December 19, 2018

NYSDEC
Mr. Benjamin McPherson, P.E.
Assistant Engineer
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203

Re: Response to November 16, 2018 NYSDEC letter to MJ Painting Contractor Corp.
Remedial Investigation Work Plan
350 Franklin Street BCP #C905046

Dear Mr. McPherson:

Roux Associates, Inc. and Roux Environmental Engineering and Geology, D.P.C. (collectively referred to as "Roux"), on behalf of MJ Painting Contractor Corp. (MJ Painting), have prepared the following response to the New York State Department of Environmental Conservation (NYSDEC) November 16, 2018 letter to MJ Painting (presented as Attachment 1) regarding the Remedial Investigation Work Plan (RIWP) submitted on September 11, 2018.

Below are responses to the NYSDEC comments listed in the November 16, 2018 e-mail; for convenience, we included the NYSDEC comments in italics, followed by our responses.

Section 1: Petroleum Impacts

- *While the primary contaminants of concern at the site are expected to be related to petroleum impacts, the remedial program must fully investigate and characterize the nature and extent of all contamination at the site. Therefore, the reference to petroleum impacts in this section will be revised or clarified to reflect the requirements of the remedial program.*

Response: Section 1 of the RIWP has been updated to more clearly outline adherence with the requirements of the remedial program.

Section 2.1: Two Mile Creek

- *According to the Department's Environmental Resource Mapper (http://www.dec.ny.gov/gis/erm), Two Mile Creek is a Class C water body. This section will be revised accordingly.*

Response: Section 2.1 of the RIWP has been updated to correctly identify the classification of Two Mile Creek.

Section 3.1.1: Sampling Interval

- *If multiple, discrete layers of contamination are observed in the subsurface then analytical samples should be collected from each layer. This section will be revised accordingly;*

Response: Section 3.1.1 of the RIWP has been updated to state that samples will be collected from each discrete layer of contamination, if encountered.

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California ■ Illinois ■ Massachusetts ■ New Jersey ■ New York ■ Texas

Section 3.2: Well Screen

- *The anticipated length of the well screen should be stated in this section. This section will be revised accordingly;*

Response: Section 3.2 of the RIWP has been updated to elaborate on the method for determining the length of well screen to be used. Exact well screen lengths will be determined based on lithology encountered during test pit/soil boring advancement.

Section 3.2: Well Construction

- *Drill cuttings may not be used to backfill soil borings that are completed as monitoring wells [DER-10 Section 3.3 (e)1.ii]. This section will be revised to include alternate material(s) to fill the annular above the bentonite seal;*

Response: Section 3.2 of the RIWP has been updated to include alternate material to fill the annular space above the bentonite seal.

Section 3.2: Site Datum

- *The use of a site datum is acceptable, but is should be noted that all sample locations must be converted into the equivalent NAD 83 coordinates;*

Response: Section 3.2 of the RIWP has been updated to state that equivalent NAD 83 coordinates will be provided.

Section 3.2.1: Existing Wells

- *The existing monitoring wells should be assessed for structural integrity during development to ensure that representative groundwater samples may be collected. Any well(s) determined to be damaged or incapable of producing a representative sample will be replaced. This section will be revised accordingly;*

Response: Section 3.2.1 of the RIWP has been updated to state that existing monitoring wells will be assessed prior to the collection of groundwater samples. Any existing wells not suitable for groundwater sampling will be replaced.

Section 3.2.1: NAPL Detection

- *The method(s) to be used for determining if non-aqueous phase liquid (NAPL) is present in monitoring wells will be stated in this section;*

Response: Section 3.2.1 of the RIWP has been updated to state that an interface probe will be used to detect NAPL in monitoring wells.

Section 3.2.1: Full Suite Samples;

- *The work plan states that 'select groundwater samples' will be tested for additional analytical parameters (i.e. sampled for the full suite of contaminants), but it is not clear how many samples will be collected. The number of wells proposed for this additional sampling will be clarified in this section;*

Response: Section 3.2.1 of the RIWP has been updated to state how many full-suite groundwater samples will be collected.

Section 3.2.2: Sampling Locations;

- *It is requested that the monitoring wells proposed for emerging contaminant sampling be listed in this section or shown on a figure. This section will be revised accordingly;*

Response: Figure 3 of the RIWP has been updated to identify emerging contaminant sample locations.

Section 4.5: Groundwater;

- *The filtered and unfiltered groundwater samples collected for metals analyses are not reflected in the quality assurance table.*

Response: The table in Section 4.5 of the RIWP has been updated to account for filtered and unfiltered groundwater samples collected for metals analyses.

Section 4.5: Emerging Contaminants;

- *In additions to the matrix spikes and field duplicates, an equipment blank sample should be collected prior to sampling. This section will be revised accordingly.*

Response: Text has been added to Section 4.5 of the RIWP to indicate that equipment blanks will be collected prior to sampling for emerging contaminants.

Section 4.5: EQuIS;

- *All analytical data generated as part of this work plan will be submitted to the EQuIS system (see https://www.dec.ny.gov/chemical/62440.html for more information). Provisions for this will be added to this section;*

Response: Section 4.5 of the RIWP has been updated to state that analytical data will be provided to NYSDEC through the EQuIS system.

Section 6.1: Personnel;

- *This section will be updated to reflect staffing changes at Roux Associates;*

Response: The Roux Associates personnel listings in Section 6.1 of the RIWP has been updated. Additionally, Appendix C (Health and Safety Plan) has been updated to reflect staffing changes at Roux Associates.

Figures:

- *All figures will be revised or added to the work plan as discussed during our November 5, 2018 conference call.*

Response: RIWP figures have been revised, based on the November 5, 2018 conference call between Roux Associates and NYSDEC.

Please let us know if you have any questions or comments.

Sincerely,

ROUX ASSOCIATES, INC.

Joseph Taormina
Principal Engineer

ROUX ENVIRONMENTAL ENGINEERING AND GEOLOGY, D.P.C.

Noelle Clarke
Principal Engineer

Attachments
cc: M. John, MJ Painting Contractor Corp.

REMEDIAL INVESTIGATION WORK PLAN

350 Franklin Street,
Olean, New York 14760

December 19, 2018

Prepared for:

MJ PAINTING CONTRACTOR CORP.
Mr. Mike John
291 Homer Street, Olean, New York

Prepared by:

ROUX ASSOCIATES, INC.
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Woburn, Massachusetts 01801

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1. INTRODUCTION

MJ Painting Contractor Corp. (MJ Painting), has elected to pursue investigation, remediation and redevelopment of the property located at 350 Franklin Street, Olean, New York (See Figures 1, 2 and 3), under the New York State Brownfield Cleanup Program (BCP or Program) and has submitted an application to the New York State Department of Environmental Conservation (NYSDEC) for entry into the Program. If accepted into the Program, MJ Painting will enter into a Brownfield Cleanup Agreement (BCA) with NYSDEC as a Volunteer.

Based on discussions from an April 18, 2018 pre-BCP application meeting with NYSDEC, Roux Associates, Inc. and Roux Environmental Engineering and Geology, D.P.C (collectively referred to as "Roux"), on behalf of MJ Painting, has prepared the following Remedial Investigation Work Plan (RIWP) to perform additional investigation activities to further evaluate the potential petroleum impacts in soil, groundwater, and soil vapor at 350 Franklin Street (the Site).[1] This RIWP has been prepared in general accordance with NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated May 3, 2010 (NYSDEC DER-10).

The remainder of this RIWP is divided into the following sections:

- Section 2.0 provides a description of the Site and known conditions;
- Section 3.0 provides a description of the proposed investigation activities;
- Section 4.0 provides a discussion on the quality assurance/quality control (QA/QC) protocols to be implemented as part of the investigation activities;
- Section 5.0 provides a discussion on health and safety protocols to be followed during the investigation activities; and
- Section 6.0 provides a list of the principal personnel who will be conducting the work and their contact information, as well as an anticipated schedule for performing the work and a brief description of the report that will be prepared once the proposed investigation activities have been completed.

[1] Primary contaminants of concern are expected to be related to petroleum impacts, based on Site history. However, the remedial program will fully investigate and characterize the nature and extent of all contamination at the Site.

2.0 DESCRIPTION OF THE SITE AND KNOWN CONDITIONS

2.1 Site Description

The Site is located in the City of Olean, Cattaraugus County, New York, at 350 Franklin Street (Figure 1). According to the City of Olean Assessor's Office on-line property information database, 350 Franklin Street consists of a 9.34-acre parcel (S.B.L. #94.040-1-2.3). The property is currently owned by MJ Painting, a commercial and industrial painting contractor. Currently, 350 Franklin Street consists of an undeveloped grass field, with the exception of two billboards located along the northwestern property boundary, adjacent to Interstate 86 (I-86).

Properties in the vicinity (approximately a 0.5-mile radius) of the Site are primarily developed as mixed use and include residential, municipal, commercial, manufacturing and industrial properties. The Site is bordered to the north/northwest by I-86; to the east by "All Weather Self Storage" at 302 Franklin Street and the Southern Tier Railroad Authority (STRA) property (S.B.L. #94.048-1-3); to the southeast by "First Transit, Inc." at 351 Franklin Street and "Scotts Rotary Seals" at 301 Franklin Street; and to the southwest by "Napoleon Engineering Services" at 1601 Johnson Street.

According to the U.S. Fish and Wildlife National Wetlands Inventory (FWS Wetland Mapper), Two Mile Creek is the only wetland located in the vicinity of the Site. Two Mile Creek is located directly northwest of the Site (see Figure 1). Two Mile Creek flows southwest through Olean, New York and discharges to the Allegheny River. According to the NYSDEC Protection of Waters Program, Two Mile Creek is considered a Class C Stream in the area of the Site. Class C is the second lowest ranking used by NYSDEC to classify waterways in New York and consists of waterways and or waterway segments which cannot be used as a drinking water source, are not suitable for swimming or contact activities, but are suitable for fisheries support or non-contact activities.[2]

The Site and surrounding areas are located within the Allegheny-Ohio-Mississippi River drainage basin and according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Olean, New York (Figure 4), the Site encompasses both "Zone B" and "Zone C" floodplain areas. Zone B areas are located between the limits of the base flood and the 500-year floodplain. Zone C areas are considered "areas of minimal flood hazard."

2.2 Historical Land Use

The section of Olean, NY which surrounds the area of the Site, has historically been occupied with industrial operations including, but not limited to, petroleum storage and refining, leather tanneries, heavy and light manufacturing, chrome plating, fertilizer manufacturing, and railroad facilities. The Site and area immediately surrounding the Site were formally part of the Socony-Vacuum Oil Company, Inc. refinery, and used primarily as a petroleum refining facility between 1876 and 1954. From 1954 through 1964, Swan Finch Oil Company Olean Industries, Inc. stored grain and corn in approximately 60 tanks and buildings on the refinery property. From 1964 through 1981, Felmont Oil and Agway removed the old refinery tanks and buildings and constructed an anhydrous ammonia plant, jointly producing ammonia and other fertilizers on portions of the surrounding area.

[2] Higher classifications of waterways include Class A or AA (drinking water source) and Class B (suitable for swimming or contact activities).

Following ownership by Felmont Oil Corporation, the Cattaraugus County Industrial Development Agency owned the parcel from 1981 through 1989 when Blue Bird Industrial Park, Inc. took over ownership in 1989. The parcel was subsequently purchased from Blue Bird Industrial Park, Inc by MJ Painting in March 2018.

2.3 Regulatory History

According to NYSDEC Spill Database, three Spill Numbers (0501100, 0550226 and 1300859) have been assigned to areas surrounding and/or within the 350 Franklin Street parcel as far back as 2005. Several investigation and remedial activities were performed at 350 Franklin Street and are summarized below by Spill Number:

Spill Number 0501100

According to the NYSDEC Spill Report Form for Spill Number 0501100, on April 27, 2005 at 5:06 am, a tractor-trailer owned and operated by Anthony Mast, Inc. was involved in a traffic accident on I-86 eastbound between exits 25 and 26 in Olean, New York. The accident involved the tractor-trailer overturning causing a release of approximately 30 gallons of diesel fuel from a saddle tank of the truck. The diesel fuel was released onto the unpaved, grassy medium. Portville Trucking responded to the spill and cleaned up the immediate area with "speedi-dry". NYSDEC, which was notified of the release at 5:45 am on April 27, 2005, assigned Spill Number 0501100.

On April 29, 2005, NYSDEC received a report of a sheen on the surface of the water and banks of Two Mile Creek, which flows adjacent to 1-86. NYSDEC determined that the source of the sheen was a culvert that receives drainage from the bridge drains of I-86 in the area of the Anthony Mast, Inc. April 27, 2005 release. According to the NYSDEC Spill Report Form updated August 8, 2005, the observed sheen on the Two Mile Creek extended from the culvert to the bridge on 24th Street, approximately 1.4 miles away. OP Tech Environmental Services, Inc. (OP Tech) responded to the sheen report and deployed absorbent pads and booms. No new spill number was issued by NYSDEC for the sheen found on the Two Mile Creek. According to the NYSDEC Spill Report Form, the sheen on the Two Mile Creek appeared to be flowing from the culvert associated with storm water drainage from I-86.

On May 4, 2005, OP Tech excavated soil from the area around the storm water drainage culvert as part of release response actions associated with the Anthony Mast, Inc. diesel fuel release. While removing soils from ground surface to 6 inches (in) below ground surface (bgs), OP Tech personnel observed what they described to be a "sludge/oil material" directly below surficial soils. Under the direction of NYSDEC, OP Tech continued the excavation activities to an approximate depth of 4 to 5 feet (ft) bgs where they encountered groundwater with a "sludge/oil" material on the surface. NYSDEC determined that "a very old product was present just under the area that had been excavated for the spill" and assigned Spill Number 0550226. Spill Number 0501100 was subsequently closed by NYSDEC on February 23, 2006.

Spill Number 0550226

In a June 7, 2005 letter to ExxonMobil, NYSDEC identified ExxonMobil as a responsible party for Spill Number 0550226 and requested investigation and remedial work. Subsequently, several investigations were performed under Roux oversight, on behalf of ExxonMobil, for Spill Number 0550226 which are summarized below:

- July/August 2007 - Roux conducted investigation activities which included the installation of soil borings to facilitate the collection of soil samples as well as discrete groundwater samples. The July/August 2007 subsurface investigation results are provided in the November 27, 2007 *Summary of Subsurface Investigation Report,* prepared by Roux, on behalf of ExxonMobil.

- January 2011 - Roux conducted additional investigation activities which included the installation of soil borings and monitoring wells to facilitate the collection of soil samples and groundwater samples to further evaluate the presence of petroleum impacts. The January 2011 subsurface investigation results are provided in the April 28, 2011 *Subsurface Investigation Summary Report,* prepared by Roux, on behalf of ExxonMobil.

- June and October 2011 - Roux conducted two additional rounds of ground water sampling in 2011, the results of which were provided in the February 28, 2012 *Ground Water Monitoring Summary Report,* prepared by Roux, on behalf of ExxonMobil.

- July and November 2012 - Roux conducted bi-annual ground water monitoring activities in of 2012, the results of which were provided in the April 1, 2013 *Bi-Annual Ground Water Monitoring and Subsurface Investigation Summary Report,* prepared by Roux, on behalf of ExxonMobil.

- December 2012/January 2013 - Roux conducted additional investigation activities which included the installation of soil borings and monitoring wells to facilitate the collection of soil samples and ground water samples to further evaluate the presence of petroleum impact. The December 2012/January 2013 investigation results are provided in the April 1, 2013 *Bi-Annual Ground Water Monitoring and Subsurface Investigation Summary Report*, prepared by Roux, on behalf of ExxonMobil.

- July 2013 – In a letter dated July 5, 2013 to ExxonMobil, NYSDEC closed Spill Number 0550226 on July 2, 2013 with a status of "inactive".

Spill Number 1300859

In a letter dated April 26, 2013 to ExxonMobil, NYSDEC issued Spill Number 1300859, indicating that *"This spill is associated with petroleum contained in, and potentially spilled from, abandoned dilapidated piping"*, potentially, *"…associated with the historic SOCONY Vacuum Refinery…"* located at 351 Franklin Street, Olean, New York (S.B.L. #94.040-1-29.1) and on the adjacent STRA property (S.B.L.s #94.048-1-3 and #94.040-1-26). Specifically, the *"petroleum contained within the piping"* was identified during remedial activities at the adjacent 301 Franklin Street property under the NYSDEC BCP (Scott Rotary Seals Site No. C905036). These remedial activities included *"the removal of abandoned refinery piping. Pipes extending off site were cut and capped at the property boundary"* and information pertaining to these pipes is provided in the *Final Engineering Report* prepared for the Scott Rotary Seals site.[3] Further, in the April 26, 2013 letter, NYSDEC requested that ExxonMobil initiate cleanup and removal activities of the "spill" including submittal of a remedial investigation work plan.

Following the initial investigation/remedial efforts conducted under Spill Number 1300859, the Site was expanded to include the 350 Franklin Street parcel. Subsequently, several investigation and remedial activities were performed at the 350 Franklin Street parcel under Roux oversight, on behalf of ExxonMobil, for Spill Number 1300859 which are summarized below:

- October 2014 – A geophysical survey was performed at a portion of the 350 Franklin Street parcel to assist in further identifying abandoned piping and to better understand any additional potential subsurface features. Details regarding the October 2014 work is summarized in the April 14, 2015 *Piping Investigation Summary Report*, prepared by Roux, on behalf of ExxonMobil;

[3] The *Final Engineering Report* describes piping extending onto 351 Franklin Street (southwest of 301 Franklin Street) and the STRA property (east and southeast of 301 Franklin Street).

- June 2015 – A geophysical survey of the remainder of the 350 Franklin Street parcel was conducted to assist in further identifying abandoned piping and potential subsurface features. Details regarding the June 2015 work is summarized in the October 21, 2015 *Test Pit Investigation Summary Report,* prepared by Roux, on behalf of ExxonMobil;

- November/December 2015 – Test pitting to investigate subsurface features and identify areas of grossly contaminated material (GCM) was performed at 350 Franklin Street.[4] Details regarding the November/December 2015 work is summarized in the June 14, 2016 *Test Pit and Piping Investigation Summary Report*, prepared by Roux, on behalf of ExxonMobil;

- November/December 2016 - Test pitting and piping/GCM removal activities were performed at 350 Franklin Street. Details regarding the November/December 2016 work is summarized in the July 6, 2017 *Test Pit and Piping Investigation Summary Report*, prepared by Roux, on behalf of ExxonMobil.

Based upon the impacts identified at the Site, an additional phase of investigation is being proposed to further evaluate the remainder of 350 Franklin Street for petroleum and other impacts. Copies of the previously submitted reports described above, along with comprehensive maps summarizing historical soil and groundwater detections above applicable regulatory standards/guidance values observed at the Site (Figure 2 and Figure 3 of the BCP Application) are included as Appendix A.

[4] Per 6 NYCRR Part 375, "GCM" means soil which contains sources or substantial quantities of mobile contamination in the form of Non-Aqueous Phase Liquid (NAPL), as defined in subdivision 375-1.2(ac), that is identifiable either visually, through strong odor, by elevated contaminant vapor levels, or is otherwise readily detectible without laboratory analysis.

3.0 PROPOSED INVESTIGATION ACTIVITIES

As discussed, this RIWP has been prepared to further evaluate the nature and extent of contamination at the Site. The proposed investigation activities, which include the assessment of soil, groundwater and soil vapor are discussed in the Sections below.

Prior to performing any subsurface investigation activities, DigSafely NewYork, Inc. and the City of Olean, New York water and sewer departments will be contacted by Roux to identify and mark, if applicable, known utilities at the Site.

Due to the importance of community air monitoring, a Community Air Monitoring Plan (CAMP) has been prepared, outlined in Section 5.0 and included as Appendix B. Additionally, a Site-Specific Health and Safety Plan (HASP) has been included as Appendix C. Real time air and particulate monitoring will be implemented during all ground intrusive activities throughout the implementation of this RIWP in accordance with the CAMP.

All work will be conducted in general accordance with Roux Standard Operating Procedures (SOP), EPA guidance and NYSDEC DER-10 guidance. A list of applicable Roux SOPs is summarized in Section 4.0 and included as Appendix D.

3.1 Soil Investigation Activities

Roux proposes to complete up to 31 test pit excavations at the Site. Each location will be advanced in an effort to adequately characterize the depth of potential contamination at the Site. Based on visual classification of the soil encountered, sample interval (depth), and/or the presence of petroleum impacts (i.e. odor, sheen, staining or volatile organic compounds (VOCs) in jar headspace readings), locations may be selected for installation of monitoring wells as described below. Note that soil borings may be advanced to further delineate the horizontal or vertical extent of contamination, if necessary. Proposed test pit locations are shown on Figure 3.

All soil removed during test pit excavations and/or soil boring advancement will be returned to the subsurface in the general order that it was removed upon completion of soil sample collection. All locations will be recorded electronically using a Global Positioning System (GPS) device.

3.1.1 Soil Sample Collection Methodology

Soil samples will be collected continuously during test pit excavation using the excavator bucket (minimum of 3-foot intervals). If a soil boring is deemed necessary, samples will be collected using a direct push sampler (3- or 4-foot long macro-core or equivalent) lined with a polyvinyl chloride (PVC) sleeve. Upon retrieval, each soil sample within the collection device (complete sample interval) will be visually inspected for the presence of petroleum impact, screened using calibrated photoionization detector (PID), and characterized for visual and textural classifications based on the Unified Soil Classification System (USCS). In addition, any observations regarding staining, odor and/or sheen in/on the soil will be noted.

Roux will prepare up to three soil samples from each location for laboratory analysis (up to two surface samples and up to one subsurface soil sample). Surface soil samples (0 to 2 inches below vegetative cover) will be collected from each test pit location in an effort to assess potential human exposures to soil. Note that additional near surface soil samples (0 to 1 foot below vegetative cover) may be collected in an effort to assess cover soil in anticipation for remedial efforts. Subsurface soil samples will be collected in an effort to

provide a profile of subsurface conditions. The subsurface soil sample will be collected from discrete interval within each location based on visual classification, the presence of petroleum impacts, and/or evidence of VOCs in PID screening results.[5] Sampling activities will be conducted in general accordance with Section 3.5 of the NYSDEC DER-10 and Roux SOPs.

Soil samples will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified commercial laboratory for analyses including:

- VOCs by EPA Methods 8260B including tentatively identified compounds (TICs);
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270C including TICs; and
- Total Target Analyte List (TAL) Metals by EPA Methods 6010B/7470A.[6]

Up to 12 surface soil samples and/or near surface soil samples and up to 12 subsurface soil samples will also be tested for total cyanide, polychlorinated biphenyls (PCBs), pesticides and herbicides. The locations of the soil samples being tested for these additional analyses will be selected based on conditions encountered during test pit excavation and will provide spatial coverage. Note that additional samples may be collected, and additional analyses may be performed based on conditions encountered in the field and/or disposal facility characterization requirements.

3.2 Groundwater Investigation Activities

Roux proposes to install and sample up to seven monitoring wells in addition to the 11 existing monitoring wells. Monitoring well locations will provide spatial coverage and will be selected based on conditions encountered during test pit excavation to permit characterization of up gradient and down gradient groundwater conditions, in addition to groundwater conditions on the interior of the Site. Proposed monitoring well locations are shown on Figure 3.

Monitoring wells will be constructed with two-inch diameter, 0.10-inch slotted schedule 40 polyvinyl chloride (SCH 40 PVC) screen (well screen) with an appropriate length of solid SCH 40 PVC casing to extend the well to approximately surface grade. To facilitate the installation of the monitoring wells, soil borings will be advanced using either hollow-stem auger and/or direct push methods. The wells will be installed in the borehole so that the screen extends from above the observed water table to the top of the silty clay confining layer. As such, screen lengths at each location will vary based on field observations. The annulus around the well will be filled with silica sand from the bottom of the well to approximately one foot above the top of the well screen. A well seal consisting of approximately two feet of hydrated bentonite will be placed above the sand pack. The remainder of the annular space will be filled with bentonite, silica sand, or hydraulic cement. All monitoring wells will be fitted with a locking gripper plug and completed with a flush mount road box or stickup protective steel casing.

Excess soil cuttings, including all soil not suitable for backfill, generated during boring advancement activities will be placed in Department of Transportation (DOT) approved 55-gallon steel drums and temporarily stored

[5] If multiple discrete layers of contamination are encountered, samples from each individual layer will be collected for laboratory analysis.

[6] TAL metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

on-Site pending disposal characterization and profiling. Upon characterization and profiling, the drum(s) will be shipped to a NYSDEC-approved disposal/recycling facility.

A survey will be conducted by a licensed surveyor at the conclusion of monitoring well installation activities to measure the elevation of each monitoring well relative to a local site datum.[7]

3.2.1 Ground Water Sample Collection Methodology

Following monitoring well installation activities, the seven newly installed and eleven previously existing monitoring wells will be developed in accordance with Roux's SOP for developing monitoring wells in unconsolidated formations.[8] Water levels (and NAPL levels, if present) in each monitoring well will be measured using an electronic interface probe. Groundwater samples will be collected from all monitoring wells that do not exhibit the presence of NAPL in general accordance with EPA low-flow sampling methodology.[9] Groundwater gauging and sampling activities will be conducted in accordance with Section 3.7 of the NYSDEC DER-10 and Roux SOPs.

Groundwater samples collected will be submitted to a NYSDOH ELAP certified commercial laboratory for analyses including:

- VOCs by EPA Methods 8260B including TICs;
- SVOCs by EPA Method 8270C including TICs;
- Total TAL Metals by EPA Methods SW846 (unfiltered);
- Dissolved TAL Metals by EPA Methods SW846 (field filtered through 0.45-micron filter);

Groundwater samples from up to 8 monitoring wells will also be tested for total cyanide, polychlorinated biphenyls (PCBs), pesticides and herbicides. Sample locations for this additional testing will be distributed across the Site (up gradient, on-Site, down-gradient). All liquid (e.g., purge water) generated during sample collection will be placed in DOT approved 55-gallon steel drums and temporarily stored at the Site pending disposal. At the conclusion of groundwater sampling activities, the drum(s) will be shipped to a NYSDEC-approved disposal/recycling facility.

3.2.2 Emerging Contaminants Sample Collection Methodology

As discussed during the BCP Pre-Application meeting between MJ Painting, Roux and NYSDEC on April 18, 2018, NYSDEC has required the assessment of "emerging contaminants" as part of a state-wide initiative to better understand the risk posed by 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS). Emerging contaminant sampling will be completed on four monitoring well locations including at two down-gradient monitoring well, one up gradient monitoring well and one on-Site monitoring wells. Proposed sampling locations are provided on Figure 3. The following sections detail the sample preparation, sample collection, sample analysis and reporting requirements as outline by NYSDEC in their April 2018 *Groundwater Sampling for Emerging Contaminants* guidance included as Appendix E.

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[7] The site datum will be established during the survey activities. Corresponding North American Datum of 1983 (NAD83) coordinates will be provided to NYSDEC for sample locations.

[8] If an existing monitoring wells is found to be damaged during development, the monitoring well will be replaced.

[9] Low-flow sampling uses a peristaltic pump to extract ground water while minimizing the stress to surrounding aquifer. Water quality parameters, including pH, dissolved oxygen content, oxidation reduction potential and temperature, are measured during ground water purging. Ground water samples are collected when water quality parameters stabilize, indicating that ground water is being drawn from the aquifer surrounding the well screen.

3.2.2.1 Sample Preparation

In accordance with the April 2018 NYSDEC *Groundwater Sampling for Emerging Contaminants* guidance (Appendix E), acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. All sampling equipment components and sample containers will be handled in a way as to not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials. All clothing worn by sampling personnel will have been laundered multiple times and will not contain PTFE material (including GORE TEX®) or have been waterproofed with perfluorinated compound (PFC) materials. All food and drink packaging will be avoided throughout the duration of the sampling. If contact does occur with any of the prohibited materials outline above, a standard two-step decontamination using detergent and a clean water rinse will be performed for all equipment and/or sampler's hands that come in contact with PFC materials.

3.2.2.2 Sample Collection

Groundwater samples collected for analysis of emerging contaminates will be containerized first at each monitoring well as to avoid the potential for contamination from other sampling bottles or equipment. Sample collection will be conducted in accordance with the procedure outlined above in Section 3.2.1. Note that the sampler must wear clean nitrile gloves while handling, filling and sealing all sample bottles associated with emerging contaminates analysis. As describe above, if contact does occur with any of the prohibited materials outline above, a standard two-step decontamination using detergent and a clean water rinse will be performed for all equipment and/or sampler's hands that do come in contact with PFC materials.

3.2.2.3 Sample Analysis

PFAS

Groundwater samples will be submitted to a NYSDOH ELAP certified commercial laboratory for PFAS analyses by EPA Method 537 or ISO 25101. Samples will be analyzed for the full PFAS target analyte list provided in the April 2018 *Groundwater Sampling for Emerging Contaminants* guidance using the modified EPA Method 537 to achieve a method detection limit (MDL) for perfluorooctanoic acid (PFOA) and perfluorooctanessulfonic acid (PFOS) that is no higher than 2 nanograms per liter (ng/l).

1,4-Dioxane

Groundwater samples will be submitted to a NYSDOH ELAP certified commercial laboratory for 1,4-dioxane analyses by EPA Method 8270 in "selective ion monitoring" (SIM) mode to achieve a MDL for 1,4-dioxane that is no higher than 0.28 microgram per liter (µg/l).

3.3 Soil Vapor Investigation Activities

In accordance with Section 2.6.1 of New York State Department of Health's (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006 and updated in May 2017 (NYSDOH Guidance), soil vapor at the Site must be assessed in an effort to:

- Evaluate the potential for current on-Site or off-Site exposures;
- Evaluate the potential for future exposures if development on a known suspected contaminated area on-Site is possible; and
- Evaluate on-Site and off-Site preferential migration pathways in areas with low permeability soils (i.e., utility trenches).

Nine soil vapor points will be installed at the Site to meet the objectives outlined above. Soil vapor sample locations will be selected considering the location of off-Site receptors, the location of underground utilities and the location of areas of grossly contaminated material identified in test pits/soil borings. Proposed soil vapor point locations are shown on Figure 3.

Soil vapor points will be constructed by installing a six-inch long, stainless steel sample screen to the depths between 2.5 feet and 4 feet below ground surface.[10] Teflon-lined polyethylene tubing will attach to each sample screen and extend to above surface grade. Silica sand will be added around the soil vapor point sample screen to six inches above the top of the screen. A one-foot thick layer of hydrated bentonite will be placed above the sand. The remainder of the boring annulus will be filled with a cement-bentonite grout in an effort to prevent negative bias due to potential infiltration of outdoor air. The soil vapor point will be completed to grade with a secure, five-inch diameter, flush-mounted curb box set in a concrete pad.

3.3.1 Soil Vapor Sample Collection Methodology

Following installation, soil vapor points will be sampled in accordance with the NYSDOH Guidance using the following procedure:

1. Each soil vapor point, including sample tubing and the surrounding sand pack, will be purged of approximately three volumes of air using a vacuum pump set at a rate of approximately 0.2 liters per minute.

2. Tracer gas testing will be conducted on all soil vapor points to verify that ambient air is not diluting the soil vapor sample during collection. Tracer gas testing includes:

    a) Isolating the soil vapor point beneath a plastic container (i.e., a five-gallon bucket);

    b) Injecting tracer gas (i.e. helium) into the sealed plastic container during purging of the soil vapor point to create a tracer gas enriched environment within the sealed plastic container;

    c) Screening both the air purged from the soil vapor point and air drawn from the tracer gas enriched environment within the sealed plastic container for the tracer gas using a Dielectric MGD-2002 helium detector; and

    d) Comparing the screening results from the soil vapor point to the screening results in the tracer gas enriched environment within the sealed plastic container. If the helium concentration observed in air drawn from the soil vapor point is less than 10% of the helium concentration in the tracer gas enriched environment within the sealed plastic container, the soil vapor point is considered to be free from ambient air impacts (i.e., leaks resulting in sample dilution).

3. Soil vapor samples will be collected using a laboratory-supplied, calibrated flow controller to direct soil vapor or ambient air, as applicable, at a rate of 0.2 liters per minute or less, to a 6-liter Summa canister over a 30-minute sampling period.

Soil vapor samples will be submitted to a NYSDOH ELAP-certified commercial laboratory for analyses of VOCs by EPA Method TO-15.

[10] NYSDOH Guidance specifies that soil vapor samples for evaluation of potential on-Site exposure be collected at a depth comparable to the depth of foundation footings (determined on a building-specific or Site-specific basis) or at least one foot above the water table in areas where the groundwater table is less than six feet below grade. Proposed on-Site buildings will be constructed with slab-on-grade construction with pillar footings extending approximately 2.5 feet to 4 feet below ground surface.

4.0 QA/QC PROTOCOLS

4.1 Project Scope and Goals

The following Quality Assurance Project Plan (QAPP) has been prepared.

4.2 Project Organization

This QAPP was prepared in accordance with Section 2 of the NYSDEC DER-10, Quality Assurance for Sampling and Laboratory Analysis and has been reviewed by the project Quality Assurance Officer (QAO). This project is managed by Brian Klaus of Roux under the direction of Mike John Sr. of MJ Painting Contractor Corp. Additional information regarding principal project personnel is provided in Section 6.0.

4.3 Sampling and Equipment Decontamination Procedures

Sampling and equipment decontamination procedures will be conducted in general accordance with Roux Standard Operating Procedures (SOP), EPA guidance and NYSDEC DER-10 guidance. A list of applicable Roux SOPs that are included as Appendix D is summarized below:

- SOP 3.1 – Collection of Quality Control Samples for Water-Quality Data;
- SOP 3.2 – Field Record Keeping and Quality Assurance/Quality Control;
- SOP 3.3 – Sample Handling;
- SOP 4.1 – Measuring Water Levels and Sounding a Well with a Steel Tape;
- SOP 4.2 - Measuring Water Levels using an Electronic Sounding Device (Well Gauging);
- SOP 4.3 - Purging a Well;
- SOP 4.4 - Sampling Ground Water Monitoring Wells for Dissolved Constituents;
- SOP 4.6 – Filtration of Groundwater and Surface-Water Samples for Dissolved Metals Analysis;
- SOP 4.7 – Measuring the Thickness of Floating Separate-Phase Organic Liquids;
- SOP 5.1 - Collection of Soil Samples for Laboratory Analysis;
- SOP 5.4 - Screening Soil Samples for Volatile Organic Vapors using a Portable Photoionization Detector;
- SOP 6.1 – Measuring pH of Water Samples;
- SOP 6.2 – Measuring the Conductivity of Water Samples;
- SOP 6.3 – Measuring Water Temperature;
- SOP 9.1 - Decontamination of Field Equipment;
- SOP 10.3 - Soil Boring and/or Monitoring or Observation Well Drilling, Formation Sampling and Borehole Abandonment in Unconsolidated Formations; and
- SOP 10.4 – Construction, Development and Abandonment of Monitoring or Observation Wells in Unconsolidated Formations.

4.4 Investigation Locations

A Site map showing the existing monitoring well locations and proposed investigation locations is provided as Figure 3.

4.5 Analytical Methods/Quality Assurance Summary Table

The following Analytical Methods/Quality Assurance Summary Tables have been prepared for the environmental and quality control samples for the proposed soil and ground water sampling:

Sample Quantity	MS/MSD	No. of Field Duplicates	Analytical Method	Sample Preservative	Container/ Volume	Holding Time
Maximum of 23 surface samples; maximum of 23 near surface samples; maximum of 23 subsurface samples (up to 69 samples)	3	3	Full list of VOCs EPA Method 8260B	MeOH	1 x 40-mL vial (glass)	14 days
				$NaHSO_4$	2 x 40-mL vial (glass)	14 days
			SVOCs EPA Method 8270C	None	1 x 8-oz jar (glass)	14 days
			Total TAL Metals EPA Methods SW846 6010B & 7470A			28+ days
Maximum of 12 Surface samples/near surface samples; maximum of 12 subsurface samples (up to 24 samples)	1	1	PCBs EPA Method 8082A	None	1 x 4-oz jar (glass)	14 days
			Pesticides EPA Method 8081A	None	1 x 4-oz jar (glass)	14 days
			Herbicides EPA Method 8151A	None	1 x 4-oz jar (glass)	14 days
			Total Cyanide	None	1 x 4-oz jar (glass)	14 days
1 per monitoring well location (up to 17 samples; 6 from newly installed monitoring wells, 11 from existing monitoring wells)	1	1	VOCs EPA Method 8260B	HCl	3 x 40-mL vial (glass)	14 days
			SVOCs EPA Method 8270C	None	2 x 1,000-mL bottle (glass)	7 days
			TAL Metals (total) EPA Method SW846 6010B & 7470A	Nitric Acid	1 x 250-mL (plastic)	28+ days
			TAL Metals (dissolved) EPA Method SW846 6010B & 7470A	Nitric Acid	1 x 250-mL (plastic)	28+ days
1 from each of up to 8 monitoring well locations	1	1	PCBs EPA Method 8082A	None	2 x 1,000-mL bottle (glass)	7 days
			Pesticides EPA Method 8081A	None	2 x 1,000-mL bottle (glass)	7 days
			Herbicides EPA Method 8151A	None	2 x 1,000-mL bottle (glass)	7 days
			Total Cyanide	NaOH	1 x 1,000-mL bottle (plastic)	14 days
1 from each of up to 4 monitoring well locations	1	1	PFAS EPA Method 537[11]	Trizma	2 x 500-mL bottle (HDPE or polypropylene plastic)	14 days
			1,4-dioxane EPA Method 8270 SIM[12]	None	2 x 500-mL bottle (glass)	7 days
1 per soil vapor point location (up to 9 samples)	1	1	VOCs by EPA Method TO-15	None	1 x 6-L Summa Canister	30 days

[11] One equipment blank sample will be collected prior to each sampling event.
[12] One equipment blank sample will be collected prior to each sampling event.

Notes:

If additional samples are collected, one field duplicate and one MS/MSD will be collected for every 20 samples.
MS/MSD = matrix spike/matrix spike duplicate
mL = milliliter
oz = ounce
HCl = hydrochloric acid
MeOH = methanol
$NaHSO_4$ = sodium bisulfate
NaOH = sodium hydroxide
VOC = volatile organic compound
SVOC = semi-volatile organic compound
TAL = target analyte list
TPH = total petroleum hydrocarbons

All data deliverables submitted as part of this remedial investigation will be requested in NYSDEC ASP Category B deliverables and will be reviewed and a Data Usability Summary Report (DUSR) will be prepared in accordance with the requirement of Appendix 2B of DER-10 for all data used to characterize the nature and extent of contamination at the Site. All analytical data generated as part of this remedial investigation will be submitted to the NYSDEC EQuIS system. Data providers will be instructed to submit a complete data package to EQuIS.[13]

4.6 Sampling Storage and Handling Requirements

All laboratory samples collected will be properly preserved according to laboratory requirements, placed in appropriate containers as specified in the above table, and transported on ice under chain of custody to a NYSDOH ELAP-certified laboratory.

[13] More information on the NYSDEC EQuIS program is available at https://www.dec.ny.gov/chemical/62440.html

5.0 HEALTH AND SAFETY PROTOCOLS

Roux has prepared a Site-specific HASP that will be adhered to by all personnel involved in the work activities (see Appendix C). The Site-specific HASP was prepared in accordance with the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Operations and Emergency Response Standards (29 CFR 1910.120 and 1926.65) and other OSHA requirements for job safety and health protection, as well as Roux SOPs. The Site-specific HASP includes Safety Data Sheets (SDS) for chemicals and materials being used and personal protective equipment (PPE) requirements specific to the type of work that will be conducted. Various documents were consulted while preparing the HASP, including the National Institutes of Safety and Health (NIOSH's) Occupation Safety and Health Guidance Manual for Hazardous Waste Activities.

Site-specific information in the HASP includes:

- Personnel training requirements;
- Description of field activities;
- Decontamination procedures;
- Waste disposal protocols;
- Monitoring procedures for Site operations;
- A hazard assessment;
- The designation of a Site Health and Safety Officer (SHSO);
- A heavy equipment exclusion zone policy; and
- CAMP.

The HASP designates a SHSO who will report directly to the Project Manager and the Corporate Health and Safety Coordinator. The HASP will be subject to revision as necessary, based on new information that is identified during the field investigation. A copy of the Site-specific HASP will be on-Site at all times throughout the work activities.

Remedial construction specialty contractors (Contractors) working under the direction of Roux will be required to prepare and submit a Site-specific HASP prior to initiation of work activities that will cover their employees and their project-specific tasks. Contractors will monitor general Site conditions for safety hazards to verify that all OSHA requirements outlined in 29 CFR Part 1910 and 1926 are adhered to.

5.1 Community Air Monitoring

Real-time community air monitoring will be performed during remedial activities at the Site. A CAMP is included as Appendix B. The CAMP is consistent with the requirements for community air monitoring at remediation sites as established by the NYSDOH and NYSDEC. Accordingly, the CAMP follows procedures and practices outlined under NYSDEC DER-10, including NYSDOH's Generic Community Air Monitoring Plan, and Fugitive Dust and Particulate Monitoring.

Roux will monitor for airborne particulates and VOCs along the upwind and downwind perimeter of the work area. Air monitoring will occur during all ground intrusive activities throughout the duration of this RIWP including, but not limited to: excavation of test pits; advancement of soil borings for completion as monitoring wells and soil vapor points; collection of soil (surface and subsurface), groundwater and soil vapor samples; excavation of petroleum impacted soil; temporary soil stockpiling; placement and compaction of backfill; treatment of excavated soil, and loading of excavated soil into trucks for transport off-Site. All monitoring data gathered in accordance with the CAMP will be recorded and available for NYSDEC and NYSDOH personnel to review upon request.

6.0 PRINCIPAL PERSONNEL, WORK SCHEDULE AND REPORTING

6.1 List of Principal Personnel/Contact Information

Provided below is a list of key personnel involved in the work, contact information and their responsibilities:

Mike John, Sr. – Property Owner
MJ Painting Contractor Corp.
291 Homer Street
Olean, New York
(716) 373-3033
mikejohn@mjpaintingcontractor.com

Brian Klaus – Project Manager/QAO
Project Geologist
Roux Associates, Inc.
12 Gill Street, Suite 4700
Woburn, Massachusetts
(781) 569-4000
bklaus@rouxinc.com

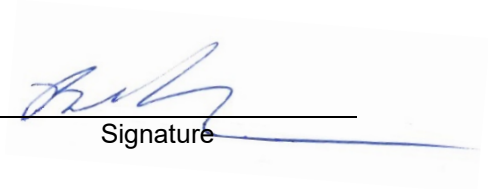
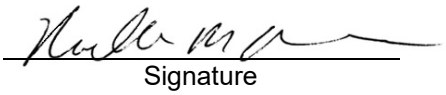
Joseph Taormina – Project Principal
Principal Engineer
Roux Associates, Inc.
12 Gill Street, Suite 4700
Woburn, Massachusetts
(781) 569-4000
jtaormina@rouxinc.com

Noelle Clarke – Principal Engineer
Roux Environmental Engineering and Geology, D.P.C
209 Shafter Street
Islandia, New York
(631) 232-2600
nclarke@rouxinc.com

6.2 Work Schedule and Reporting

The Investigation is anticipated to begin in April 2019 depending on 1) acceptance of the 350 Franklin Street Site into the BCP; and 2) NYSDEC approval of this RIWP. Within 90 days following the completion of the investigation activities, MJ Painting will submit to NYSDEC a report providing the methods and results of the sampling along with a plan for additional investigation and/or remedial actions, if required.

Prepared By:

Brian Klaus	12/19/2018	
Project Geologist	Date	Signature
Joseph Taormina	12/19/2018	
Principal Engineer	Date	Signature
Noelle Clark	12/19/2018	
Principal Engineer	Date	Signature

FIGURES

1. Site Map
2. Site Boundary Map
3. Site Plan
4. Flood Insurance Rate Map

T:\GIS\MJ PAINTING CONTRACTOR CORP\2317.0002M000\106\2137.0002M000.106.1.mxd

SITE LOCATION

QUADRANGLE LOCATION

SOURCE:
USGS: 1980, Olean, New York 7.5 Minute Topographic Quadrangle. Contour Interval 3 Meters

1,000 0 1,000 2,000 Feet

Title:

SITE LOCATION MAP

350 FRANKLIN STREET

Prepared For: MJ PAINTING CONTRACTOR CORP.

ROUX

Compiled by: SB	Date: 10DEC18
Prepared by: SB	Scale: AS SHOWN
Project Mgr: BK	Project: 2317.0002M000
File: 2137.0002M000.106.1.mxd	

FIGURE 1

LEGEND

SITE FEATURES

SITE BOUNDARY

NOTES:
1.ALL LOCATIONS ARE APPROXIMATE

2.2006 AERIAL PHOTOGRAPH AND PROPERTY BOUNDARY OBTAINED FROM THE CATTARAUGUS COUNTY GIS WEBSITE http://maps.cattco.org/website/parcel/viewer.htm

50 0 50 100
Feet

Title: **SITE PLAN**

350 FRANKLIN STREET, OLEAN, NY

Prepared For: MJ PAINTING CONTRACTOR CORP.

ROUX

Compiled by: SB	Date: 10DEC18	FIGURE
Prepared by: SB	Scale: AS SHOWN	2
Project Mgr: BK	Project: 2317.0002M000	
File: 2317.0002M000.106.4.mxd		

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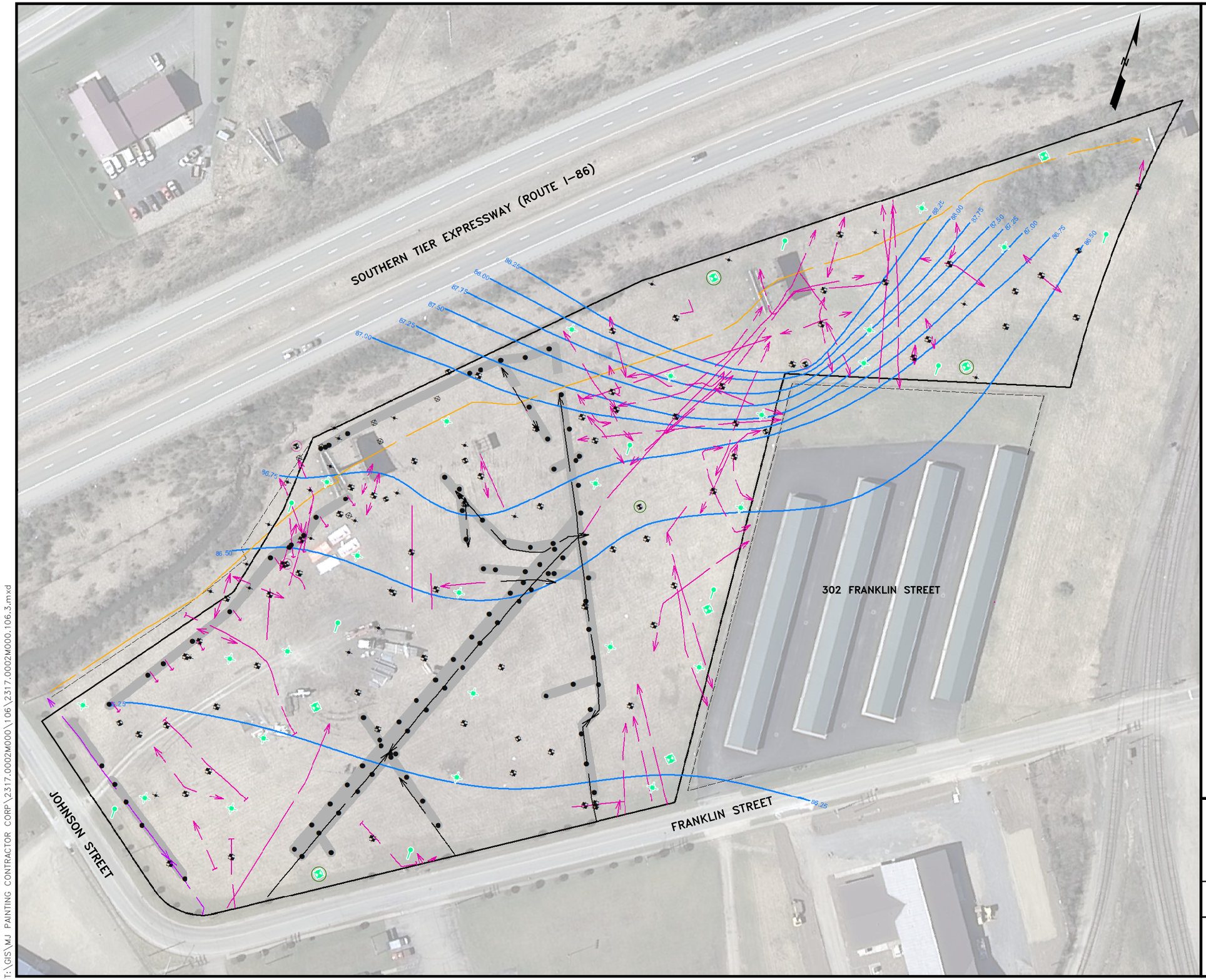

LEGEND

SITE FEATURES

- SITE BOUNDARY
- EXISTING FENCE
- ACTIVE ELECTRIC UTILITY
- POTENTIAL SUBSURFACE PIPING
- ASSESSED SUBSURFACE PIPING LEFT IN PLACE
- REMOVED SUBSURFACE PIPING
- LINE OF EQUAL WATER TABLE ELEVATION IN FEET RELATIVE TO SITE DATUM

EXISTING MONITORING LOCATIONS AND PREVIOUS INVESTIGATION LOCATIONS

- APPROXIMATE LOCATION OF MONITORING WELL
- APPROXIMATE LOCATION OF MONITORING WELL WITH SPH OBSERVED
- APPROXIMATE LOCATION OF DISCRETE SAMPLE
- APPROXIMATE LOCATION OF SOIL BORING
- APPROXIMATE LOCATION OF TEST PIT
- PIPING REMOVAL AND EXCAVATION END POINT SAMPLE LOCATION
- AREA OF COMPLETED PIPING REMOVAL AND EXCAVATION ACTIVITIES

PROPOSED INVESTIGATION LOCATIONS

- PROPOSED TEST PIT/SOIL BORING LOCATION
- PROPOSED TEST PIT/SOIL BORING LOCATION TO BE COMPLETED AS A MONITORING WELL
- PROPOSED SOIL VAPOR POINT LOCATION
- PROPOSED LOCATION OF EMERGING CONTAMINANT SAMPLING

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE

2. 2006 AERIAL PHOTOGRAPH AND PROPERTY BOUNDARY OBTAINED FROM THE CATTARAUGUS COUNTY GIS WEBSITE http://maps.catfco.org/website/parcel/viewer.htm

3. GROUND WATER ELEVATIONS ARE IN FEET RELATIVE TO SITE DATUM (TOP OF THE CONCRETE PAD PROTECTING MW-208 HAS BEEN ASSIGNED THE VALUE OF 100.00 FEET)

4. GROUNDWATER CONTOURS ARE BASED ON GAUGING DATA COLLECTED JANUARY 22, 2013 AND JANUARY 23, 2013

50 0 50 100
Feet

Title: **SITE PLAN**

350 FRANKLIN STREET, OLEAN, NY

Prepared For: MJ PAINTING CONTRACTOR CORP.

ROUX

Compiled by: SB	Date: 14DEC18	FIGURE
Prepared by: SB	Scale: AS SHOWN	3
Project Mgr: BK	Project: 2317.0002M000	
File: 2317.0002M000.106.3.mxd		

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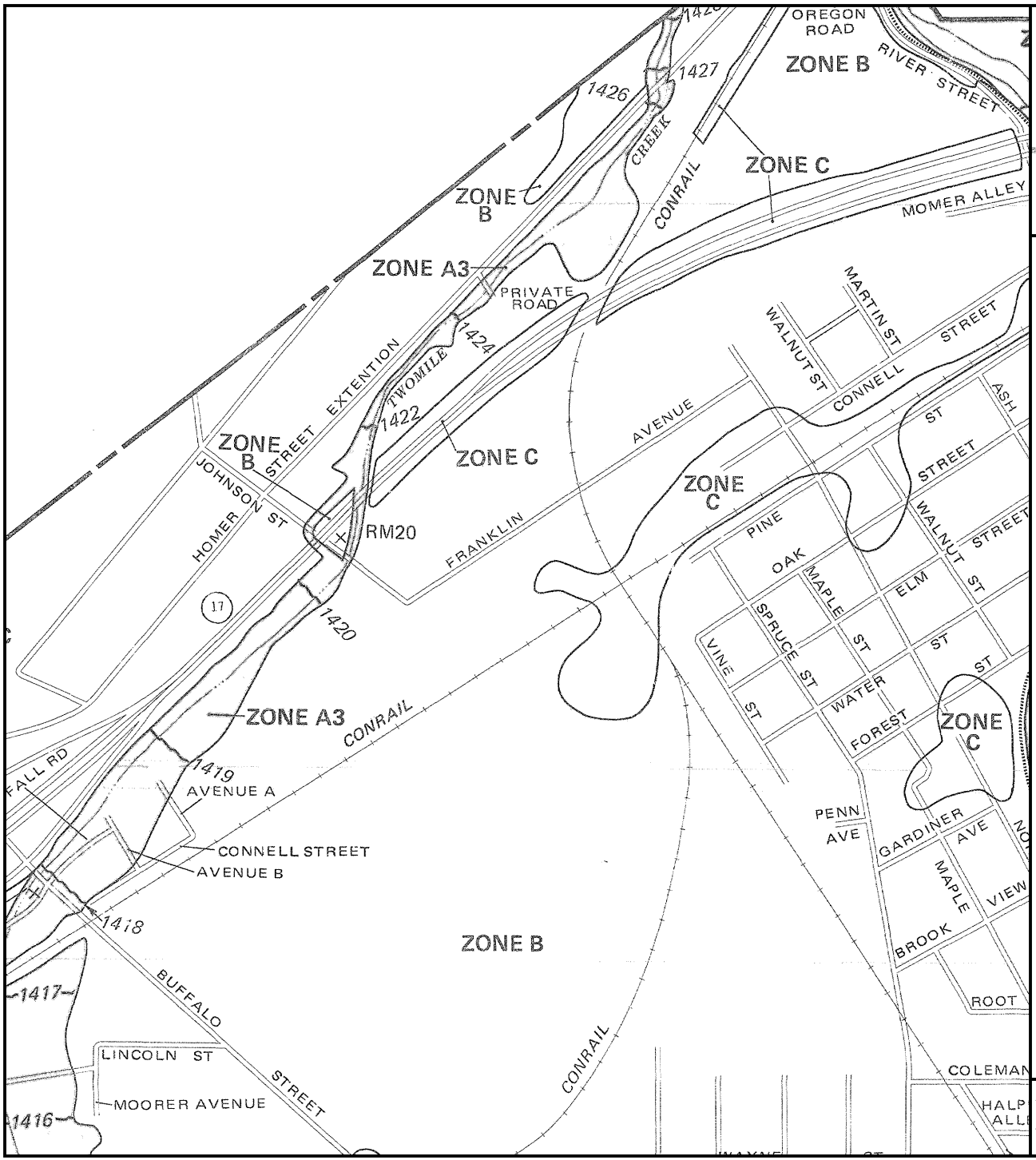


NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

CITY OF
OLEAN, NEW YORK
CATTARAUGUS COUNTY

COMMUNITY-PANEL NUMBER
360088 0001 B

(ONLY PANEL PRINTED)

MAY 9 1980

U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

FIGURE 4

APPENDICES

A. Historical Information – included on CD
B. Community Air Monitoring Plan
C. Health and Safety Plan
D. Roux Standard Operating Procedures
E. Groundwater Sampling for Emerging Contaminants

APPENDIX A

Historical Information – included on CD

APPENDIX B

Community Air Monitoring Plan

COMMUNITY AIR MONITORING PLAN

350 Franklin Street,
Olean, New York 14760

July 18, 2018

Prepared for:

MJ PAINTING CONTRACTOR CORP.
Mr. Mike John
291 Homer Street, Olean, New York

Prepared by:

ROUX ASSOCIATES, INC.
12 Gill Street, Suite 4700
Woburn, Massachusetts 01801

2317.0002M000.103/RCV

Table of Contents

Appendices

1.0 INTRODUCTION

Roux Associates, Inc. (Roux Associates), on behalf of MJ Painting Contractor Corp. (MJ Painting), has prepared the following Community Air Monitoring Plan (CAMP) to ensure the subsurface investigation and remediation activities at 350 Franklin Street Site (the Site), in Olean, New York 14760 do not adversely affect the downwind community, and to preclude or minimize airborne migration of Site contaminants to offsite areas. The proposed sub-surface investigation activities include excavation of test pits; advancement of soil borings for completion as monitoring wells and soil vapor points; collection of soil (surface and subsurface), groundwater and soil vapor samples; excavation of petroleum impacted soil; temporary soil stockpiling; placement and compaction of backfill; treatment of excavated soil, and loading of excavated soil into trucks for transport off-Site.

Compliance with this CAMP is required during all subsurface investigation activities that have the potential to generate airborne particulate matter and volatile organic compounds (VOCs). Subsurface investigation activities include both ground intrusive activities requiring continuous monitoring (test pitting, and petroleum impacted soil excavation, temporary soil stockpiling, placement of backfill, loading trucks, soil boring advancement, and installation of groundwater monitoring wells), as well as non-intrusive activities requiring periodic monitoring (collection of soil and groundwater samples). This CAMP has been prepared to ensure that subsurface investigation activities do not adversely affect passersby or workers in the area immediately surrounding the Site and to preclude or minimize airborne migration of airborne particulate matter and VOCs to off-Site areas.

This CAMP is consistent with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan, which is included as Appendix 1A of the New York State Department of Environmental Conservation (NYSDEC) “Draft DER-10 Technical Guidance for Site Investigation and Remediation (DER-10),” dated May 3, 2010.

2.0 AIR MONITORING PROCEDURES DURING SUBSURFACE INVESTIGATION ACTIVITIES

VOCs, semi-volatile organic compounds (SVOCs), and metals are all constituents of concern at the Site. The appropriate method to monitor air for these constituents during subsurface investigation activities is through real-time VOC and air particulate (dust) monitoring. As discussed, subsurface investigation activities include both ground intrusive activities requiring continuous monitoring for VOC and dust concentrations and non-intrusive activities requiring periodic monitoring for VOCs. Specific air monitoring procedures required during ground intrusive and non-intrusive activities are described below.

Ground Intrusive Activities

Continuous VOCs and particulate monitoring will be required for all ground intrusive activities conducted at the Site including test pitting, petroleum impacted soil excavation, temporary soil stockpiling, placement of backfill, loading trucks, soil boring advancement, and groundwater monitoring well installation.

Non-Intrusive Activities

Periodic monitoring for VOCs will be required during non-intrusive activities including the collection of soil and groundwater samples.

2.1 Wind Direction

Wind direction will be evaluated at a minimum at the start of each workday, noon of each workday, and the end of each workday. These readings will be utilized to position the monitoring equipment in appropriate upwind and downwind locations. An appropriate Site figure will be included on the contractor's daily sheet to record the wind direction and monitoring equipment locations.

2.2 Volatile Organic Compound Monitoring

During all ground intrusive activities, VOCs will be monitored periodically at the upwind perimeter and continuously at the downwind perimeter of the designated work areas. A portable hand-held PID will be used to periodically monitor conditions at upwind locations. Monitoring equipment capable of measuring total VOC concentrations (PID) and capable of integrating (averaging) over periods of 15 minutes or less will be set up at the downwind location, at a height of approximately 4 to 5 feet above land surface (i.e., the breathing zone). The audible alarm on the PID will be set at 5 parts per million (ppm). Monitoring equipment will be MiniRAE 2000 portable VOC monitors or similar equipment.

VOC concentrations will be measured at monitoring stations located along the upwind and downwind perimeters of all ground intrusive work areas. Locations of both upwind and downwind monitoring stations will be determined based upon the meteorological data collected throughout the workday and are subject to change in response to changes in wind direction and speed.

A portable hand-held PID will be used to periodically monitor conditions at locations downwind of all non-intrusive work areas during, or immediately prior to, soil and groundwater sampling activities.

The following summarizes VOC action levels and the appropriate responses:

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps are performed, work activities can resume, provided the total organic vapor level 200 feet downwind of the work area or half the distance to the nearest potential receptor or residential/commercial structure – whichever is less but in no case less than 20 feet – is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown, the source of vapors identified, and corrective measures taken to abate emissions, as described below in Section 2.2.1.

All readings will be recorded and made available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report, as shown in Appendix A, will be completed.

2.2.1 Potential Corrective Measures and VOC Suppression Techniques

If the 15-minute integrated VOC level at the downwind location persists at a concentration that exceeds the upwind level by more than 5 ppm but less than 25 ppm during ground intrusive activities, then vapor suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive organic vapors:

- limiting the excavation size;
- backfilling the excavation;
- spraying water onto the excavation faces and equipment;
- covering soil stockpiles with 6-mil plastic sheeting;
- hauling waste materials in properly tarped containers; and/or
- applying vapor suppressant foam.

All air monitoring readings will be recorded in the field logbook and will be available for the NYSDEC and NYSDOH personnel to review.

2.3 Particulate Monitoring

Air monitoring for particulates (i.e., dust) will be performed continuously during intrusive subsurface investigation activities using both air monitoring equipment and visual observation at upwind and downwind locations. Monitoring equipment capable of measuring particulate matter smaller than 10 microns (PM_{10})

and capable of integrating (averaging) over periods of 15 minutes or less will be set up at upwind (i.e., background) and downwind locations, at heights approximately four to five feet above land surface (i.e., the breathing zone). Monitoring equipment will be MIE Data Ram monitors, or equivalent. The audible alarm on the particulate monitoring device will be set at 90 micrograms per cubic meter (µg/m^3). This setting will allow proactive evaluation of worksite conditions prior to reaching the action level of 100 µg/m^3 above background. The monitors will be calibrated at least once per day prior to work activities and recalibrated as needed thereafter. In addition, fugitive dust migration will be visually assessed during all intrusive subsurface investigation activities.

The following summarizes particulate action levels and the appropriate responses:

- If the downwind PM_{10} particulate level is 100 µg/m^3 greater than background (upwind perimeter) for the 15-minute period, or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM_{10} particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM_{10} particulate levels are greater than 150 µg/m^3 above the upwind level, work must be stopped and an evaluation of activities initiated. Work can resume provided that dust suppression measures (as described in Section 2.3.1 below) and other controls are successful in reducing the downwind PM_{10} particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report, as shown in Appendix A, will be completed.

2.3.1 Potential Particulate Suppression Techniques

If the integrated particulate level at the downwind location exceeds the upwind level by more than 100 µg/m^3 at any time during intrusive subsurface investigation activities, then dust suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive dusts:

- limiting the excavation size;
- backfilling the excavation;
- spraying water onto the excavation faces and equipment;
- covering soil stockpiles with 8-mil plastic sheeting;
- hauling waste materials in properly tarped containers; and/or
- limiting vehicle speeds on Site.

Work may continue with dust suppression techniques provided that downwind PM_{10} levels are not more than 150 µg/m^3 greater than the upwind levels.

There may also be situations where the dust is generated by intrusive subsurface investigation activities and migrates to downwind locations, but is not detected by the monitoring equipment at or above the action level. Therefore, if dust is observed leaving the working area, dust suppression techniques such as those listed above will be employed.

If dust suppression techniques do not lower particulates to below 150 µg/m^3, or visible dust persists, work will be suspended until appropriate corrective measures are identified and implemented to remedy the situation.

All air monitoring readings will be recorded in the field logbook and will be available for the NYSDEC and NYSDOH personnel to review.

3.0 REFERENCES

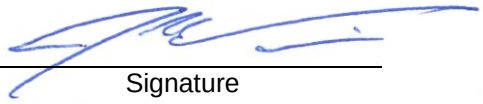
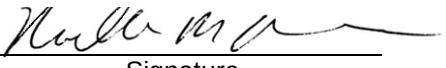
NYSDOH, 2010. New York State Department of Health Generic Community Air Monitoring Protocol, May 3, 2010 (also included as Appendix 1A to the Draft Technical Guidance for Site Investigation and Remediation, NYSDEC, May 2010).

COMMUNITY AIR MONITORING PLAN

350 Franklin Street,
Olean, New York 14760

July 18, 2018

Prepared By:

Amy Hoffmann	7/31/2018	
Project Geologist	Date	Signature
Joseph Taormina	7/31/2018	
Principal Engineer	Date	Signature
Noelle Clark	7/31/2018	
Principal Engineer	Date	Signature

APPENDICES

A. Action Limit Report

APPENDIX A

Action Limit Report

ACTION LIMIT REPORT

Project Location: _____

Date: _____ Time: _____

Name: _____

Contaminant: PM-10: _____ VOC: _____

Wind Speed: _____ Wind Direction: _____

DOWNWIND DATA

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

UPWIND DATA

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

BACKGROUND CORRECTED LEVELS

Monitor ID #: _____ Location: _____ Level Reported: _____

Monitor ID#: _____ Location: _____ Level Reported: _____

ACTIONS TAKEN

APPENDIX C

Health and Safety Plan

HEALTH & SAFETY PLAN

MJ Painting Contractor Corp.
350 Franklin Street, Olean, NY 14760

Date: July 17, 2018
Date of Reissue: December 13, 2018

Project Manager: _____ 12/13/2018
Brian Klaus *Date*

Office Health &
Safety Manager: _____ 12/13/2018
James Dick *Date*

Site Health &
Safety Manager: _____ 12/13/2018
Sara Barrientos *Date*

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& Management
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rouxinc.com

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SITE-SPECIFIC EMERGENCY INFORMATION

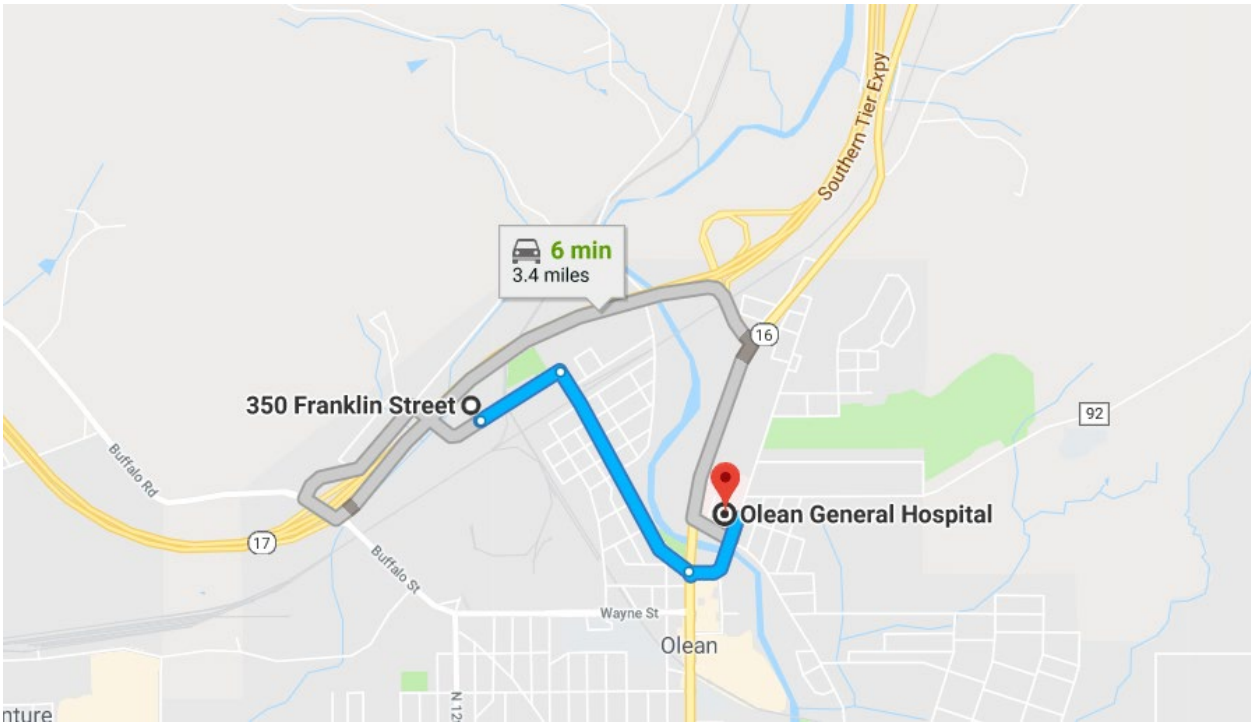
Emergency Phone Numbers

Most emergency services can be obtained by calling **911**. Where 911 service is not available, use the telephone numbers provided in the below table. The following is a master emergency phone list for use by the project management personnel. A more condensed version of the emergency numbers listed below will be posted throughout project work areas. Emergencies encountered on the Site will be responded to by a combination of off-Site emergency services and Site personnel.

Emergency Contact Information			
Site Personnel			
Title	Contact		Telephone
Project Manager (PM)	Brian Klaus		781-569-4039 516-448-8265 (Cell)
Office Health and Safety Manager (OHSM)	James Dick		781-569-4036 617-596-8841 (Cell)
Site Supervisor	Sara Barrientos		781-569-4033 781-513-6984 (Cell)
Site Health and Safety Officer (SHSO)	Sara Barrientos		781-569-4033 781-513-6984 (Cell)
Outside Assistance			
Agency	Contact	Telephone	Address/Location
Ambulance/EMS	Olean Fire Department	716-376-5609 911	542 North Union Street Olean, NY 14760
Police	Olean Police Department	716-376-5677 911	101 E State Street Olean, NY 14760
Fire	Olean Fire Department	716-376-5609 911	542 North Union Street Olean, NY 14760
Hospital	Olean General Hospital	716-373-2600	515 Main Street Olean, NY 14760
Occupational Health Clinic	Olean General Hospital Occupational Medicine	716-375-7495	901 Wayne Street Olean, NY 14760

Directions to Hospital

The nearest hospital to the Site is Olean General Hospital located approximately 1.4 miles from the Site at 515 Main Street, Olean, NY. The Hospital contact number for Olean General Hospital is (716) 373-2600. The map and directions from the Site to Olean General Hospital are as follows:



350 Franklin St

Olean, NY 14760

1. Head northeast on Franklin St — 0.3 mi
2. Turn right onto N Union St
   - Pass by 7-Eleven (on the right in 0.8 mi)

   — 0.8 mi
3. At the traffic circle, take the 2nd exit onto Main St
   - Pass by Pizza Hut (on the right)
   - Destination will be on the left

   — 0.3 mi

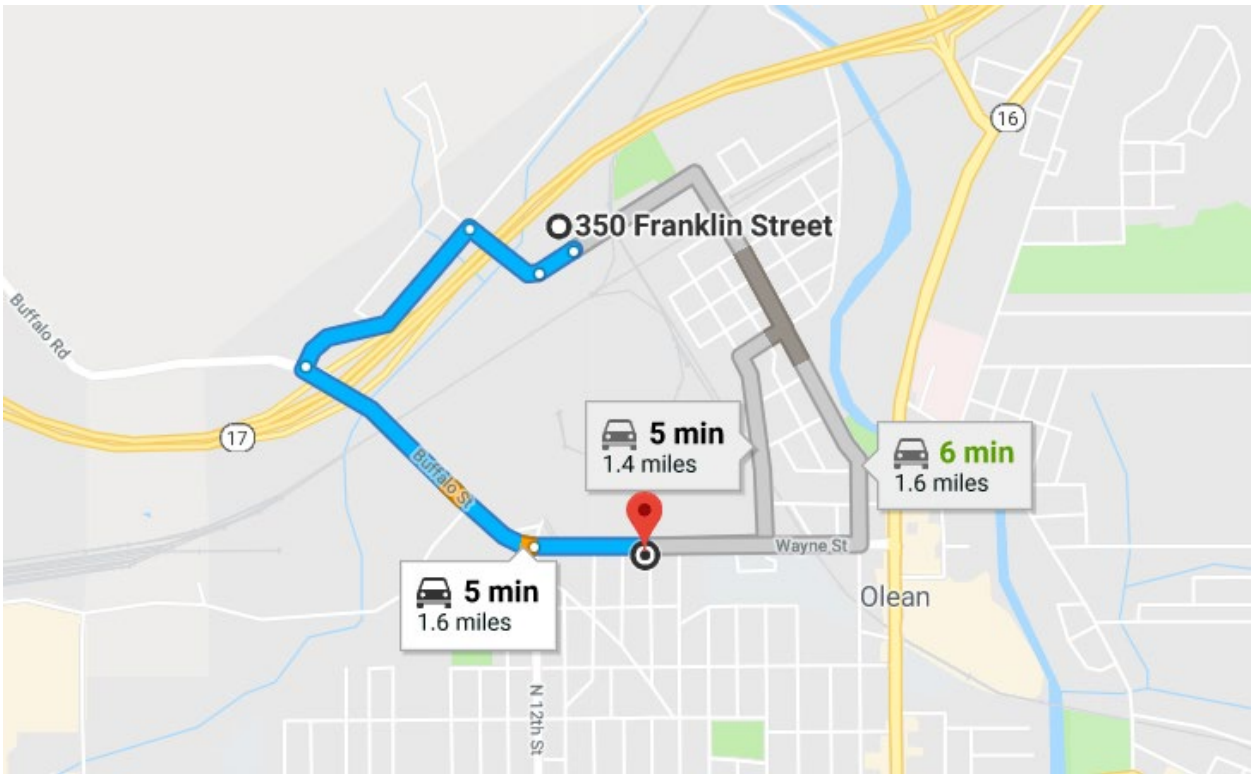
Olean General Hospital

515 Main St, Olean, NY 14760

Directions to Occupational Health Clinic

An occupational health clinic (OHC) is to be used for non-emergency situations so that delays in treatment and unnecessary services and medications that typically occur as a result of emergency room visits can be avoided. A non-emergency situation is defined as a non-life-threatening occupational injury or illness where the proper use of first aid is the appropriate treatment as opposed to more extensive medical treatment unless it is subsequently determined that the more extensive medical treatment is necessary. Occupational health clinic professionals are more extensively trained in first aid protocols (as defined by OSHA at 29 CFR 1904). These protocols are designed to return of the injured or ill worker to his/her job as quickly as possible and avoid over treatment. Emergency room visits (i.e., 911 calls) are to be reserved for life-threatening situations and those requiring treatment beyond first aid including but not limited to: respiratory distress (i.e., not breathing), amputations, and severe bleeding.

The nearest occupational health clinic to the Site is Olean General Hospital Occupational Medicine, and is located approximately 1.3 miles from the Site at 901 Wayne Street, Olean, NY. The hours of the OHC are Monday - Friday 8 a.m. - 4 p.m. The telephone number for Olean General Hospital Occupational Medicine is (716) 375-7495. The map and directions from the Site are as follows:



350 Franklin St

Olean, NY 14760

1. Head southwest on Franklin St toward Johnson St — 472 ft
2. Continue onto Johnson St — 0.2 mi
3. Turn left onto Homer St — 0.5 mi
4. Turn left onto Buffalo St — 0.6 mi
5. Continue onto Wayne St — 0.2 mi
   Destination will be on the right

901 Wayne St

Olean, NY 14760

1.0 INTRODUCTION

This Site-specific Health and Safety Plan (HASP) has been prepared by Roux Associates, Inc. (Roux) for use during the subsurface investigation and remedial activities at 350 Franklin Street in Olean, New York ("the Site"; see **Figure 1**). These activities fall within the scope of operations covered by the Occupational Safety and Health Administration (OSHA) standards promulgated at 29 CFR 1910.120 and 29 CFR 1926.65, both commonly referred to as the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. In accordance with the HAZWOPER Standard, this Site-specific HASP was prepared to address the safety and health hazards associated with subsurface investigation and remedial activities being performed at the Site by Roux, and to provide requirements and procedures for the protection of Roux employees, subcontractor personnel, government oversight personnel, Site personnel, and the general public. It also addresses client- and Site-specific requirements for health and safety.

Implementation of this HASP is the joint responsibilities of the Project Manager (PM), the Site Health and Safety Officer (SHSO), and all field staff, with assistance from the Project Principal and the Office Health and Safety Manager (OHSM). The PM for this project is Brian Klaus. The SHSO and Site Supervisor is Sara Barrientos.

1.1 Roles and Responsibilities

Overall Roles and Responsibilities (R&Rs) of Roux personnel are provided in Roux's Policies and Procedures Manual. Only those R&Rs specific to HASP requirements are listed below.

Project Manager (PM)

The PM has responsibility and authority to direct all work operations. The PM coordinates safety and health functions with the SHSO, has the authority to oversee and monitor the performance of the SHSO, and bears ultimate responsibility for the proper implementation of this HASP. The specific duties of the PM are:

- preparing and coordinating the Site work plan;
- providing Site Supervisor(s) with work assignments and overseeing their performance;
- coordinating safety and health efforts with the SHSO;
- ensuring effective emergency response through coordination with the Emergency Response Coordinator (ERC); and
- serving as primary Site liaison with public agencies and officials and Site contractors.

Site Health and Safety Officer (SHSO)

The SHSO has full responsibility and authority to develop and implement this HASP and to verify compliance. The SHSO reports to the PM. The SHSO is on Site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SHSO include:

- managing the safety and health functions on this Site;
- serving as the Site's point of contact for safety and health matters;

- ensuring Site monitoring, worker training, and effective selection and use of PPE;
- assessing Site conditions for unsafe acts and conditions and providing corrective action;
- assisting the preparation and review of this HASP;
- maintaining effective safety and health records as described in this HASP; and
- coordinating with the Site Supervisor(s) and others as necessary for safety and health efforts.

Site Supervisor

The Site Supervisor is responsible for field operations and reports to the PM. The Site Supervisor ensures the implementation of the HASP requirements and procedures in the field. The specific responsibilities of the Site Supervisor include:

- executing the work plan and schedule as detailed by the PM;
- coordination with the SHSO on safety and health; and
- ensuring Site work compliance with the requirements of this HASP.

Site Workers

Site workers are responsible for complying with this HASP, using the proper PPE, reporting unsafe acts and conditions, and following the work and safety and health instructions of the PM, SHSO, and Site Supervisor.

2.0 BACKGROUND

MJ Painting Contractor Corp. (MJ Painting) owns the property of concern at 350 Franklin Street, Olean, Cattaraugus County, New York depicted in **Figure 1**. The current use of the parcel is an undeveloped grass field with the exception of billboards adjacent to Interstate 86 located along the northwestern property line. The parcel is comprised of approximately 9.34 acres of land currently zoned for Commercial/Industrial use. A Site Map is included as **Figure 2**.

MJ Painting plans to expand its current operations from the 291 Homer Street parcel onto the 350 Franklin Street parcel which will include redevelopment plans for future growth on an as-need basis. All future use following redevelopment activities on 350 Franklin Street will remain consistent with the current zoning laws/maps (Commercial/Industrial).

2.1 Site Description

The Site is located in the City of Olean, Cattaraugus County, New York, at 350 Franklin Street (Figure 1). According to the City of Olean Assessor's Office on-line property information database, 350 Franklin Street consists of a 9.34-acre parcel (S.B.L. #94.040-1-2.3). As stated above, 350 Franklin Street consists of an undeveloped grass field, with the exception of two billboards located along the northwestern property boundary, adjacent to Interstate 86 (I-86).

According to the U.S. Fish and Wildlife National Wetlands Inventory (FWS Wetland Mapper), Two Mile Creek is the only wetland located in the vicinity of the Site. Two Mile Creek is located directly northwest of the Site (see Figure 1). Two Mile Creek flows southwest through Olean, New York and discharges to the Allegheny River. According to the NYSDEC Protection of Waters Program, Two Mile Creek is considered a Class D Stream in the area of the Site. Class D is the lowest ranking used by NYSDEC to classify waterways in New York and consists of all waterways and/or waterway segments which cannot be used as a drinking water source, are not suitable for swimming or contact activities and are not suitable for fisheries support or non-contact activities.

The Site and surrounding areas are located within the Allegheny-Ohio-Mississippi River drainage basin and according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Olean, New York (Figure 3), the Site encompasses both "Zone B" and "Zone C" floodplain areas. Zone B areas are located between the limits of the base flood and the 500-year floodplain. Zone C areas are considered "areas of minimal flood hazard."

Properties in the vicinity (approximately a 0.5-mile radius) of the Site are primarily developed as mixed use and include residential, municipal, commercial, manufacturing and industrial properties. The Site is bordered to the north/northwest by I-86; to the east by "All Weather Self Storage" at 302 Franklin Street; to the southeast by "First Transit, Inc." at 351 Franklin Street and "Scotts Rotary Seals" at 301 Franklin Street; and to the southwest by "Napoleon Engineering Services" at 1601 Johnson Street.

2.2 Site History

The section of Olean, NY which surrounds the area of the Site, has historically been occupied with industrial operations including, but not limited to, petroleum storage and refining, leather tanneries, heavy and light manufacturing, chrome plating, fertilizer manufacturing, and railroad facilities. The Site and area immediately surrounding the Site were formally part of the Socony-Vacuum Oil Company, Inc. refinery, and used primarily

as a petroleum refining facility between 1876 and 1954. From 1954 through 1964, Swan Finch Oil Company Olean Industries, Inc. stored grain and corn in approximately 60 tanks and buildings on the refinery property. From 1964 through 1981, Felmont Oil and Agway removed the old refinery tanks and buildings and constructed an anhydrous ammonia plant, jointly producing ammonia and other fertilizers on portions of the surrounding area. Following ownership by Felmont Oil Corporation, the Cattaraugus County Industrial Development Agency owned the parcel from 1981 through 1989 when Blue Bird Industrial Park, Inc. took over ownership in 1989. The parcel was subsequently purchased from Blue Bird Industrial Park, Inc by MJ Painting in March 2018.

2.3 Known and Potential Releases of Hazardous Substances at the Site

Several environmental investigations have been performed at the Site from 2005 through 2016. Previous environmental investigations at the Site include multiple subsurface investigations to evaluate the presence of petroleum impacted soil and/or groundwater associated with past uses of the land and various spills that have occurred on or near the property. Test pit investigations, coupled with geophysical surveys, and limited excavations were also conducted to assess and remove subsurface piping and petroleum-impacted soils.

Previous environmental investigations are summarized below by the applicable NYSDEC Spill Number:

Spill Number 0501100

According to the NYSDEC Spill Report Form for Spill Number 0501100, on April 27, 2005 at 5:06 am, a tractor-trailer owned and operated by Anthony Mast, Inc. was involved in a traffic accident on I-86 eastbound between exits 25 and 26 in Olean, New York. The accident involved the tractor-trailer overturning causing a release of approximately 30 gallons of diesel fuel from a saddle tank of the truck. The diesel fuel was released onto the unpaved, grassy medium. On April 29, 2005, NYSDEC received a report of a sheen on the surface of the water and banks of Two Mile Creek, which flows adjacent to 1-86. NYSDEC determined that the source of the sheen was a culvert that receives drainage from the bridge drains of I-86 in the area of the Anthony Mast, Inc. April 27, 2005 release.

On May 4, 2005, OP Tech excavated soil from the area around the storm water drainage culvert as part of release response actions associated with the Anthony Mast, Inc. diesel fuel release. While removing soils from ground surface to 6 inches (in) below ground surface (bgs), OP Tech personnel observed what they described to be a "sludge/oil material" directly below surficial soils. Under the direction of NYSDEC, OP Tech continued the excavation activities to an approximate depth of 4 to 5 feet (ft) bgs where they encountered groundwater with a "sludge/oil" material on the surface. NYSDEC determined that "a very old product was present just under the area that had been excavated for the spill" and assigned Spill Number 0550226. Spill Number 0501100 was subsequently closed by NYSDEC on February 23, 2006.

Spill Number 0550226

In a June 7, 2005 letter to ExxonMobil, NYSDEC identified ExxonMobil as a responsible party for Spill Number 0550226 and requested investigation and remedial work. Subsequently, several investigations including soil boring, well installation, soil sampling, and groundwater sampling were performed under Roux oversight, on behalf of ExxonMobil.

Spill Number 1300859

In a letter dated April 26, 2013 to ExxonMobil, NYSDEC issued Spill Number 1300859, indicating that *"This spill is associated with petroleum contained in, and potentially spilled from, abandoned dilapidated piping"*,

potentially, *"…associated with the historic SOCONY Vacuum Refinery…"* located at 351 Franklin Street, Olean, New York (Parcel 94.040-1-29.1) and on the adjacent Southern Tier Railroad Authority (STRA) property (Parcels 94.048-1-3 and 94.040-1-26). Specifically, the *"petroleum contained within the piping"* was identified during remedial activities at the adjacent 301 Franklin Street property under the NYSDEC BCP (Scott Rotary Seals Site No. C905036). These remedial activities included *"the removal of abandoned refinery piping. Pipes extending off site were cut and capped at the property boundary"* and information pertaining to these pipes is provided in the *Final Engineering Report* prepared for the Scott Rotary Seals site. Further, in the April 26, 2013 letter, NYSDEC requested that ExxonMobil initiate cleanup and removal activities of the "spill" including submittal of a remedial investigation work plan.

Following the initial investigation/remedial efforts conducted under Spill Number 1300859, the Site was expanded to include the 350 Franklin Street parcel. Subsequently, several investigation and remedial activities including geophysical surveys, test pitting, and petroleum impacted soil removal activities were performed at the 350 Franklin Street parcel under Roux oversight, on behalf of ExxonMobil.

3.0 SCOPE OF WORK

Site activities planned at this time and covered by this HASP include activities associated with subsurface investigation and remediation activities. All subcontractors used for the completion of these activities will be vetted by Roux for compliance with respect to health and safety requirements and metrics as well as compliance with licensing and insurance requirements.

Proposed activities associated with the subsurface investigation and remediation activities include:

- Excavation of test pits;
- Advancement of soil borings for completion as monitoring wells and soil vapor points;
- Collection of soil (surface and subsurface);
- Groundwater and soil vapor sampling;
- Excavation of petroleum-impacted soil;
- Temporary soil stockpiling;
- Placement and compaction of backfill;
- Treatment of excavated soil;
- Loading of excavated soil into trucks for transport off-Site; and
- Performing air monitoring in the work area throughout the subsurface investigation and remediation activities as detailed in the Community Air Monitoring Plan in accordance with the New York State Department of Health (NYSDOH).

If there are any changes with the scope a revision of the HASP will be required to address any new hazards.

4.0 SITE CONTROL

This Site control program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas, to identify and isolate contaminated areas of the site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the site, and to deter vandalism and theft.

4.1 Site Map

A map of this site, showing site boundaries is provided in **Figure 2**. Designated work zones and points of entry and exit will accompany this HASP in a separate document.

4.2 Site Access

During work, access to the Site will be restricted to reduce the potential for exposure to its safety and health hazards; work zones will be demarcated during heavy equipment operation and physical barriers (i.e., fencing) are planned to be installed for the heavy construction phase(s) at the Site.

Appendix H details Roux Associates' Traffic Control Management Program and shall be referenced when establishing Site access points.

4.3 Buddy System

While working in the Exclusion Zone, site workers use the buddy system. The buddy system means that personnel work in pairs and stay in close visual contact to be able to observe one another and summon rapid assistance in case of an emergency. The responsibilities of workers using the buddy system include:

- Remaining in close visual contact with partner,
- Providing partner with assistance as needed or requested,
- Observing partner for signs of heat stress or other difficulties,
- Periodically checking the integrity of partner's PPE, and
- Notifying the SHSO or other site personnel if emergency assistance is needed.

4.4 Site Communications

The following communication equipment is used to support on-Site communication: Cell phones.

A current list of emergency contact numbers is posted in the following locations: See SITE-SPECIFIC EMERGENCY INFORMATION section in this HASP.

4.5 Site Work Zones

This Site is divided into three (3) major zones, described below. These zones are characterized by presence or absence of biological and chemical hazards and the activities performed within them. Zone boundaries are clearly marked at all times and the flow of personnel among the zones is controlled. The Site is monitored for changing conditions that may warrant adjustment of zone boundaries. Zone boundaries are adjusted as necessary to protect personnel and clean areas. Whenever boundaries are adjusted, zone markings are

also changed and workers are immediately notified of the change. Refer to the Heavy Equipment Exclusion Zone (HEEZ) Policy in **Appendix E** for guidance on implementing and adhering to work zone requirements when heavy equipment is in operation.

Exclusion Zone

The area where contamination exists is the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered the EZ. This zone will be clearly delineated by orange high visibility fencing. Safety tape may be used as a secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy (co-worker)
- Required minimum level PPE
- Medical Authorization
- Training certification
- Requirement to be in the zone

Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) is established between the Exclusion Zone and the Support Zone. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of personnel and equipment. The CRZ will be used for general Site entry and egress in addition to access for heavy equipment and emergency support services. Personnel are not allowed in the CRZ without:

- A buddy (co-worker)
- Appropriate PPE
- Medical authorization
- Training certification
- Requirement to be in the zone

Support Zone

The Support Zone (SZ) is an uncontaminated area that will be the field support area for the Site operations. The SZ will contain the HASP, sampling equipment, air monitoring equipment and provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

5.0 JOB HAZARD EVALUATION

Roux's work at the Site is expected to entail a variety of physical, chemical, and biological hazards, all of which must be sufficiently managed to allow the work to be performed safely. Some of the hazards are Site-specific (i.e., they are associated with the nature, physical characteristics, and/or routine operation of the Site itself), while others are activity-specific (i.e., they are associated with (or arise from) the particular activity being performed). The various hazards can be grouped into the following categories:

Caught/Crushed – the potential to become caught in, under, between, or by an object or parts of an object, such as equipment with parts that open and close or move up and down ("pinch points") or equipment that rotates, and the accompanying potential to have body parts cut, mangled, or crushed thereby.

Contact – the potential to be struck by or against moving or stationary objects that can cause physical injury, such as heavy machinery, overhead piping, moving vehicles, falling objects, and equipment (including tools and hand-held equipment) or infrastructure with the ability to cut or impale.

Energy Sources – the potential for bodily harm associated with energy sources, most notably electricity, but also including latent energy sources such as compressed air and equipment under tension (which when released could cause injurious contact or a fall).

Ergonomics – the potential for musculoskeletal injury associated with lifting/carrying, pushing/pulling, bending, reaching, and other physical activity attributable to poor body position/mechanics, repetitive motion, and/or vibration. A management plan to circumvent ergonomic issues during driving and field activities is included in **Appendix K**.

Exposure – the potential for injury/illness due to physical, chemical, or biological exposures in the work environment, including but not limited to temperature extremes, solar radiation, and noise (physical), chemical splashes and hazardous atmospheres (chemical), and animal/insect bites and poisonous plants (biological). Roux Associates' Hearing Conservation Management Program to evaluate noise exposure in the workplace is provided in **Appendix L**. SDSs for potential contaminants that may be encountered during the work activities discussed in this HASP are included in **Appendix C**.

Falls – the potential to slip or trip and thus fall or drop a load, resulting in bodily injury to oneself or others

The foregoing is intended to provide Roux employees with a general awareness of the hazards involved with Site work. A more detailed review of the potential hazards associated with each specific activity planned for the Site (or ongoing activity, as the case may be) is provided in the activity-specific Job Safety Analysis (JSA) forms in **Appendix A**. As can be seen in the JSA forms, the hazards are identified by category per the above, and specific measures designed to mitigate/manage those hazards are also identified. In preparing the JSA forms, all categories of hazards were considered, and all anticipated potential hazards were identified to the extent possible based on the experience of the personnel preparing and reviewing the JSA forms. However, there is always the possibility for an unanticipated hazard to arise, potentially as conditions change over the course of the workday. Roux personnel must maintain a continual awareness of potential hazards in the work zone, regardless of whether the hazard is identified in the JSA form. Particular attention should be paid to hazards associated with exposure to hazardous substances (see **Table 1** for a listing of the hazardous substances most likely to be encountered in environmental media at the Site) and to Site personnel being located "in the line of fire" with respect to moving equipment, pinch points, and latent energy, e.g., being

located or having body parts located within the swing radius of an excavator, between two sections of pipe being connected, below a piece of suspended equipment, or adjacent to a compressed air line.

5.1 Employee Notification Hazards and Overall Site Information Program

The information in the JSAs and safety data sheets is made available to all employees and subcontractors who could be affected by it prior to the time they begin their work activities. Modifications to JSAs are communicated during routine pre-work briefings.

6.0 EMERGENCY RESPONSE PLAN

This emergency response plan details actions to be taken in the event of site emergencies. The PM and SHSO are responsible for the implementation of emergency response procedures onsite. The SHSO/PM provides specific direction for emergency action based upon information available regarding the incident and response capabilities and initiates emergency procedures and notification of appropriate authorities. In the event of an emergency, site personnel are evacuated and do not participate in emergency response activities, response is facilitated through external emergency services.

6.1 Emergency Response

The SHSO, after investigating the incident and relevant information, shall determine the level of response required for containment, rescue and medical care. Limited on-site emergency response activities could occur therefore the SHSO is responsible for notifying external emergency response agencies. The SHSO provides relevant information to the responding organizations, including but not limited to the hazards associated with the emergency incident, potential containment problems, and missing site personnel.

6.2 Emergency Alerting and Evacuation

If evacuation notice is given, site workers leave the worksite, if possible, by way of the nearest exit. Appropriate primary and alternate evacuation routes and assembly areas must be identified prior to initiating work activities. The routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by SHSO/PM. A Site-specific emergency response plan and evacuation routes including urgent care and emergency medical facilities is provided in **Appendix B**.

Personnel exiting the Site gather at a designated assembly point. To determine that everyone has successfully exited the Site, personnel will be accounted for at the assembly site. If any worker cannot be accounted for, notification is given to so that appropriate action can be initiated. Subcontractors on this site have coordinated their emergency response plans to ensure that these plans are compatible and potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

6.3 Emergency Medical Treatment and First Aid

In the event of a work-related injury or illness, employees are required to follow procedures outlined below. All work-place injury and illness situations require Roux's Project and Corporate Management Team to be notified when an injury / illness incident occurs, and communication with the contracted Occupational Health Care Management Provider, AllOne Health (AOH), is initiated. The Injury/Illness Notification Flowchart is provided below and within Roux's Incident Investigation and Reporting program included as **Appendix D**.

If onsite personnel require any medical treatment, the following steps will be taken:

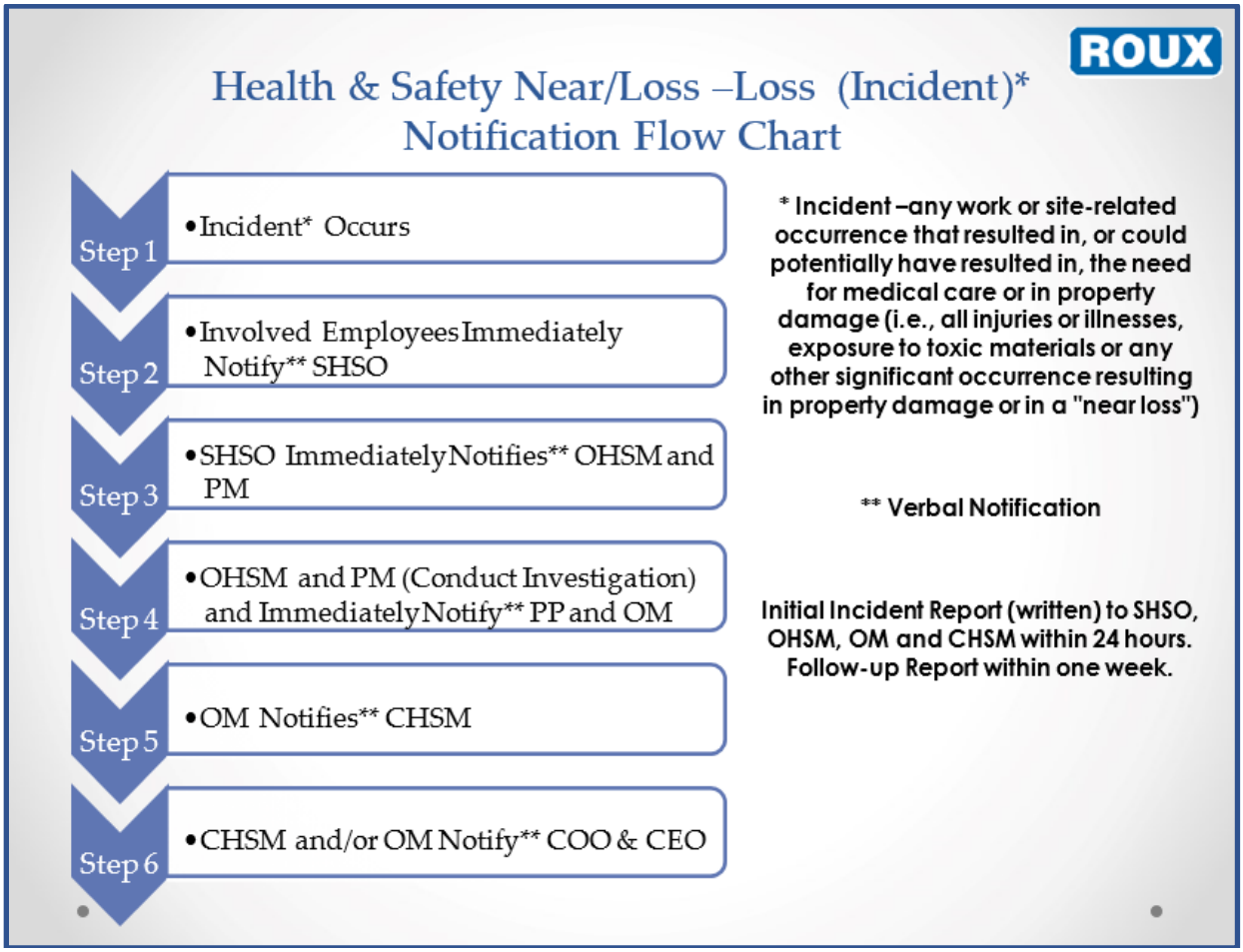
a. Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence, and communicate with the contracted Occupational Health Care Management Provider, AOH, immediately following the notifications provided above.

b. Based on discussions with the Project Team, Corporate Management and the AOH evaluation, if medical attention beyond onsite First Aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team. An Urgent Care/Hospital Route map with directions to Olean General Hospital and Olean General Hospital Occupational Medicine is provided at the beginning of this HASP.

c. Decontaminate to the extent possible prior to administration of first aid or movement to medical or emergency facilities.

d. First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).

e. The SHSO and PM will perform a Loss Investigation (LI) and the Project Team will complete the final LI Report. If a Roux employee is involved in a vehicular incident, the employee must also complete the Acord Automobile Loss Notice.



6.4 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or project principal will determine if work can continue without jeopardizing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related conditions.
- Limited visibility.
- Electrical storm potential.

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

6.5 Electrical Storm Guidelines

In the event that lightning and/or thunder are observed while working on-Site, all onsite activities shall stop and personnel shall seek proper shelter (e.g., substantial building, enclosed vehicle, etc.). Work shall not resume until the threat of lighting has subsided and no lightning or thunder has been observed for 30 minutes. If the possibility of lightning is forecast for the day, advise the onsite personnel on the risks and proper procedure at the pre-work safety briefing. Continuously monitor for changing weather conditions and allow enough time to properly stop work if lightning is forecast.

7.0 SAFETY PROCEDURES

This section of the HASP presents the specific safety procedures to be implemented during Roux's activities at the Site in order to protect the health and safety of various on-site personnel. Minimum OSHA-mandated procedures are presented first, followed by client- and Site-specific procedures. Lastly, activity-specific procedures are discussed. These Site- and activity-specific procedures supplement the general safety procedures included in Roux's Corporate Health and Safety Manual, which also must be followed in their entirely.

7.1 Training

At a minimum, Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety-trained prior to performing work on site per OSHA 29 CFR 1910.120(e) and 29 CFR 1926.65(e). More specifically, all Roux, subcontractor, and other personnel engaged in sampling and remedial activities at the Site and who are exposed or potentially exposed to hazardous substances, health hazards, or safety hazards must have received at a minimum the 40 hour initial HAZWOPER training consistent with the requirements of 29CFR 1910.120(e)(3)(i) training and a minimum of 3 days' actual field experience under the direct supervision of a trained experienced supervisor, plus 8 hours of refresher training on an annual basis. Depending on tasks performed, less training may be permitted. Evidence of such training must be maintained at the Site at all times. Furthermore, all on-site management and supervisory personnel directly responsible for or who supervise the employees engaged in Site remedial operations, must have received an additional 8 hours of specialized training at the time of job assignment on topics including, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques, plus 8 hours of refresher training on an annual basis. Moreover, all on-Site personnel who will perform work must meet the requirements of Roux Associates' Short Service Employee Management Program outlined in **Appendix J**.

Roux personnel training records are maintained in a corporate database with records available upon request from either the OHSM/SHSO/CHSM or Human Resources Department.

7.2 Site-Specific Safety Briefings for Visitors

A site-specific briefing is provided to all site visitors who enter this site beyond the site entry point. For visitors, the site-specific briefing provides information about site hazards, the site lay-out including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

7.3 HASP Information and Site-Specific Briefings for Workers

Site personnel review this HASP and are provided a site-specific tailgate briefing prior to the commencement of work to ensure that employees are familiar with this HASP and the information and requirements it contains as well as relevant JSAs. Additional briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during ongoing site characterization and analysis. Conditions for which we schedule additional briefings include, but are not limited to: changes in site conditions, changes in the work schedule/plan, newly discovered hazards, and incidents occurring during Site work.

7.4 Medical Surveillance

The medical surveillance section of the HASP describes how worker health status is monitored at this site. Medical surveillance is used when there is the potential for worker exposure to hazardous substance at levels above OSHA permissible exposure limits or other published limits. The purpose of a medical surveillance program is to medically monitor worker health to ensure that personnel are not adversely affected by site hazards. The provisions for medical surveillance at this site are based on the site characterization and job safety analysis found in Section 4 of this HASP and are consistent with OSHA requirements in 29 CFR 1910.120(f) and the following substance-specific requirements:

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Naphthalene
- Isopropylbenzene
- Pyrene
- Phenanthrene
- Arsenic
- Barium
- Chromium

7.4.1 Site Medical Surveillance Program

Medical surveillance requirements are based on a worker's potential for exposure as determined by the site characterization and job safety analysis documented in Section 4 and JSAs within **Appendix A** of this HASP and in compliance with the requirements of 29 CFR 1910.120(f)(2). Based on site information and use of direct reading instruments, limited use of respirators (less than 30 days per year), and the absence of an employee-staffed HAZMAT team, a limited medical surveillance program is required and implemented at this site. The medical surveillance program provides that:

1. Workers assigned to tasks requiring the use of respirators receive medical examinations in accordance with 29 CFR 1910.134(e) to ensure they are physically capable to perform the work and use the equipment, and

2. If a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substance or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.

These medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to workers free of cost, without loss of pay, and at a reasonable time and place. In addition, the need to implement a more comprehensive medical surveillance program will be re-evaluated after any apparent over-exposure.

7.4.2 Medical Recordkeeping Procedures

Medical recordkeeping procedures are consistent with the requirements of 29 CFR 1910.1020 and are described in the company's overall safety and health program. A copy of that program is available at our Islandia, NY office.

The following items are maintained in worker medical records:

- Respirator fit test and selection
- Physician's medical opinion of fitness for duty (pre-placement, periodic, termination)
- Physician's medical opinion of fitness for respirator protection (pre-placement, periodic)
- Exposure monitoring results

7.4.3 Program Review

The medical program is reviewed to ensure its effectiveness. The Corporate Health and Safety Manager (CHSM) in coordination with the Human Resources Director is responsible for this review. At minimum, this review consists of:

- Review of accident and injury records and medical records to determine whether the causes of accidents and illness were promptly investigated and whether corrective measures were taken wherever possible,
- Evaluation of the appropriateness of required medical tests based on site exposures,
- Review of emergency treatment procedures and emergency contacts list to ensure they were site-specific, effective, and current.

7.5 Personnel Protection

Site safety and health hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices and personal protective equipment (PPE) are used to protect employees. Appropriate PPE shall be worn by Site personnel when there is a potential exposure to chemical hazards or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity and noise), as determined by the SHSO. The level of personal protection, type and kind of equipment selected will depend on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors will be made before work can be safely executed.

Roux maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit and inspection (refer to **Appendix G**). PPE to be used at the Site will meet the

appropriate American National Standards Institute (ANSI) standards and the following OSHA (General Industry) standards for minimum PPE requirements.

The minimum level of PPE for entry onto the Site is Level D. The following equipment shall be worn:

- Work uniform (long pants, sleeved shirt)
- Hard hat
- Steel or composite toe work boots
- Safety Glasses (must comply with one of the following ANSI/ISEA Z87.1-2010, ANSI Z87.1-2003, ANSI Z87.1-2003)
- Boot Covers (as needed)
- Hearing Protection (as needed)
- High visibility clothing (shirt/vest)
- Hand Protection (e.g., minimum cut resistance meeting ANSI 105-2000 Level 2)

Note that jewelry shall be removed or appropriately secured to prevent it from becoming caught in rotating equipment or unexpectedly snagged on a fixed object. (e.g., wrist watches bracelets, rings, chains and necklaces, open earrings). Do not wear loose clothing and all shoulder length hair should be tied back.

Site specific PPE ensembles and materials are identified within task specific JSAs located within **Appendix A**, and any upgrades or downgrades of the level of protection (i.e., not specified in the JSA) must be immediately communicated to all Roux personnel and subcontractors as applicable. PPE shall be used in accordance with manufacturer's recommendations.

7.6 Monitoring

An air monitoring program is important to the safety of on- and off-Site personnel. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of Site work including, but not limited to, monitoring wind direction and approximate temperature during all invasive site activities. This survey will be conducted with the appropriate air monitoring instrument(s) as warranted by the field activity. Once this survey has been complete, any change in the type of PPE will be determined.

A Site-specific Community Air Monitoring Plan (CAMP) has been prepared to ensure that remediation activities do not adversely affect passersby or workers in the area immediately surrounding the Site and to preclude or minimize airborne migration of airborne particulate matter and volatile organic compounds (VOCs) to off-Site areas. The CAMP is a separate document from this HASP and will be available on-Site during construction activities.

Air monitoring may be performed to verify that the proper level of equipment is used and to determine if increased protection or work stoppage is required. The following equipment may be used to monitor conditions:

- Photoionization Detector (PID) and Lower Explosion Limit / Oxygen Meter (LEL/O_2)

Monitoring equipment will be calibrated in accordance with applicable regulatory requirements and manufacturer specifications.

Below are monitoring action levels for Site-specific chemicals of concern. In the event that PID readings above the thresholds identified below are sustained for 5 minutes in the breathing zone, worker protection will require upgrading - following notification to the OHSM and applicable parties (e.g., client, board of health, regulators, etc.).

OVM/Multi-gas Meter Action Levels

Action Levels for Respiratory Protection	
OVM Reading in Breathing Zone (ppm)	
< 5	No Action
≥ 5 - < 25	Level C
≥ 25	Cease Field Operations
Multi-gas Reading in Breathing Zone (%)	
LEL ≥ 2	Cease Field Operations
O_2 < 19.5 or > 21.5	Cease Field Operations

7.7 Tailgate Safety Meetings

A designated Site worker will provide daily safety briefings (e.g., tailgate meetings) including, but not limited to, the following scenarios:

- When new operations are to be conducted;
- Whenever changes in work practices must be implemented; and
- When new conditions are identified and/or information becomes available.

Daily safety briefings shall be recorded on the Roux Daily Tailgate Health and Safety Meeting Log/Daily Site Safety Checklist, and all completed forms will become a part of the project file.

7.8 Spill Containment

Spill containment equipment and procedures should, at a minimum, meet the requirements of the facility's Spill Prevention, Control and Countermeasure Plan, if applicable. Otherwise, spill containment equipment and procedures must be considered depending on the task including, but no limited to, chemical/product transfer points and handling.

7.8.1 Initial Spill Notification and Response

Any worker who discovers a hazardous substance spill will immediately notify Joseph Taormina, the Principal Engineer. The worker will, to his/her best ability, report the hazardous substance involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, and any associated injuries without compromising their own safety.

7.8.2 Spill Evaluation and Response

Joseph Taormina, Principal Engineer is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. If necessary to protect nearby community members, notification of the appropriate authorities is made by the PM as appropriate. On-site response is limited to small spills (e.g., <10 gallons), large spills require external emergency responders who will be contacted by the SHSO.

7.9 Decontamination

The decontamination section of the HASP describes how personnel and equipment are decontaminated when they leave the Exclusion Zone. This section also describes how residual waste from decontamination processes is disposed. The site decontamination procedures are designed to achieve an orderly, controlled removal or neutralization of contaminants that may accumulate on personnel or equipment. These procedures minimize worker contact with contaminants and protect against the transfer of contaminants to clean areas of the site and off-site. They also extend the useful life of PPE by reducing the amount of time that contaminants contact and can permeate PPE surfaces. Decontamination is facilitated within the CRZ at this Site.

7.9.1 Decontamination Procedures for Personnel and PPE

The following are general decontamination procedures established and implemented at this site.

1. Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the Support Zone only after undergoing the decontamination procedures described below in the next section.

2. Protective clothing is decontaminated, cleaned, laundered, maintained and/or replaced as needed to ensure its effectiveness.

3. PPE used at this site that requires maintenance or parts replacement is decontaminated prior to repairs or

4. PPE used at this site is decontaminated or prepared for disposal on the premises. Personnel who handle contaminated equipment have been trained in the proper means to do so to avoid hazardous exposure.

5. This site uses an off-site laundry for decontamination of PPE. The site has informed the facility of the hazards associated with contaminated PPE from this site.

6. The site requires and trains workers that if their permeable clothing is splashed or becomes wetted with a hazardous substance, they will immediately exit the work zone, perform applicable decontamination procedures, shower, and change into uncontaminated clothing.

7. Procedures for disposal of decontamination waste meet applicable local, State, and Federal regulations.

7.9.2 Decontamination Procedures for Equipment

All tools, equipment, and machinery from the Exclusion Zone or CRZ are decontaminated in the CRZ prior to removal to the Support Zone. Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure and to avoid cross-contamination and chemical incompatibilities.

General Equipment Decontamination Procedures:

1. Decontamination is required for all equipment exiting a contaminated area. Equipment may re-enter the Support Zone only after undergoing the equipment decontamination procedures.

2. Vehicles that travel regularly between the contaminated and clean areas of the Site are carefully decontaminated each time they exit the Exclusion Zone and the effectiveness of that decontamination is monitored to reduce the likelihood that contamination will be spread to other parts of the Site.

3. Particular attention is given to decontaminating tires, scoops, and other parts of heavy equipment that are directly exposed to contaminants and contaminated soil.

The following items may be used to decontaminate equipment:

- Fresh water rinse;
- Non-phosphorus detergent wash;
- Distilled water rinse;
- Acetone rinse;
- Distilled water rinse; and
- A steam cleaner or pressure washer (heavy equipment only).

7.9.3 Monitoring the Effectiveness of Decontamination Procedures

Visual examination and sampling are used to evaluate the effectiveness of decontamination procedures. Visual examination is used to ensure that procedures are implemented as described and that they appear to control the spread of contaminants under changing site conditions. Visual examination is also used to inspect for signs of residual contamination or for contaminant permeation of PPE.

Personnel who work in contaminated areas of the site, either the CRZ or the Exclusion Zone, are trained in the principles and practices of decontamination described in this section of the HASP and in related SOPs. If Site procedures are changed as a result of inspection and monitoring, all affected employees are notified of these changes.

7.10 Confined Space Entry

The following is a list of the safety requirements for confined space entry at the Site.

- **ROUX PERSONNEL ARE NOT AUTHORIZED TO ENTER AN OSHA PERMIT REQUIRED CONFINED SPACE**;
- Currently the scope of work **DOES NOT** require personnel to enter permitted confined space for this project; and
- Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and OHSM.

Confined space is defined as any space, depression, or enclosure that:

- Has limited opening for entry and egress;
- Is large enough for and employee to enter and perform assigned work; and
- Is not intended for continuous occupancy.

A permit required confined space is one that meets the definition of a confined space and has one or more of the following characteristics:

- May contain or produce life-threatening atmospheres due to oxygen deficiency the presence of toxic, flammable, or corrosive contaminants;
- Contains a material that has the potential for engulfment;
- Has an internal configuration that may cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; and
- Contains any other serious safety or health hazards.

Although Roux personnel will not perform confined space entry, it is expected that subcontractors performing cleaning and mitigation and/or remedial measures activities may be required to enter structures that are considered to be a permit required confined space. Permitting of the confined space as well as hazard mitigation for entry will be completed by the subcontractor in accordance with 1910.146.

7.11 Client and Site-Specific

In addition to the OSHA-specific procedures discussed above, there may be client and site-specific safety procedures that must be adhered to during the performance of remedial activities at the Site.

7.12 Unusual or Significant Risks

Field activities that appear to have unusual or significant risks that cannot be adequately managed with existing risk tools such as SPSAs, HASPs, traffic safety plans, work permits, design and O&M practices, equipment HAZOPS or other safety tools must be referred to the CHSM to help with the assessment and

management of the associated potential safety risks. Examples include the use of explosives for demolition, use of firearms to control wildlife, rappelling, demolition over water, etc.

7.13 Activity-Specific

In addition to the general hazards discussed above, there are activity-specific hazards associated with each work activity planned for the Site. For instance, **Appendix F** references a subsurface utility clearance management program that Roux has instituted to ensure, to the greatest extent possible, that utilities have been identified and other subsurface structures will be avoided during any drilling activities. Similarly, **Appendix I** details procedures to follow to mitigate worker exposure to biological hazards such as ticks. An activity-specific JSA has been completed for each of the activities planned for the Site. JSAs are provided in **Appendix A**. In the event that new work activities or tasks are planned, JSAs will be developed and implemented prior to performing the new activities. In the absence of a JSA, the personnel performing work must prepare a field JSA and receive clearance from a designated competent safety official prior to performing any task with significant risk. In emergency situations where time is critical SPSAs will be utilized to identify the task, associated hazards and mitigative actions to take. For lower risk activities (as deemed by the discretion of a Competent Person) where a JSA is determined to not be needed, the individual(s) conducting the activities must perform SPSAs prior to and during the work.

8.0 FIELD TEAM REVIEW

Each person performing work at or visiting this site shall sign this section after site-specific training is completed and before being permitted to access the CRZ or Exclusion Zone.

I have read and understand this Site-specific HASP. I will comply with the provision contained therein.

Site/Project: MJ Painting Contractor Corp., 350 Franklin Street, Olean, New York

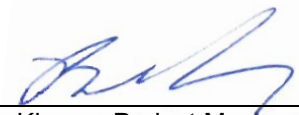
Name Printed	Signature	Date

9.0 APPROVALS

By their signature, the undersigned certify that this HASP is approved and will be utilized at the MJ Painting Contractor Corp. Site located at 350 Franklin Street, Olean, NY 14760.

Sara Barrientos – Site Health and Safety Officer	12/13/2018 Date

James Dick - Office Health and Safety Manager	12/13/2018 Date



Brian Klaus – Project Manager	12/13/2018 Date

Joseph Taormina – Project Principal	12/13/2018 Date

TABLES

1. Toxicological Properties of Hazardous Substances Present at the Site

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site								
Compound	**CAS #**	**TLV**	**IDLH**	**PEL**	**Routes of Exposure**	**Toxic Properties**	**Target Organs**	**Physical/Chemical Properties**
Arsenic (As)	7440-38-2	0.01	(ND)	0.5 mg/m^3 organic 0.10 mg/m^3 - inorganic	Dermal; inhalation; ingestion	Sensory irritant Lung & Skin Cancer Aplastic anemia Numbness	skin eyes lungs blood peripheral nervous system	Silver gray - tin white BP: sublimes
Asphalt (fume)	8052-42-4	0.5 (fumes)	(ND)	None	Dermal; inhalation ingestion	Severe burns Dermatitis Photosensitization Pyloric obstruction	skin eyes stomach	Black or dark brown mass BP = <470° F1.Pt = 464°F LEL = 0.7% UEL = 6.0%
Barium (soluble)	7440-39-3	0.5 mg/m^3	250 mg/m^3	0.5 mg/m^3	Inhalation; ingestion	Sensory irritant Increase muscle contractility Slows heart rate	skin eyes smooth muscle heart	Silver white BP: 1640°
Barium (insoluble) (as barium sulfate)	7727-43-7	10 mg/m^3	(ND)	10 mg/m^3 5 mg/m^3 resp.	Inhalation; ingestion	Baritosis	lungs	White or yellow odorless
Benzene	71-43-2	1.6 mg/m^3 0.5 ppm	Ca (ND)	1 ppm	Dermal; inhalation ingestion	CNS depression Hematopoietic depression Dermatitis	CNS blood skin eyes resp system bone marrow	Liquid (solid below 42°F BP: 80.093°C flammable LEL: 1.4% UEL: 8.0%
Butane	106-97-8	1,000 mg/m^3 800 ppm	(ND)	1,900 mg/m^3 800 ppm	Dermal; inhalation	Frostbite Narcotic	eyes, skin CNS	Colorless gas; petroleum odor BP = 0.5° FP = 138° LEL = 1.9% UEL = 8.5% F1.Pt = -76°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site								
Compound	**CAS #**	**TLV**	**IDLH**	**PEL**	**Routes of Exposure**	**Toxic Properties**	**Target Organs**	**Physical/Chemical Properties**
Cadmium (dust)	7440-43-9	0.01 mg/m^3	9 mg/m^3	0.005 mg/m^3	Inhalation; ingestion	Sensory irritant Lung injury Kidney disease Cancer	skin eyes kidneys bone	Silver-white/blue tinged BP: 1409°F Noncombustible
Chromium	7440-47-3	0.5	250 mg/m3	OSHA: 1	Inhalation; Skin; eye contact; ingestion	Irritation to eyes, skin; lung fibrosis.	Eyes, Skin, Respiratory system.	Blue-White to steel-gray, lustrous, brittle, hard, odorless solid
Chromium (III)	7440-47-3	0.5 mg/m^3	25	0.5 mg/m^3	Dermal; inhalation ingestion	Decreased pulmonary function Sensory irritant	lung skin eyes	Steel gray metal
Chromium (VI)	7440-47-3	0.05 mg/m^3	(ND)	None	Dermal; inhalation; ingestion	Nasal and lung tumors Sensory irritant	lungs eyes skin	Red, rhombic crystals
Chromic Acid and Chromates	133-82-0	0.1 as CrO3	Ca [15 mg/m3] as Cr(VI)	0.1	Inhalation; Skin and/or eye contact; ingestion	Respiratory system irritant, nasal septum perforation, liver, kidney damage, leukocytosis, leukopenia, monocytosis, eosinophillia, skin ulcers [Potential Carcinogen].	Eyes, Skin, Respiratory system, Blood, Liver, Kidneys [Lung Cancer].	CRo3: Dark-red, odorless flakes or powder. [Note: often used in aqueous solutions (H2CrO4)]
Coal Tar (Petroleum Naptha)	8030-30-6	0.2 mg/m^3	Ca 80 ppm	0.2 mg/m^3	Dermal; inhalation	Acne, folliculitis Lung cancer	resp system bladder kidney skin	Black, dark brown amorphous residue
Copper (dusts and mists as Cu)	7440-50-8	1 mg/m^3	100 mg/m^3	1 mg/m^3	Dermal; inhalation; ingestion	Sensory irritant GI irritation CNS depressant	skin eyes GI tract CNS	Reddish metal BP: 4730°F Powdered form may ignite

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,1-Dichloroethane	75-34-3	405 mg/m^3 100 ppm	3,000 ppm	400 mg/m^3 100 ppm	Dermal; ingestion; inhalation	CNS depression Liver damage Sensory irritant	CNS liver eyes	Liquid; Chloroform odor BP: 57.3°C flammable LEL: 5.6% UEL: 11.4%
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	40 mg/m^3 10 ppm	Ca (ND)	4.0 mg/m^3 1 ppm	Dermal; ingestion; inhalation	CNS depressant Liver neurosis Kidney damage Dermatitis	CNS liver kidneys skin	Colorless liquid BP: 83.5° LEL: 6.2% UEL: 15.9%
1,2-Dichloroethene	540-59-0	793 200 ppm	1,000 ppm	790 200 ppm	Dermal; ingestion; inhalation	CNS depressant Epigastric cramps Sensory irritant Dermatitis	CNS stomach skin	Colorless liquid BP: 59° LEL: 9.7% UEL: 12.8%
Diesel Fuel	68334-30-5	10 ppm	NA	NA	Dermal; inhalation	Resp irritation Dizziness, nausea Skin disorders Liver disorders	lungs CNS skin liver	Light amber liquid F1.Pt = >100°F LEL = 0.6% UEL = 7.0%
Ethylbenzene	100-41-4	434 mg/m^3 20 ppm	800 ppm (10% LEL)	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant CNS depressant Narcosis Hematological disorders	eyes skin CNS respiratory system blood	Liquid aromatic odor BP: 277°F Fl.P: 59°F LEL: 1.2% UEL: 7.0%
No. 2 Fuel Oil	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%
Fuel Oil	68476-33-5	200 ppm	(ND)	NA	Dermal; inhalation ingestion	Skin cancer Liver damage Blood disorders	skin liver bone marrow	Dark liquid LEL = 1.0% UEL = 3.0% F1.Pt = >140°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Jet A Fuel	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%
Jet Fuel JP-4	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%
Jet Fuel JP-5	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%
Jet Fuel JP-8 (Kerosene)	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%
Jet Oil II	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%
Jet Oil 291	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Jet Oil 254	8008-20-6	200 ppm	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid Aromatic odor BP = 347-617°F Fl Pt. = 100-162°F UEL = 5.0% LEL = 0.7%
Lube Oil	NL	NL	None	NL	Dermal; inhalation	Sensory Irritant Pulmonary Edema	Skin, eyes, respiratory tract	Liquid BP = °F Fl Pt. = °F UEL = % LEL = %
Furfural	98-01-1	7.9 mg/m^3 2 ppm	100 ppm	20 mg/m^3 5 ppm	Dermal; inhalation; ingestion	Eye, skin irritation Resp. irritation Dizziness, nausea	eyes respiratory system skin CNS	Brown liquid F1.Pt = 142°F LEL = 2.1% UEL = 16.3%
Gasoline	8006-61-9	896 mg/m^3 300 ppm	Ca (ND)	None	Dermal; inhalation; ingestion	CNS depression Sensory irritant Dermatitis Pelmonary Edema	CNS eyes skin resp system	Liquid, aromatic F1.Pt = -50°F
Hydrogen Sulfide	7783-06-4	TWA 5 ppm STEL 10 ppm (adopted by EM, Sep. 2010)	100 ppm	20 ppm	Dermal; inhalation; ingestion	CNS depression Resp distress Conjunctivitis	resp system eyes CNS	Colorless gas, rotten egg odor BP - -76°F UEL = 46% LEL = 4.3%
Kerosene	8008-20-6	200 ppm	NA	NA	Dermal; inhalation	Eye/skin irritation Resp. irritation Dizziness, nausea	eyes skin resp. system CNS	yellow to white oily liquid F1.Pt = >115°F LEL = 0.7% UEL = 5.0%
Lead (as Pb)	7439-92-1	0.05 mg/m^3	100 mg/m^3	<0.1 mg/m^3	Dermal; inhalation ingestion	Abdominal pain CNS depressant Anemia Nephropathy Reproductive effects	GI tract CNS blood kidneys	Metal - soft gray BP: 3164°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Naphtha	8032-32-4	1,590 mg/m^3 400 ppm	1000 ppm	400 mg/m^3 100 ppm	Inhalation; ingestion	Resp irritant Eye irritation	eye resp tract	Clear, flammable
Nickel	7440-02-0	1.5 mg/m^3	Ca 10 mg/m^3	0.015 mg/m^3	Dermal; inhalation; ingestion	Pulmonary fibrosis Lung cancer Sinus cancer Sensory irritant GI irritation	lungs skin eyes GI tract	Silver-white metal BP: 2730°
Petroleum hydrocarbons (Petroleum distillates) (Red Dye Liquid)	8002-05-9	1,600 400 ppm	10,000	1,600 400 ppm	Dermal; inhalation; ingestion	CNS depressant Respiratory irritant Dried/cracked skin	CNS respiratory tract skin	Colorless liquid BP = 86-460□F UEL = 5.9% LEL = 1.1% Flammable
Selenium (Se)	7782-49-2	0.2 mg/m^3	1 mg/m^3	0.2 mg/m^3	Dermal; inhalation; ingestion	Sensory irritant Bronchial irritation GI distress	respiratory system skin eyes liver kidneys blood	Steel grey, non-metallic BP: 690°F
Silver (Ag)	7440-22-4	0.1 mg/m^3	10 mg/m^3	0.01 mg/m^3	Dermal; inhalation; ingestion	Sensory irritant Bronchitis	skin eyes lungs	Lustrous white metal BP: 2212°
Tetrachloroethene (perchloroethylene PCE)	127-18-4	170 mg/m^3 25 ppm	Ca 150 ppm	100 ppm	Dermal; inhalation; ingestion	CNS depression Liver damage Sensory irritant	CNS liver skin eyes kidneys	Liquid ether-like odor BP: 121.20°C
Toluene	108-88-3	188 mg/m^3 200 ppm	500 ppm	200 ppm	Dermal; inhalation; ingestion	CNS depression Liver damage Kidney damage Defatting of skin	CNS liver kidney skin	Liquid benzene odor BP: 110.4°C flammable LEL: 1.2% UEL: 7.1%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Trichloroethene (TCE)	79-01-6	269 mg/m^3 10 ppm	Ca 1000 ppm	50 ppm	Dermal; inhalation; ingestion	CNS depression Sensory irritant Kidney damage Liver damage Heart damage	CNS skin eyes kidney liver CVS	Liquid BP: 86.7°flammable LEL: 12.5% UEL: 90%
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	1,910 mg/m^3 350 ppm	700 ppm	1,900 mg/m^3 350 ppm	Dermal; ingestion; inhalation	Sensory irritant CNS depression Cardiac arrhythmia	skin CNS CVS eyes	Liquid; BP: 74.1° Fl.P: = 32.5°
Vinyl chloride (chloroethylene)	75-01-4	2.6 mg/m^3 1 ppm	Ca (ND)	1 ppm	Inhalation; ingestion	Liver tumors Blood tumors Sensory irritant CNS depressant	liver blood eyes skin CNS	Colorless gas Highly flammable BP: 13° FP: -159.7° LEL: 4% UEL: 22%
Xylene(s)	1330-20-7	434 mg/m^3 100 ppm	900 ppm	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant Blood dyscrasia Bronchitis CNS depression	CNS eyes skin GI tract blood liver kidneys	Liquid Aromatic odor BP: 138.5° flammable LEL: 1.1% UEL: 7.0%
Zinc Oxide (dust)	7440-66-6	2 mg/m^3	None	10 5 resp.	Dermal; inhalation; ingestion	Skin irritant Cough	skin lungs	Bluish-white metallic element BP: 908°

Notes:
Ca – Carcinogen
TLV – Threshold Limit Value (ACGIH)
IDLH – Immediately Dangerous to Life and Health (OSHA)
PEL – Permissive Exposure Level (OSHA)
PPM – Parts per million
mg/m^3 – milligrams per cubic meter
Fl. Pt. – Flash point
LEL – Lower Explosive Level
UEL – Upper Explosive Level
BP – Boiling Point
NA – Not Available
ND – Not Determined

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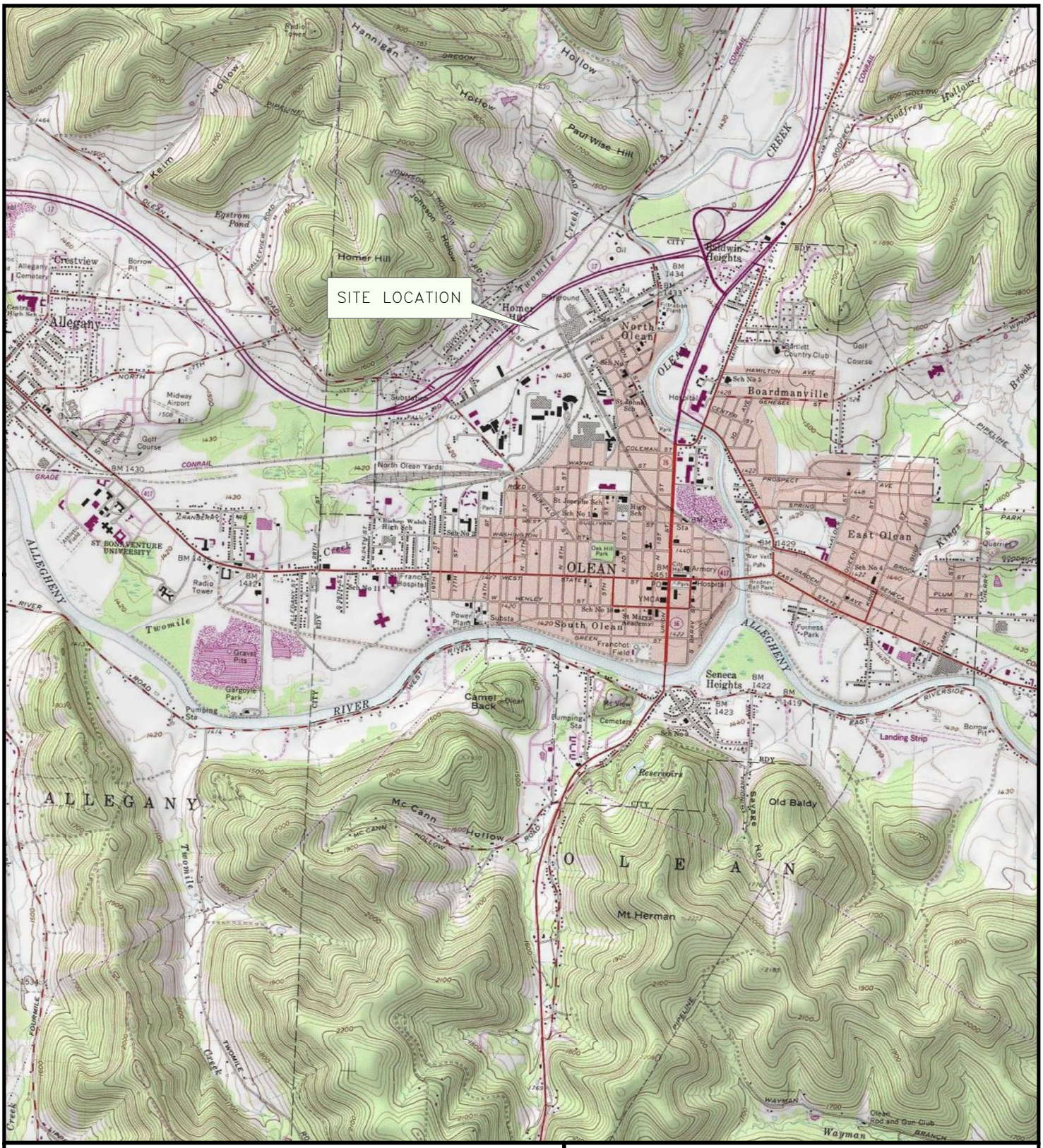
FIGURES

1. Site Location Map/Site Setting
2. Site Map



QUADRANGLE LOCATION

N

USGS, 1980, Olean, New York 7.5 Minute Topographic Quadrangle. Contour Interval 3 Meters

Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

1,800 0 1,800 3,600 Feet

Title:

SITE LOCATION MAP

350 FRANKLIN STREET

Prepared For: MJ PAINTING CONTRACTOR CORP.

ROUX

Compiled by: SB	Date: 28JUN18
Prepared by: SB	Scale: AS SHOWN
Project Mgr: AH	Project: 2317.0002M02000
File: 2317.0002M000.100.1.mxd	

FIGURE 1

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N

LEGEND

PROPOSED BCP SITE – 350 FRANKLIN STREET

EXISTING FENCE

NOTES:
1.ALL LOCATIONS ARE APPROXIMATE

1.2006 AERIAL PHOTOGRAPH AND PROPERTY BOUNDARY OBTAINED FROM THE CATTARAUGUS COUNTY GIS WEBSITE http://maps.cattco.org/website/parcel/viewer.htm

50 0 50 100
Feet

Title: **SITE MAP**

350 FRANKLIN STREET, OLEAN, NY

Prepared For: MJ PAINTING CONTRACTOR CORP.

ROUX

Compiled by: SB	Date: 12JUL18	FIGURE 2
Prepared by: SB	Scale: AS SHOWN	
Project Mgr: AH	Project: 2317.0002M000	
File: 2317.0002M000.101.HASP_Fig2.mxd		

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APPENDICES

A. Job Safety Analysis (JSA) Forms
B. Site-Specific Emergency Response Plan & Routes to Urgent Care and Emergency Medical Facilities
C. SDSs for Chemicals Used
D. Incident Investigation and Reporting Program
E. Heavy Equipment Exclusion Zone Policy
F. Subsurface Utility Clearance Management Program
G. Personal Protective Equipment Management Program
H. Traffic Control and Wheel Chocking
I. Tick Management Program
J. Short Service Employee Management Program
K. Ergonomics Management Program
L. Hearing Conversation Management Program

APPENDIX A

Job Safety Analysis (JSA) Forms

JOB SAFETY ANALYSIS	Ctrl. No. GEN-003	DATE 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Construction - Excavation**	**Backfilling Excavation & Compaction**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Project Engineer	Brian Hobbs	Senior Health & Safety Manager
Edward Lacina	Senior Construction Manager	Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather/ cut-resistant level 2
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: reflective DOT approved safety	☐ OTHER _____
☒ SAFETY GLASSES	☒ SAFETY TOE BOOTS		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Payloader, Backhoe, Dump Trucks, Mechanical gas powered tampers, Excavator with hydraulic tamper. APR when tamping if dust present. Two-way radios.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around excavator, backhoe, tampers, and dump trucks.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-construction meeting: Review proposed excavation locations	**1a. CONTACT:** Potential for contact with subsurface utilities and above ground utilities	1a. Call state 811 for mark out service and one call ticket. 1a. Obtain private utility mark out service as necessary. 1a. Review and mark proposed excavations w/white paint. 1a. Identify all "Critical" zones. A Critical zone is any area within 10 feet of any operating utility. 1a. **Complete subsurface clearance checklist.** 1a. Soft dig must be conducted within 2 lateral feet of any suspected underground utility. 1a. Protection of aboveground utilities identified as being located within the work zone must be coordinated w/ client and utility owner.
2. Secure Work Area	**2a. CONTACT:** Potential for personnel to enter the work area. Potential for equipment to contact, or crush personnel. **2b. EXERTION:** Potential for muscle strain or tear while installing traffic cones and barrel	2a. Ensure work area is secure and inform others of work activity. Establish a heavy equipment exclusion zone (HEEZ) using 42" traffic cones, barrels & snow fencing or telescoping poles. Use of flag persons to maintain clear traffic and to minimize motorist confusion during set-up of new traffic pattern. HEEZ to include tip/swing radius of equipment. 2a. Dump Truck/Excavator/Payloader/Backhoe equipment to be set-up by personnel who are familiar with machinery. Spotters shall be in place for all equipment. and to control access to the HEEZ 2a. Truck wheels are chocked when driver is not in truck and engine shut off. 2a. Personnel shall stay out of the exclusion zone (10' minimum or greater than the equipment boom) while equipment is maneuvering. 2b. Keep back straight, keep load close to the body and bend knees while lifting and working. If over 50 lbs., use 2 or more laborers for lifting or use of equipment.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Backfilling excavation, and compaction	**3a. CONTACT:** Traffic and live equipment.	3a. Equipment and trucks shall be isolated from other workers, subcontractors and third party traffic with 42" traffic cones, barricades, snow fencing or telescoping poles, and/or Jersey barriers. Spotters shall direct dump truck for placement of fill near excavation. Pay loader/ Excavator, as directed by spotter, shall move fill into trench where it shall be placed in layers and compacted by mechanical means. 3a. Spotters will wear florescent vests at all times. 3a. Spotters will remain out of the exclusion zone, line of fire from equipment and third-party vehicles. 3a. Spotters and operators will have radios for communication, when other visual and/or hand signals are insufficient. 3a. Locate all overhead utilities. All personnel and machinery should maintain a 10' distance from overhead electric lines. Refer to OSHA chart for distances and voltage. 3a. For excavations engineered (shored, sloped, benched} all personnel, equipment, and materials must remain a minimum of 2 feet from edge of excavation.
	. **3b. EXPOSURE:** Fumes from gas powered tamper	3b. Fueling of all equipment will be done outside of work area in a well-ventilated area. Refueling will be done only after a 2-5-minute cool down.
	3c. FALL: Slips, trips, fall hazards.	3c. Work area will be clean and free of any debris to remove slip, trip and fall hazards. All tools will be kept in designated areas. Insure work area is well illuminated. 3c. Workers should only be working in areas that have been leveled with a machine. 3c. All persons working at elevations over 6' shall use a guardrail system or personal fall arrest system while around excavation.
	3d. OVEREXERTION: Muscle strain, or tear.	3d. Keep knees bent and back straight while transferring/ lifting/lowering tamper from elevated areas. Utilize a co-worker to avoid staining muscles. 3d. Keep knees bent and back straight while maneuvering tamper. Utilize a co-worker to avoid staining muscles.
	3e. EXPOSURE: Noise from tamper. Dust inhalation.	3e. Workers will wear hearing protection during compaction tamper activities. 3e. Wear NIOSH approved dust mask for personal comfort. If dust is visible for extended time, limit by wetting down area. 3e. If dust continues stop work and evaluate if APR is needed with approval and clearance.
4. Secure/leave site.	**4a. FALL:** Slip, trip, fall	4a. Clear work area of all debris and store all equipment in designated areas/containers before opening to traffic. 4a. Replace fencing and barricades as needed to secure path before opening roadway or area up to traffic(vehicle, pedestrian and/or bicycle).

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[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-006	DATE 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
Generic	**Drilling**	**Direct Push Soil Borings / Well Installation**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Timothy Zei	Project Hydrogeologist	Raymond Olson	Staff Assistant Geologist
		Christine Pietrzyk	Office Health & Safety Manager
		Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing, Long Sleeve Shirt	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Geoprobe or Truck-Mounted Direct Push Drill Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Macrocore liners, Liner Opening Tool, 20 lb. Type ABC Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs, Water

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ) – All non-essential personnel will maintain a distance of 10 feet from drilling equipment while equipment is moving/engaged

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed)	**1a. CONTACT:** Equipment/property damage.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. Use a spotter for all required backing operations. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have a minimum **exclusion zone of 10 feet** for non-essential personnel (i.e., driller helper, geologist) when the rig is moving/ in operation.
	1b. FALL: Slip/trip/fall hazards.	1b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.
	1c. CONTACT: Crushing from roll-over.	1c Geoprobe should cross all hills/obstructions head on with the mast down to reduce risk of roll-over.
2. Raising tower/derrick of drill rig	**2a. CONTACT:** Overhead hazards.	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for wires, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. Maintain a safe distance of 10' from overhead structures.
	2b. CONTACT: Pinch Points/Amputation Points when raising the rig and instability of rig	2b. Inspect the equipment prior to use and avoid pinch/amputation points. 2b. Lower outriggers to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.
3. Advancement of drilling equipment and well installation	**3a. CONTACT:** Flying debris	3a. Be aware of and avoid potential lines of fire and wear required PPE such as eye, ear, and hand protection.
	3b. EXPOSURE: Noise and dust.	3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if conditions warrant. 3b. Wear hearing protection when the drill rig is in operation.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Advancement of drilling equipment and well installation (Continued)	**3a. CONTACT:** Flying debris	3c. Contain drill cuttings and drilling water to prevent fall hazards from developing in work area. 3c. See 1b.
	3b. EXPOSURE: Noise and dust.	3d. Ensure all Emergency Safety Stop buttons function properly. 3d. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools.
	3c. FALL: Slip/trip/fall hazards.	3d. Inspect the equipment prior to use for potential pinch/amputation points. Keep hands away from pinch/amputation points and use of tools is preferable compared to fingers and hands.
	3d. CAUGHT: Limb/extremity pinching; abrasion/crushing.	3d. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3d. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3d. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. 3d. Drillers and helpers will understand and use the "Show Me Your Hands" Policy. 3d. Spinning rods/casing have an **exclusion zone of 10 feet** while in operation.
	3e. CONTACT: Equipment imbalance during advancement of drill equipment.	3e. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3e. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3e. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (**minimum exclusion zone of 10 feet**).
	3f. EXPOSURE: Inhalation of contamination/vapors.	3f. Monitor ambient air for dangerous conditions using a calibrated photoionization detector (PID) to periodically monitor the breathing zone of the work area. 3f. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site specific health and safety plan. 3f. Use a multi-gas meter to monitor ambient air for dangerous conditions (i.e. unsafe levels of carbon monoxide when drilling indoors or the presence of explosive vapors).
	3g. EXERTION: Potential for muscle strain/injury while lifting and installing well casings, lifting sand bags, and/or lifting rods.	3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Remove sample liner.	**4a. EXERTION:** Potential for muscle strain/injury while removing liner from probe rod.	4a Utilize team lifting for objects over 50lbs. 4a. Use hydraulic liner extruder if available.
	4b. CONTACT: Pinch points and cuts	4b. Place liner on sturdy surface when opening. 4b. Don cut-resistant gloves and use appropriate liner cutter when opening liners. 4b. Always cut away from the body.
	4c. EXPOSURE: Inhalation and/or dermal contact with contaminants.	4c. Wear chemical-resistant disposable gloves when handling liners. 4c. See 3e.
5. Decontaminate equipment.	**5a. EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors).	5a. Wear chemical-resistant disposable gloves and safety glasses. 5a. Contain decontamination water so that it does not spill. 5a. Use an absorbent pad to clean spills, if necessary. 5a. Spray equipment from side angle, not straight on, to avoid backsplash. 5a. See 3b.
	5b. EXPOSURE: To chemicals in cleaning solution including ammonia.	5b. See 4a. Review SDS to ensure appropriate precautions are taken and understood.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-007	DATE 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**General Site Activity**	**Driving**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Valerie Sabatasso	Staff Scientist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather/ cut-resistant level 2
☒ HARD HAT: when outside vehicle	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: high visibility vest, when outside vehicle	
☒ SAFETY GLASSES:when outside vehicle	☒ SAFETY TOE BOOTS: when outside vehicle		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Motor Vehicle (i.e. car, truck, SUV)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around motor vehicles when operating.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc. *Common factors that may lead to CONTACT incident, but not limited to: • distracted driving (cell phone, GPS, radio, billboards, "rubber necking") • lack of situational awareness • unfamiliarity with traffic patterns/road layout • weather conditions (wet/icy roads, hydroplaning, black ice) • weariness • high speeds • obstructed vision (solar glare, debris on windshield, blind spots) • changes in travel pathway (construction, snow banks, non-operational signals, potholes, detours, special events) • improper vehicle maintenance (non-operational signal light, worn tires, cracked windshield, ineffective wipers) • loose or unsecure objects	1a. PLAN AHEAD – review/make yourself familiar with maps and driving directions before beginning the drive to the Site. Do not attempt to drive and review maps/directions at the same time. Pull over and stop your vehicle before looking at maps/directions. 1a. Complete a basic vehicle inspection before driving. Verify Inspection and Registration are current, tires and wipers are in good condition, all lights are functional, all glass/mirrors are undamaged, the horn is functional, roof/hood/trunk are free from accumulated snow and visibility is not impaired due to snow/ice/frost/fog on windows. 1a. Do not hang items in car that can obstruct your view or become projectiles in a collision. 1a. Do not get distracted using touch screen radios or GPS units built into newer models. Keep your eyes on the road and stay alert. 1a. Follow posted speed limits and obey traffic signals and roadway signs. 1a. Always wear your seat belt and shoulder harness when driving. 1a. When driving around large vehicles and trucks, maintain extra space as these vehicles may not be able to see a smaller car too close. 1a. Follow the "Rules of the Road" including: using your turn signals, coming to a complete stop, and allowing vehicles the right of way (yield) when they are when traffic laws require. 1a. Apply the Smith Five Keys® of safe driving • Aim High in Steering® - Expand eye lead time to a minimum of 15 seconds • Get the Big Picture® - Maintain proper a 4 second minimum following distance at all times - Scan mirrors every 5-8 seconds to achieve a circle of awareness - Position your vehicle so you can see relevant/non-relevant objects • Keep Your Eyes Moving® - Try to maintain about 180 degrees of visibility - Avoid blank and fixed stares. Avoid focusing on one object for more than 2 seconds • Leave Yourself an Out® - Avoid traveling in traffic clusters - Surround yourself with space - Anticipate the actions of others

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site (cont'd)	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	• Make Sure They See You® - Maintain eye contact with on-coming vehicles/pedestrians - Use warning devices (e.g., hand signals, high-lights, horns etc.) - Proper timing is essential 1a. Do not perform reconnaissance or inspections while driving. Your vehicle should be parked in a safe location when viewing or surveying the Site and vicinity 1a. Avoid sudden turns and stops. Don't drive recklessly – be in control of vehicle at all times. 1a. In inclement weather, first determine if work can be POSTPONED. Otherwise, plan according to weather conditions including checking forecast along entirety of travel route (especially, for long distances). Reduce speed as road conditions warrant. Travelling with winter car equipment, in the winter, is strongly recommended (i.e., shovel, scraper, brush, blanket, extra clothing, flashlight, bag of sand). If your vehicle has 4-wheel drive, review to operators manual and understand operating procedure prior to engaging 4-wheel drive. If at any point on your drive weather becomes too severe to proceed safely pull over if safe to do so or seek nearest cover (e.g., overpass) 1a. If feeling drowsy or sleepy, do not drive. Pull over in a safe place to rest if you experience any signs of drowsiness. Make sure to get adequate sleep the night before an early drive. 1a. Never operate a vehicle under the influence of alcohol or illegal substances or medications affecting your performance. 1a. Keep your eyes on the road. Do not call or talk on cellular phones. Pull over to a safe location if you must answer or make a call. (Legal requirement in: CA, CT, DE, D.C., HI, IL, LA*, MD, NV, NH*, NJ, NM, NY, OK*, OR, TX*, VT, WA, WV as of 01/20/15; per www.IIHS.org) * = Applicable to some drivers, situations or to be implemented in 2015 1a. When parking, pull-through when possible. If backing is required visually inspect area to ensure it is free from obstructions prior to backing in and relying solely on mirrors; use spotters when available.
2. Entering/Exiting Vehicle.	**2a. CAUGHT:** Personal injury (broken fingers/hand) while entering or exiting vehicles **2b. FALL:** Personal injury (twisted ankle, deep contusion, concussion, broken wrist/arm, etc.) from slip/fall on uneven or unstable or slippery surface while exiting/entering vehicle **2c. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	2a. Open and close doors slowly. Never put hands or feet in between door and vehicle to avoid pinch points. 2b. When exiting the vehicle make sure your feet are on firm footing and weight is evenly distributed before exiting/standing. In inclement weather use hands to support yourself, by holding the car door and/or steering wheel, when exiting the vehicle. 2c. Check both directions for traffic before opening door. Do not exit vehicle if traffic does not permit you to exit safely 2c. Check anticipated path of door prior to opening, do not open door into any obstructions (e.g., bollards, high curbing)

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-009	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**O&M**	**Movement of 55-Gallon Drums/Drum Handling with Mobile Carrier**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Michael Sarni	Technician	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant gloves
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent long sleeve shirt or long sleeve shirt and reflective safety vest.	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or composite toe		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Mobile Drum Carrier, safety cones, and caution tape

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around heavy equipment (i.e. forklift).

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Preparing for and Inspection of Drum	**1a. FALL:** Tripping/falling due to uneven surface. Loose debris/garbage in work area.	1a. Clear area of loose garbage and debris. Inspect 55-gal drums for proper condition, labeling, check drum ring and bolts for tightness, inspect mobile drum carrier. 1a. Do a Test Lift to get a general sense of the weight of the drum. 1a. Inspect and use established pathways to avoid uneven terrain, weather-related hazards (i.e., debris, puddles, ice, etc.), and other obstructions. 1a. Secure work area and coordinate and communicate the planned work activities with other personnel working in the area. 1a. Delineate work area with 42" safety cones.
	1b. CONTACT/EXPOSURE: Drums could potentially be damaged or contain hazardous material. Mobile drum carrier could potentially be in poor working condition causing malfunctioning during operation.	1b. Prior to inspecting drums don cut-resistant gloves. If drum is not properly labeled, do not open and cease all drum transport activities. Immediately contact project manager and inform him/her of drum situation. 1b. Do not continue drum transport activities until further actions are determined by the project manager. 1b. If the drum is properly labeled, but leaking, improperly sealed or in poor condition, place drum in an over-pack drum. 1b. Inspect mobile drum carrier to ensure its overall integrity. Look for rust marks or potential weak points where the drum carrier could malfunction. Inspect the wheels to ensure that they easily turn and nothing is impeding their movement.
	1c. EXERTION/CAUGHT: Potential pinching/exertion hazards while securing ring/ tightening bolts	1c. Keep back straight and knees slightly bent while securing drum ring/tightening bolt. Wear cut-resistant gloves.
2. Position drum clamp tightly in between drum ribs, securing drum clamp to drum with chain	**2a. CAUGHT:** Pinching fingers between drum clamp and handle/chain.	2a. Attach drum clamp with chain and tighten until snug. Do not place hands between drum clamp and drum as the chain is tightened; wear cut resistant gloves. Keep face away from drum when handling in case of escaping vapors.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Disengage safety latches on handle, pull handle down until drum is lifted off ground and safety latches are reengaged; slightly suspending drum off the ground	**3a. EXERTION/ CONTACT:** Potential muscle strain associated with lifting/engaging drum/handle. Drum could shift/slip downward and crush toes.	3a. Ascertain whether the drum is overweight; if it is, then two people are needed to lower handle while drum is secured with clamp so that safety latches can be engaged. Keep body out of the line of fire of the handle (do not position head above handle) as it is being pushed down. Do not allow feet/toes to be positioned under the drum as it is being lifted; wear steel/composite toe boots.
	3b. CAUGHT: Fingers could be pinched while engaging/disengaging safety latches on handle	3b. Wear cut-resistant gloves while disengaging/reengaging safety latches. 3b. Avoid placing hands in pinch points.
4. Transport drums to designated location and disengage drum clamp (repeat Step 3 in reverse order)	**4a. FALL:** Tripping/ falling due to obstructions and uneven terrain. Potential for drum to fall during transport.	4a. Ensure transport path is free of potential obstructions that may cause the drum/carrier to become unstable. Position drum clamp between the ribs on the drum to prevent possible slipping.

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JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Surveying**	**Elevation Surveying**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Mark M Emmons	Project Engineer	Brian Hobbs	Senior Health & Safety Manager
Bjorn Wespestad	Senior Engineer	Joe Gentile	Corporate Health & Safety Manager
William Hansen	Senior Engineer		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant or leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Long sleeve Shirt
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel-toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Surveying equipment (i.e., leveling rod/measuring ruler, tripod and autolevel).

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site manager/ property owner.	**1a. CONTACT/EXPOSURE/FALL:** Lack of communication could result in H&S incident.	1a. Inform Site personnel of work scope, timeline and location(s). 1a. Inquire about other activities taking place at the Site. 1a. If applicable, obtain General Work permit for the day.
2. Locate surveying position for instrument and rod and set-up work area	**2a. FALL:** Slip/trip hazards	2a. Inspect area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.) and obstructions prior to setting up at the survey location. Keep eyes engaged with walking surface while in movement. Remember "Walking is Working." 2a. Conduct housekeeping and maintain clear paths to walk in and remove debris as required.
	2b. CONTACT: Traffic (surveying locations could potentially be in parking areas and sidewalks)	2b. Be aware of oncoming traffic. Utilize a flagman / spotter for locations in streets or high-traffic areas. 2b. Place 42 inch cones around the work area and delineate work zone with caution tape, snow fencing or safety bars, if necessary. 2b. Wear appropriate PPE including long sleeve high visibility clothing and or reflective safety vest. 2b. Face traffic, maintain eye contact with oncoming vehicles and establish a safe exit route.
	2c. OVEREXERTION: Hazard due to carrying, lifting, and bending while transporting equipment	2c. Use proper body positioning and lifting techniques; keep back straight, lift with legs, keep load close to body, and never reach with a load. 2c. Avoid carrying too much equipment at one time and team-lift equipment that is more than 50 lb.
	2d. CAUGHT/CONTACT: Pinch Points / sharp edges associated with setting up the tripod	2d. Wear cut resistant gloves when handling the tripod and keep fingers away from pinch points located near moving parts of the tripod. Don't carry tripod by the pointed ends.
	2e. OVEREXERTION: Hazard due to bending awkwardly to look through the autolevel	2e. When practical, set the height of the autolevel optic as to minimize bending at the waist.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Open / close manhole cover to well that is being surveyed (if necessary).	**3a. OVEREXERTION:** Muscle strain	3a. See 1c. Bend knees when reaching to open well. Use manhole lifting hook or pry bar to avoid bending.
	3b. CAUGHT: Pinch points associated with removing / replacing manholes and working with hand tools	3b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 3b. Use proper tools (ratchet and crowbar or pry bar for well cover) and inspect before use. 3b. Do not put fingers under well cover.
	3c. EXPOSURE: To potentially hazardous vapors To biological hazards	3c. No open flames/heat sources. 3c. To minimize exposure to vapors, allow well to vent after opening it and before survey activities begin. 3c. Work on the upwind side of manhole/well. 3.c Use caution while opening lids to inspect work area for bees and insects inside of covers. 3c. Use insect/tick repellent as necessary.
	3d. CONTACT: With traffic	3d. See 2b.
4. Perform survey.	**4a. FALL:** Slip/trip hazards	4a. See 2a.
	4b. CONTACT: Traffic (surveying locations could be potentially located in parking areas and sidewalks)	4b. See 2b. 4b. Personnel using the scope will be devoting most of their attention to the surveying activity and shall be aware of vehicular and pedestrian traffic. Personnel holding the measuring stick should be extra vigilant of survey personnel and communicate any potential hazards to the instrument person via handheld radio or similar means. Ensure reflective safety vest is worn.
	4c. ENERGY SOURCES: Electrical shock from survey rod striking overhead electric lines or lights	4c. Prior to raising and extending the survey rod, personnel should thoroughly inspect the area above the measuring point. If overhead electrical lines are encountered within 20 feet of the measuring point; stop work and consult with the office health and safety officer.
5. Break down work area.	**5a. CONTACT:** Traffic (surveying locations can potentially be in parking areas and sidewalks)	5a. See 2b.
	5b. EXERTION: Hazard due to carrying, lifting, and bending while transporting equipment	5b. See 2c.
	5c. CONTACT: Personal injury or equipment damage by striking surroundings with an extended rod or unsecured tripod leg	5c. Ensure rod is entirely collapsed prior to mobilization / demobilization between survey points. 5c. Ensure tripod legs are fully collapsed and secured with strap prior to mobilization / demobilization between set-ups.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-011	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Construction - Excavation**	**Excavation / Trenching**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Project Engineer	Brian Hobbs	Senior Health & Safety Manager
Ian Holst	Project Engineer	Joseph Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☒ LONG SLEEVED SHIRT	☒ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility long sleeved clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-toe boots		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Jackhammer, Excavator, Backhoe, Hand Tools, Photoionization Detector, barrels, 42" traffic cones, snow fencing, telescoping poles, temporary chain link fence, ladders, shovels, digging bars, power tools (cut-off saw), Two-way radios, Sheeting, Trench box, Retractable lanyard, Harness

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in motion and outside the swing/tip radius.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-Clearance Protocol.	**1a. CONTACT:** Damage to underground utility.	1a. Confirm that (if applicable) "Call Before You Dig" and local utility companies were contacted prior to trenching in order to confirm utility mark outs. Must have a case # before digging.
	1b. ENERGY SOURCE/CONTACT: Property damage; Pressurized water mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death.	1b. Pre-clearing of the trenching location must be conducted to a minimum of 5 vertical feet below the ground surface (10 feet minimum for Critical Zone) using hand tools (shovel and non-metallic dig bar) prior to trenching. Supervisor should be contacted to discuss appropriate pre-clearing depth. Complete subsurface clearance checklist.
	1c. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	1c. Be aware of the conditions when walking or loading equipment and working. Walk within established pathway avoiding uneven surfaces. Remove potential slip/trip/fall hazards.
2. Set up work zone.	**2a. CONTACT/CAUGHT:** Cuts/lacerations from equipment. Broken bones from contact by vehicle.	2a. Isolate work area from hazards with cones, barricades, and snow fencing, telescoping poles or temporary chain link fence. Utilize a flag person when necessary (i.e., third party traffic in area). Install traffic signs in roadways and for detours. Spotters will maintain and enforce exclusion zone.
	2b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	2b. See 1c.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Trenching Activity.	**3a. CONTACT:** Serious injury including broken bones, muscle strains or tears, and possibly death due to contact with machine.	3a. Spotter(s) required for all heavy equipment operation. No worker shall be allowed inside the exclusion zone or along the trench/excavation area while any equipment is in operation. A minimum exclusion zone greater than the length of the equipment boom must be established. Workers only allowed in exclusion zone if the operator is in "Hands Off "mode. Operator will not operate equipment until worker is out of exclusion zone. Spotters and operators will have radios for communication, when either loses sight of one another, and/or in case of emergency.
	3b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones	3b. Any trench/excavation deeper than 3' must have a ladder within 25' of any worker in the excavation. At least 3'(rungs) of the ladder shall be above the top of the excavation. All spoil piles shall be maintained 2' minimum from edge of excavation. 3b. Any trench/excavation deeper than 6' must have fall protection, retractable lanyard for ladder use, and 42" high guardrails along the edge of the trench/excavation.
	3c. EXPOSURE: Noise, Dust, Concrete- Asphalt, petroleum hydrocarbon vapors may cause damage to ears and lungs	3c. Air monitoring using a calibrated photoionization detector (PID) will be used to monitor the breathing zone of the work area. If a reading of >5ppm is recorded, the oversight personnel must temporarily cease work and instruct all Site personnel to step away from the area of elevated readings.
4. Setting Trench protections if necessary.	**4a. CAUGHT:** Injury due to contact with failed trench, may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4a. To prevent cave-ins and avoid caught by/between, excavations over 4' in depth, unless working in stable rock, shall have engineer approved shoring, sheeting or trench box. Top of protection shall be at least 2' above top of excavation.
	4b. CONTACT/CAUGHT: Injury due to rigging activities and entering exclusion zone during lifting and/or transport of shoring/trench box/material may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4b. Use only inspected rigging with 2, 3 or 4 lift points; wear cut-resistant gloves. Rigging to be hooked up to factory installed hook up points on equipment. Control load with non-conductive tag lines with workers out of exclusion zone. Don't stand underneath suspended load; wear steel toed boots and hard hat.
	4c. FALL: Possible injury due to fall into excavation may include muscle strains or tears, abrasions or lacerations, or broken bones.	4c. Shoring to be set and sides will be backfilled to avoid fall hazards before workers are allowed to enter area. Operator will be in "HANDS OFF" mode before workers enter work area to unhook rigging. An inspected ladder extending 3' above top of the shoring will be used to enter and exit the shoring. Workers will use three points of contact when using the ladder.
5. Secure/Leave Site. If backfilling, see excavation backfilling and compaction JSA for potential hazards and critical actions.	**5a. FALL:** Potential Slip, Trip or Fall - may cause muscle strains or tears, abrasions or lacerations, or broken bones.	5a. See 1c. 5a. All open excavations must be backfilled or secured prior to departure with steel plates, orange construction fence or temporary chain link fencing.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-012	DATE 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE:	WORK ACTIVITY (Description):
Generic	**Construction - General**	**Installation or Repair of Chain Link Fence**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Ray Greenidge	OHSM	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or Composite toed boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Fence materials, Hand tools, Power Tools, GFCI

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure work zone	**1a. FALL:** Slip, trip, or fall hazards associated with site conditions.	1a. Maintain good housekeeping and keep work area free of potential Slip, Trip and Fall hazards. 1b. Utilize Traffic Control devices to secure work zone (42" traffic cones with flags, and caution tape).
	1b. CONTACT: Vehicular and pedestrian traffic.	1b. Use work truck or rigid barriers to barricade the side of work area in the line-of-fire of vehicular traffic.
2. Development of anchor locations for Post-Holes for fences using either a Hammer drill or Post-Hole digger.	**2a. CONTACT:** Potential cut/abrasion hazards and splinters. Operation of hammer drill can result in ejected debris and eye hazard.	2a. De-energize power tools by removing battery packs or unplugging electrical supply prior to switching out components (i.e., Sawsall blades or drill bits). 2a. Unplug from electrical power or remove battery pack from tools before handing them off to another person. 2a. Wear Cut resistant gloves and safety glasses.
	2b. ERGONOMICS: Back strain while maneuvering Post-Hole digger or Shovel.	2b. Utilize proper lifting techniques when using digging tools. Keep back straight, bend at the knees, keep load close to body, turn with legs, and do not twist back. 2b. Inspect post-hole digger prior to use. Ensure there are no splinters on handle. Ensure that the shovel section bolts are in good working condition. 2b. Wear leather or cut-resistant gloves.
	2c. EXPOSURE: Operation of hammer drill can generate greater than 85 dBAs	2c. Wear hearing protection. Personnel not involved in the task must stand at least 10-foot away from the operating hammer drill.
	2d. ENERGY SOURCE: Electric hazards from operation of power tools.	2d. Use heavy-duty, outdoor cords with ground, rated for the electrical load required. Inspect extension cords, verify good condition; no exposed wires, cuts, damage, worn insulation, or damaged plugs. 2d. If the use of a generator is required, do not refuel generator while it is running. 2d. Use GFCI.
	2e. ERGONOMICS: Vibration injury.	2e. Wear vibration resistant gloves.
	2f. EXPOSURE: Exposure to generator noise/fumes.	2f. See 2c. 2f. Position generator such that exhaust is pointed away from workers or downwind of work area. Wear hearing protection if generator cannot be positioned out of the work area and if noise levels exceed 85 dBAs.
	2g. FALL: Trip hazards from equipment being left in work zone.	2g. Maintain good housekeeping and keep work area free of Slip, Trip and Fall hazards. Stage tools in designated areas at lowest potential energy. 2g. When possible route extension cords and hoses overhead or outside of walk path.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Manual lifting of fence materials	**3a. EXERTION/ERGONOMICS:** Back strain and personal injury from lifting heavy loads.	3a. 50 lbs is the maximum allowable weight per manual lift. Use a mechanical lifting device or the buddy system if the weight is greater than 50 lbs. 3a. Keep back straight, bend at the knees, and keep load close to body when lifting. 3a. Use buddy system when lifting awkward materials.
	3b. CONTACT: Potential cut/abrasion hazards.	3b. Ensure long sleeves are covering arms, wear cut-resistant gloves. Avoid grabbing sharp edges.
4. Installation of chain link fence or fabric.	**4a. OVEREXERTION:** Back strain and personal injury from lifting heavy loads	4a. See 3a.
	4b. CONTACT: Potential cut/abrasion hazards on fencing.	4b. Avoid sharp edges on fencing; ensure long sleeved shirts are fully covering arms, wear cut-resistant gloves. 4b. Use retractable knife for cutting privacy fabric.
5. Housekeeping.	**5a. FALL:** Slip, trip, fall hazards from items left in the work zone.	5a. Clean up loose items including fabric cuttings, tools, etc. 5a. Remove Slip, Trip and Fall hazards from the work area. 5a. Inspect work area to verify it is left in a safe condition.

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JSA TYPE CATEGORY	WORK TYPE:	WORK ACTIVITY (Description):
Generic	**Gauging and Sampling**	**Gauging and Sampling**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Brandon Tufano	Staff Geologist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☒ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☐ HEARING PROTECTION ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Knee pads, Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

42-inch Safety Cones, Caution Tape, Interface Probe and/or Water Level Meter, 20-lb., Type ABC Fire Extinguisher, Buckets. Tools as needed: Socket Wrench, Screw Driver, Crow Bar, Mallet, and Wire Brush.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization to monitoring well(s).	**1a. FALL:** Personal injury from slip/trip/fall due to uneven terrain and/or obstructions.	1a. Inspect pathway and plan for most suitable designated pathway prior to mobilization. 1a. Use established pathways, walk and/or drive on stable, secure ground and avoid steep hills or uneven terrain. 1a. If working near open water with an unguarded edge, wear life vest.
	1b. CONTACT: With traffic/third parties.	1b. Identify potential traffic sources and delineate work area with 42-inch traffic safety cones. Position vehicle to protect against oncoming traffic. Use caution tape to provide a more visible delineation of the work area if necessary. 1b. Wear appropriate PPE including high visibility clothing or reflective vest. 1b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.
	1c. EXERTION: Muscle strain from lifting equipment	1c. Use proper lifting techniques when handling/moving equipment; bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50 lbs. or heavier. 4c. Make multiple trips to carry equipment.
	1d. EXPOSURE: To biological hazards.	1d. Inspect work area for bees and insects. 1d. Use insect/tick repellent as necessary.
2. Open/close well.	**2a. EXERTION:** Muscle strain.	2a. Use proper lifting techniques; keep back straight, lift with legs and bend knees when reaching to open/close well.
	2b. CAUGHT: Pinch/crush points associated with removing/replacing manholes and working with hand tools.	2b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 2b. Use proper tools (ratchet and pry bar for well cover) and inspect before use. 2b. Do not put fingers under well cover.
	2c. CAUGHT: Pinch points associated with placing J-plug back onto PVC pipe.	2c. See 2b. 2c. Keep fingers out of line-of-fire when securing cap.
	2d. EXPOSURE: To potential hazardous vapors.	2d. No open flames/heat sources. 2d. To minimize exposure to vapors, allow well to vent after opening it and before sampling activities begin. 2d. Stand up-wind, if possible, to avoid inhaling vapors.
3. Gauge well.	**3a. CONTACT:** With contamination (e.g. contaminated groundwater).	3a. Wear chemical-resistant disposable gloves (over cut-resistant gloves) and safety glasses when gauging well. 3a. Insert and remove probe slowly to avoid splashing. 3a. Use an absorbent pad to clean probe.
	3b. CONTACT: With traffic.	3b. See 1b.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
4. Purge and sample well	**4a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors) and/or sample preservatives.	4a. Open and fill sample jars slowly to avoid splashing and contact with preservatives. 4a. Wear cut-resistant gloves and chemical-resistant disposable gloves when sampling. 4a. Fill sample containers over purge container to avoid spilling water onto the ground. 4a. Use an absorbent pad to clean spills. 4a. When using a bailer to purge a well, pull the bailer slowly from the well to avoid splash hazards. 4a. When sampling or purging the water using a bailer, pour out water slowly to reduce the potential for splash hazards with groundwater. 4a. When using a tubing valve always remove the valve slowly after sample collection to release any pressure and avoid pressurized splash hazards. 4a. When collecting a groundwater sample always point sampling apparatus (tubing, bailer, etc.) away from face and body.
	4b. CONTACT: Personal injury from cuts, abrasions, or punctures by glassware or sharp objects.	4b. To avoid spills or breakage, place sample ware on even surface. 4b. Do not over tighten caps on glass sample ware. 4b. Wear chemical-resistant nitrile disposable gloves over cut-resistant (i.e., Kevlar) gloves when sampling and handling glassware (i.e., VOA vials) or when using cutting tools.
	4c. EXERTION: Muscle strain while carrying equipment.	4c. Use proper lifting techniques when handling/moving equipment, bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50 lbs. or heavier. 4c. Make multiple trips to carry equipment.
	4d. CONTACT: With traffic.	4d. See 1b.
	4e. CONTACT: Pinch points with groundwater pump components (i.e., wheel, line, clamps).	4e. Wear leather gloves when working with groundwater pumps. 4e. Never place hands on or near pinch points such as the wheel, clamps or other moving parts during pump operations. 4e. Use the correct mechanisms, such as a pump reel, to lower pump into well. 4e. Never attempt to manually stop any moving part of equipment including hose reels and/or tubing.
	4f. EXERTION: Muscle strain from repetitive motion of bailing and sampling a well.	4f. See 4c. 4f. Include a stretch break when repetitive motions are part of the task.
5. Management of purge water.	**5a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors).	5a. Do not overfill container and pour liquids slowly so that they do not splash. 5a. Properly dispose of used materials/PPE in appropriate container in designated storage area.
	5b. EXERTION: Muscle strain from lifting/carrying and moving containers.	5b. Use proper lifting techniques when lifting / carrying or moving container(s) (see 4c.). 5b. Do not overfill container(s).
6. Decontaminate equipment.	**6a. EXPOSURE/CONTACT:** To contamination (e.g., SPH, contaminated groundwater, vapors).	6a. Work on the upwind side, where possible, of decon area. 6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Use an absorbent pad to clean spills.
	6b. CAUGHT: Pinch points associated with handling hand tools	6b. See 2b. 6b. Inspect hand tools for sharp edges before decontaminating.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-015	DATE: 1/4/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Mobilization/Demobilization**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Rebecca Lowy	Staff Assistant Geologist	Brian Hobbs	Senior Health & Safety Manager
Tally Sodre	OHSM	Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION (as needed) ☒ SAFETY SHOES: Steel Toe or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest of high-visibility clothing; long sleeve shirt; long pants	☒ GLOVES: Leather, nitrile, and cut resistant (as needed) ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: None

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around equipment in use..

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilize/demobilize and establish work area	**1a. FALL:** Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.	1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle. 1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground. 1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping; organize and store equipment neatly in one area at its lowest potential energy. 1a. Wear boots with adequate treads. 1a. Delineate unsafe areas with 42" cones, caution tape and/or flagging.
	1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.	1b. Observe and maintain the posted speed limits. 1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers. 1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities and to discuss any special hazards. Ensure that short-service employees (SSE) are identified. 1b. Identify potential traffic sources. 1b. Wear PPE including high visibility clothing or reflective vest. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing whenever possible. 1b. Maintain a minimum 10' exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver-to-spotter visibility. 1b. Delineate work area with 42" cones, flags, caution tape, and/or other barriers. 1b. Position "Work Area" signs at Site entrances, if possible, or at either side of work area.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
		1b. Position largest vehicle to protect against oncoming traffic. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route. 1b. Observe potential overhead and ground surface features that may interfere with moving equipment. Clear the path of physical hazards prior to initiating mobilization.
	1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.	1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient (positioned to best block oncoming traffic) of work area. 1c. Wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools/glass. 1c. Keep body parts away from line-of-fire of equipment. 1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure. 1c. Remove any loose jewelry. Avoid wearing loose clothing and/or ensure loose clothing is secure. 1c. Secure all items on the equipment, tighten up any items or features that have potential to shift or break during mobilization.
	1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.	1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, turn with whole body, keep load close to body, and never reach with a load. 1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either unwieldy or over 50 lbs.
	1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.	1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.). 1e. Wear long sleeved clothes treated with Permethrin, apply insect repellant containing DEET to exposed skin, and inspect clothes and skin for ticks during and after work. 1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.
	1f. EXPOSURE: Weather related injuries.	1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, nausea, rapid and shallow breathing). Take breaks in cool places and hydrate as needed. 1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks in warm areas as needed. 1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers). 1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.
	1g. EXPOSURE: Personal injury from noise hazards.	1g. Wear hearing protection if sound levels exceed 85 dBA (if you must raise your voice for normal conversation).

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-019	DATE: 1/4/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY **GENERIC**	WORK TYPE **Site Recon**	WORK ACTIVITY (Description) **Site Walk and Inspection**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Sara Barrientos	Staff Geologist	Brian Hobbs	Senior Health and Safety Manager
		Joe Duminuco	Vice President
		Joe Gentile	Corporate Health and Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest or high-vis outerwear	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: Tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map, emergency contact list, documentation of urgent care/hospital routes and / or guide familiar with Site, operating cell phone or walkie-talkie if Site allows.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): A minimum 10' exclusion zone will be maintained around equipment.

SITE SECURITY: Prior to site inspection verify appropriate method to address Site Security concerns as it relates to potential criminal activity, homeless population, and/or isolation concerns. Work with the Project Principal and/or Project Manager to address appropriately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site contact.	**1a. CONTACT/EXPOSURE/FALL:** Personal injury caused by lack of site specific hazards.	1a. Inquire about hazards and other activities taking place at the Site. 1a. Inform Site contact of work scope, timeline and location(s). 1a. Discuss emergency evacuation procedures and muster points with Site contact.
2. Traversing the Site	**2a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites.	2a. All equipment must be stowed and secured prior to moving. 2a. Maintain speed limit as posted on-site. 2a. When possible drive on established roadways. 2a. Yield to all pedestrians. 2a. Use pull-through spots or back into parking spots. 2a. Don high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season.
	2b. FALL: Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone.	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. When possible, use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others.
	2c. OVEREXERTION: Muscle strain while carrying equipment.	2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment.
	2d. EXPOSURE: Biological hazards – ticks; bees/wasps; poison ivy; insects; (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: • Use bee spray as appropriate to deter/eliminate bees.

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	2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	• Protect exposed skin with insect repellent. 2d. Poison Ivy: • Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin contacts poison ivy, wash skin thoroughly with soap and water. 2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected. 2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 2e. Wear appropriate rain gear as needed. 2e. Take frequent breaks if tired, wet, or cold/hot. Drink water. 2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
3. Walking near heavy equipment and machinery.	**3a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris **3b. OVEREXERTION:** Personal injury from lifting/moving/rotating equipment. **3c. EXPOSURE:** Hearing damage from noise generating equipment/processes. Inhalation/exposure to hazardous vapors and or dust. **3d. EXPOSURE:** Working in a remote area.	3a. See 2a. 3a. Maintain an exclusion zone of at least 10'-25' feet from all engaged equipment. 3a. Keep body parts out of the line of fire of pinch points. 3a. Wear appropriate PPE always. 3b. See 2c. 3c. Wear hearing protection if >85 dBA. (i.e. noise levels which require you to raise your voice to communicate) 3c. Always wear leather gloves when handling any tools or equipment. 3c. Always wear appropriate PPE based off chemicals present. 3d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work if applicable. 3d. Always carry a communication (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) device when traversing remote areas.
4. Working in adverse weather conditions.	**4a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	4a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 4a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 4a. Wear appropriate rain gear as needed. 4a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 4a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
5. Departing Site.	**5a. EXPOSURE:** Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.	5a. Sign out or notify Site contact and Roux Project Manager of your departure.

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JOB SAFETYANALYSIS Ctrl. No. GEN-020	DATE: 1/4/2018	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY: **GENERIC**	WORK TYPE: **Gauging & Sampling**	WORK ACTIVITY (Description): **Soil Sampling**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
MaryBeth Lyons	Project Scientist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health and Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES ☒ FLAME RESISTANT CLOTHING (as needed)	☐ GOGGLES ☐ FACE SHIELD: ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Recommended Equipment: 42" traffic cones, caution tape, trowel

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around moving equipment, if present.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure location	**1a. CONTACT:** Personnel and vehicular traffic may enter the work area.	1a. If in an area with foot or vehicle traffic, delineate the work area with 42" traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 1a. Wear reflective vest and/or high visibility clothing. 1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic. 1a. Communicate work activity with adjacent work areas.
	1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.	1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions. 1b. Use established pathways and walk on stable, secure ground. 1b. Stage equipment and tools in a convenient, stable, and orderly manner. Store equipment at lowest potential energy. 1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be required (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.
	1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke. Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire, if applicable. Exposure to explosive vapors due to tank farm operations. Exposure to airborne dust due to high wind speeds. Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.	1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected. 1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are expected. 1c. Be aware of the location of all Site personnel. 1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). 1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). 1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or a climate controlled area (i.e., car, site trailer, etc.). 1c. No open flames/heat sources. 1c. Flame retardant clothing must be worn when specified by Site policy. 1c. Cell phones should be disabled when specified by Site policy. 1c. Pre-treat field clothing with Permethrin prior to site visit to kill ticks and insects. 1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 1c. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 1c. Inspect area to avoid contact with biological hazards. 1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1c. Wear spoggles if the average wind speeds are above 15 mph. 1c. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite. 1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. If rash persists after washing, immediately notify your supervisor, the OM and OHSM for possible consultation with a physician at an approved Occupational Health Clinic.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Collect Soil Sample	**2a. CONTACT:** Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling. Personal injury from contact with glass sample jars.	2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant (nitrile) disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the “show me your hands” policy. 2a. See 1a.
	2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.	2b. Wear chemical-resistant (nitrile) disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. Wear safety glasses to protect eyes from dust or air-borne contaminants that may results from disturbing the soil. 2b. Where possible, remain upgradient from sample location if collecting soil sample from stockpile, drill rig, etc. to avoid breathing contaminant vapors, if they are present. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.
	2c. EXERTION: Exertion due to repetitive motion and ergonomics.	2c. Utilize a table or raised surface for soil sampling if multiple soil samples are going to be taken to minimize repetitive bending motion.
3. Decontaminate equipment	**3a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil).	3a. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area. 3a. Remain upwind of sample and avoid breathing contaminant vapors, if they are present.
	3b. EXPOSURE: Chemicals in cleaning solution including ammonia.	3b. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3b. Work on the upwind side of decontamination area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area. Ensure that all drums are properly labeled and secured.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-021	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Gauging and Sampling**	**Soil Vapor Sampling (Permanent Monitoring Points)**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Jeff Wills	Project Hydrogeologist	Brian Hobbs	Senior Health & Safety Manager
Julie Moriarity	Project Scientist	Joe Gentile	Corporate Health and Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut-resistant & Nitriles
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Bug Spray, Sun Screen, Knee Pads or kneeling pad
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel-toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

9/16" Socket and Wrench, Non-Toxic Clay, Teflon-Lined Tubing, Masterflex Tubing, Air Pump with Low Flow, Dry Cal, Enclosure (Bucket with 2 holes), Helium Gas Canister, Summa Canisters and Flow Controllers, MultiRae Photo Ionization Detector (PID), Helium Detector, Tubing Cutter, 42-inch Safety Cones, Caution Tape or Retractable Cone Bars

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): A 5-foot exclusion zone will be maintained for non-essential personnel.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Define and secure work area.	**1a. FALL:** Potential tripping hazards.	1a. Ensure work area is secure and inform others (third party) of work activity. 1a. Remove tripping hazards and inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment.
	1b. CONTACT: Potential contact with moving vehicles or pedestrians.	1b. If working alongside roads, look both ways before entering roadways, face traffic, and utilize work vehicle to protect employees. 1b. Delineate work area (including vehicles) with traffic safety cones and caution tape or retractable cone bars. 1b. Maintain a 5-foot exclusion zone. 1b. Wear high visibility clothing or reflective safety vest.
	1c. EXERTION: Muscle strain while lifting and carrying equipment.	1c. When carrying equipment to/from work area, keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced. Use mechanical assistance/make multiple trips to carry equipment.
2. Remove well cover / close well cover.	**2a. CONTACT/CAUGHT:** Pinch points and scrapes associated with hand tools and well covers.	2a. Keep hands away from pinch points. 2a. Use hand tools with extensions to remove and replace well covers. 2a. Wear cut-resistant gloves. 2a. Use knee pads or kneeling pad when repetitive kneeling on rough ground is anticipated.
	2b. FALL: Potential tripping hazards associated with installing bolts.	2b. Place security bolts in secure location so not to create tripping hazards. Replace security bolts so that they fit flush with monitoring well covers.
	2c. EXERTION: Physical exertion to remove bolts that were over torqued or stripped.	2c. Replace any security bolts that show signs of stripping. Do not over tighten. 2c. Use body positioning and bending techniques that minimize muscle strain; keep back straight, bend at the knees. 2c. See 2a.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Screen vapor point with PID.	**3a. FALL:** Potential tripping hazards associated with equipment. **3b. EXPOSURE:** Inhalation of soil vapor	3a. Place equipment in one area close to the sampling location. 3b. Identify area where equipment is to be stored within the work area (away from main walking path). 3a. Don't leave equipment on the ground. Return equipment to storage area between uses. 3b. Replace brass caps immediately upon completion to avoid soil vapors migrating to the surface through sample tubing. 3b. Stand upwind of sample point during screening activities.
4. Remove / replace brass caps at the end of the sam`ple tubing.	**4a. CONTACT:** Pinch points associated with hand tools and brass caps. **4b. EXPOSURE:** Potential pathway for vapors to migrate to land surface.	4a. Use wrench to remove and replace brass caps. 4a. Wear cut-resistant gloves to protect against pinch points and scrapes. 4b. See 3b. 4b. Stand up wind of sample point location.
5. Set up soil vapor sampling equipment and calibration of meters.	**5a. FALL:** Potential tripping hazards associated with equipment and tubing.5b. **5b. CONTACT:** Pinch points associated with handling equipment. **5c. EXPOSURE:** Inhalation of calibration gas and helium.	5a. See 3a. 5a. Keep tubing slack to a minimum and locate the summa canister as close to the sampling location as possible. 5a. Avoid stepping over equipment and tubing. 5b. Do not place fingers/hands under sampling equipment. 5b. Make multiple trips when unloading equipment in work area. 5b. Wear cut-resistant gloves to protect against pinch points while handling sampling equipment. 5c. Review SDS for each type of calibration gas used before calibrating. 5c. Calibrate meters in a well-ventilated area and keep air flow regulator away from face. 5c. Close valve on canisters after use to avoid inhalation of excess helium or calibration gas. 5c. Stand up wind of bucket during helium tracer gas test.
6. Cleaning Work Area.	**6a. FALL:** Potential tripping hazards associated with equipment and tubing. **6b. CONTACT:** Storing and transport of equipment in car.	6a. See 3a. 6a. See 3b. 6b. Ensure that equipment is placed securely in the vehicle. Do not stack equipment on top of each other. Secure equipment so that it will not slide while being transported. 6b. Wear cut-resistant gloves while handling/loading equipment.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-023	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Construction**	**Spotting Heavy Machinery**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Levi Curnutte	Project Scientist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ Particulate Respirator	☒ GLOVES: Cut resistant / leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☒ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-/Composite-toe boots/shoes		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Heavy Machinery (i.e. excavator, payloader, truck, forklift, etc.)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around heavy equipment. Larger equipment with an increased operating or tip-over radius may need a larger exclusion zone. This should be defined prior to operating each piece of equipment

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Prepare for machine activity.	**1a. CONTACT:** Obstructions in the work area may create contact hazards from machinery.	1a. Cordon off the work area with safety barrels/cones and a rigid barrier (snow fence, traffic bar, etc.). Communicate that only necessary personnel should be in the work area. Spotter and equipment operator shall enforce the **10-ft (exclusion zone) EZ.** Operator will not operate but shall remain in the hands-off mode while personnel are within the exclusion zone.
	1b. Fall : Slip/Trip/Fall	1b. Ensure that work area is flat, level and clear of any obstructions or debris before setting up work zone.
2. Spotting.	**2a. CONTACT:** Machine or load contact with personnel, property, or machinery.	2a. Discuss the specifics of the work with the operator and be clear about any hand signals that will be used. Clearly discuss the limits of the assigned work area and the machine's Exclusion Zone. Maintain Exclusion Zone. The Exclusion Zone shall be delineated by using 42-inch traffic cones/barrels and a fixed rigid barrier. 2a. The Minimum Heavy Equipment Exclusion zone is 10ft. if it is a larger piece of equipment or has an increased swing or tip-over radius the exclusion zone will need to be increased to accommodate the full range of motion. 2a. Both the spotter and equipment operators shall have 2-way radios/cellular devices on their persons to ensure audible communication in the event any changes or new hazards may arise. 2a. All workers should stay outside of the Exclusion Zone of all equipment unless operator is stopped and in "Hands Off" mode. **(This includes the spotter unless an exception has been established in the Site-specific JSA).** If the Exclusion Zone must be reduced due to work area restrictions then the spotter and operator shall enforce the reduced Exclusion Zone. 2a. Spotters must make eye contact with the machine operator or all movement ceases until visual contact can be reestablished. 2a. Spotter shall keep an eye out for any issues with the machine the operator may not see and communicate with other work crews and spotters on behalf of the operator. 2a. If the spotter needs to take a break, he must find a replacement before leaving or have the machine stop operations. **No heavy equipment shall operate without a spotter under any circumstances.** 2a. Wear fluorescent clothing/safety vest.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
	2b. FALL: Slip/Trip/Fall	2b. Look where walking to identify and avoid slip/trip/fall hazards. Avoid icy and/or wet surfaces. Remove obstacles if possible. 2b. Use designated walkways during spotting whenever possible.
	2c. CAUGHT: Caught between machinery and nearby objects.	2c. **Maintain Exclusion Zone.** Do not stand between large, loose or fixed objects or structures and the machinery while it is in motion. Keep in sight of operator at all times while being aware of surrounding structures.
	2d. EXPOSURE: Inhalation of exhaust from machinery.	2d. The spotter will position him/herself upwind of the working machinery, when possible. Spotter will also inform others working within the vicinity of the EZ of proper positioning, if applicable.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-024	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
GENERIC	**Site Maintenance**	**Tree/Brush/Overgrowth/Lawn Maintenance**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Robert Chimchirian	Senior Engineer	Brian Hobbs	Senior Health & Safety Manager
Scott Wright	Staff Geologist	Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES: spoggles when using chain saw	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION ☒ SAFETY SHOES: Steel Toed Boots (Composite Toe are not acceptable for use with chainsaws) ☐ KNEE PADS	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High visibility long- sleeved shirt/Fluorescent reflective vest with long-sleeved shirt	☒ GLOVES: Cut-Resistant ANSI Level 2 work gloves ☒ OTHER: Insect Repellant (DEET/permethrin), sunscreen (as needed), logging helmet, safety glasses, Tyvek (as needed).

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Brush Hog, Wood Chipper, Lawn Mower, Hand Grabber, Blower, Line Trimmers, Pruning Shears, Chain Saw, Hand Tools,42" Safety Cones, Wheel Chocks, A-Frame ladder.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE: A varying sized exclusion zone will be determined based on equipment being used.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Inspect all equipment prior to use.	**1a. FALL:** Uneven terrain and other debris.	1a. Use designated walk areas. Remove slip, trip and fall hazards from walk areas.
	1b. EXPOSURE: Biological hazards, and bloodborne pathogens (i.e., insects, poison ivy, snakes, used syringes, contaminated trash, bed bugs, etc.) and sun exposure.	1b. Equipment inspections should take place in a parking lot or cleared area to avoid exposure to biological hazards (e.g. paved parking lot, stone paved area, etc.).
2. Prune Brush/Overgrowth Maintenance.	**2a. FALL:** Uneven terrain and other debris. **2b. EXPOSURE:** Biological hazards, and bloodborne pathogens (i.e., insects, poison ivy, animals, used syringes, contaminated trash, bed bugs, etc.) and sun exposure.	2a. Use designated walk areas. Remove slip, trip and fall hazards from walk areas. 2b. Survey work area: Identify biohazards (i.e., bees nest, toxic vegetation, animals). 2b. Use bee sprays to remove nests. 2b. Avoid contact with toxic vegetation (i.e., poison ivy). If contact cannot be avoided, wear protective gloves or coveralls when handling toxic vegetation. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. 2b. Wear light-colored clothing.. 2b. Pre-treat field clothing with Permethrin prior to site visit to kill/repel ticks and insects. [Note: clothing treated with Permethrin should be allowed 2 to 4 hours to dry prior to being worn.] 2b. Wear long-sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 2b. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 2b. Wear cut resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 2b. Have Tyvek suits onsite in case tick populations in work areas warrant additional PPE. 2b. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite. 2b. Wear sunscreen with an SPF of at least 15 whenever 30 minutes or more of exposure is expected. 2b. Use grabber to pick up trash and sharp objects. 2b. Place sharps (syringes) in a hard shelled container and dispose of at a designated facility. 2b. Use mechanical methods when possible to lift and load abandoned mattresses and sofas to avoid contact with bed bugs.
	2c. CONTACT: Falling debris or overhead hazards. Contaminated soils. Personal injury from contact with hand tools/equipment.	2c. Wear safety glasses and hardhat. 2c. Prune in a manner so that cuttings are propelled away from the operator and bystanders. 2c. Stay clear from line-of-fire of overhead branches when cutting, as well as check branches for tension prior to pruning. 2c. Wear coveralls and nitrile gloves over cut-resistant gloves to protect against exposure to potentially contaminated soils. 2c. Check handle of chainsaw for proper position (tool should be balanced at handle) adjust and tighten as needed. 2c. Check integrity of blade edge; sharpen as necessary to avoid slippage while cutting.
	2d. FALL: Pruned branches.	2d. Place in back of truck branches cut from shrubs and trees to minimize trip hazards and to make it easier to identify any additional trip hazards (i.e., branches, roots, depressions).

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Branch/Tree Removal using chain saw.	**3a. OVEREXERTION**: Back strain when cutting, lifting and reaching.	3a. Use correct body positioning while handling saw, bend at the knees, keep back straight and saw forward and away from body. Be aware of foot and leg placement in relation to saw blade. 3a. Use an A-Frame ladder to cut hard-to-reach branches. 3a. Use a buddy to stabilize ladder if the terrain is uneven. 3a. Use the buddy system to lift branches that are heavier than 50 lbs.
	3b. CONTACT: Deep cut and amputation hazard while operating chainsaw.	3b. Ensure chain guard is on chain saw. 3b. Cut away from body. 3b. Turn off chain saw when it is not in use.
	3c. FALL: Uneven terrain and debris.	3c. Use three points of contact when exiting/entering truck. 3c. Inspect walking path for uneven terrain, weather-related hazards (i.e., tree debris, puddles, ice, etc.), and obstructions prior to accessing work area. 3c. Use established pathways and walk on stable, secure ground. 3c. Place tools and equipment in designated area and maintain good housekeeping. 3c. Wear boots with a minimum of ¼" treads and steel toes.
	3d. EXPOSURE: Biological hazards, animals, and loud noise from equipment.	3d. See 2b. 3d. Survey your surroundings for potential hazards. 3d. Wear logging helmet equipped with hearing protection to prevent exposure to loud engine noise. 3d. Inspect area for insect nests and toxic vegetation and remove as necessary, or stay away until sprayed. 3d. Wear hearing protection while using the chain saw.
	3e. CONTACT: Flying debris. Potential contact with chainsaw blade or hot surface and fence.	3e. Determine areas where tree or branches are to be felled (cut so branches fall away) and plan escape route accordingly; delineate area and identify obstructions. 3e. Wear logging helmet equipped with screen and always wear spoggles. 3e. Provide advanced warning when tree will be coming down. 3e. Other personnel should maintain a distance of 100 feet away from large tree cutting activities.
4. Branch/Tree Consolidation.	**4a. CONTACT:** Downed branches and tree. Loading of debris from tree into truck.	4a. Wear cut-resistant gloves and ensure arms are fully covered by long sleeve shirt while handling trees. 4a. Do not stand under branches that are being cut.
	4b. OVEREXERTION: Back strain when cutting, lifting, consolidating.	4b. See 3a. above. 4b. Cut downed trees into pieces that are less than 50 lbs. Use assistance for loads heavier than 50 pounds.
	4c. EXPOSURE: Biological hazards, animals and noise.	4c. See 3c. above.
5. Cut Lawn Area/ and sweep/blow away grass cuttings.	**5a. CONTACT:** Obstacles and large debris. Flying debris.	5a. Inspect work area and identify hazards before starting the work. Remove small obstacles when possible and avoid large obstacles that cannot be removed. 5b. **Maintain 10' exclusion zone** around mower and a **30' exclusion zone** around mower discharge.
	5b. EXPOSURE: Loud noise from the mower and dust while blowing.	5b. Wear hearing protection while using the mower. 5b. Wear dust masks and blow downwind when possible.
6. Load Equipment and Leave work site.	**6a. CONTACT:** Sharp edges of equipment. Faulty equipment.	6a. Inspect tools before loading them. 6a. Carry equipment by the handles. Check handle for proper position (tool should be balanced at handle), adjust and tighten as needed. Keep working end of tool facing away from body to prevent contact. 6a. Wear leather gloves.
	6b. EXPOSURE: Biological hazards.	6b. Conduct tick check. Inspect any areas of body that were exposed, all clothing and other potential entry points such as the ankle and neck areas should be examined closely. 6b. Wash any areas of exposed skin.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-025	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**General**	**Trucking**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Lauren Dolginko	Project Geologist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility long sleeved clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-toe boots		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Heavy equipment (i.e. trucks)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in Hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE: A 10' minimum exclusion zone will be maintained around excavator, backhoe, dump trucks and other heavy equipment.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set up work zone.	**1a. CONTACT:** Personal injury/property damage caused by obstruction/vehicle.	1a. Establish work zone for manifesting/paperwork by communicating with workers before task begins. Maintain a **10 ft Exclusion Zone (EZ)** around all heavy equipment.
2. Loading of truck.	**2a. CONTACT:** Rolling Vehicle could cause bodily harm. **2b. CONTACT:** Machine or load may crush personnel, property or machinery. **2c. CONTACT:** Load shifting during travel.	2a. All commercial vehicles without an operator must have their engines off and wheels chocked. Truck and loading area should be on level ground. 2b. All machines (Excavator, Lull, Backhoe) must have a spotter. Spotter must communicate contact hazards such as other personnel in the work area, objects in the machine's blind spot, and overhead lines to the operator. Spotter and operator should have 2-way radios or established hand signals to communicate when needed. 2b. Loads must not be swung over other vehicles or personnel. 2b. Maintain **10ft EZ** around all equipment. 2c. Secure all loads prior to moving the truck with chains or straps or cribbing. 2c. Any loose soil or debris should be cleaned off truck sides prior to truck mobilization. 2c. All truck beds must be secured prior to traveling.
3. Dumping loads.	**3a. CONTACT:** Truck may flip sideways or backwards.	3a. All workers must stay behind and away from the side of trucks that are dumping to avoid contact with the truck potentially tipping sideways or backwards. EZ must be maintained equal to the height of bed while lifted.
4. Exchanging paperwork with truck driver.	**4a. CONTACT/CAUGHT:** Broken bones from contact by vehicle. **4b. FALL:** Slip, Trip or Fall may cause muscle strains or tears, abrasions or lacerations, or broken bones.	4a. Truck driver should exit truck with proper PPE and enter the established work zone to complete paperwork. If Site-specific safety prohibits drivers from exiting the truck, wait until truck is finished loading, with engine turned off, before approaching truck. 4a. Always establish eye contact with driver prior to approaching truck. 4a. Confirm sides of truck have been cleaned/brushed off prior to approaching truck. 4b. Survey walking route to identify slip/trip/fall hazards. Avoid icy/wet surfaces. Remove slip/trip/fall hazards if present. 4b. Communicate with driver and spotter prior to approaching truck. Maintain a **10 ft EZ** around all heavy equipment.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-026	DATE: 1/4/2018	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**O&M**	**Vac Truck Product Pump Out of ASTs and Drums**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Alfredo Fernandez	Staff Scientist	Brian Hobbs	Senior Health & Safety Manager
		Joe Gentile	Corporate Health & Safety Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☒ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High Visibility clothing, Tyvek suit (if needed), fire retardant suit	☒ GLOVES: Cut Restant / Leather / Nitrile / Chemical resistant ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: vac hoses, 5-gas meter (multi-gas meter), 20 lb. Type ABC fire extinguishers, safety cones, rigid barriers
Recommended: sunscreen/bug repellent (as needed)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): A 10-foot exclusion zone will be maintained around vac truck.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Calibrate multi-gas meter	**1a. EXPOSURE:** Calibration gas.	1a. Outside of work area calibrate the multi-gas meter while wearing nitrile gloves and safety glasses. 1a. Ensure cal gas is contained. Avoid inhalation of the gas.
2. Perform Vac Truck Inspection	**2b. CONTACT:** With personnel and structures	2a. Don appropriate PPE including high visibility clothing. 2b. Prior to moving truck, perform a visual check of the critical parts with the driver and complete appropriate checklist.
3. Setup Vac Truck and Work area	**3a. CONTACT:** With personnel and structures.	3a. Don high visibility clothing. 3a. Prior to moving truck, review where truck is to be positioned and secure work area with 42" traffic cones and rigid barrier/snow fence. 3a. Review hand signals with driver prior to backing and use a spotter at all times while moving the vehicle. 3a. Chock wheels once in place.
	3b. CAUGHT: In the line of fire of vac truck while backing. Caught in pinch points while making hose connections.	3b. Back up spotter must position him/herself to "leave him/herself an out". Stay out of the line of fire of the truck. 3b. Keep hands clear of potential pinch points while making hose connections (i.e., cam fittings); wear cut-resistant gloves.
	3c. SLIP/TRIP/FALL: Hazards from any debris in the immediate area.	3c. Inspect work area for slip, trip or fall hazards and remove or delineate. Designate a walking path free of debris. 3c. Stage tools and equipment out of walking surfaces to prevent slip/trip/falls. Maintain good housekeeping. 3c. Minimize vac hose/bond wire lengths and setup outside of walking paths.
	3d. EXPOSURE: Biological hazards. Contaminants in or on vac hose Loud noise from truck.	3d. Inspect work area for signs of biological inhabitation (insect nests or activity, animal signs). 3d. Use permethrin and DEET when working in grassy locations to prevent tick and insect exposure. 3d. Wear light clothing when possible and conduct a tick/insect check routinely. 3d. Wear nitrile gloves and keep hose clean with absorbent pads. 3d. Minimize duration or work around loud equipment if possible. Don hearing protection when noise levels exceed 85 dBA.
	3e. ERGONOMICS: From setting up work area and vac hoses.	3e. Utilize correct body positioning (i.e., knees bent, back straight, shoulders square). 3e. Do not reach more than an arm's length away to obtain an item. 3e. Do not lift loads over 50lbs without additional assistance.
	3f. ENERGY: Static electricity.	3f. Verify truck is either bonded to vessel that is being vacuumed or that the truck is grounded.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
4. Perform Vac Activities.	**4a. SLIP/TRIP/FALL:** Hazards from any debris in the immediate area. **4b. CAUGHT:** In crush/pinch points associated with vac truck valve handles. **4c. TRIP/SLIP/FALL:** Hazards from any debris in the immediate area. **4d. EXPOSURE:** Liquids, noise, and vapors.	4a. Maintain distance of 10 feet from vac hose/truck while operating. 4a. Ensure vac truck wheels are chocked. 4b. Keep hands clear of potential pinch points while making hose connections (i.e., cam fittings); wear cut-resistant gloves. 4c. See 3c. 4d. Secure hose connections prior to beginning vac activities (fully latched and close pin engaged). 4d. Upon completing vac activities, wipe down equipment with absorbent pads, as necessary. 4d. Don nitrile gloves while handling impacted equipment. 4d. Monitor breathing zone with multi-gas meter. 4d. Minimize duration or work around loud equipment if possible. Don hearing protection if noise exceeds 85 dBA.
4. Obtain tank level measurement / Pack truck for departure.	**5a. SLIP/TRIP/FALLS:** From tools and equipment in the work area. Climbing fixed ladder to gauge truck. **5b. ERGONOMICS:** Opening vac truck dome. **5c. EXPOSURE:** Petroleum-impacted materials. **5d. CAUGHT:** Pinch points when closing dome, storage boxes.	5a. See 3c. 5a. Prior to ascending truck ladder, verify that it is secure and in good condition (i.e., all steps intact, no signs of rot, no missing hardware). Use three points of contact at all times. 5a. If vac truck is equipped with a catwalk and guardrails, verify that they are structurally sound. 5a. Don harness and attach lanyard to anchor point if truck is not equipped with catwalk around dome of truck. Inspect harness and lanyard for tears prior to use. 5b. See 3c. 5c. Wipe down gauge stick over dome so as not to drip liquids on truck or ground. 5c. See 4d. 5d. See 4b.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

APPENDIX B

Site-Specific Emergency Response Plan & Routes to Urgent Care and Emergency Medical Facilities

Appendix B

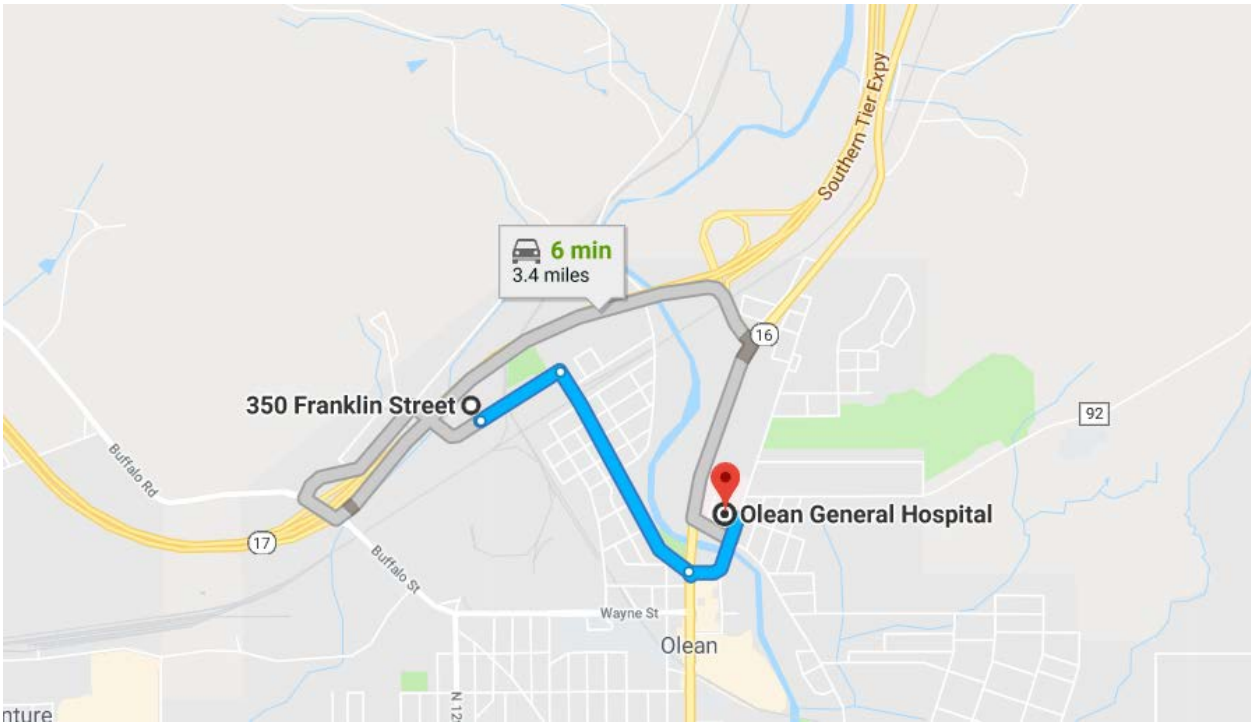
DIRECTIONS TO OLEAN GENERAL HOSPITAL

Olean General Hospital is located at 515 Main Street in Olean, NY 14760. The Hospital contact number for Olean General Hospital is (716) 373-2600.

Directions from the Site to Olean General Hospital are as follows:

- Head NORTHEAST on Franklin Street.
- Turn RIGHT on N UNION STREET.
- At the traffic circle, take the second exit onto MAIN STREET.
- END at Olean General Hospital, 515 MAIN STREET, Olean, NY 14760.

The driving time from the site to Olean General Hospital is approximately 6 minutes (3.4 miles from the site).



Appendix B

DIRECTIONS TO OLEAN GENERAL HOSPITAL OCCUPATIONAL MEDICINE

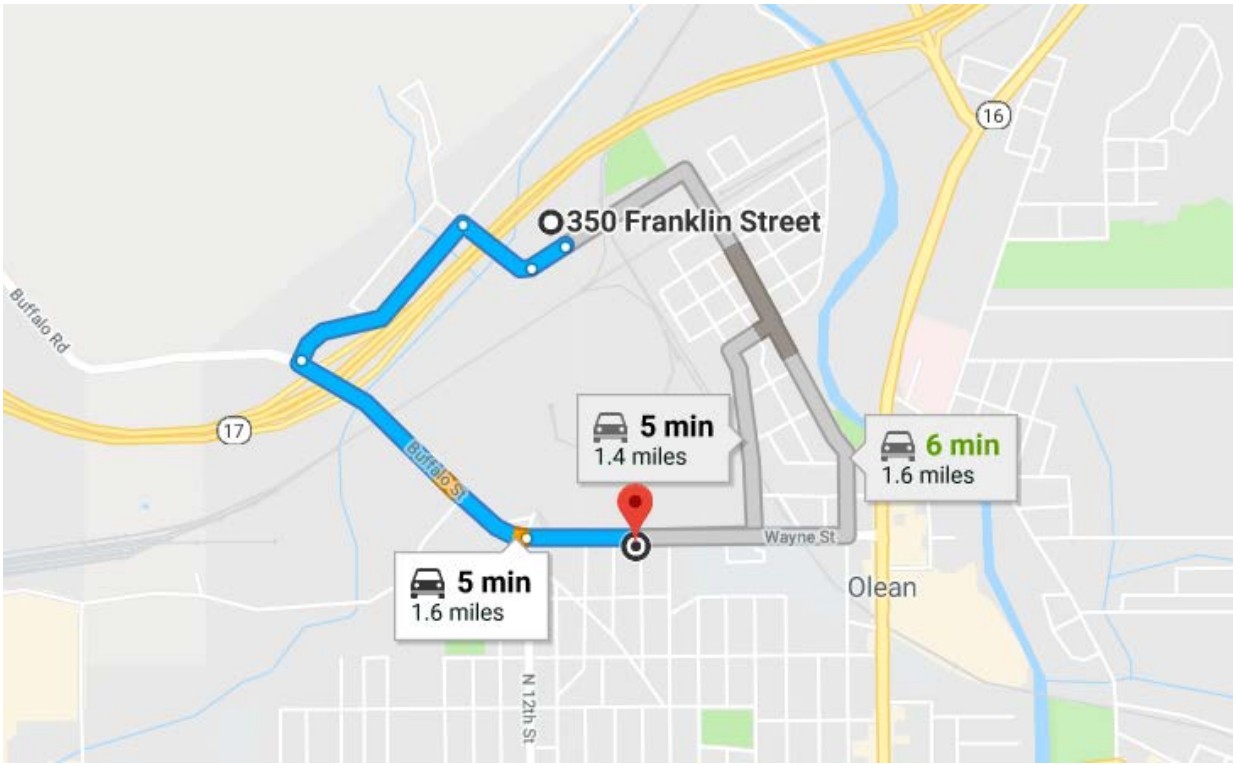
The nearest occupational health clinic to the Site is Olean General Hospital Occupational Medicine located at 901 Wayne Street in Olean, NY 14760. The telephone number for Olean General Hospital Occupational Medicine is (716) 375-7495. The hours for the clinic are as follows:

- (Mon. – Fri.) 8am – 4pm.

Directions from the Site to the urgent care center are as follows:

- Head SOUTHWEST on Franklin Street toward JOHNSON STREET.
- Continue onto JOHNSON STREET
- Turn LEFT onto HOMER STREET
- Turn LEFT onto BUFFALO STREET
- Continue onto WAYNE STREET
- END at Olean General Hospital Occupational Medicine 901 WAYNE STREET, Olean, NY, 14760.

The driving time from the site to the clinic is approximately 5 minutes (1.6 miles from the site).



APPENDIX C

SDSs for Chemicals Used

SAFETY DATA SHEET

1. Identification

Product identifier: HYDROCHLORIC ACID

Other means of identification

Synonyms:	Muriatic Acid, Hydrogen Chloride, Aqueous
CAS No.:	7647-01-0

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

Company Name:	Quality Environmental Containers, Inc.
Address:	607 Industrial Park Road • PO Box 1160 Beaver, WV 25813
Telephone:	Customer Service: 800-255-3950
e-mail:	info@qecusa.com

Emergency telephone number:

Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metals	Category 1

Health Hazards

Acute toxicity (Oral)	Category 4
Skin Corrosion/Irritation	Category 1
Serious Eye Damage/Eye Irritation	Category 1
Specific Target Organ Toxicity - Single Exposure (Inhalation - vapor)	Category 3

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: May be corrosive to metals.
Harmful if swallowed.
Causes severe skin burns and eye damage.
May cause respiratory irritation.

Precautionary Statement

Prevention: Keep only in original container. Wash thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. Do not eat, drink or smoke when using this product.

Response: Absorb spillage to prevent material damage. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

Storage: Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in corrosive resistant container with a resistant inner liner.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
HYDROCHLORIC ACID		7647-01-0	20 - 40%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing If breathing is difficult, give oxygen.

Skin Contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Causes severe skin and eye burns. Harmful if swallowed.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: No data available.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Fire or excessive heat may produce hazardous decomposition products.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Ventilate closed spaces before entering them. Keep unauthorized personnel away. Evacuate area. Keep upwind. See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Neutralize with lime or soda ash. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: Do not eat, drink or smoke when using the product. Do not get in eyes, on skin, on clothing. Wash hands thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use caution when adding this material to water.

Conditions for safe storage, including any incompatibilities: Keep container tightly closed. Store in a well-ventilated place. Unsuitable containers: metals.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
HYDROCHLORIC ACID	Ceiling	2 ppm	US. ACGIH Threshold Limit Values (2011)
	Ceil_Time	5 ppm 7 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	Ceiling	5 ppm 7 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceiling	5 ppm 7 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)

Appropriate Engineering Controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing and gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

Hygiene measures: Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not get in eyes. Wash contaminated clothing before reuse. Do not get this material in contact with skin.

9. Physical and chemical properties

Appearance

Physical state: Liquid
Form: Liquid
Color: Colorless
Odor: Pungent
Odor threshold: No data available.
pH: 0.1 (1 N aqueous solution)
Melting point/freezing point: -35 °C

Initial boiling point and boiling range:	48 °C
Flash Point:	Not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	14.1 kPa
Vapor density:	No data available.
Relative density:	1.18 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Reacts violently with strong alkaline substances.
Chemical Stability:	Material is stable under normal conditions.
Possibility of Hazardous Reactions:	Hazardous polymerization does not occur.
Conditions to Avoid:	Avoid contact with strong reducing agents. Strong oxidizing agents. Contact with alkalis.
Incompatible Materials:	Acids. Amines. Alkalies. Metals. Reducing agents. Oxidizing agents.
Hazardous Decomposition Products:	Chlorine. hydrogen chloride By heating and fire, corrosive vapors/gases may be formed.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	Harmful if swallowed.
Inhalation:	Causes severe burns.
Skin Contact:	Causes severe skin burns.
Eye contact:	Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product:	ATEmix (Rat): 581 mg/kg

Dermal

Product:	No data available.

Specified substance(s):

HYDROCHLORIC ACID	LD 50 (Mouse): 1,449 mg/kg

Inhalation

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID	LC 50 (Mouse, 1 h): 1108 ppm LC 50 (Rat, 1 h): 3124 ppm

Repeated Dose Toxicity

Product: No data available.

Skin Corrosion/Irritation

Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation

Product: Causes serious eye damage.

Respiratory or Skin Sensitization

Product: Not a skin sensitizer.

Carcinogenicity

Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No mutagenic components identified

In vivo

Product: No mutagenic components identified

Reproductive Toxicity

Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure

Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure

Product: None known.

Aspiration Hazard

Product: Not classified

Other Effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID — LC 50 (Western mosquitofish (Gambusia affinis), 96 h): 282 mg/l Mortality

Aquatic Invertebrates

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID — LC 50 (Green or European shore crab (Carcinus maenas), 48 h): 240 mg/l Mortality
LC 50 (Common shrimp, sand shrimp (Crangon crangon), 48 h): 260 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic Invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and Degradability

Biodegradation

Product: Expected to be readily biodegradable.

BOD/COD Ratio

Product: No data available.

Bioaccumulative Potential

Bioconcentration Factor (BCF)

Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)

Product: No data available.

Mobility in Soil: The product is water soluble and may spread in water systems.

Other Adverse Effects: Large amounts of the product may affect the acidity (pH-factor) in water with possible risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws. Since emptied containers retain product residue, follow label warnings even after container is emptied.

Contaminated Packaging: No data available.

14. Transport information

DOT

UN Number:	UN 1789
UN Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es)	
Class(es):	8
Label(s):	8
Packing Group:	II
Marine Pollutant:	No

IMDG

UN Number:	UN 1789
UN Proper Shipping Name:	HYDROCHLORIC ACID
Transport Hazard Class(es)	
Class(es):	8
Label(s):	8
EmS No.:	F-A, S-B
Packing Group:	II
Marine Pollutant:	No

IATA

UN Number:	UN 1789
Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es):	
Class(es):	8
Label(s):	8
Marine Pollutant:	No
Packing Group:	II

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

HYDROCHLORIC ACID Reportable quantity: 5000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

[X] Acute (Immediate) [ ] Chronic (Delayed) [ ] Fire [ ] Reactive [ ] Pressure Generating

SARA 302 Extremely Hazardous Substance

Chemical Identity	RQ	Threshold Planning Quantity
HYDROCHLORIC ACID	5000 lbs.	500 lbs.

SARA 304 Emergency Release Notification

Chemical Identity	RQ
HYDROCHLORIC ACID	5000 lbs.

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
HYDROCHLORIC ACID	500lbs

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
HYDROCHLORIC ACID	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

HYDROCHLORIC ACID Reportable quantity: 5000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

HYDROCHLORIC ACID Threshold quantity: 15000 lbs

HYDROCHLORIC ACID Threshold quantity: 5000 lbs

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

HYDROCHLORIC ACID Listed

US. Massachusetts RTK - Substance List

HYDROCHLORIC ACID Listed

US. Pennsylvania RTK - Hazardous Substances

HYDROCHLORIC ACID Listed

US. Rhode Island RTK

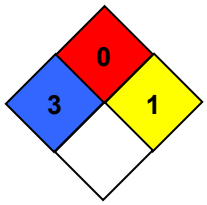
HYDROCHLORIC ACID Listed

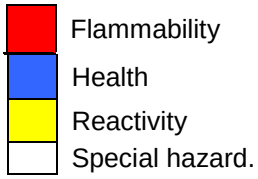
Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EU EINECS List:	On or in compliance with the inventory
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	On or in compliance with the inventory
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Switzerland Consolidated Inventory:	Not in compliance with the inventory.
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

NFPA Hazard ID





Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue Date:	02-02-2015
Revision Date:	No data available.
Version #:	4.0
Further Information:	No data available.
Disclaimer:	THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED "AS IS," AND QUALITY ENVIRONMENTAL CONTAINERS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION<(>,<)> WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, QUALITY ENVIRONMENTAL CONTAINERS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. QUALITY ENVIRONMENTAL CONTAINERS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **GASOLINE, UNLEADED AUTOMOTIVE**
Product Description: Hydrocarbons and Additives
Product Code: 123455-20
Intended Use: Fuel, Gasoline

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77253 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 1.
Skin irritation: Category 2. Germ Cell Mutagen: Category 1B. Carcinogen: Category 1B. Specific target organ toxicant (central nervous system): Category 3. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H224: Extremely flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H336: May cause drowsiness or dizziness. H340: May cause genetic defects. H350:

May cause cancer.

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P261: Avoid breathing mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P233: Store in a well-ventilated place. Keep container tightly closed. P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: GASOLINE

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. May be irritating to the eyes, nose, throat, and lungs. Exposure to benzene is associated with cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

ENVIRONMENTAL HAZARDS

Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	1	Flammability:	3	Reactivity:	0
HMIS Hazard ID:	Health:	1*	Flammability:	3	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL ALCOHOL	64-17-5	< 11%	H225, H319(2A)
GASOLINE	86290-81-5	89 - 100%	H224, H304, H336, H340(1B), H350(1B), H315, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
BENZENE	71-43-2	<= 1.65%	H225, H303, H304, H340(1B), H350(1A), H315, H319(2A), H372, H401
ETHYL BENZENE	100-41-4	1 - 5%	H225, H332, H373, H401, H412
N-HEXANE	110-54-3	1 - 5%	H225, H304, H336, H361(F), H315, H373, H401, H411
NAPHTHALENE	91-20-3	<1%	H302, H351, H400(M factor 1), H410(M factor 1)
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%	H226, H332, H335, H315, H319(2A), H401, H411
TOLUENE	108-88-3	5 - 10%	H225, H304, H336, H315, H373, H401, H412
TRIMETHYL BENZENE	25551-13-7	1 - 5%	H226, H315
XYLENES	1330-20-7	5 - 10%	H226, H304, H312, H332, H335, H315, H320(2B), H373, H401

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: The concentration of the components shown above may vary substantially. In certain countries, benzene content may be limited to lower levels. Oxygenates such as tertiary-amyl-methyl ether, ethanol, di-isopropyl ether, and ethyl-tertiary-butyl ether may be present. Because of volatility considerations, gasoline vapor may have concentrations of components very different from those of liquid gasoline. The major components of gasoline vapor are: butane, isobutane, pentane, and isopentane. The reportable component percentages, shown in the composition/information on ingredients section, are based on API's evaluation of a typical gasoline mixture. Oxygenates may be present up to the maximum permitted by European Standard EN228. Motor gasoline is considered a mixture by EPA under the Toxic Substances Control Act (TSCA). The refinery streams used to blend motor gasoline are all on the TSCA Chemical Substances Inventory.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This light hydrocarbon material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Extremely Flammable. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: <-40°C (-40°F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6

Autoignition Temperature: >250°C (482°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Keep away from incompatible materials. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
BENZENE		OSHA Action level	0.5 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	5 ppm		N/A	OSHA Sp.Reg.
BENZENE		TWA	1 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	1 ppm		N/A	ExxonMobil
BENZENE		TWA	0.5 ppm		N/A	ExxonMobil
BENZENE		STEL	2.5 ppm		Skin	ACGIH
BENZENE		TWA	0.5 ppm		Skin	ACGIH
ETHYL ALCOHOL		TWA	1900	1000 ppm	N/A	OSHA Z1

			mg/m3			
ETHYL ALCOHOL		STEL	1000 ppm		N/A	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
GASOLINE		STEL	200 ppm		N/A	ExxonMobil
GASOLINE		TWA	100 ppm		N/A	ExxonMobil
GASOLINE		STEL	500 ppm		N/A	ACGIH
GASOLINE		TWA	300 ppm		N/A	ACGIH
N-HEXANE		TWA	1800 mg/m3	500 ppm	N/A	OSHA Z1
N-HEXANE		TWA	50 ppm		Skin	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)		TWA	25 ppm		N/A	ACGIH
TOLUENE		Ceiling	300 ppm		N/A	OSHA Z2
TOLUENE		Maximum concentration	500 ppm		N/A	OSHA Z2
TOLUENE		TWA	200 ppm		N/A	OSHA Z2
TOLUENE		TWA	20 ppm		N/A	ACGIH
TRIMETHYL BENZENE		TWA	25 ppm		N/A	ACGIH
XYLENES		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
XYLENES		STEL	150 ppm		N/A	ACGIH
XYLENES		TWA	100 ppm		N/A	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
BENZENE	Creatinine in urine	End of shift	500 ug/g	t,t-Muconic acid	ACGIH BELs (BEIs)
BENZENE	Creatinine in urine	End of shift	25 ug/g	S-Phenylmercapturic acid	ACGIH BELs (BEIs)
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
N-HEXANE	Urine	End of shift at end of work wk	0.4 mg/l	2,5-Hexanedion, without hydrolysis	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)
TOLUENE	Blood	Prior to last shift of work wk	0.02 mg/l	Toluene	ACGIH BELs (BEIs)
TOLUENE	Creatinine in urine	End of shift	0.3 mg/g	o-Cresol, with hydrolysis	ACGIH BELs (BEIs)
TOLUENE	Urine	End of shift	0.03 mg/l	Toluene	ACGIH BELs

					(BEIs)
XYLENES	Creatinine in urine	End of shift	1.5 g/g	Methylhippuric acids	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.74
Density (at 15 ºC): 720 kg/m³ (6.01 lbs/gal, 0.72 kg/dm³) - 758 kg/m³ (6.33 lbs/gal, 0.76 kg/dm³)
Flammability (Solid, Gas): N/A
Flash Point [Method]: <-40°C (-40°F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)
Boiling Point / Range: > 20°C (68°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): 3 at 101 kPa
Vapor Pressure: > 26.6 kPa (200 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): > 10
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3
Solubility in Water: Negligible
Viscosity: <1 cSt (1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: None

MATERIALS TO AVOID: Alkalies, Halogens, Strong Acids, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 > 5000 mg/m3 (Vapor)	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Caused genetic effects in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475 476
Carcinogenicity: Data available.	Caused cancer in laboratory animals. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 416 421
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	May cause drowsiness or dizziness.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 412 453

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk.

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Very high exposure (confined spaces / abuse) to light hydrocarbons may result in abnormal heart rhythm (arrhythmias). Concurrent high stress levels and/or co-exposure to high levels of hydrocarbons (above occupational exposure limits), and to heart-stimulating substances like epinephrine, nasal decongestants, asthma drugs, or cardiovascular drugs may initiate arrhythmias.

Gasoline unleaded: Caused cancer in animal tests. Chronic inhalation studies resulted in liver tumors in female mice and kidney tumors in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations In Vitro or In Vivo. Negative in inhalation developmental studies and reproductive tox studies.Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing).

Contains:

BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies.

ETHANOL: Prolonged or repeated exposure to high concentrations of ethanol vapor or overexposure by ingestion may produce adverse effects to brain, kidney, liver, and reproductive organs, birth defects in offspring, and developmental toxicity in offspring.

NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown.

TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects.

TRIMETHYLBENZENE: Long-term inhalation exposure of trimethylbenzene caused effects to the blood in laboratory animals.

ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 3, 6

ETHYL BENZENE	100-41-4	5
GASOLINE	86290-81-5	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Majority of components -- Expected to be inherently biodegradable

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY. TCLP (BENZENE)

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
ID Number: 1203
Packing Group: II
Marine Pollutant: Yes
ERG Number: 128
Label(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II, MARINE POLLUTANT

LAND (TDG)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Special Provisions: 17

SEA (IMDG)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1203
Packing Group: II
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1203, MOTOR SPIRIT or GASOLINE or PETROL, 3, PG II, (-40°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Label(s) / Mark(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health. Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
BENZENE	71-43-2	<= 1.65%
ETHYL BENZENE	100-41-4	1 - 5%
N-HEXANE	110-54-3	1 - 5%
NAPHTHALENE	91-20-3	<1%
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%
TOLUENE	108-88-3	5 - 10%
XYLENES	1330-20-7	5 - 10%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 2, 4, 10, 11, 13, 15, 16, 17, 18, 19
ETHYL ALCOHOL	64-17-5	1, 4, 13, 16, 17, 18
ETHYL BENZENE	100-41-4	1, 4, 10, 13, 16, 17, 18, 19
GASOLINE	86290-81-5	1, 18
N-HEXANE	110-54-3	1, 4, 13, 16, 17, 18, 19
NAPHTHALENE	91-20-3	1, 4, 10, 17, 19
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1, 13, 16, 17, 18, 19
TOLUENE	108-88-3	1, 4, 11, 13, 15, 16, 17, 18, 19
TRIMETHYL BENZENE	25551-13-7	1, 13, 16, 17, 18
XYLENES	1330-20-7	1, 4, 13, 15, 16, 17, 18, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK

3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H224: Extremely flammable liquid and vapor; Flammable Liquid, Cat 1
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H312: Harmful in contact with skin; Acute Tox Dermal, Cat 4
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
H320(2B): Causes eye irritation; Serious Eye Damage/Irr, Cat 2B
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H335: May cause respiratory irritation; Target Organ Single, Resp Irr
H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
H340(1B): May cause genetic defects; Germ Cell Mutagenicity, Cat 1B
H350(1A): May cause cancer; Carcinogenicity, Cat 1A
H350(1B): May cause cancer; Carcinogenicity, Cat 1B
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H361(D): Suspected of damaging the unborn child; Repro Tox, Cat 2 (Develop)
H361(F): Suspected of damaging fertility; Repro Tox, Cat 2 (Fertility)
H372: Causes damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 1
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Section 06: Accidental Release - Spill Management - Water information was modified.
Section 06: Protective Measures information was modified.
Section 07: Handling and Storage - Handling information was modified.
Section 07: Handling and Storage - Storage Phrases information was modified.
Section 08: Biological Exposure Limits (ACG BEL) Table information was modified.

Section 10: Materials to Avoid information was modified.
Section 11: Chronic Tox - Component information was modified.
Section 11: Other Health Effects information was modified.
THIS MSDS COVERS THE FOLLOWING MATERIALS: ESSO EXTRA MIDGRADE UNLEADED | ESSO MIDGRADE UNLEADED | ESSO PREMIUM UNLEADED | ESSO REGULAR UNLEADED | ESSO SUPER PREMIUM UNLEADED | EXXON MIDGRADE UNLEADED | EXXON PREMIUM UNLEADED | EXXON REGULAR UNLEADED | GASOLINE | INDOLENE GASOLINE | MIDGRADE UNLEADED | MOBIL EXTRA UNLEADED | MOBIL REGULAR UNLEADED | MOBIL SPECIAL UNLEADED | MOBIL SUPER UNLEADED | PREMIUM UNLEADED | REGULAR UNLEADED | UNLEADED GASOLINE

Internal Use Only

MHC: 1A, 0B, 0, 0, 4, 1 PPEC: CF

DGN: 2000316XUS (1011203)

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MOBIL HYDRAULIC 10W**
Product Description: Base Oil and Additives
Product Code: 20152060D010, 581637-00
Intended Use: Hydraulic/transmission fluid

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX 77253 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	www.exxon.com, www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary

from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ZINC ALKYL DITHIOPHOSPHATE	113706-15-3	0.1 - < 1%	H303, H315, H318, H401, H411

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurized mists may form a flammable mixture.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >200°C (392°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator

selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Amber
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.868
Flammability (Solid, Gas): N/A
Flash Point [Method]: >200°C (392°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Decomposition Temperature: N/D

Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: [N/D at 40 °C] | 6.5 cSt (6.5 mm2/sec) at 100°C [ASTM D 445]
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -18°C (0°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
Ingestion	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitization	
Respiratory Sensitization: No end point data	Not expected to be a respiratory sensitizer.

for material.	
Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

Contains:
Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is not considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ZINC ALKYL DITHIOPHOSPHATE	113706-15-3	15
ZINC DIALKYL DITHIOPHOSPHATE	68457-79-4	15

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H318: Causes serious eye damage; Serious Eye Damage/Irr, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Composition: Component Table information was modified.
Section 01: Company Contact Methods information was modified.
Section 01: Company Mailing Address information was modified.
Section 01: Product Code information was modified.
Section 05: Hazardous Combustion Products information was modified.
Section 07: Handling and Storage - Handling information was modified.
Section 07: Handling and Storage - Storage Phrases information was modified.
Section 09: Boiling Point C(F) information was modified.
Section 09: Flash Point C(F) information was modified.
Section 09: n-Octanol/Water Partition Coefficient information was modified.
Section 09: Relative Density information was modified.
Section 09: Vapor Pressure information was added.
Section 09: Vapor Pressure information was deleted.
Section 09: Viscosity information was modified.
Section 14: Marine Pollutant information was modified.
Section 15: List Citations Table information was modified.
Section 15: National Chemical Inventory Listing information was modified.
Section 15: SARA (313) TOXIC RELEASE INVENTORY - Table information was deleted.
Section 16: HCode Key information was modified.

Internal Use Only
MHC: 0B, 0B, 0, 0, 0, 0 PPEC: A

DGN: 7054111XUS (546411)

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **NO. 2 DIESEL FUEL**
Product Description: Hydrocarbons and Additives
Product Code: 123455-22, 123455-29, 152017-00
Intended Use: Diesel engine fuel, Heating Oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	www.exxon.com, www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 3.
Acute inhalation toxicant: Category 4. Skin irritation: Category 2. Carcinogen: Category 2. Specific target organ toxicant (repeated exposure): Category 2. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H226: Flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H332: Harmful if inhaled. H351: Suspected of causing cancer. H373: May cause damage to organs

through prolonged or repeated exposure. Bone marrow, Liver, Thymus

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P260: Do not breathe mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: DIESEL OIL..C9-20

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS
Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS
May cause central nervous system depression. High-pressure injection under skin may cause serious damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. May be irritating to the eyes, nose, throat, and lungs.

ENVIRONMENTAL HAZARDS
Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability:	2	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
DIESEL OIL..C9-20	68334-30-5	80 - > 99%	H226, H304, H332, H351, H315, H373, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL BENZENE	100-41-4	0.1 - 1%	H225, H332, H373, H401, H412
NAPHTHALENE	91-20-3	0.1 - 1%	H302, H351, H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: Composition may contain up to 0.5% performance additives and / or dyes.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Contains hydrocarbon solvent/petroleum hydrocarbons; skin contact may aggravate an existing dermatitis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Flammable. Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Do not siphon by mouth. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Fixed storage

containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
DIESEL OIL..C9-20	Stable Aerosol.	TWA	5 mg/m3		Skin	ExxonMobil
DIESEL OIL..C9-20	Vapor.	TWA	200 mg/m3		Skin	ExxonMobil
DIESEL OIL..C9-20 [total hydrocarb, vapor&aerosol]	Inhalable fraction and vapor	TWA	100 mg/m3		Skin	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: If contact with material is likely, chemical goggles are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.81 - 0.87
Density (at 15 ºC): 810 kg/m³ (6.76 lbs/gal, 0.81 kg/dm³) - 876 kg/m³ (7.31 lbs/gal, 0.88 kg/dm³)
Flammability (Solid, Gas): N/A
Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)
Boiling Point / Range: 145°C (293°F) - 370°C (698°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa

Vapor Pressure: 0.067 kPa (0.5 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 1.7 cSt (1.7 mm2/sec) at 40 °C - 4.1 cSt (4.1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: < -6°C (21°F)

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Halogens, Strong Acids, Strong Bases, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 4100 mg/m3 (Vapor and aerosol)	Moderately toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 434
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data	Not expected to be a respiratory sensitizer.

for material.	
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475
Carcinogenicity: Data available.	Caused cancer in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Test(s) equivalent or similar to OECD Guideline 414
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: Data available.	Concentrated, prolonged or deliberate exposure may cause organ damage. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 413

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Target Organs Repeated Exposure: Bone marrow, Liver, Thymus

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Diesel fuel: Caused cancer in animal tests. Caused mutations in vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.

Diesel exhaust fumes: Carcinogenic in animal tests. Inhalation exposures to exhaust for 2 years in test animals resulted in lung tumors and lymphoma. Extract of particulate produced skin tumors in test animals. Caused mutations in vitro.

Contains:

NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is

uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

High molecular wt. component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be inherently biodegradable

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 1 - 1000 mg/l: data for similar materials
Aquatic - Acute Toxicity	96 hour(s)	Fish	LL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	EL50 1 - 100 mg/l: data for similar materials

Aquatic - Chronic Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	NOELR 1 - 10 mg/l: data for similar materials

Persistence, Degradability and Bioaccumulation Potential

Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded < 60 : similar material

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: DIESEL FUEL
Hazard Class & Division: COMBUSTIBLE LIQUID
ID Number: NA1993
Packing Group: III
Marine Pollutant: Yes
ERG Number: 128
Label(s): NONE
Transport Document Name: NA1993, DIESEL FUEL, COMBUSTIBLE LIQUID, PG III, MARINE POLLUTANT

Footnote: The flash point of this material is greater than 100 F. Regulatory classification of this material varies. DOT: Flammable liquid or combustible liquid. OSHA: Combustible liquid. IATA/IMO: Flammable liquid. This material is not regulated under 49 CFR in a container of 119 gallon capacity or less when transported solely by land, as long as the material is not a hazardous waste, a marine pollutant, or specifically listed as a hazardous substance.

LAND (TDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III

SEA (IMDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1202
Packing Group: III
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III, (>38°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III
Label(s) / Mark(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, IECSC, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE GHS HAZARD CLASSES: Acute Toxicity (any route of exposure), Aspiration Hazard, Carcinogenicity, Flammable (gases, aerosols, liquids, or solids), Skin Corrosion or Irritation, Specific Target Organ toxicity (single or repeated exposure)

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ETHYL BENZENE	100-41-4	0.1 - 1%
NAPHTHALENE	91-20-3	0.1 - 1%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
DIESEL OIL..C9-20	68334-30-5	1, 18
ETHYL BENZENE	100-41-4	1, 4, 10, 17, 19
NAPHTHALENE	91-20-3	1, 4, 10, 17, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Section 05: Fire Fighting Measures - Fire Fighting Instruction information was modified.
Section 05: Fire Fighting Measures - Unusual Fire Hazards information was modified.
Section 10: Conditions to Avoid information was modified.
Section 14: DOT Footnote information was modified.
Section 15: SARA (311/312) REPORTABLE GHS HAZARD CLASSES information was added.
Section 15: SARA (311/312) REPORTABLE HAZARD CATEGORIES information was deleted.

Section 16: HCode Key information was modified.
Section 16: Standard phrases for California Proposition 65 information was modified.
THIS MSDS COVERS THE FOLLOWING MATERIALS: DIESEL EFFICIENT | DIESEL NO. 2 | ESSO DIESEL FUEL | EXXON DIESEL FUEL | EXXON SYNERGY DIESEL EFFICIENT | LOW SULFUR DIESEL | MARINE DIESEL FUEL | MOBIL DIESEL EFFICIENT | MOBIL DIESEL FUEL | MOBIL SYNERGY DIESEL EFFICIENT | ULTRA LOW SULFUR DIESEL | WINTERIZED DIESEL FUEL

Internal Use Only

MHC: 1A, 0B, 2, 0, 4, 1 PPEC: C

DGN: 7079307XUS (1012398)

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **NO. 1 DIESEL FUEL**
Product Description: Hydrocarbons and Additives
Product Code: 708118-00, 978585, 979118, 979485, 97AC22, 97AJ11, 97AJ19, 97AJ21, 97AJ22, 97AJ23, 97AJ34, 97AJ35, 97BQ86, 97BR49, 97BR50, 97BR51, 97BR52, 97BR53, 97BR54, 97U646, EMGF24
Intended Use: Fuel

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77253 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 3.
Skin irritation: Category 2. Specific target organ toxicant (central nervous system): Category 3. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H226: Flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation.
H336: May cause drowsiness or dizziness.

Precautionary Statements:
P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P261: Avoid breathing mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves and eye / face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. May be irritating to the eyes, nose, throat, and lungs. Breathing of high vapor concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness.

ENVIRONMENTAL HAZARDS

Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0
HMIS Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a complex substance.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
KEROSENE	8008-20-6	> 95 %	H226, H304, H336, H315, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL BENZENE	100-41-4	0.1 - 1%	H225, H332, H373, H401, H412
NAPHTHALENE	91-20-3	< 1%	H302, H351, H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: Composition may contain up to 0.5% performance additives and / or dyes.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION
Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT
Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT
Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION
Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN
If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE
Contains hydrocarbon solvent/petroleum hydrocarbons; skin contact may aggravate an existing dermatitis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING
Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Flammable. Hazardous material. Firefighters should consider protective equipment indicated in Section 8. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.7 UEL: 5.0
Autoignition Temperature: 250°C (482°F) [ASTM E659]

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however,

geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Do not siphon by mouth. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
KEROSENE	Stable Aerosol.	TWA	5 mg/m3		N/A	ExxonMobil
KEROSENE	Vapor.	TWA	200 mg/m3		N/A	ExxonMobil
KEROSENE [as total hydrocarbon vapor]	Non-Aerosol	TWA	200 mg/m3		Skin	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1

NAPHTHALENE		TWA	10 ppm		Skin	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.775 - 0.83
Density (at 15 °C): 750 kg/m³ (6.26 lbs/gal, 0.75 kg/dm³) - 860 kg/m³ (7.18 lbs/gal, 0.86 kg/dm³) [ASTM D4052]
Flammability (Solid, Gas): N/A
Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.7 UEL: 5.0
Autoignition Temperature: 250°C (482°F) [ASTM E659]
Boiling Point / Range: > 200°C (392°F) [EN ISO 3405]
Decomposition Temperature: N/D
Vapor Density (Air = 1): N/D
Vapor Pressure: < 0.133 kPa (1 mm Hg) at 20 °C [EN 13016-1]
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 1.1 cSt (1.1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/D

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Halogens, Strong Acids, Alkalies, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 > 5000 mg/m3 (Vapor)	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 420
Skin	
Acute Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475 476 478 479
Carcinogenicity: Data available.	Not expected to cause cancer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 414 421
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	May cause drowsiness or dizziness.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 412

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Vapor/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness and other central nervous system effects including death.
Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Contains:

Kerosene: Carcinogenic in animal tests. Lifetime skin painting tests produced tumors, but the mechanism is due to repeated cycles of skin damage and restorative hyperplasia. This mechanism is considered unlikely in humans where such prolonged skin irritation would not be tolerated. Did not cause mutations In vitro. Inhalation of vapors did not result in reproductive or developmental effects in laboratory animals. Inhalation of high concentrations in animals resulted in respiratory tract irritation, lung changes and some reduction in lung function. Non-sensitizing in animal tests.
NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.
ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

Majority of components -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Majority of components -- Low potential to migrate through soil.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be inherently biodegradable

Atmospheric Oxidation:

Majority of components -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	96 hour(s)	Oncorhynchus mykiss	LL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	EL50 1 - 100 mg/l: data for similar materials
Aquatic - Chronic Toxicity	21 day(s)	Daphnia magna	NOELR 0.48 mg/l: data for similar materials
Aquatic - Chronic Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	NOELR 1 - 10 mg/l: data for similar materials

Persistence, Degradability and Bioaccumulation Potential

Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded < 60 : similar material

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: KEROSENE
Hazard Class & Division: COMBUSTIBLE LIQUID
ID Number: 1223
Packing Group: III
Marine Pollutant: No
ERG Number: 128
Label(s): NONE
Transport Document Name: UN1223, KEROSENE, COMBUSTIBLE LIQUID, PG III

Footnote: The flash point of this material is greater than 100 F. Regulatory classification of this material varies. DOT: Flammable liquid or combustible liquid. OSHA: Combustible liquid. IATA/IMO: Flammable liquid.

LAND (TDG)

Proper Shipping Name: KEROSENE
Hazard Class & Division: 3
UN Number: 1223
Packing Group: III

SEA (IMDG)

Proper Shipping Name: KEROSENE
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1223
Packing Group: III
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1223, KEROSENE, 3, PG III, (38°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: KEROSENE
Hazard Class & Division: 3
UN Number: 1223
Packing Group: III
Label(s) / Mark(s): 3
Transport Document Name: UN1223, KEROSENE, 3, PG III

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive

Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ETHYL BENZENE	100-41-4	0.1 - 1%
NAPHTHALENE	91-20-3	< 1%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	1, 4, 10, 17
KEROSENE	8008-20-6	1, 18, 19
NAPHTHALENE	91-20-3	1, 4, 9, 10, 17

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2

H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 05: Hazardous Combustion Products information was modified.
Section 11: Tox List Cited Table information was modified.
Section 15: Community RTK - Header information was modified.
Composition: Component Table information was modified.
GHS Precautionary Statements - Response information was modified.
Section 08: Biological Exposure Limits (ACG BEL) - Limit Header information was added.
Section 16: Revision Information - Implementation of GHS requirements phrase. information was deleted.
Section 08: Biological Exposure Limits (South Africa) - Limit Header information was deleted.
Section 02: GHS Contains for LABEL_GHS codes information was deleted.
Section 02: GHS Contains - Header information was deleted.
THIS MSDS COVERS THE FOLLOWING MATERIALS: DIESEL NO. 1 | ESSO DIESEL FUEL NO. 1 | EXXON DIESEL FUEL NO. 1 | KEROSENE (FUEL) | LOW SULFUR DIESEL NO. 1 | MOBIL DIESEL FUEL NO. 1 | ULTRA LOW SULFUR DIESEL NO. 1 | WINTERIZED DIESEL FUEL NO. 1

Internal Use Only
MHC: 1A, 0B, 0, 0, 4, 1 PPEC: C

DGN: 2000440XUS (1016820)

SAFETY DATA SHEET

Methanol

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Methanol (230, 232, 233)
CAS Number	:	67-56-1
Product Use Description	:	Solvent
Manufacturer or supplier's details	:	Quality Environmental Containers, Inc. 607 Industrial Park Road • PO Box 1160 Beaver, WV 25813
For more information call	:	1-800-255-3950 Monday-Friday, 8:00am-6:00pm)
In case of emergency call	:	**CHEMTREC): 1-800-424-9300** (24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	:	liquid, clear
Color	:	colourless
Odor	:	slight alcohol-like

Classification of the substance or mixture

Classification of the substance or mixture	:	Flammable liquids, Category 2 Eye irritation, Category 2A Reproductive toxicity, Category 2 Specific target organ toxicity - single exposure, Category 1, Eyes, Nervous system, Systemic toxicity

GHS Label elements, including precautionary statements

Symbol(s) :

Signal word : Danger

Hazard statements : Highly flammable liquid and vapour.
Causes serious eye irritation.
Suspected of damaging fertility or the unborn child.
Causes damage to organs.

Precautionary statements :

Prevention:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear protective gloves/ eye protection/ face protection.

Response:
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF exposed: Call a POISON CENTER or doctor/ physician.
If eye irritation persists: Get medical advice/ attention.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

Storage:
Store in a well-ventilated place. Keep cool.

Store locked up.

Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Carcinogenicity

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : CH4O

Chemical nature : Substance

Chemical Name	CAS-No.	Concentration
Methanol	67-56-1	100.00 %

SECTION 4. FIRST AID MEASURES

Inhalation : Call a physician immediately. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Use oxygen as required, provided a qualified operator is present.

Skin contact : Wash off immediately with plenty of water for at least 15 minutes. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Call a physician.

Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician.

Ingestion : Call a physician immediately. Do NOT induce vomiting. Immediate medical attention is required. Never give anything by mouth to an unconscious person.

Notes to physician

Treatment : Treat symptomatically.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Alcohol-resistant foam
Carbon dioxide (CO2)
Dry chemical
Cool closed containers exposed to fire with water spray.

Unsuitable extinguishing media : Do not use a solid water stream as it may scatter and spread fire.

Specific hazards during firefighting : Flammable.
Vapours may form explosive mixtures with air.
Vapours are heavier than air and may spread along floors.
Vapors may travel to areas away from work site before igniting/flashing back to vapor source.
In case of fire hazardous decomposition products may be produced such as:
Carbon monoxide
Carbon dioxide (CO2)
Formaldehyde

Special protective equipment for firefighters : Wear self-contained breathing apparatus and protective suit.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Wear personal protective equipment.
Immediately evacuate personnel to safe areas.
Keep people away from and upwind of spill/leak.
Ensure adequate ventilation.
Remove all sources of ignition.
Do not swallow.
Do not breathe vapours or spray mist.
Avoid contact with skin, eyes and clothing.

Environmental precautions : Prevent further leakage or spillage if safe to do so.

Prevent product from entering drains.
Discharge into the environment must be avoided.
Do not flush into surface water or sanitary sewer system.
Do not allow run-off from fire fighting to enter drains or water courses.

Methods for cleaning up : Ventilate the area.
No sparking tools should be used.
Use explosion-proof equipment.
Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).

SECTION 7. HANDLING AND STORAGE

Handling

Handling : Wear personal protective equipment.
Use only in well-ventilated areas.
Keep container tightly closed.
Do not smoke.
Do not swallow.
Do not breathe vapours or spray mist.
Avoid contact with skin, eyes and clothing.

Advice on protection against fire and explosion : Keep away from fire, sparks and heated surfaces.
Take precautionary measures against static discharges.
Ensure all equipment is electrically grounded before beginning transfer operations.
Use explosion-proof equipment.
Keep product and empty container away from heat and sources of ignition.
No sparking tools should be used.
No smoking.

Storage

Requirements for storage areas and containers : Store in area designed for storage of flammable liquids.
Protect from physical damage.
Keep containers tightly closed in a dry, cool and well-ventilated place.
Containers which are opened must be carefully resealed and

kept upright to prevent leakage.
Keep away from heat and sources of ignition.
Keep away from direct sunlight.
Store away from incompatible substances.
Container hazardous when empty.
Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures	:	Ensure that eyewash stations and safety showers are close to the workstation location.
Engineering measures	:	Use with local exhaust ventilation. Prevent vapour buildup by providing adequate ventilation during and after use.
Eye protection	:	Do not wear contact lenses. Wear as appropriate: Safety glasses with side-shields If splashes are likely to occur, wear: Goggles or face shield, giving complete protection to eyes
Hand protection	:	Solvent-resistant gloves Gloves must be inspected prior to use. Replace when worn.
Skin and body protection	:	Wear as appropriate: Solvent-resistant apron Flame retardant antistatic protective clothing. If splashes are likely to occur, wear: Protective suit
Respiratory protection	:	In case of insufficient ventilation, wear suitable respiratory equipment. For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Use NIOSH approved respiratory protection.
Hygiene measures	:	When using do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product. Keep working clothes separately.

Do not swallow.
Do not breathe vapours or spray mist.
Avoid contact with skin, eyes and clothing.
This material has an established AIHA ERPG exposure limit.
The current list of ERPG exposure limits can be found at http://www.aiha.org/insideaiha/GuidelineDevelopment/ERPG/Documents/2011erpgweelhandbook_table-only.pdf.

Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis
Methanol	67-56-1	TWA : time weighted average	(200 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values
Methanol	67-56-1	STEL : Short term exposure limit	(250 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values
Methanol	67-56-1	SKIN_DES : Skin designation:	Can be absorbed through the skin.	2008	ACGIH:US. ACGIH Threshold Limit Values
Methanol	67-56-1	REL : Recommended exposure limit (REL):	260 mg/m3 (200 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards
Methanol	67-56-1	SKIN_DES : Skin designation:	Can be absorbed through the skin.	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards

Methanol	67-56-1	STEL : Short term exposure limit	325 mg/m3 (250 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards
Methanol	67-56-1	PEL : Permissible exposure limit	260 mg/m3 (200 ppm)	02 2006	OSHA_TRANS:US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Methanol	67-56-1	TWA : time weighted average	260 mg/m3 (200 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000)
Methanol	67-56-1	STEL : Short term exposure limit	325 mg/m3 (250 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000)
Methanol	67-56-1	SKIN_FINAL : Skin designation (Final Rule Limit applies):	Can be absorbed through the skin.	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000)

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : liquid, clear

Color : colourless

Odor : slight alcohol-like

pH : Note: Not applicable

Melting point/freezing point	:	Note: Not applicable
Boiling point/boiling range	:	64.7 °C
Flash point	:	52 °F (11 °C) Method: closed cup
Evaporation rate	:	ca. 5 Method: Compared to Butyl acetate.
Lower explosion limit	:	6 %(V)
Upper explosion limit	:	36 %(V)
Vapor pressure	:	129.32 hPa at 20 °C(68 °F)
Vapor density	:	1.11 Note: (Air = 1.0)
Density	:	0.792 g/cm3 at 20 °C
Water solubility	:	Note: completely soluble
Ignition temperature	:	464 °C
Molecular weight	:	32.04 g/mol

SECTION 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Hazardous polymerisation does not occur.
Conditions to avoid	:	Heat, flames and sparks. Keep away from direct sunlight.
Incompatible materials to avoid	:	Strong oxidizing agents Aluminium Magnesium May attack many plastics, rubbers and coatings.
Hazardous decomposition products	:	In case of fire hazardous decomposition products may be produced such as: Carbon monoxide Carbon dioxide (CO2) Formaldehyde

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50: 5,628 mg/kg Species: Rat
Acute inhalation toxicity	:	LC50: 64000 ppm Exposure time: 4 h Species: Rat
Acute dermal toxicity	:	LD50: 15,800 mg/kg Species: Rabbit
Skin irritation	:	Species: Rabbit Classification: irritating Exposure time: 24 h

Eye irritation	:	Species: rabbit eye Classification: irritating
Repeated dose toxicity	:	Species: Rat Application Route: Inhalation Test substance: Methanol Note: Developmental Toxicity NOAEL (maternal toxicity) 10,000 ppm NOAEL (developmental toxicity) 5,000 ppm Skeletal and visceral malformations.
Genotoxicity in vitro	:	Note: In vitro tests did not show mutagenic effects
Genotoxicity in vivo	:	Note: In vivo tests did not show mutagenic effects

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Toxicity to fish	:	LC50: 29,400 mg/l Exposure time: 96 h Species: Fathead minnow
Toxicity to daphnia and other aquatic invertebrates	:	LC50: 10,000 mg/l Exposure time: 24 h Species: Daphnia (water flea)
Toxicity to bacteria	:	EC50: 43,000 mg/l Exposure time: 5 min Species: Photobacterium phosphoreum
	:	EC50: 40,000 mg/l Exposure time: 15 min Species: Photobacterium phosphoreum
	:	EC50: 39,000 mg/l Exposure time: 25 min Species: Photobacterium phosphoreum

Further information on ecology

Additional ecological information	:	Accumulation in aquatic organisms is unlikely. The product is readily degradable in the environment.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods	:	Observe all Federal, State, and Local Environmental regulations.

SECTION 14. TRANSPORT INFORMATION

DOT	UN/ID No.	:	UN 1230
	Proper shipping name	:	METHANOL
	Class		3
	Packing group		II
	Hazard Labels		3

IATA	UN/ID No.	:	UN 1230
	Description of the goods	:	METHANOL
	Class	:	3
	Packaging group	:	II
	Hazard Labels	:	3 (6.1)
	Packing instruction (cargo aircraft)	:	364
	Packing instruction (passenger aircraft)	:	352
	Packing instruction (passenger aircraft)	:	Y341

IMDG	UN/ID No.	:	UN 1230
	Description of the goods	:	METHANOL
	Class	:	3
	Packaging group	:	II
	Hazard Labels	:	3 (6.1)
	EmS Number	:	F-E, S-D
	Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

Inventories

US. Toxic Substances Control Act	:	On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	:	On the inventory, or in compliance with the inventory
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL)	:	All components of this product are on the Canadian DSL.
Japan. Kashin-Hou Law List	:	On the inventory, or in compliance with the inventory
Korea. Toxic Chemical Control Law (TCCL) List	:	On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	:	On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances	:	On the inventory, or in compliance with the inventory
New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand	:	On the inventory, or in compliance with the inventory

National regulatory information

US. EPA CERCLA Hazardous Substances (40 CFR 302)	:	The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ): Reportable quantity: 5000 lbs

	:	Methanol	67-56-1
SARA 302 Components	:	No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.	
SARA 313 Components	:	The following components are subject to reporting levels established by SARA Title III, Section 313:	
	:	Methanol	67-56-1
SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard Chronic Health Hazard	
CERCLA Reportable Quantity	:	5000 lbs	
California Prop. 65	:	WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	
		Methanol	67-56-1
Massachusetts RTK	:	Methanol	67-56-1
New Jersey RTK	:	Methanol	67-56-1
Pennsylvania RTK	:	Methanol	67-56-1
WHMIS Classification	:	B2: Flammable liquid D1B: Toxic Material Causing Immediate and Serious Toxic Effects D2A: Very Toxic Material Causing Other Toxic Effects D2B: Toxic Material Causing Other Toxic Effects This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.	

SECTION 16. OTHER INFORMATION

		HMIS III	NFPA
Health hazard	:	2*	1
Flammability	:	3	3
Physical Hazard	:	0	
Instability	:		0

* - Chronic health hazard

Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

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 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. Final determination of suitability of any material is the sole responsibility of the user. This information should not constitute a guarantee for any specific product properties.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.
Previous Issue Date: 03/19/2014
Prepared by Honeywell Performance Materials and Technologies Product Stewardship Group

Section 1: IDENTIFICATION

Product Name: Simple Green® All-Purpose Cleaner
Additional Names:

Manufacturer's Part Number: **Please refer to Section 16*

Recommended Use: Cleaner & Degreaser for water tolerant surfaces.
Restrictions on Use: Do not use on non-rinsable surfaces.

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA
Telephone: 800-228-0709 ● 562-795-6000 *Mon – Fri, 8am – 5pm PST*
Fax: 562-592-3830
Email: info@simplegreen.com
Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

This product is not classified as hazardous under 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200).

OSHA HCS 2012
Label Elements
Signal Word: None **Hazard Symbol(s)/Pictogram(s):** None required

Hazard Statements: None
Precautionary Statements: None
Hazards Not Otherwise Classified (HNOC): None
Other Information: None Known

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	> 84.8%*
Ethoxylated Alcohol	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Tetrasodium *N,N*-bis(carboxymethyl)-L-glutamate	51981-21-6	< 1%*
Sodium Carbonate	497-19-8	< 1%*
Citric Acid	77-92-9	< 1%*
Isothiazolinone mixture	55965-84-9	< 0.2%*
Fragrance	Proprietary Mixture	< 1%*
Colorant	Proprietary Mixture	< 1%*

**specific percentages of composition are being withheld as a trade secret*

Section 4: FIRST-AID MEASURES

Inhalation: Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.
Skin Contact: Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.
Eye Contact: Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.
Ingestion: May cause upset stomach. Drink plenty of water to dilute. See section 11.

Most Important Symptoms/Effects, Acute and Delayed: None known.

Indication of Immediate Medical Attention and Special Treatment Needed, if necessary: Treat symptomatically

Section 5: FIRE-FIGHTING MEASURES

Suitable & Unsuitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam. Avoid high volume jet water.
Specific Hazards Arising from Chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective Actions for Fire-Fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

See section 16 for NFPA rating.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and Materials for Containment and Clean Up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Conditions for Safe Storage including Incompatibilities: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.

Appropriate Engineering Controls: Showers, eyewash stations, ventilation systems

Individual Protection Measures / Personal Protective Equipment (PPE)
Eye Contact: Use protective glasses or safety goggles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolonged periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Green Liquid
Odor: Added sassafras odor
Odor Threshold: Not determined
pH ASTM D-1293**:** 8.5 – 9.5
Freezing Point ASTM D-1177**:** 0-3.33°C (32-38°F)
Boiling Point & Range ASTM D-1120**:** 101°C (213.8°F)
Flash Point ASTM D-93**:** > 212°F
Evaporation Rate ASTM D-1901**:** ½ Butyl Acetate @ 25°C
Flammability (solid, gas): Not applicable
Upper/Lower Flammability or Explosive Limits: Not applicable
Vapor Pressure ASTM D-323**:** 0.60 PSI @77°F, 2.05 PSI @100°F
Vapor Density: Not determined

Partition Coefficient: n-octanol/water: Not determined
Autoignition Temperature: Non-flammable
Decomposition Temperature: 109°F
Viscosity: Like water
Specific Gravity ASTM D-891**:** 1.01 – 1.03
VOCs: ***Water & fragrance exemption in calculation*

SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0%
CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
SCAQMD Method 313:	Not tested		

VOC Composite Partial Pressure: Not determined
Relative Density ASTM D-4017**:** 8.34 – 8.42 lb/gal
Solubility: 100% in water

Section 10: STABILITY AND REACTIVITY

Reactivity: Non-reactive.
Chemical Stability: Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
Possibility of Hazardous Reactions: None known.
Conditions to Avoid: Excessive heat or cold.
Incompatible Materials: Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products: Normal products of combustion - CO, CO2.

Section 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:
Inhalation - Overexposure may cause headache.
Skin Contact - Not expected to cause irritation, repeated contact may cause dry skin.
Eye Contact - Not expected to cause irritation.
Ingestion - May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.
Interactive effects: Not known.

Numerical Measures of Toxicity

Acute Toxicity:
Oral LD_{50} (rat) > 5 g/kg body weight
Dermal LD_{50} (rabbit) > 5 g/kg body weight
Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin Corrosion/Irritation: Non-irritant per Dermal Irritection® assay modeling. No animal testing performed.
Eye Damage/Irritation: Minimal irritant per Ocular Irritection® assay modeling. No animal testing performed.
Germ Cell Mutagenicity: Mixture does not classify under this category.
Carcinogenicity: Mixture does not classify under this category.
Reproductive Toxicity: Mixture does not classify under this category.
STOT-Single Exposure: Mixture does not classify under this category.
STOT-Repeated Exposure: Mixture does not classify under this category.
Aspiration Hazard: Mixture does not classify under this category.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Aquatic: Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC_{50} & IC_{50} ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Terrestrial: Not tested on finished formulation.

Persistence and Degradability: Readily Biodegradable per OCED 301D, Closed Bottle Test
Bioaccumulative Potential: No data available.
Mobility in Soil: No data available.
Other Adverse Effects: No data available.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used Liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.N. Number: Not applicable
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
Transport Hazard Class(es): Not applicable
NMFC Number: 48580-3
Packing Group: Not applicable
Class: 55
Environmental Hazards: Marine Pollutant - NO
Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code): Unknown.
Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises: None known.

U.S. (DOT) / Canadian TDG: Not Regulated for shipping.
ICAO/ IATA: Not classified as Hazardous
IMO / IDMG: Not classified as Hazardous
ADR/RID: Not classified as Hazardous

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 Hazard Categories – Not applicable.
Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.
Sections 302 – Not applicable.

Clean Air Act (CAA): Not applicable
Clean Water Act (CWA): Not applicable

State Right To Know Lists: No ingredients listed
California Proposition 65: No ingredients listed
Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m^3 long term	600 µg/m^3 short term
Sodium Citrate	68-04-2	5 µg/m^3 long term	50 µg/m^3 short term
Sodium Carbonate	497-19-8	5 µg/m^3 long term	50 µg/m^3 short term
Citric Acid	77-92-9	10 µg/m^3 long term	100 µg/m^3 short term

Section 16: OTHER INFORMATION

Size	UPC	Size	UPC
2 oz. Pump	043318130366	1 Gallon w/ Dilution Bottle	043318000669
2 oz. Pump	043318131035	1 Gallon	043318000799
4 oz. Pump	043318130014	1 Gallon w/ Dilution Bottle	043318001383
16 oz. Trigger	043318130021	1 Gallon w/ Dilution Bottle	043318002021
22 oz. Trigger	043318130229	1 Gallon	043318130052
24 oz. Trigger, 12 per case	043318000034	1 Gallon w/ Dilution Bottle, 112 per case	043318480140
24 oz. Trigger	043318000300	1 Gallon w/ Dilution Bottle, 4 per case	043318480416
24 oz. Trigger	043318130137	1 Gallon w/ Dilution Bottle, 24 per case	043318480492
32 oz. Trigger	043318000652	1 Gallon w/ laundry	043318002052
32 oz. Trigger	043318130335	1 Gallon w/ towel	043318001222
67.6 oz	043318000393	140 oz.	043318001390
67.6 oz.	043318130144	140 oz., 168 per case	043318561405
1 Gallon w/ Dilution Bottle	043318000539	140 oz. w/ Dilution Bottle	043318001468
1 Gallon w/ Dilution Bottle	043318000645		

USA items listed only. Not all items listed. USA items may not be valid for international sale.

Section 16: OTHER INFORMATION - continued

NFPA:

Health – None
Flammability – Non-flammable
Stability – Stable
Special - None

Acronyms

NTP	National Toxicology Program	IARC	International Agency for Research on Cancer
OSHA	Occupational Safety and Health Administration	CPSC	Consumer Product Safety Commission
TSCA	Toxic Substances Control Act	DSL	Domestic Substances List

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.
This SDS has been revised in the following sections: Revised SDS layout

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 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.

APPENDIX D

Incident Investigation and Reporting Program

INCIDENT INVESTIGATION AND REPORTING MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Joseph W. Gentile, CIH**
EFFECTIVE DATE	**:**	**07/17**
REVISION NUMBER	**:**	**4**

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APPENDICES

1.0 PURPOSE

Roux Associates, Inc. (Roux Associates) has instituted the following management program for reporting Environmental Health and Safety (EHS) incidents and near losses, investigation and correcting the causes of incidents, tracking incidents and corrective actions taken, and sharing the cause and corrective actions with Roux Associates' personnel. These practices and procedures establish a method to track progress and improvements to the company EHS performance.

2.0 SCOPE AND APPLICABILITY

These procedures apply to all Roux Associates employees. Employees are required to follow these procedures for all incidents involving Roux Associates, Inc. personnel, or other personnel (e.g., subcontractors) working for Roux Associates, Inc., regardless of the specific work activity or work location.

This program is intended, in part, to fulfill the Occupational Safety and Health Administration (OSHA) occupational injury and illness reporting and recording requirements cited in the Code of Federal Regulations (CFR) at 29 CFR 1904.

3.0 RESPONSIBILITIES

It shall be the responsibility of all Roux Associates, Inc. employees to report all incidents as soon as possible to the PM (or Administrative Manager for office-related incidents), SHSO, OHSM and OM, regardless of severity. Additionally, the following positions have specific responsibilities for implementing this specific SOP.

3.1 Corporate Health and Safety Manager (CHSM)

- The CHSM has the responsibility of ensuring that a system is in place for reporting, investigation, correction, and communicating of EHS incidents and near losses.
- The CHSM has the overall responsibility of implementing and communicating the contents of this program to Office Health and Safety Managers (OHSMs).
- The CHSM will review all incidents and corrective actions taken. The CHSM will provide a summary of serious incidents to the Board of Directors.

- The CHSM will communicate learnings from incidents and corrective actions taken to all personnel, through quarterly communications.
- The CHSM will periodically review and evaluate the effectiveness of this procedure.

3.2 Office Manager (OM)

- The OM will designate the individual to serve as the OHSM responsibility for ensuring that requirements in this procedure are met.
- The OM will ensure that sufficient resources are allocated to fulfill the requirements of this procedure.
- The OM will conduct final review of all incident reports prepared under this procedure.

3.3 Office Health and Safety Manager (OHSM)

- It is the responsibility of the OHSM to review draft incident reports and assist the OM in finalizing reports of all accidents, illnesses and incidents related to work activity, and to assist the SHSO when necessary.
- The OHSM may not approve a site-specific HASP unless the HASP includes incident reporting procedures and forms.
- The OHSM will suggest and implement corrective actions to prevent the same type of incident from re-occurring.
- The OHSM will keep all incident reports, corrective action taken, and follow-up forms on file. The OHSM will provide copies of all final reports and forms to the CHSM within one week of the incident. If a serious incident occurs, the CHSM will be notified as soon as possible.
- The occurrence of a serious incident will trigger an EHS audit by the OHSM.

3.4 Project Manager (PM)

- It shall be the PM's responsibility to promptly correct any deficiencies that were determined to cause or contribute to the incident investigated.
- If a site-specific HASP is not utilized, the PM must ensure that field personnel have copies of the Roux Accident Reporting and Investigation Forms.
- The PM has the responsibility of ensuring that the SHSO and other field personnel understand the need for timely incident reporting.
- In the event of an incident, the PM will determine the root cause of the incident with the assistance of the SHSO and/or OHSM. The PM should provide input as to corrective preventative measures.

3.5 Site Health and Safety Officer (SHSO)

- The SHSO shall provide the details of the incident to the OHSM, PM and OM. The OM or his delegate will provide additional notifications, such as, in the event of a work-related motor vehicle accident, to include Roux Legal.
- It is the SHSO's responsibility to immediately notify the OHSM and the PM when any incident occurs. Such notification should take place immediately following the completion of any emergency actions required by the HASP.
- The SHSO should provide input as to corrective preventative measures.
- The SHSO must ensure that corrective actions proposed by the OHSM or OM are carried out.

3.6 All Personnel

- All personnel are responsible for reporting and describing the details of any incident in which they are involved to the SHSO and PM. Such notification should take place immediately following the completion of any emergency actions required by the HASP and after the loss and before the scene is disturbed or vehicles moved.

4.0 PROCEDURE

4.1 Incident Investigation

On receiving a report of incident (or "near-loss") occurrence from a Roux Associates, Inc. employee, the SHSO or OHSM shall immediately investigate the circumstances and shall make appropriate recommendations to prevent recurrence. The Incident Report form can be found in **Appendix A**, and "near loss" Roux Lessons Learned form can be found in **Appendix B**. The OHSM may participate in the investigation of more serious accidents and incidents that occur on-site. The Corporate Health and Safety Manager (CHSM) shall also be immediately notified by telephone on occurrence of a serious accident or incident. At the CHSM's discretion, he may also participate in the investigation.

4.2 Incident Report

Details of the incident shall be documented using the Accident Report and Investigation Forms (Appendix A) within twenty-four (24) hours of the incident and shall be distributed to the SHSO, the OHSM, PM, OM and the CHSM. The CHSM will update OSHA Forms 301 and the 300 log when necessary.

Appendix A – Accident Report and Investigation Form

Associates, Inc. ☐ **Remedial Engineering, P.C.**
(Check applicable company name)

ACCIDENT REPORT

Joe Gentile, Corporate Health and Safety Manager
Cell: (610) 844-6911; Office: (856) 423-8800; Office FAX: (856) 423-3220; Home: (484) 373-0953

PART 1: ADMINISTRATIVE INFORMATION

Project #: _____
Project Name: _____
Project Location (street address/city/state)**:**
_____
_____
Client Corporate Name / Contact / Address / Phone #:
_____
_____
_____
_____
_____

Immediate Verbal Notifications Given To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Office Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No
Client Contact	☐Yes	☐No

REPORT STATUS (time due):
☐ Initial (24 hr) ☐ Final (5-10 days)
Date: _____ Date: _____

Accident Report Delivered To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Office Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No

REPORT TYPE: ☐ Loss ☐ Near Loss Estimated Costs: $ _____

OSHA CASE # Assigned by Corporate Health & Safety if Applicable:

Corporate Health & Safety Confirmed Final Accident Report
☐Yes ☐No

DATE OF INCIDENT: _____

TIME INCIDENT OCCURRED: _____ ☐AM ☐PM

INCIDENT LOCATION – City, State, and Country (If outside U.S.A.)
_____

INCIDENT TYPES: (Select most appropriate if Loss occurred.)
From lists below, please select the option that best categories the incident. When selecting an injury or illness, also indicate the severity level.

☐**INJURY** ☐**ILLNESS**

----------**Severity Level**----------

☐Fatality ☐First Aid ☐Medical
☐Restricted Work ☐Lost Time Treatment

OTHER INCIDENT TYPES

☐Spill / Release
Material involved:_____
Quantity (U.S. Gallons): _____

☐Misdirected Waste ☐Consent Order ☐NOV
☐Property Damage ☐Exceedance
☐Motor Vehicle ☐Fine / Penalty

ACTIVITY TYPE (Check most appropriate one.)

☐Decommissioning	☐Geoprobe	☐Sampling
☐Demolition	☐Motor Vehicle	☐System Start-up
☐Dewatering	☐Operations/ Maintenance	☐Trenching
☐Drilling		☐AST/UST Removal
☐Excavation	☐Pump/Pilot Test	☐Other_____
☐Gauging	☐Rigging/Lifting	

INJURY TYPE (Check all applicable.)

☐Abrasion	☐Occupational Illness
☐Amputation	☐Puncture
☐Burn	☐Rash
☐Cold/Heat Stress	☐Repetitive Motion
☐Inflammation	☐Sprain/Strain
☐Laceration	☐Other_____

BODY PART AFFECTED (Check all applicable.)

☐Respiratory	☐Shoulder	☐Face
☐Neck	☐Arm	☐Leg
☐Chest	☐Wrist	☐Knee
☐Abdomen	☐Hand/Fingers	☐Ankle
☐Groin	☐Eye	☐Foot/Toes
☐Back	☐Head	☐Other_____

I. PERSON(S) DIRECTLY / INDIRECTLY INVOLVED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Directly/Indirectly Involved in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:
1)				
2)				

II. PERSONS INJURED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Injured in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:	Description of Injury:
1)					
2)					

III. PROPERTY DAMAGED IN INCIDENT (Attach additional information as necessary/applicable.)

Property Damaged:	Property Location:	Owner Name, Address & Phone #:	Description of Damage:	Estimated Cost:
1)				
2)				$

IV. WITNESSES TO INCIDENT (Attach additional information as necessary/applicable.)

Witness Name:	Address:	Phone #:
1)		
2)		

PART 2: WHAT HAPPENED AND INCIDENT DETAILS

PROVIDE FACTUAL DESCRIPTION OF INCIDENT (e.g., describe loss/near loss, injury, response / treatment).

I. AUTHORITIES/GOVERNMENTAL AGENCIES NOTIFIED (Attach additional information as necessary/applicable.)

Authority/Agency Notified:	Name/Phone #/Fax # of Person Notified:	Address of Person Notified:	Date & Time of Notification:	Exact Information Reported/Provided:

II. PUBLIC RESPONSES TO INCIDENT (if applicable)

Response/Inquiry By: (check one)	Entity Name:	Name/Phone # of Respondent/ Inquirer:	Address of Entity/Person:	Date & Time of Response/Inquiry:
☐ Newspaper ☐ Television ☐ Community Group ☐ Neighbors ☐ Other _____				

Describe Response/Inquiry:

Roux/Remedial Response:

(Check all that apply.) (Attach photos, drawings, etc. to help illustrate the incident.)
ATTACHED INFORMATION: ☐Photo ☐Sketches ☐Vehicle Acord Form ☐Police Report ☐Other

Name(s) of person(s) who prepared Initial and Final Report:	**Title(s):**	**Phone number(s):**

PART 3: INVESTIGATION TEAM ANALYSIS

CONCLUSION: WHY IT HAPPENED (LIST CAUSAL FACTORS AND CORRESPONDING ROOT CAUSES)

(Root Causes: Lack of knowledge or skill, Doing the task according to procedures or acceptable practices takes more time or effort, Short-cuts or not following acceptable practices is reinforced or tolerated, Not following procedures or acceptable practices did not result in an accident, Lack of or inadequate procedures, Inadequate communications of expectations regarding procedures or acceptable practices, Inadequate tools or equipment, External Factors)

ROOT CAUSE(S) AND SOLUTION(S): HOW TO PREVENT INCIDENT FROM RECURRING

PERSONAL FACTORS:

A. LACK OF SKILL OR KNOWLEDGE

B. DOING THE JOB ACCORDING TO PROCEDURES OR ACCEPTABLE PRACTICES TAKES MORE TIME OR EFFORT

C. SHORT-CUTTING PROCEDURES OR ACCEPTABLE PRACTICES IS POSITIVELY REINFORCED OR TOLERATED

D. IN PAST, DID NOT FOLLOW PROCEDURES OR ACCEPTABLE PRACTICES AND NO INCIDENT OCCURRED

JOB FACTORS:

E. LACK OF OR INADEQUATE PROCEDURES

F. INADEQUATE COMMUNICATION OF EXPECTATIONS REGARDING PROCEDURES OR ACCEPTABLE STANDARDS

G. INADEQUATE TOOLS OR EQUIPMENT (available, maintained, etc.)

CAUSAL FACTOR / BEHAVIOR / CONDITION	ROOT CAUSE	SOLUTION(S) [Must Match Root Cause(s)]		PERSON RESPONSIBLE	AGREED DUE DATE	ACTUAL COMPLETION DATE
		#	Solution(s)			

INVESTIGATION TEAM:

PRINT NAME	JOB POSITION	DATE	SIGNATURE

QUALITY REVIEW Correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?

Name: **Job Title:**

PART 4: Date Solutions were Implemented & Validated (Were Solutions Effective?)			
Date	**Solution**	**Verifier / Validator Name and Job Title**	**Details** (of I & V performed)

Appendix B-Lessons Learned Form

HEALTH & SAFETY LESSONS LEARNED
ROUX REPORT FORM

☐ **Roux Associates, Inc.** ☐ **Remedial Engineering, P.C.**
(Check applicable company name)

PART 1: ADMINISTRATIVE INFORMATION

Office: ☐ New York ☐ Massachusetts ☐ New Jersey ☐ Illinois ☐ CA - Los Angeles ☐ CA - Oakland

Project Manager:	**Project Principal:**
Project Name:	**Project Location:**

PART 2: LESSONS LEARNED INCIDENT DETAILS

Date\Time Occurred (MM/DD/YYYY HH:MM)**:**	**Date\Time Submitted** (MM/DD/YYYY HH:MM)**:**

LESSONS LEARNED INCIDENT TYPE - What could have happened? - Select all that apply (1-7)

1. ☐ Fire / Explosion
2. ☐ Injury / Illness
3. ☐ Security (e.g, theft, trespassing, vandalism)
4. ☐ Environmental (spill, permit exceedance, etc.)
5. ☐ Transportation of personnel (vehicle accident)
6. ☐ Property/Equipment Damage
7. ☐ Business Interruption

Event Leading to Potential Injury/Illness:

Job Task*:	**Equipment Involved*:**

WHAT HAPPENED? Do not include individuals' names. Ensure photos, sketches, etc. are not personally identifiable unless written consent has been obtained.

Summary (1-2 sentences. Provide brief description of the incident. Provide facts only, no speculation or opinion)**:**

Incident Details (Brief factual details of what, where, when; include photos, sketches, etc. as attachments)**:**

Immediate Corrective Actions Taken:

SERIOUS INJURY OR FATALITY (SIF): **IF AN ACTUAL SIF, USE EXISTING ROUX ACCIDENT REPORTING FORM**

Could this have resulted in a SIF? ☐ **Yes** ☐ **No**

A potential SIF is defined as likely to have caused an injury resulting in significant physical body damage with probable long term and/or life altering complications.

INCIDENT INVOLVED:

Roux Employee: ☐ **Yes** ☐ **No** **Subcontractor Company Name:**

INVESTIGATION TEAM

NAME	JOB TITLE	NAME	JOB TITLE

PART 3: INCIDENT INVESTIGATION FINDINGS AND REPORT QUALITY REVIEW

Date Investigation Team Assigned (mm/dd/yyyy):

INVESTIGATION SUMMARY: Determine from list below what behaviors and/or conditions may have contributed to the H&S Lessons Learned Incident. Then, use the "Multiple-Why Technique" for each of these behaviors/conditions; provide a narrative for each that explains how the associated Root Cause(s) was determined. Do not include individuals' names.

ROOT CAUSES: HOW TO REDUCE POSSIBILITY OF INCIDENT RECURRING
Selection of RCs and solutions reflects the analysis of investigation team. It is not meant as a legally binding conclusion as to causal factors and/or solutions.

PERSONAL FACTORS:

A. LACK OF SKILL OR KNOWLEDGE

B. DOING THE JOB ACCORDING TO PROCEDURES OR ACCEPTABLE PRACTICES TAKES MORE TIME OR EFFORT

C. SHORT-CUTTING PROCEDURES OR ACCEPTABLE PRACTICES IS POSITIVELY REINFORCED OR TOLERATED

D. IN PAST, DID NOT FOLLOW PROCEDURES OR ACCEPTABLE PRACTICES AND NO INCIDENT OCCURRED

JOB FACTORS:

E. LACK OF OR INADEQUATE PROCEDURES

F. INADEQUATE COMMUNICATION OF EXPECTATIONS REGARDING PROCEDURES OR ACCEPTABLE STANDARDS

G. INADEQUATE TOOLS OR EQUIPMENT (available, maintained, etc.)

Behavior / Condition	Root Cause	Solution(s) (Must Match Root Cause)	Person Responsible for Completion	Completion Target Date	Completion Actual Date

QUALITY REVIEW Correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?

Name: **Job Title:**

PART 4: Date Solutions were Implemented & Validated (Were Solutions Effective?)

Date	Solution	Verifier / Validator Name and Job Title	**Details** (of I & V performed)

JOB TASK - Select the most appropriate one (primary job associated with incident-related work activity, avoid "Other" if possible)

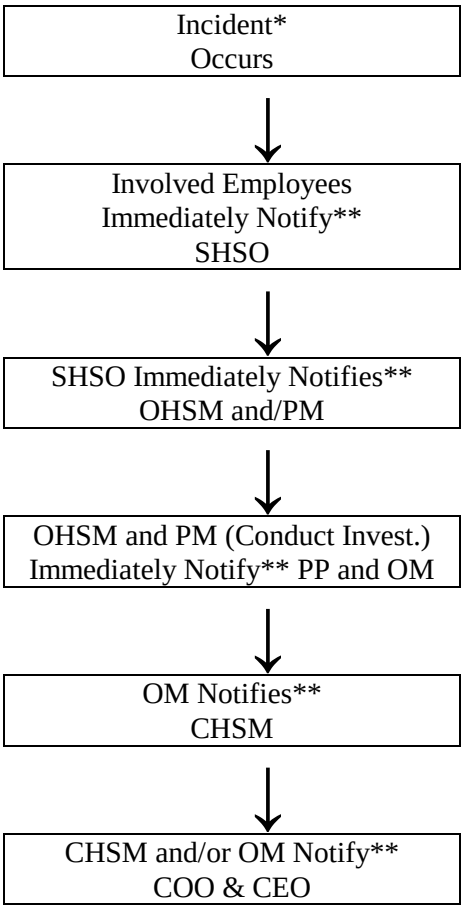
1. Carbon Change	7. Gauging	12. Pavement Cutting	18. System Startup
2. Construction	8. Geoprobe / Direct Push	13. Pump Test	19. UST Removal (includes exposure and backfill)
3. Demolition	9. Mobil Remediation (includes vacuum event and chemical injection)	14. Sampling	
4. Dewatering		15. Site Visit / Survey	20. Waste Management
5. Drilling (well install)	10. NAPL Recovery	16. Subsurface Clearance	21. Well Abandonment
6. Excavation / Trenching	11. O&M (remediation system)	17. System Install	22. Other:

EQUIPMENT INVOLVED THAT CONTRIBUTED TO H&S LESSONS LEARNED - Select all that apply

1. Air Stripper
2. API Separator
3. Automobile
4. Boom Material
5. Bulldozer
6. Cable
7. Carbon Drum / Vessel
8. Chain Block
9. Compressor, Air
10. Control Panel (local)
11. Crane (mobile)
12. Drill Rig
13. Drilling Equipment, Vacuum
14. Drum, Vertical
15. Dump Truck
16. Electric Heater
17. Electrical Power Supply
18. Engine, Combustion
19. Equipment Safety Grounding
20. Excavator / Power Shovel
21. Exclusion Zone Equipment
22 Fan / Blower
23 Fencing
24 Filter
25. Fire Extinguisher
26. Forklift
27. Front End Loader
28. Grader
29. Hammer
30. Knife
31. Non-Powered Equipment
32. Powered Equipment
33. Drill
34. Grinder
35. Hydraulic Torque Wrench
36. Powered Saw
37. Impact Wrench
38. Saw
39. Screwdriver
40. Shears
41. Shovel
42. Snip
43. Wrench
44. Hoist
45, Hook/Clamp/Buckle, etc.
46. Jack
47. Ladder, Extension
48. Ladder, Platform
49. Ladder, Step
50. Lock Out / Tag Out
51. Maintenance Tool, General
52. Manifold
53, Manlift/Basket/Cherry Picker
54. Motor, Electric
55. Oxidizer
56. Pallet
57. Piping
58. Piping, Hose
59. Piping, Injection/Mixing Point
60. Hydrojet
61. Centrifugal Pump
62. Diaphragm Pump
63. Reciprocating Pump
64. Regenerative Pump
65. Rotary Pump
66. Transfer Pump
67. Submersible Pump
68. Face Shield
69. Fall Protection
70. Gloves
71. Hard Hat / Helmet
72. Hearing Protection
73. Respiratory PPE (Chemical)
74. Respiratory PPE (Particulate)
75. Safety Glasses
76. Safety Goggles
77. Safety Shoes / Boots
78. Safety Vest / Clothing
79. Rope
80. Bailer
81. Geoprobe
82. Hand Auger
83. PID
84. Multi-Gas Meter
85. Sample Container
86. Split-Spoon Sampler
87. Sling
88. Snow Blower
89. Snow Plow
90. Space Heater
91. Air Sparging System
92. Carbon Treatment System
93. Chemical Oxidation System
94. Dual Phase Product Recovery System
95. Groundwater Pump and Treat System
96. POET System
97. Shed or Trailer
98. Vapor Extraction System
99. Vapor-Phase Treatment System
100. Other System, Type:_____
101. Surge Tank
102. Underground Tank
103. Telemetry System
104. Testing Devices
105. Tractor Trailer
106. Truck, Flatbed
107. Truck, Pickup
108. Truck, Tank Truck
109. Truck, Vacuum
110. Safety Valve
111. Block Valve
112. Extraction Well
113. Monitoring Well
114. Recovery Well
115. Winch
116. Wire Rope
117. No Equipment Involved
118. MPT – Traffic Control Devices
118. Not in List (describe):_____

Appendix C – Injury Illness Reporting Flow Chart

Health & Safety Near/Loss – Loss (Incident)*
Notification Flow Chart



* Incident – any work or site-related occurrence that resulted in, or could potentially have resulted in, the need for medical care or in property damage (i.e., all injuries or illnesses, exposure to toxic materials or any other significant occurrence resulting in property damage or in a "near loss")

** Verbal Notification

Initial Incident Report (written) to SHSO, OHSM, OM and CHSM within 24 hours
Follow-up Report within one week.

APPENDIX E

Heavy Equipment Exclusion Zone Policy

HEAVY EQUIPMENT EXCLUSION ZONE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile, CIH
EFFECTIVE DATE	:	07/17
REVISION NUMBER	:	1

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1.0 PURPOSE

The purpose of the Exclusion Zone Management Program is to establish the minimum clearance distance that must be maintained between workers and heavy equipment while equipment is in operation (i.e., engaged or moving). The intent is to have no personnel or equipment entering the Exclusion Zone while the equipment is in operation or moving to ensure that Roux and Subcontractor employees are not unnecessarily exposed to the hazards of the equipment.

2.0 SCOPE AND APPLICABILITY

This Management Program applies to all Roux Associates Inc. (Roux Associates) employees and their subcontractors who are performing field work and are potentially exposed to heavy equipment. For the purpose of this program, heavy equipment includes, but is not necessarily limited to: excavation equipment, drill rigs, vacuum trucks, forklifts, lull telehandlers, man lifts, bobcats, delivery trucks, etc.

3.0 PROCEDURES

As specified in the following sections of this Program, an Exclusion Zones must be established and maintained during activities involving the movement/operation of heavy equipment. The Exclusion Zone requirements apply to all personnel on the site but are primarily focused on those personnel who are required to be working in the vicinity of the equipment. The exclusion zone is in effect when heavy equipment is moving or engaged (ex. movement of an arm or bucket of an excavator, rotation of an auger, lifting of a load with a forklift, raising/lowering of a man lift, etc.).

1. The Exclusion Zone must meet the following minimum requirements:
    - A minimum distance of 10 feet from all heavy equipment and loads being moved by the equipment;
    - Greater than the swing/reach radius of any moving part on the heavy equipment (i.e., for large equipment this may mean an exclusion zone distance larger than 20 feet);
    - Greater than the tip-over distance of the heavy equipment; and
    - Greater than the radius of blind spots.

The size of the Exclusion Zone will need to be determined on a task-specific basis considering the size of the heavy equipment in use and the task being performed. Prior to all heavy equipment operations, the Exclusion Zone(s) distance must be specifically identified in the Job Safety Analysis (JSA).

2. The spotter (or another individual) should be assigned responsibility for enforcing the Exclusion Zone. The spotter should be positioned immediately outside of the Exclusion Zone within a clear line of sight of the equipment operator. The spotter must signal the operator to stop work if anyone or anything has the potential to enter or compromise the Exclusion Zone. The operator should stop work if the spotter is not within his/her line of sight. If multiple pieces of equipment are being used, each piece of equipment must have its own Exclusion Zone and spotter. For large excavation and demolition projects the spotter should be in constant radio contact (not cell phone) with the machine driver.
3. If an individual must enter the Exclusion Zone, the designated Spotter must signal the Equipment Operator to stop the equipment. Once the equipment is no longer moving (ex. movement of an arm of an excavator is STOPPED, lifting of a load with a forklift STOPPED, raising/lowering of a man lift is STOPPED, etc.), the operator must DISENGAGE THE CONTROLS and STOP and SIGNAL BY "SHOWING HIS HANDS". This signal will indicate that it is safe for the personnel to enter the limits of the Exclusion Zone to perform the required activity. The equipment must remain completely stopped/disengaged until all personnel have exited the limits of the Exclusion Zone and the designated Spotter has signaled by "SHOWING HIS HANDS" to the Equipment Operator that it is safe to resume operations.
4. When entering the limits of the Exclusion Zone, personnel must at a minimum:
   - Establish eye contact with the operator and approach the heavy equipment in a manner that is in direct line of sight to the Equipment Operator;
   - Never walk under any suspended loads or raised booms/arms of the heavy equipment; and
   - Identify a travel path that is free of Slip/Trip/Fall hazards.
5. The Exclusion Zone should be delineated using cones with orange snow fence or solid poles between the cones, barrels, tape or other measures. For work in rights-of-way rigid barriers, such as Jersey barriers or temporary chain link fence should be used. For certain types of wide-spread or moving/mobile equipment operations, such delineation may not be practicable around pieces of equipment or individual work areas. In such instances, it is expected that the entire operation will be within a larger secure work area or that additional means will be utilized to ensure security of the work zone.

All subcontractors who provide heavy equipment operations to field projects must implement a program that meets or exceeds the expectations described above as well as any additional requirements that may be required on a client or site-specific basis.

3.1 Exceptions

It is recognized that certain heavy equipment activities may require personnel to work within the limits of the Exclusion Zone as specified in this program. Such activities may include certain excavation clearance tasks, drill crew activities or construction tasks. However, any such activity must be pre-planned with emphasis on limiting the amount and potential exposure of any activity required within the zone. The critical safety steps to mitigate the hazards associated with working within the Exclusion Zone must be defined in the JSA and potentially other project-specific plans (i.e., critical lift plans, etc.), and approved by the Roux Project Principal and client representative, if required, prior to implementation.

4.0 TRAINING

Many Roux projects have different requirements that are client-specific or site-specific in nature. It is the responsibility of the Project Principal (or Project Manager if delegated this responsibility by the Project Principal) to ensure that the workers assigned to his/her projects are provided orientation and training with respect to these client and/or site-specific requirements.

APPENDIX F

Subsurface Utility Clearance Management Program

SUBSURFACE UTILITY CLEARANCE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile, CIH
EFFECTIVE DATE	:	07/17
REVISION NUMBER	:	1

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APPENDICES

1.0 PURPOSE

Roux Associates, Inc. (Roux Associates) has instituted the following program for completing proper utility mark-outs and for conducting subsurface clearance activities. This establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided.

2.0 SCOPE AND APPLICABILITY

The Subsurface Utility Clearance Management Program applies to all Roux Associates employees, its contractors and subcontractors. Employees are expected to follow this program for all intrusive work involving Roux Associates or other personnel (e.g., contractors/subcontractors) working for Roux Associates unless the client's requirements are more stringent. Deviation from the program regardless of the specific work activity or work location must be pre-approved based on client's site knowledge, site experience and client's willingness for the use of this program. Any and all exceptions shall be documented and pre-approved by the Project Principal and the Office Manager.

3.0 PROCEDURES

3.1 Before Intrusive Activities

During the project kick-off meeting for intrusive activities the PM will review the Roux Subsurface Utility Clearance Checklist and Utility Verification (Appendix C) / Site Walkthrough Record (Appendix D) and the below bullet points with the project field team:

(Please note that these are intended as general reminders only and should not be solely relied upon.)

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report) is complete and accurate for the site including address and cross streets and review for missing utilities. (Note: utility mark-out organizations do not have contracts with all utilities and it is often necessary to contact certain utilities separately such as the local water and sewer authorities).
- Have written confirmation prior to mobilizing to the site that the firm or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all

known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux Associates personnel for review and project files documentation.

- Do not begin any intrusive activity until all utilities mark-out has been completed (i.e., did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if said utilities have been located by the utility locators.

  (Note: The Tolerance Zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside edge of any subsurface structure.)
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or other soft digging techniques) for the first 5-ft below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-Clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM.
- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12" for first 5 feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes performed to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.
- In addition, the following activities should be conducted:
  - Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities,
  - Attempt to procure any utility maps or historic drawings of subsurface conditions of the site,

- **Determine the need for utility owner companies to be contacted or to have their representatives on site**,
- Where mark-outs terminate at the property boundary, consider the use of private utility locating / GPR / geophysical-type services which may be helpful in locating utilities. Use of private utility locating firms, however, does not eliminate the legal requirement for the Excavator firm to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas and below reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance.
- Documented description of the dig site which is included in the projects Health and Safety Plan (HASP) and one call report will be maintained in the field and distributed amongst Roux personnel its contractors and subcontractors.
- Documentation of the actual placement of mark outs in the field shall be collected using dated pictures, videos and/or sketches with distance from markings to fixed objects. All documentation shall be maintained within the project file.

3.2 During Intrusive Activities

The PM, field team lead or personnel performing oversight is to:

- Ensure the mark-out remains valid. (In certain states there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases refreshed periodically to be considered valid, this will be accomplished through calls to the one call center.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities have resulted in discovery of an unmarked utility. Roux Associates personnel shall notify the facility owner/operator and the one call center. All incidents such as this will be reported as per Roux Associates' Incident Investigation and Reporting Management Program.

- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Completing any subsurface utility clearance incident reports that are necessary.
- If a utility cannot be found as marked Roux Associates personnel shall notify the facility owner/operator directly or through the one call center. Following notification, the excavation may continue, unless otherwise specified in state law.
- Contractors/subcontractors must contact the one-call center to refresh the ticket when the excavation continues past the life of the ticket. Ticket life shall be dictated by state law however at a maximum ticket life shall not exceed 20 working days.

3.3 Stop Work Authority

Each Roux employee has Stop Work Authority which he or she will execute upon determination of any imminent safety hazard, emergency situation, or other potentially dangerous situation, such as hazardous weather conditions. This Stop Work Authority includes subsurface clearance issues such as the adequacy of a mark-out or identification during intrusive operations of an unexpected underground utility. Authorization to proceed with work will be issued by the PM/PP after such action is reviewed and resolved. The PM will initiate and execute all management notifications and contact with emergency facilities and personnel when this action is appropriate.

Appendix A- Definitions

Intrusive Work Activities	All activities such as digging or scraping the surface, including but not limited to, excavation, test pitting or trenching, soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells, and drilling within the basement slab of a recently demolished building.
Mark-out / Stake Out	The process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark-out and delineate utilities that are identified so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed the soft digging will be completed prior to intrusive work.
Tolerance Zone	Defined as two feet on either side of the designated centerline of an identified utility, plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct backs and other non-cylindrical utilities) of that utility and two feet from the outside edge of any subsurface structure.
Structure	For the purpose of this program a structure is defined as any underground feature that may a present potential source(s) of energy such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks and ducts.
Soft Digging	The safest way to remove material from unknown obstructions or services is by using tools such as a vactor or air knife, non-mechanical tools, or hand tools. The methods are clean and non-evasive and used for uncovering and exposing buried services, excavating and for providing a quick method of soil removal from sensitive areas.
Verification	Exploratory test-hole dug with hand tools within the Tolerance Zone to expose and verify the location, type, size, direction-of-run and depth of a utility or subsurface structure. Vacuum excavation (soft dig) methods can further facilitate exposure of a subsurface utility and accurately provide its

location and identification prior to intrusive work approaching the Tolerance Zone.

Appendix B-Example of Completed One Call Report

Example Completed One-Call Report

New York 811

Send To: C_EMAIL Seq No: 744

Ticket No: 133451007 ROUTINE

Start Date: 12/16/13 Time: 7:00 AM Lead Time: 20

State: NY County: QUEENS Place: QUEENS
Dig Street: 46TH AVE Address:
Nearest Intersecting Street: VERNON BLVD
Second Intersecting Street: 11TH ST

Type of Work : SOIL BORINGS
Type of Equipment : GEOPROBE
Work Being Done For: ROUX

In Street: X On Sidewalk: X Private Property: Other:
On Property Location if Private: Front: Rear: Side:

Location of Work: MARK THE ENTIRE NORTH SIDE OF THE STREET AND SIDEWALK OF:
46TH AVE BETWEEN VERNON BLVD AND 11TH STREET

Remarks:

Nad: Lat: Lon: Zone:
ExCoord NW Lat: 40.7475399 Lon: -73.9534811 SE Lat: 40.7457406 Lon: -73.9493680

Company : ZEBRA ENVIROMENTAL Best Time: 6AM-5PM
Contact Name : DAVID VINES Phone: (516)596-6300
Field Contact : DAVID VINES Phone: (516)596-6300
Caller Address: 30 N PROSPECT AVE Fax Phone: (516)596-4422
LYNBROOK, NY 11563
Email Address : david@zebraenv.com

Additional Operators Notified:
ATTNY01 AT&T CORPORATION (903)753-3145
CEQ CONSOLIDATED EDISON CO. OF N.Y (800)778-9140
MCINY01 MCI (800)289-3427
PANYNJ01 PORT AUTHORITY OF NY & NJ (201)595-4841
VZQ VERIZON COMMUNICATIONS (516)297-1602

Link to Map for C_EMAIL: http://ny.itic.occinc.com/XGMZ-DF2-L23-YAY

Original Call Date: 12/11/13 Time: 1:15 PM Op: webusr
IMPORTANT NOTE: YOU MUST CONTACT ANY OTHER UTILITIES DIRECTLY.

Appendix C-Roux Subsurface Utility Clearance Checklist

Roux Subsurface Utility Clearance Checklist

Date of Revision – 12/3/14

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained				
HASP is available and reviewed by site workers / visitors				
Subsurface Utility Clearance Procedure has been reviewed with all site workers				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time				
Tolerance zone work identified				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work)				
Verbal endorsement received from Roux PM for any required field deviations to work execution plan				

Key reminders for execution:

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be solely relied upon.

- Tolerance zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside of any subsurface structure.

- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or vacuum excavation) must be performed for the first five feet below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternate approaches will need to be pre-approved by the OM.
- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12" for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.

Appendix D- Utility Verification/Site Walkthrough Record

Employee Name:_____

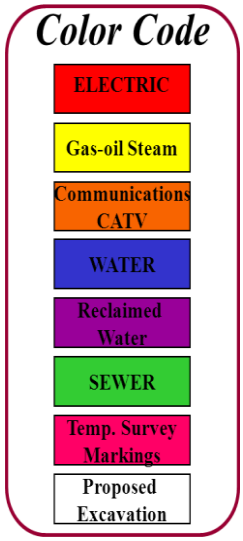
Date: _____

Instructions: For each utility suspected at the job site, indicate location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified On-site	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary & Storm-water Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

bls - below land surface

Site Sketch Showing Utilities:



Other Comments / Findings:

Completed by: _____

Signature: _____ Date: _____

APPENDIX G

Personal Protective Equipment Management Program

PERSONAL PROTECTIVE EQUIPMENT MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile, CIH
EFFECTIVE DATE	:	07/17
REVISION NUMBER	:	3

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1.0 PURPOSE

Roux Associates, Inc. (Roux Associates) has instituted the following program to establish guidelines for the selection of personal protective equipment (PPE) for use by Roux Associates, Inc. personnel performing field activities in hazardous environments. PPE is not meant to be a substitute for engineering, work practice, and/or administrative controls, but PPE should be used in conjunction with these controls to protect the employees in the work place. Clothing, body coverings, and other accessories designed to prevent worker exposure to workplace hazards are all types of PPE. To ensure adequate PPE employee-owned PPE is evaluated on a case-by-case basis to insure its adequacy, maintenance and sanitation.

2.0 SCOPE AND APPLICABILITY

These guidelines apply to all PPE selection decisions to be made in implementing the Roux Associates, Inc. program. The foundations for this program are the numerous Occupational Health and Safety Administration (OSHA) standards related to PPE cited in 29 CFR 1910 Subpart I, 29 CFR 1926 Subpart E, and the hazardous environment work employee protection requirements under the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 and 1926.65. To ensure hazard assessments are documented the levels of protection, types of protection and tasks requiring protection are covered in site-specific Health and Safety Plans (HASPs) and Job Safety Analyses (JSAs).

3.0 PROCEDURES

Due to the varied nature of site activities and the different potential hazards associated with different sites, a number of aspects must be considered when selecting PPE. The following text describes PPE selection logic and provides guidelines and requirements for the appropriate selection and use of PPE.

3.1 Introduction

To harm the body, chemicals must first gain entrance. The intact skin and the respiratory tract are usually the first body tissues attacked by chemical contaminants. These tissues provide barriers to some chemicals but in many cases, are damaged themselves or are highly permeable by certain chemical compounds. Personal protective equipment therefore is used to minimize or eliminate chemical compounds coming into contact with these first barrier tissues.

The proper selection of equipment is important in preventing exposures. The PM making the selection will have to take several factors into consideration. The level of protection, type and kind of equipment selected depends on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out.

3.2 Types of PPE

The type and selection of PPE must meet certain general criteria and requirements as required under OSHA 29 CFR 1910.132 and 1926.95. In addition to these general requirements, specific requirements and specifications exist for some types of PPE that form the basis of the protective clothing scheme. Following is a list of the common types of specific PPE and the specific requirements for the PPE type, where applicable:

1. Hard Hats - Regulated by 29 CFR 1910.135 and 1926.100; and, specified in ANSI Z89.1.
2. Face Shields and Safety Glasses - Regulated by 29 CFR 1910.133 and 1926.102; and, specified in ANSI Z87.1.
3. Respiratory Protection - Regulated by 29 CFR 1910.134 and 1926.103.
4. Hand Protection - Not specifically regulated.
5. Foot Protection - Regulated by 29 CFR 1910.136 and 1926.96; and, specified in ANSI Z41.1.
6. Protective Clothing (e.g., fully encapsulated suits, aprons) - Not specifically regulated.

3.3 Protective Clothing Selection Criteria

3.3.1 Chemicals Present

The most important factor in selecting PPE is the determination of what chemicals the employee may be exposed to. On field investigations, the number of chemicals may range from a few to several hundred. The exact chemicals or group of chemicals present at the site (certain groups tend to require similar protection) can be determined by collecting and analyzing samples of the air, soil, water, or other site media. When data are lacking, research into the materials used or stored at the site can be used to infer chemicals possibly on the site.

Once the known or suspected chemicals have been identified, and taking into consideration the type of work to be performed, the most appropriate clothing shall be selected.

Protective garments are made of several different substances for protection against specific chemicals. There is no universal protective material. All will decompose, be permeated by, or otherwise fail to protect under given circumstances. Fortunately, most manufacturers make guides to the use of their products (i.e., Dupont's Tyvek™ Permeation Guide). These guides are usually for gloves and coveralls and typically provide information regarding chemical degradation rates (failure of the material to maintain structural integrity when in contact with the chemical), and may provide information on the permeation rate (whether or not the material allows the chemical to pass through). When permeation tables are available, they shall be used in conjunction with degradation tables to determine the most appropriate protective material.

During most site work, chemicals are usually in mixed combinations and the protective materials are not in continuous contact with pure chemicals for long periods of time; therefore, the selected material may be adequate for the particular chemical and type of work being performed, yet not the "best" protecting material for all site chemicals and activities. Selection shall depend upon the most hazardous chemicals based on their hazards and concentrations. Sometimes layering, using several different layers of protective materials, affords the best protection.

3.3.2 Concentration of the Chemical(s)

One of the major criteria for selecting protective material is the concentration of the chemical(s) in air, liquid, and/or solid state. Airborne and liquid chemical concentrations should be compared to the OSHA standards and/or American Conference of Governmental Industrial Hygienists (ACGIH) and National Institute for Occupational Safety and Health (NIOSH) guidelines to determine the level of skin or other absorptive surface (e.g., eyes) protection needed. While these standards are not designed specifically for skin exposed directly to the liquid, they may provide skin designations indicative of chemicals known to have significant skin or dermal absorption effects. For example, airborne levels of PCB on-site may be low because it is not very volatile, so the inhalation hazard may be minimal; however, PCB-containing liquid coming in direct contact with the skin may cause overexposure. Thus, PCB has been assigned a skin designation in both the OSHA and ACGIH exposure limit tables.

3.3.3 Physical State

The characteristics of a chemical may range from nontoxic to extremely toxic depending on its physical state. Inorganic lead in soil would not be considered toxic to site personnel, unless it became airborne, since it is generally not absorbed through the intact skin. Organic lead in a liquid could be readily absorbed. Soil is frequently contaminated with hazardous materials. Concentrations will vary from a few parts per million to nearly one hundred percent. The degree of hazard is dependent on the type of soil and concentration of the chemical. Generally speaking, "dry" soils do not cause a hazard to site personnel if they take minimal precautions such as wearing some type of lightweight gloves.

3.3.4 Length of Exposure

The length of time a material is exposed to a chemical increases the probability of breakthrough. Determinations of actual breakthrough times for short-term exposures indicate that several different materials can be used which would be considered inadequate under long-term exposures. It should be kept in mind that during testing, a pure (100% composition) liquid is usually placed in direct contact with the material producing a worst-case situation.

3.3.5 Abrasion

When selecting protective clothing, the job the employee is engaged in must be taken into consideration. Persons moving drums or performing other manual tasks may require added protection for their hands, lower chest and thighs. The use of leather gloves and a heavy apron over the other normal protective clothing will help prevent damage to the normal PPE and thus reduce worker exposures.

3.3.6 Dexterity

Although protection from skin and inhalation hazards is the primary concern when selecting PPE, the ability to perform the assigned task must be maintained. For example, personnel cannot be expected to perform work that requires fine dexterity if they must wear a thick glove. Therefore, the PPE selection process must consider the task being performed and provide PPE alternatives or techniques that allow dexterity to be maintained while still protecting the worker (e.g., wearing tight latex gloves over more bulky hand protection to increase dexterity).

3.3.7 Ability to Decontaminate

If disposable clothing cannot be used, the ability to decontaminate the materials selected must be taken into consideration. Once a chemical contacts the material, it must be cleaned before it can be reused. If the chemical has completely permeated the material, it is unlikely that the clothing can be adequately decontaminated and the material should be discarded.

3.3.8 Climactic Conditions

The human body works best with few restraints from clothing. Protective clothing adds a burden by adding weight and restricting movement as well as preventing the natural cooling process. In severe situations, a modified work program must be used.

Some materials act differently when they are very hot and very cold. For example, PVC becomes almost brittle in very cold temperatures. If there are any questions about the stability of the protective materials under different conditions, the manufacturer should be contacted.

3.3.9 Work Load

Like climactic conditions, the type of work activity may affect work duration and the ability or personnel to perform certain tasks. Similarly, the amount of protective materials a person wears will affect their ability to perform certain tasks. For example, a person in a total encapsulating suit, even at 72 ^{o}F, cannot work for more than a short period of time without requiring a break.

The work schedule should be adjusted to maintain the health of the employees. Special consideration should be given to the selection of clothing that both protects and adds the least burden when personnel are required to perform strenuous tasks. Excessive bodily stress frequently represents the most significant hazard encountered during field work.

3.4 Types of Protective Materials

1. Cellulose or Paper
2. Natural and Synthetic Fibers
   a. Tyvek™
   b. Nomex™
3. Elastomers
   a. Polyethylene

b. Saran
c. Polyvinyl Chloride (PVC)
d. Neoprene
e. Butyl Rubber
f. Viton

3.5 Protection Levels

3.5.1 Level A Protection

Level A protection (a fully encapsulated suit) is used when skin hazards exist or when there is no known data that positively rule out skin and other absorption hazards. Since Level A protection is extremely physiologically and psychologically stressful, the decision to use this protection must be carefully considered. At no time will Level A work be performed without the consent of the OM. The following conditions suggest a need for Level A protection:

- confined facilities where probability of skin contact is high;
- sites containing known skin hazards;
- sites with no established history to rule out skin and other absorption hazards;
- atmosphere immediately dangerous to life and health (IDLH) through the skin absorption route;
- site exhibiting signs of acute mammalian toxicity (e.g., dead animals, illnesses associated with past entry into site by humans);
- sites at which sealed drums of unknown materials must be opened;
- total atmospheric readings on the Photoionization Detector (PID), Flame Ionization Detector (FID), and similar instruments indicate 500 to 1,000 ppm of unidentified substances; and
- extremely hazardous substances (e.g., cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens and infectious substances) are known or suspected to be present and skin contact is possible.

The following items constitute Level A protection:

- open circuit, pressure-demand self-contained breathing apparatus (SCBA);
- totally encapsulated suit;
- gloves, inner (surgical type);
- gloves, outer;

- chemical protective;
- boots, chemical protective, steel toe and shank;
- radiation detector (if applicable); and
    - communications.

3.5.2 Level B Protection

Level B protection is utilized when the highest level of respiratory protection is needed but hazardous material exposure to the few unprotected areas of the body is unlikely.

The following conditions suggest a need for Level B protection:

- the type and atmospheric concentration of toxic substances have been identified and they require the highest level of respiratory protection;
- IDLH atmospheres where the substance or concentration in the air does not present a severe skin hazard;
- the type and concentrations of toxic substances do not meet the selection criteria permitting the use of air purifying respirators; and
- it is highly unlikely that the work being done will generate high concentrations of vapors, gases or particulates, or splashes of materials that will affect the skin of personnel.

Personal protective equipment for Level B includes:

- open circuit, pressure-demand SCBA;
- chemical protective clothing:
- overalls and long-sleeve jacket; or
- coveralls;
- gloves, inner (surgical type); gloves, outer, chemical protective;
- boots, chemical protective, steel toe and shank;
- communications optional.

3.5.3 Level C Protection

Level C protection is utilized when both skin and respiratory hazards are well defined and the criteria for the use of negative pressure respirators have been fulfilled (i.e., known contaminants and contaminant

concentrations, acceptable oxygen levels, approved filter/cartridge available, known cartridge service life, etc.). Level C protection may require carrying an emergency escape respirator during certain initial entry and site reconnaissance situations, or when applicable thereafter.

Personal protective equipment for Level C typically includes:

- full facepiece air-purifying respirator;
- emergency escape respirator (optional);
- chemical protective clothing:
    - overalls and long-sleeved jacket; or
    - coveralls;
- gloves, inner (surgical type);
- gloves, outer, chemical protective; and
- boots, chemical protective, steel toe and shank.

3.5.4 Level D Protection

Level D is the basic work uniform. Personal protective equipment for Level D includes:

- coveralls;
- safety boots/shoes;
- eye protection;
- hand protection;
- reflective traffic safety vest (mandatory for traffic areas or railyard);
- hard hat (with face shield is optional);
- and emergency escape respirator is optional.

3.5.5 Level E Protection

Level E protection is used when radioactivity above 10 mr/hr is detected at the site. Personal protective equipment for Level E includes:

- coveralls;
- air purifying respirator;
- time limits on exposure;
- appropriate dermal protection for the type of radiation present; and

- radiation dosage monitoring.

3.5.6 Additional Considerations

Field work will contain a variety of situations due to chemicals in various concentrations and combinations. These situations may be partially ameliorated by following the work practices listed below:

1. Some sort of foot protection is needed on a site. If the ground to be worked on is contaminated with liquid and it is necessary to walk in the chemicals, some sort of protective "booties" can be worn over the boots. This cuts down on decontamination requirements. They are designed with soles to help prevent them from slipping around. If non-liquids are to be encountered, a Tyvek™ bootie could be used. If the ground contains any sharp objects, the advantage of booties is questionable. Boots should be worn with either cotton or wool socks to help absorb the perspiration.
2. If the site situation requires the use of hard hats, chin straps should be used if a person will be stooping over where his/her hat may fall off. Respirator straps should not be placed over the hard hats. This will affect the fit of the respirator.

   Some types of protective materials conduct heat and cold readily. In cold conditions, natural material clothing should be worn under the protective clothing. Protective clothing should be removed prior to allowing a person "to get warm". Applying heat, such as a space heater, to the outside of the protective clothing may drive the contaminants through. In hot weather, under clothing will absorb sweat. It is recommended that workers use all cotton undergarments.
3. Body protection should be worn and taped to prevent anything from running into the top of the boot. Gloves should be worn and taped to prevent substances from entering the top of the glove. Duct tape is preferred, but masking tape can be used. When aprons are used, they should be taped across the back for added protection. However, this should be done in such a way that the person has mobility.
4. Atmospheric conditions such as precipitation, temperature, wind direction, wind velocity, and pressure determine the behavior of contaminants in air or the potential for volatile material getting into the air. These parameters should be considered in determining the need for and the level of protection.

5. A program must be established for periodic monitoring of the air during site operations. Without an air monitoring program, any changes would go undetected and might jeopardize response personnel. Monitoring can be done with various types of air pumps and filtering devices followed by analysis of the filtration media; personnel dosimeters; and periodic walk-throughs by personnel carrying real-time survey instruments.
6. For operations in the exclusion zone, different levels of protection may be selected, and various types of chemical-resistant clothing may be worn. This selection should be based on the job function, reason for being in the area, and the potential for skin contact with, or inhalation of, the chemicals present.
7. Escape masks must be readily available when levels of respiratory protection do not include a SCBA and the possibility of an IDLH atmosphere exists. Their use can be made on a case-by-case basis. Escape masks could be strategically located at the site in areas that have higher possibilities of vapors, gases or particulates.

APPENDIX H

Traffic Control and Wheel Chocking Management Program

TRAFFIC CONTROL GUIDANCE
MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Joseph W. Gentile, CIH**
EFFECTIVE DATE	**:**	**07/17**
REVISION NUMBER	**:**	**0**

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1.0 PURPOSE

Roux Associates, Inc. (Roux Associates) has established this Traffic Control Guidance Management Program to assure its employees and contractors work safely in situations where they are exposed to traffic hazards. This document provides guidance for assessing traffic hazards, mitigating traffic hazards and developing a traffic control plan for Roux projects to maintain a safe and secure work environment, provide a safe and efficient means of travel through a work area, and ensuring egress points are not obstructed in case of an emergency. (Note: Use of the word traffic is to be inclusive of vehicles and pedestrians.)

2.0 SCOPE AND APPLICABILITY

This guidance document shall be used when conducting work on Roux projects with actual or potential traffic hazards from external or internal traffic including:

- Active sites or facilities (e.g. parking lots, terminals, third party sites)
- Inactive and vacant sites
- Roadways, rights-of-ways

Nothing specified in this guidance document should be construed to suggest conducting work or traffic control in a manner contrary to strict compliance with national, regional and local regulations and/or more stringent contractor or site requirements. This document provides guidance for traffic control and may not contain all the information necessary to develop and implement a traffic control plan for public roadways. If necessary, a traffic control professional and/or licensed traffic control company should be contacted.

3.0 REQUIREMENTS AND MINIMUM SAFETY EXPECTATIONS

A Traffic Control Plan is used for the safe movement of vehicle and pedestrian traffic through a work zone/site and must be developed for each site with actual or potential traffic hazards.

The plan must include:

- Site map* that shows the location of work, flaggers, appropriate buffer areas, traffic flow, parking areas, existing structures and any required traffic control devices
- Established maximum speed limits for the site

*For sites where work zones and/or traffic plans are changing frequently, consider using laminated site maps to allow for updates.

Safety Expectations

- Vehicles and heavy equipment must have an audible reverse signal or a horn will be used to signal backing.
- If backing a work vehicle is required, use a spotter and sound the horn twice before backing. If a spotter is not available, sound the horn twice before backing.
- Individuals who are not familiar with the work site are not permitted to drive on site without an escort.
- Identify a safe entrance and exit path for personnel, vehicles, trucks and heavy equipment that is clear of obstructions, requires no or minimal backing and allows maximum visibility for drivers and others in the area. If visibility is obstructed when entering or exiting the site, mirrors must be installed to enhance visibility or a spotter must be used.
- Establish check-in / check-out procedures for heavy equipment onsite.
- Traffic control must be in place before any work that exposes individuals to a traffic hazard is conducted. All work should be completed before traffic control devices are removed.
- Traffic control devices must be secured to prevent movement in windy conditions.
- The Site Health and Safety Officer (SHSO) is responsible for communicating the traffic control plan including traffic communication methods to all site personnel prior to the start of any activities and periodically assessing site conditions and revising the traffic control plan as needed.

3.1 Buffer Areas

- Buffer area is a lateral and longitudinal area that separates traffic from the work. The minimum buffer area must be established between traffic and personnel, vehicles, and equipment.
- Buffer areas must be sized to provide separation between workers and internal and external traffic including vehicular, heavy equipment and pedestrian.

- The size of buffer zone depends on speed of traffic, volume, type of work, duration of work, visibility of work zone (curves, corners, rises and dips), access and egress and proximity to public facilities.
- If an unauthorized vehicle or pedestrian enters the work zone or buffer area, work must stop immediately and the traffic control plan reevaluated for effectiveness.

3.2 Levels of Traffic Control

Site factors and work factors are used to help determine the level of traffic control needed for safe operations. All work areas should keep in mind pedestrian and small motorized traffic as well as vehicle and heavy equipment traffic. Levels of traffic control are defined as follows:

Factor	Level 1	Level 2	Level 3
Speed in or next to Work Area	Low / <30km/h or 20 mph	High / >30 km/h 20 mph	NA
Use of Heavy Equipment	No	Yes	NA
Work in Public Roadway / Sidewalk/Footpath	No	Yes	Yes
Lane Closure	No	No	Yes

The highest traffic control level based on the single highest ranking factor in the above table should be implemented. Site-specific factors or hazards not presented in the above table may justify selection of a higher traffic control level and/or additional control devices.

3.2.1 Level 1 Traffic Control

- Use delineators (cones with flags, stacker cones, looper tubes, grabber tubes, etc.) to surround work zone
    - 1.1 meter (42-inches) in total height
    - 1.2 meter (4 feet) distance between delineators
- Use caution tape or barricade boards between delineators
- Use work vehicle parked between workers and on-coming traffic to provide visual warning to and physical protection from traffic

- If working close to site entrance, use a second line of delineators to create an additional buffer or utilize a spotter

- Use the buddy system or a watchperson when traffic conditions warrant.

Examples of Level 1 Traffic Control

3.2.2 Level 2 Traffic Control

- Plastic security fencing and/or barricades
    - meter (42-inches) in total height (1.8 meters/6 feet high in areas where drivers have poor visibility or other higher risk factors present)
    - meter (4 feet) distance between delineators
- Use cautionary signs (e.g., “Men Working”, “Work Zone”) in all directions from which vehicles can approach (recommended 0.8 meter or 32 inches high) and any additional signage/protection required by local, regional or national regulations.
- Use work vehicle parked between workers and on-coming traffic to provide visual warning to and physical protection from traffic.
- If working close to site entrance, use second line of delineators to create an additional buffer or utilize a spotter

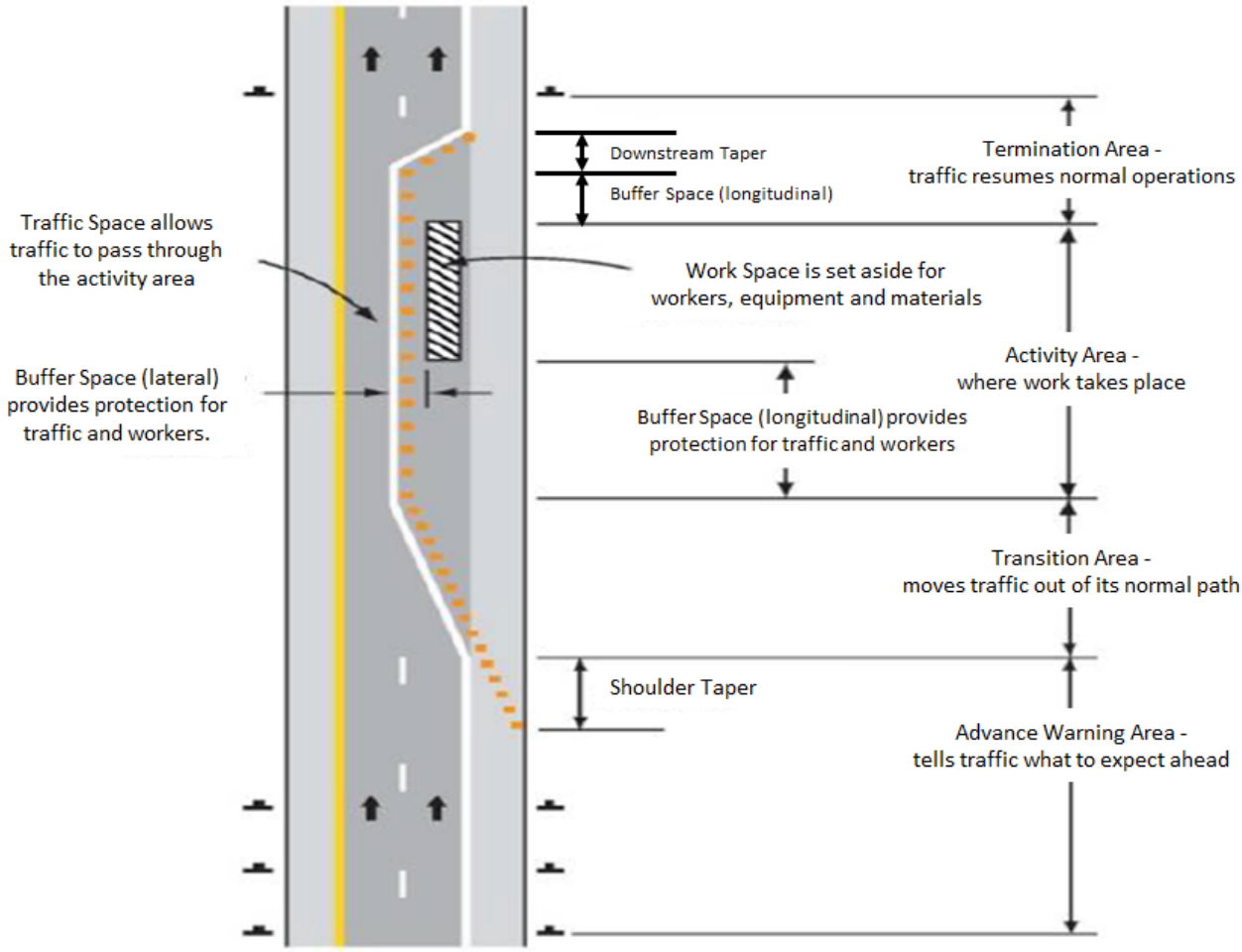
- Use the buddy system or a watchperson when traffic conditions warrant.
- Provide oversight by persons dedicated to traffic control
- Coordinate work with appropriate authorities which may require a police detail

Examples of Level 2 Traffic Control

3.2.3 Level 3 Normal Traffic Flow Interruption (Temporary Traffic Control Zone)

A temporary traffic control zone consists of four areas and may be needed when normal traffic flow is interrupted. A temporary control zone is the entire section of roadway between the first warning sign through the last traffic control device, where traffic returns to its normal path. Most temporary traffic control zones are divided into four areas:

1. Advance warning area – drivers are informed what to expect
2. Transition area – redirection of the driver's normal path
3. Activity area – area where the work is taking place
4. Termination area – traffic returns to normal path



Example of a temporary traffic control zone layout

3.2 Flagging

- Flagging is used when all other methods of traffic control are inadequate to direct or control traffic.
- Flagger locations must be documented on the Traffic Control Plan.
- Minimum standard flagging paddle size allowed is 18 inches (.45 m). It is recommended that a 24-inch (.6 m) paddle be used to improve visibility or for high speed operations.

3.3 Parking

Any vehicle not active in site operations should be parked either in a designated parking area or out of the way and/or used as a barrier to oncoming traffic to protect personnel in the work zone.

All parked vehicles (except light-duty pick-up trucks), trailers and heavy equipment; including those needing to idle while in use, must be secured as follows:

- Emergency brake set
- Manual transmission in gear (if not idling) or automatic transmission in "Park", AND
- One of the following methods:
    - Lowered hydraulic rams
    - Connection of trailer to vehicle that is secured
    - Two properly sized chocks set on either side of a wheel

Please refer to the Wheel Chocking Management Program 2.16 for additional information.

4.0 TRAFFIC CONTROL PLANNING

4.1 Components of a Traffic Control Plan

A traffic control plan will be part of the site Health and Safety Plan (HASP) and in addition to the items listed in the Minimum Safety Expectations section, should include, but is not limited to the following:

- Traffic control design
- Traffic control devices
- Traffic control operations
- Method for communicating any Traffic Control Plan changes

4.2 Assessing Traffic Hazards

Before developing the plan, conduct a site/project assessment to identify internal and external traffic hazards including:

- Traffic flow patterns around and within the work zone
- Vehicle/heavy equipment operations within work zone
- Entry and exit routes for project-related and third-party vehicles/heavy equipment (e.g., congested roadways, limited visibility)
- High traffic areas (e.g., active roadways, parking lots and garages)
- Terrain conditions (e.g., hills, loose gravel, steep slopes)

- Survey of adjacent sites activities that may change traffic patterns (e.g., school drop-off, pick-up times)
- Weather and lighting conditions
- Visibility of work area in relation to traffic flow
- Areas of previous traffic accidents
- Traffic hazards that may be encountered when traveling to and from site (including heavy equipment impacts on local streets, turning radius restrictions, etc.)

Movements of motor vehicles, bicycles, and pedestrians around the work zone should be considered, as well as the movements of personnel, vehicles and heavy equipment within the work zone. A work zone is an unexpected obstacle for those not involved in the work and may cause them to respond in unpredictable ways.

Any work in public roadways, right-of-ways, lanes, alleys, or sidewalks may require approval of appropriate jurisdiction, such as a municipality, county, state, or highway authority. This may require an application for a permit and a permit fee. Work schedules should take into account the time needed to obtain required permits.

In addition, when transporting oversized equipment to a site over public roadways or right-of-ways coordinate with local jurisd ictions for needed traffic control and permits.

4.3 Buddy System or Watchperson

If there are any questions regarding number of personnel required to safely perform project tasks on a site, a two-person crew should be dispatched for the first site visit for potential use of one person as a traffic watch. Subsequent review will determine if site activity remains a two-person job.

A two-person crew should also be scheduled if:

- Location requires traffic to be redirected into another lane or detoured
- Traffic lane will be temporarily closed

- Work is conducted alongside heavily-traveled roadway
- Pedestrian or cyclists require direction or assistance for temporary crossing/diversion
- Areas where hybrid or electric vehicles are prevalent since they may not be heard at slow speeds

4.4 Project Specific Hazards

When working at active sites:

- Determine safest travel routes into and out of work areas for project-related vehicles and heavy equipment
- If possible, minimize work-related impacts on existing site operations
- Discuss TCP with site operator/manager and others who may be impacted

When work involves excavation, consider the following:

- Space for support of the sidewalls (sloping, benching, shoring, and/or trench boxing)
- Space for the safe movement of workers and heavy equipment around the excavation.
- Should controls, such as physical barriers or visual indicators, be applied to limit access to utilities?
- When working near aboveground or underground utilities, consider the following:
    - Can equipment be operated in a way to maintain safe distances from overhead utilities?
    - Could equipment displace or crush underground utilities?

When laying out work zones, consider the following in allowing space for work activities:

- Can equipment and materials be delivered, stored, and handled readily?
- Can workers perform their tasks safely and efficiently?
- Is there space to walk so as to minimize slip, trip, and fall hazards?
- Are two-way roads three-times as wide as the widest piece of equipment using the road or does traffic need to be controlled?

On-Site Workers should take the following actions:

- Check surroundings often for potential changing traffic hazards

- Listen for and respond to warnings such as horns, whistles, and sirens
- Position yourself facing traffic. Where this is not practical, a "second set of eyes" should be considered such as a buddy or watchperson
- If walking on/near a road or access way, walk in single file (not in a group) towards/facing oncoming traffic
- Remove hearing protection when not needed
- Look out for the safety of other workers in area
- Turn off cell phones and do not use while operating or being in the vicinity of operating vehicles / heavy equipment

4.5 Deploying/Removing Traffic Control Devices

- Begin placing devices in upstream (traffic advance warning area) locations.
- Flag person used to warn incoming traffic should be placed far enough in front of work zone to allow vehicles to maneuver
- Delineate transition zone with cones and barricades
- Establish work zone
- Delineate downstream taper
- Place signs for end of work zone
- Remove devices in reverse order of deployment (remove devices at beginning of set-up last)

4.6 Traffic Control Devices

The work zone should be highly visible so that drivers can see and avoid the area. Geometry, color and reflectivity of devices affect how people see them. Location of devices relative to terrain and other objects also affects visibility. Visibility may be enhanced by increasing the height and number of traffic control devices.

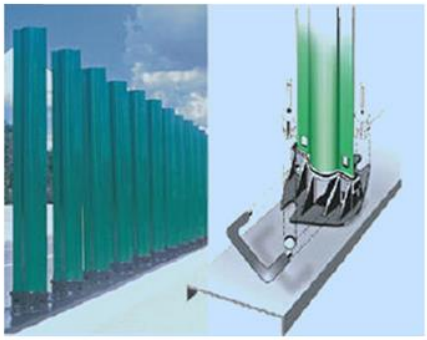
Traffic Control devices provide visibility and can include the following:

- Traffic cones with flags, looper tubes, grabber tubes and stacker cones (recommended height 1.1 meter/42 inches)
- High visibility security / temporary fencing (may require addition of reflective tape or lights)

- Warning tape
- Reflective tape
- Automated Flagger Assistance Device
- Warning and speed limit signs (e.g., "Caution Work Area")
- Traffic flow arrows (e.g., posted or painted on ground)
- Molded plastic barricades (sawhorses)
- Type I and II barricades
- Plastic channelizers (orange barrels)
- Concrete barriers (Jersey barriers or K-rails)
- Water-filled barricades
- Vehicles used as barricade (with hazard lights activated if possible)
- Light bars and reflective lights on vehicles
- Portable gates
- Glare screens
- Buddy system / Watchperson
- Temporary speed bumps or rumble strips

Commonly used traffic control devices

Extender bars used in place of tape



Glare screens can make a highly visible barrier

Barrier constructed of PVC pipe and orange fencing

Traffic control devices should be routinely inspected to ensure continued integrity and visibility.

Many traffic control devices only provide visual clues to drivers. Physical barriers, such as parked vehicles, concrete barriers, or water filled barriers can provide more protection if a driver has lost control or is not paying attention.

4.7 Night/Low Visibility

As much as practical, work should be conducted during daylight. Night operations may result in poor visibility for drivers and workers.

If work must be done at night, additional lighting/traffic control measures should be provided to warn vehicles and pedestrians. Glare from lighting should be controlled so as not to interfere with the vision of workers or drivers.

Nighttime visibility can be increased by:

- Lighted delineators
- Flood lights/Work area lights
- Higher class of high-visibility apparel
- Flashing lights on clothing/vehicles/hard hat
- Glow sticks attached to traffic vests
- Reflective tape on equipment

Glow stick

Lighted traffic control devices

Highly reflective safety gear

MOTORIZED VEHICLES AND MOBILE EQUIPMENT WHEEL CHOCKING MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile, CIH
EFFECTIVE DATE	:	07/17
REVISION NUMBER	:	0

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1.0 PURPOSE AND BACKGROUND

Roux Associates, Inc. (Roux Associates) has instituted the following program to establish a uniform approach to address hazards associated with the unintended movement of cars, trucks, construction vehicles, and/or vehicle trailers while stopped, during loading, unloading, or other related activities. This program is intended to provide protection to vehicle/mobile equipment operators, their passengers, pedestrians and forklift operators through good parking practices and the effective use of wheel chocks. Construction accident studies continue to reveal "rollaway" vehicle accidents as a common occurrence. These most often occur when the driver leaves the vehicle believing the vehicle transmission is in either Neutral or Park position and that the brakes have been set. The vehicle then rolls away and, in most instances, stops only after encountering some obstacle. Vehicular and other property damage are the result with the potential to include serious personal injuries and death.

2.0 SCOPE AND APPLICABILITY

This program applies to the following:

A. All company owned, operated, leased, or contracted motorized vehicles and mobile equipment.
B. All projects managed or supervised by Roux.
C. All Roux company and subsidiary company employees and personnel operating motorized vehicles and mobile equipment.
D. All contractor and sub-contractor personnel performing work for and/or on behalf of Roux.
E. Leased equipment and lessor's operating personnel.
F. Personally owned vehicles.

3.0 PROCEDURE GUIDELINES

A. Cars, SUVs, Pickups and Light Trucks

Park on level ground. Before exiting the vehicle, make sure the automatic transmission is in PARK with the emergency brake set. Check the brake twice.

B. All Other Motor Vehicles

- Park on level ground. Before exiting the vehicle, make sure the automatic transmission is in PARK with the emergency brake set. Check the brake twice.
- Do not leave a vehicle running without an operator seated in the driver's seat.

- When stopped or parked on slopes/inclines, chock your wheels. When chocking, use specially designed wheel chocks of the appropriate size and material to securely hold the vehicle. Don't use lumber, cinder blocks, rocks, or other makeshift items to chock. Where applicable, lower hydraulic rams and check the security of the connection between the trailer and the vehicle.
- Ensure chocks are easy to find. Store chocks inside trucks, other mobile equipment, and trailers.
- Place "Chock Your Wheels" stickers above the wheels as reminders.
- To properly chock a freestanding vehicle, place chocks on the left and right rear axle wheels. It is safest to chock both the front and back wheels on both sides of a vehicle. Some vehicle wheels may also need to be chocked at the front and back of each tire.
- Where trailers are loaded or unloaded at docks, ensure that trailers are firmly placed against the loading dock edges and prevent rollaways by using chocks. Positioning of chocks is important. Place chocks on the left and right wheels that are closest to the loading dock. This placement allows a forklift to push down on the trailer wheels and seat them more firmly against the chock. If only the front axle is chocked, a forklift could push the trailer forward and loosen the chock or cause the wheel to jump the chock. The driver, dock workers, and forklift drivers share the responsibility to ensure that the truck and trailer wheels are properly chocked.
- Use extra caution when driving a forklift into a trailer from the dock edge. If the trailer rolls away from the dock edge, the forklift could fall into the gap, resulting in the potential for severe injuries or death. Never drive a forklift into a trailer until you make sure that the wheels are properly chocked. Ensure that the trailer floor is in good condition and that it can support the weight of the forklift and its load.
- Include wheel chocking in hazard assessments and other procedures. Project and job site hazard assessments shall consider energy releases from motorized vehicles and mobile equipment on all Roux projects and work sites. Site-specific health and safety plans (HASP's) and Job Safety Analyses (JSA's) shall address wheel chocking requirements. Lockout/Tagout programs and procedures shall include applications for wheel chocking.

4.0 TYPICAL WHEEL CHOCKING APPLICATIONS

1. When performing maintenance on passenger cars, pickups, and light duty trucks, including the changing of flat tires.
2. While performing maintenance on wheeled earth-moving equipment, such as dump trucks, front end loaders, backhoes and other excavating equipment.
3. Parked auxiliary wheeled equipment whether performing maintenance or in stationary position, to include:
   a. Portable air compressors that have been disconnected from the vehicle.
   b. Portable water pumps.
   c. Portable air-moving equipment.
   d. Soil screening equipment.
   e. Wheeled drilling equipment including Geoprobes.
   f. Truck-mounted welding and cutting equipment.
   g. Truck-mounted masts and cranes.
4. Chock truck/trailer while loading/unloading pipe onto a pipe trailer or to a truck-attached bed.
5. Chock truck/trailer while loading/unloading wheeled heavy equipment (i.e., backhoe, track hoe, dozer, and forklift) from a lowboy truck trailer onto ground or when loading onto trailer.
6. Chock and secure wheel and truck mobile equipment while such equipment is being transported by trailer.
7. Chock trailer when being disconnected from truck.
8. NON-VEHICULAR APPLICATIONS: Ensure pipe is properly chocked on pipe rack; ensure 55-gallon drums on horizontal drum racks are chocked; ensure loads are blocked to prevent shifting and falling.

5.0 HYBRID VEHICLES

What is critical to be aware of with hybrid vehicles is that with the engine shut off, there is no sound coming from the engine compartment or the electric motor. With a hybrid vehicle, a silent car is no guarantee of a safe car. Consider that it is in “sleep mode.” Make sure you are aware of this before the vehicle “wakes up” and catches you by surprise!

Chocking the wheels is critical for safety around a hybrid vehicle. Fortunately, Toyota and Honda engineers have designed an indicator light to show the status of the vehicle and its potential to drive away. Under certain conditions, when the Honda Insight stops, such as in traffic or as a result of a vehicle crash, it goes into the Auto Idle-Stop mode. A small green Auto Stop LED light at the base of the tachometer in the instrument panel illuminates. This indicates that the engine is not moving at all, and reminds the driver and others, such as emergency responders, that the car is still in the "on" mode.

APPENDIX I

Tick Management Program

TICK MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile, CIH
EFFECTIVE DATE	:	07/17
REVISION NUMBER	:	2

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APPENDICES

1.0 PURPOSE AND BACKGROUND

Roux Associates, Inc. (Roux Associates) has established a Tick Management Program (Program) to provide direction and guidance to protect employees from exposure to vector borne diseases specifically resulting from tick bites. The program focuses on management practices to reduce potential exposure situations along with the use of personal protective equipment (PPE), insect repellents usage, procedures for inspections of personnel, recommendations for personal showering and the washing and drying of work clothing that has been potentially exposed to a tick environment and the required response to a known or suspected tick bite. The following diseases are of concern as it relates to ticks and include: Anaplasmosis, Babesiosis, Ehrlichiosis, Lyme Disease, Rocky Mountain Spotted Fever, Southern Tick-Associated Rash Illness, Tick-Borne Relapsing Fever, Tularemia, Colorado tick fever, Alpha-Gal Allergy and Powassan virus.

Questions pertaining to this program can be addressed by your Office Health & Safety Manager (OHSM) or the Corporate Health & Safety Manager (CHSM). Key definitions pertaining to this program can be found in Appendix A.

2.0 APPLICABILITY

The program is applicable to Roux Associates employees and their subcontractors who will be performing activities and/or work in areas which could result in potential contact with ticks. The potential for contact with all vectors including ticks is increased when work is performed in outdoor areas where vectors are potentially present and during times of the year when they are most active.

3.0 PROCEDURES

The Program Procedures described below include: Project pre-planning and tick avoidance, the proper use of PPE, responses to suspected and known tick bites, and reporting requirements.

3.1 Project Pre-Planning and Tick Avoidance

Avoidance is the preferred management approach with respect to tick(s). Pre-planning at the beginning of a project is the first step in tick avoidance. Where possible, plan the work to avoid tick-infested areas as described below:

- Avoid brushy, overgrown grassy and wooded habitats, particularly in spring and through fall when ticks are most active.
- Remove leaves, tall grass and brush from areas surrounding work areas (to include residential sites), thereby potentially reducing tick, deer and rodent habitat.
- Consider having a licensed applicator apply tick-toxic chemicals (e.g., Damminix, Dursban, Sevin, etc.) to surrounding work or residential areas to suppress the tick population.
- Consider performing work during dormant seasons or not during active seasons (spring through fall) unless it is not practical or rescheduling may introduce other hazards.

3.2 Use of Personal Protective Equipment (PPE)

Where avoidance of tick habitat or clearing of the area is not possible, employees need to wear appropriate PPE and take measures to avoid tick bites. There are two defined PPE approaches which are discussed below, that when properly implemented will provide the required protection from tick bites.

3.2.1 Preferred PPE Method

The preferred approach is the use of permethrin treated clothing and an insect repellent containing n,n-diethyl m-toluamide (DEET) on exposed skin. With the use of permethrin there are critical and time sensitive steps which are required in advance of its proper use. Additional guidelines on permethrin are provided in Appendix B and should be reviewed at least 2 days prior to the scheduled work. The use of permethrin and DEET are further discussed below:

- Using permethrin on outer clothing (including a hat) and shoes to kill ticks on contact as per manufacturer's instructions (requires pre-treatment of clothing 24 hours in advance of the scheduled work).
- Spraying the insect repellents containing DEET on exposed skin just prior to initiation of the work, in accordance with United States Environmental Protection Agency (EPA) guidelines and supplemental information which is provided in Appendix C. DEET should be used on exposed skin only as it may melt or dissolve synthetic fabrics such as polyester or rayon.
- Be sure to tuck your pant legs into your socks and your shirt into your pants.

Should you have any questions or concerns regarding the use of permethrin or DEET please contact the CHSM/OHSM. If you require assistance with obtaining approved repellents contact your OHSM.

3.2.2 Alternative PPE Method

An alternative approach to the use of permethrin would be the use of other PPE in conjunction with the application of DEET as discussed above in section 3.2.1 and as discussed below:

- Wearing non-coated Tyvek coveralls over light-colored long-sleeved shirts and pants. Tape ankle openings of coveralls and wrist if wearing gloves.
- Wear a light colored long sleeved shirt and pants and tuck your pant legs into your socks and your shirt into your pants. Socks should be a tight weave fabric to prevent exposure through the material.
- Spraying the insect repellents containing DEET just prior to initiation of the work on exposed skin, in accordance with manufacturer's instructions.

3.2.3 Proper Donning and Removal of PPE

The donning of the PPE is to occur prior to entering a potentially tick-infested area. This usually means that the PPE needs to be in place and properly worn before stepping off a paved or concrete area onto a grassy or wooded area.

The PPE needs to remain on with the tucking or taping of pant legs, all closures fastened, etc., until leaving the potentially tick-infested area. Again, this usually means upon return to the previously paved or concrete area. Upon leaving the area, remove the PPE appropriately and bag it (plastic bag) to prevent ticks from traveling and subsequently attaching themselves to your skin.

Workers are to inspect themselves and co-workers frequently during the work and again after exiting the work area.

It is also important to do another thorough examination upon arrival home prior to and during showering to further check for ticks. Areas of the body would include under arms, in/around ears, inside belly button, back of knees, around ankles, in and around your hair, between legs and around your waist. Also, it is recommended that any work clothes be immediately washed and dried at high temperatures.

3.3 Responding to Known or Suspected Tick Bites

If an embedded tick is discovered it should be promptly removed with tweezers. Please follow the following steps:

- Grasp the tick by the head or mouthparts where they enter the skin, utilizing a pair of pointed precision tweezers (provided in the on-site first aid kit). Do NOT grasp the tick by the body.
- Pull firmly and in a steady motion directly outward. Don't twist or jerk the tick as this can cause the mouth parts to break off and remain in the skin. If this occurs, remove the mouth-parts with tweezers. If you are unable to remove the mouth easily with clean tweezers leave alone and let skin heal.
- Do NOT apply petroleum jelly, a hot match, alcohol, or any other irritant to the tick to get it to back out of skin.
- Clean the bite area and your hands with antiseptic.

Preserve the tick for analysis (i.e., by placing in a zip lock bag, envelope or jar). Provide the tick to the OHSM, further testing may be required. If testing is warranted based on the circumstances the tick will be sent to an accredited laboratory (e.g. EMSL Analytical, Inc.) to be analyzed to determine if it contains the bacteria capable of causing Lyme disease**.**

The discovery of a tick embedded in the skin where the tick contact occurred at work will require adherence to the Incident Investigation and Reporting Program with all internal contacts being made through the standard notification protocol of the H&S Injury/Illness Notification Flowchart.

If you suspect you have been bitten by a tick while on the job and exhibit the following symptoms; circular rash, aches/pains and/or fever/chills contact your OHSM for additional guidance.

Appendix A

Definitions

Medical Treatment- Treatment for an injury or illness related to Roux Associates' work activities that requires professional medical treatment beyond first aid. In the case of a work-related tick bite this includes any prescription including the use of antibiotics in response to the bite. This medical treatment classification will occur even if the antibiotics were prescribed merely for preventative treatment of a work-related tick bite (i.e., a suspected tick bite with no evidence or symptoms of disease).

Work-related Tick Bite- A tick bite that occurs while working in a tick-infested work site containing a tick infected area. Any such tick bite would be identified within one day of working in the tick-infested area. There may be additional exceptions to this simple definition; therefore, it is imperative that the OHSM and CHSM be consulted immediately upon discovery of a potential tick bite. (Note: Any tick bite, or condition that develops due to a suspected tick bite, that may be attributable to contact with a tick outside of the work environment which would not be considered a work-related tick bite.)

Vectors- Living organisms that can transmit infectious diseases between humans or from animals to humans. Many of these vectors are bloodsucking insects, which ingest disease-producing microorganisms during a blood meal from an infected host (human or animal) and later inject it into a new host during their subsequent blood meal. Ticks are considered a vector.

Appendix B

Permethrin Application Guidance[1]

Permethrin is registered with the EPA for use as an insecticide and repellent. Permethrin-treated clothing repels and kills ticks, chiggers, mosquitoes, and other biting and nuisance arthropods.

Clothing, hats, shoes, bed nets, jackets, and camping gear can be treated with permethrin for added protection. Permethrin should **NOT** be applied directly to the skin. Do **NOT** apply in a way that will allow for product to contact adults, children or pets either through direct contact or through drift. Remove pets and birds and cover fish aquariums before surface applications if using spray.

Ensure application of clothing occurs in a well-ventilated outdoor area protected from wind and lay out entire outfit to be treated. Gloves and safety glasses should be worn during the application process. Apply permethrin to clothing following manufacturer instructions. Once outfit is completely treated hang clothing to air-dry. The manufacturer will specify dry times however to ensure clothing is dried completely, Roux Associates recommends all clothing and other items be treated 24–48 hours in advance of work to allow them to fully dry before handling and wearing.

Permethrin-treated materials retain repellency or insecticidal activity after repeated laundering but should be retreated, as described on the product label, to provide continued protection. Clothing that is pretreated prior to purchase has efficacy through 70 launderings.

Products such as Permanone and Sawyer, Permethrin, Repel, and Ultrathon Permethrin Clothing Treatment are registered with EPA specifically for use by consumers to treat clothing and gear. Alternatively, clothing pretreated with permethrin is commercially available, marketed to consumers in the United States as Insect Shield, BugsAway, or Insect Blocker.

[1]U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, “CDC Health information for International Travel 2018 (Yellow Book).”

Appendix C

Insect Repellent Guidance[1]

Always follow label directions and precautions when using insect repellent. When used as directed, products containing DEET are proven safe and effective. To avoid reaction to DEET or other ingredients in insect repellents, always read and follow the directions before use.

Choose a repellent that provides protection for the amount of time that you will be outdoors. The more active ingredient a repellent contains, the longer time it can protect you from potential bites. For example, 5% DEET will provide mosquito bite protection for one hour in comparison with 24% DEET for up to 5 hours. Studies suggest that concentrations of DEET above approximately 50% do not offer a marked increase in protection time against mosquitoes; DEET efficacy tends to plateau at a concentration of approximately 50%.

Do NOT spray insect repellent on skin that is under clothing. Do NOT apply insect repellent to skin that is already irritated, or to cuts/lacerations. Do NOT spray aerosol or pump products in enclosed areas. Do NOT spray a pump or aerosol product directly on the face. Do NOT apply DEET to clothing.

After returning indoors and before eating, drinking, or smoking, use soap and water to wash skin that has been treated with insect repellent. Reapply repellent when returning outdoors or after eating.

Outdoor workers may need to use sunscreen in conjunction with insect repellent. Repellents that are applied per label instructions may be used with sunscreen with no reduction in repellent activity. However, limited data show a one-third decrease in the sun protection factor (SPF) of sunscreens when DEET containing insect repellents are used after a sunscreen is applied. Products that combine sunscreen and repellent are not recommended, because sunscreen may need to be reapplied more often and in larger amounts than needed for the repellent component to provide protection from biting insects. The best option is to use separate products, applying sunscreen first and then applying the repellent.

[2]U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, "CDC Health information for International Travel 2018 (Yellow Book)."

APPENDIX J

Short Service Employee Management Program

SHORT SERVICE EMPLOYEE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile, CIH
EFFECTIVE DATE	:	07/17
REVISION NUMBER	:	4

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APPENDICES

1.0 PURPOSE

This program has been implemented to ensure that Roux and Subcontractor short service employees are identified, appropriately supervised, trained, and managed in order to prevent accidents such as personal injury, injury to others, environmental damage, and/or property damage. This is a requirement for all employees and subcontractors throughout the firm. In addition, there are additional requirements specific to ExxonMobil policies that are required on all of their projects, and are identified where applicable below.

2.0 ROLES AND BACKGROUND

Short Service Employee

A Roux employee or a Roux subcontractor employee with less than six (6) months continuous service in the same job type or less than six (6) months continuous service with his/her current employer is a Short Service Employee (SSE).

The Roux SSE process was developed and periodically updated to satisfy all expectations included in ExxonMobil's Environmental Services Short Service Worker Guidance. Roux Associates senior management will, at a minimum, perform an annual assessment of the Short Service Employee Management Program to determine its effectiveness and identify improvement opportunities. It should be noted that ExxonMobil refers to SSE as Short Service Workers or SSWs. For all ExxonMobil projects, a SSE is defined as a Roux employee or a Roux subcontractor employee with less than six (6) months of ExxonMobil worksite experience or has not worked on an ExxonMobil worksite in the last two (2) years.

SSEs shall not exceed 50% of Roux's workforce at any job site without prior written approval from the Office Manager (OM) and, when required by client contract or program, approval from the designated client representative.

The SSE process excludes workers not performing physical work onsite, visitors, regulatory agency staff, client employees or affiliates, and members of contractor management staff. In addition, certain

elements of this SSE process may not be appropriate for short-duration workers (i.e., specialized workers onsite for a short period of time to perform a very specific task and unlikely to return). If the SSE process is deemed not appropriate, the individual Project Manager will develop a case-specific risk mitigation plan to address these short duration workers or consider subcontracting the task through a long-duration contractor who has an effective SSE program.

Site Safety Mature Person (SSMP)

An SSMP is a worker who is working on an ExxonMobil site that has demonstrated knowledge and skills with regard to site hazards, hazard management, and safe working practices, and is qualified to act as an SSMP. Our "graduation" process includes administration of an LPS® written test followed by a one-on-one interview with a senior safety or project manager of the project team to ensure competence. Graduation to a SSMP typically takes 6 total months of applicable work at ExxonMobil sites. Graduation in less than 6 months requires approval by the ExxonMobil PM.

Mentor

A Mentor is a designated person(s) who is responsible and accountable for guiding and monitoring performance of SSEs in the field. The Mentor cannot be another SSE. The Mentor can be a member of the same working team, but should not be an employee of ExxonMobil or any of its affiliates. The Mentor is a SSMP and has demonstrated knowledge and skills with regard to site and task-related hazards, hazard management, and safe working practices and is able to communicate with the SSE. The Mentor is trained and knowledgeable of Loss Prevention System (LPS) tools such as SPSAs, LPOs and JSAs. The Mentor should have a positive safety attitude and understanding of both ExxonMobil's and Roux's corporate safety cultures. The Mentor should be capable of practicing Safety Leadership skills, but does not necessarily have to be the SSE's Supervisor. The Mentor should have received appropriate training and be qualified for the role by Roux management. The Mentor is expected to either be onsite with the SSE or assign a SSMP to be onsite with the SSE until the SSE graduates and becomes a SSMP. Deviation from a Mentor or SSMP being onsite with the SSE while conducting field operations requires approval by the Project Principal or the Client PM (in the case of ExxonMobil work).

Supervisor

A Supervisor is the designated person(s) who is responsible and accountable for the overall stewardship of the SSE Management Program for each project or office. The Supervisor shall be a senior member of the Roux management team.

3.0 ORIENTATION, TRAINING AND CLEARANCE

Pre-Assignment Orientation, Training, and Clearance

An initial First Day employee orientation is required before the SSE can perform any field work. Orientation must be conducted by the OM or the designated Supervisor of the SSE. The initial orientation shall at a minimum communicate the following information:

- Even though risks do exist;
- Accidents and injuries are preventable;
- Each worker has a personal responsibility for his or her safety and the safety of others both on and off the job;
- No business objective is so important that it will be pursued at the sacrifice of safety;
- Safe conduct is a condition of employment;
- Work is done well only if it is done safely;
- Roux employees are expected to have the best safety performance;
- Overview of Roux's Safety Procedures and Practices;
- General requirements for Personal Protective Equipment;
- Injury reporting and medical follow-up procedures;
- Requirements regarding participation in safety meetings, Safe Performance Self Assessments (SPSAs), pre-job Job Safety Analyses (JSAs) and the Loss Prevention Observation (LPO) / Roux Peer Observation process; and
- Requirements of this SSE Management Program.

Other pre-assignment training (or verification of prior training) is also typically required and will be determined by the OM and Supervisor of the SSE. Examples of this additional training include OSHA

Hazardous Waste Operations and Emergency Response (HAZWOPER) training, one-one-one Safety and Procedures Review with the Office Health and Safety Manager (OHSM), client-specific training program requirements (i.e., LPS®, railroad worker safety, etc.), and job skills training requirements specific to immediate job tasks (i.e., various field procedures training, equipment usage, etc.).

Medical clearance and drug testing clearance are also required prior to the performance of field work on some sites.

Project and Site-Specific Orientation and Training

Many Roux projects have different requirements that are client-specific or site-specific in nature. It is the responsibility of the Project Principal (PP) (or Project Manager (PM) if delegated this responsibility by the PP) to ensure that the SSE assigned to his/her projects is provided orientation and training with respect to these client and/or site-specific requirements. Minimum site-specific orientation shall include operations overview, review of the site-specific HASP, emergency action plan, facility sign-in and sign-out, hazard identification and reporting, MSDS information and H_2S if applicable. In addition, any restrictions on communications with non-Roux personnel, site access or operation of site equipment (both Roux and Client owned) should be reviewed.

Client-specific and site-specific orientation topics shall also include work permit training, reporting incidents and hazards, emergency response procedures, appropriate PPE requirements, and general importance and use of LPS® tools (including a client's Core Safety Expectations and consequences).

Additional SSE Training

While classified as an SSE, it is the employee's responsibility to actively seek out and participate in available training opportunities. The SSE will utilize the attached SSE Form to track the completion of training and other experience gained while an SSE. Specific training that is recommended to be completed within the first six (6) months of employment in order for the employee to graduate from SSE status is listed on the SSE Form. Individuals completing the training are required to sign-off on each type of training.

4.0 NOTIFICATIONS AND RESPONSIBILITIES

The following individuals have responsibilities for notification under this program.

Office Manager (OM) and SSE Supervisor: Have the responsibility of notifying the PP when a SSE employee is assigned to his/her project. They also have the responsibility for confirming that field assessments are conducted to verify the effectiveness of the SSE's performance.

SSE: Roux employees who are SSEs are required to identify themselves as such to the Roux PM prior to reporting to the job Site and to provide the PM with an up-to-date copy of his/her Roux SSE Training and Assignments Documentation Form. SSEs are required to wear company- supplied fluorescent green hard hats (or other project-specific distinct identification) when in the field in order to be easily identifiable.

Project Principals (PPs) and Project Managers (PMs): PPs are responsible for notifying the PM when a SSE is assigned to his/her project and for ensuring that the requirements of this SSE Management Program are adhered to on their projects. When required by Client contract or program, the Roux PP (or PM if delegated this authority by the PP) shall provide applicable notice to the client's designated representative regarding SSE's being assigned to field work. The notice should be completed in advance using any applicable client SSE notification forms and shall be acknowledged / approved by the client representative prior to the SSE commencing work.

The Roux PM shall notify the Field Manager/Supervisor who will be responsible for field mentoring/training of the SSE on their project and for making sure everyone on the job site is aware that SSEs are present. All personnel are expected to help the SSE and to explain potential hazards before each job. The Roux PM shall maintain a list of SSE workers, their entry date and date that they complete the SSE process.

The PP and PM shall ensure that the requirements of this SSE Program are implemented for all subcontractor employees performing field work on the Firm's projects.

Mentor: The PP (or PM if delegated this authority by the PP) must designate an onsite Supervisor for the SSE. A Mentor shall be capable of demonstrating safety leadership, will not currently be a SSE, have a positive safety attitude, will be capable of providing effective training / coaching, and will have good communication skills. The Mentor will have a positive safety attitude, will be motivated and is to have good knowledge of client-specific and site-specific safety programs/culture and requirements (e.g., ExxonMobil LPS® program). An SSE may only work under the direct on-site supervision of the designated Supervisor who, as one of his or her duties, serves as a mentor/trainer in safety for the SSE. The onsite Supervisor or Mentor must provide close supervision and not allow the SSE to perform any task in which the SSE has not been properly trained. The onsite Supervisor will review with the SSE any hazards associated with the task and review all emergency equipment and response procedures. The Mentor must actively work with and engage the SSE on a daily basis to provide mentoring and monitoring of the SSE with respect to safe work practices and identification of hazards.

Site-specific Mentor responsibilities shall also include applicable work permit training, reporting of incidents and hazards, emergency response procedures, appropriate PPE requirements, and general importance and use of LPS® tools. At the completion of each field assignment, the onsite Supervisor/Mentor will complete the applicable section of the employee's SSE form to document the work experience and provide feedback to the Project Manager as well as the OM and Project Principal regarding the SSE's performance and capabilities.

5.0 SHORT SERVICE EMPLOYEE MANAGEMENT Program EXCEPTIONS

Any exception to this Short Service Employee Management Program must be approved in writing by the OM and PP, and, when required by client contract or program, by the designated client representative. An exception to the onsite Supervisor / Mentor requirement and 50 percent SSE limitation may be granted for activities typically performed by one Roux employee (e.g., field work oversight, field inspections, etc.). To be eligible for an exception, the employee must have had training and demonstrated prior experience in the specific work area. In addition, the PM shall also provide additional communications during the course of each day to review safety requirements and work progress to ensure work is being performed safely and in accordance with expectations.

An exception to the 50% SSE limitation may be granted for work that requires increased staffing levels by Roux or Roux subcontractors (e.g., construction projects). The exception request must be submitted in writing, using a form similar to the attached Roux SSE Exception Form, by the contractor, outlining SSE expectations limitations, types of work to be performed, and mitigative measures that will be taken to minimize risks associated with the increased utilization of SSEs. The exception request must be approved by the OM and, when required by client contract or program, approval from the designated client representative.

Exceptions to the Short Service Employee Management Program at ExxonMobil sites must be approved in writing by the ExxonMobil Project Manager.

6.0 PROGRAM COMPLETION

To be removed from SSE status, the OM and the SSE's Supervisor must be convinced that the SSE has a working knowledge of both Roux and any applicable client Safety Policies and has demonstrated safe work practices and behavior. In addition, the SSE must have completed all required initial SSE training (as documented in his/her SSE Form) and have performed all activities without a serious loss incident (i.e., property damage, OSHA-Recordable injury). At that time, if the OM and Supervisor are convinced of the SSE's capabilities, the OM may remove the employee from the Roux SSE process by completing and signing the applicable section of the employee's SSE Form. The signed form will then be forwarded to Human Resources to be included in the employee's personnel file. If the SSE has been actively working on a client site under client-specific SSE requirements, the PM may need to obtain approval from the client representative as well.

If within six (6) months, the SSE is not capable of demonstrating the appropriate level of task, project, or safety knowledge, they shall be restricted from performing field activities until a point in time when they qualify to do so or are to be removed from the site.

For those SSE workers performing work at ExxonMobil worksites, they will have to successfully complete an LPS® assessment and demonstrate sufficient knowledge to complete the SSE requirements

and be removed from the SSE process. Prior to being removed from SSE status workers performing work at ExxonMobil worksites will at a minimum complete the following:

- SSE shall participate in creating a minimum of one JSA;
- SSE shall identify and prepare two near loss reports, including participation in the root cause analyses;
- SSE shall perform and communicate a minimum of twenty SPSAs to a peer or manager;
- SSE shall lead a minimum of two toolbox safety meetings; and
- SSE shall participate in two LPOs as observee or observer.

SSEs will also complete a one-on-one interview with their associated Supervisor to confirm that they are ready to complete the program. At ExxonMobil sites, completion of the SSE program in less than six months needs to be approved by the ExxonMobil Project Manager.

7.0 SUBCONTRACTORS

All subcontractors who supply field personnel to Roux job sites must implement a program that meets or exceeds the expectations described above as well as any additional requirements that may be required on a client or site-specific basis.

Appendix A

SHORT SERVICE EMPLOYEE TRAINING AND ASSIGNMENTS DOCUMENTATION FORM

I. SSE Information

SSE Name:_____ Current Job Title:_____

Date of Employment:_____ Experience:_____Years Current Position Experience:_____Years _____Mos.

SSE On-site Mentor:_____Designated SSE Supervisor:_____

II. Orientation, Training and Clearance

Requirement	Date Completed	SSE Initial	Mentor Initials	Supervisor Initials
Drug and Alcohol Screening				
OHSA Medical Surveillance Physical Exam				
OSHA 40-Hour HAZWOPER Training				
Roux Policy Procedures Manual Review (Clarity ® Link to D&A Training: Departments/Health & Safety/Shared Documents/Training Programs/Drug and Alcohol Training)				
Safety, Policies, and Procedures Orientation with OM or SSE Supervisor (including required PPE)				
LPS® Initial Training				
Emergency Response Procedures Review				
Completion of 20 SPSAs/Safety Assessments				
Completion of 2 LPOs/RPOs (Roux Peer Observations)				
Completion of 2 LI/NLI/H&S Lessons Learned				
Client Work Permit Procedures				
Client-Specific Training (LPS, LIRR, Amtrak, NJ Transit)				
Defensive Driving (i.e., Smith System)				
Field Notebook				
Subcontractor Oversight				
Field Manager / SHSO				
Lead 2 Toolbox Safety Meetings				
Job Safety Analysis (create 1 new JSA)				

---First Day ---

III. Field Assignments (Attach additional sheets for each additional assignment while SSE)

Site	From::	To:	Onsite Mentor	Supervisor

IV. Release from SSE Status

Based upon the SSE's successful completion of the above training and assignments, the SSE's Mentor, Supervisor, and OM indicated below have been convinced that the SSE has a working knowledge of both Roux and any applicable Client Safety Policies, and has demonstrated safe work practices and behavior. Additionally, the SSE has completed all applicable SSE training (as documented above) and performed all activities without a serious loss incident (i.e., property damage, OSHA recordable injury). The individual is thereby removed from status as an SSE.

_____ SSE Mentor

_____ SSE Supervisor

_____ Office Manager

_____ Date

Appendix B

ROUX SSE EXCEPTION FORM

This form is to be filled out and approved by the Roux Office Manager and Project Principal whenever the onsite Supervisor requirement and/or 50% SSE limitation will not be met on the project.

IV. Variance Information

Variance Justification: (What are the current circumstances and what will be done to ensure an acceptable level of risk?)	#####
Alternatives to Variance: (If the variance is denied, what are the alternatives to completing the scope of the work? Briefly detail the cost and operational impact of the alternatives.)	#####

List the steps to be taken to manage the SSE risk to an acceptable level:

1. #####
2. #####
3. #####
4. #####
5. #####
6. #####
7. #####
8. #####
9. #####
10. #####

V. Variance Review and Approvals

Variance Expiration Date: #####

Project Principal ☐ Approves ☐ Denies

Signed: _____ Date: #####

Office Manager ☐ Approves ☐ Denies

Signed: _____ Date: #####

Appendix C

SHORT SERVICE EMPLOYEE MENTOR DOCUMENTATION FORM

I. Mentor Information

Mentor Name:_____ Current Job Title:_____

Date of Employment:_____ Experience:_____Years Current Position Experience:_____Years _____Mos.

II. Demonstrated Experience

The mentor of any SSE will have demonstrated the following as endorsed by their supervisor or Office Manager

Requirement

- Is not a Short Service Employee
- Is LPS® trained and is capable of providing quality review of LPS® tools effectively
- Demonstrates proper usage of SPSAs and actively coaches others
- Has developed multiple JSAs
- Understands emergency response procedures and can explain them to others
- Is proficient in preparing and reviewing work permits
- Understands injury reporting and case management responsibilities and is capable of explaining them to employees and subcontractors
- Has working knowledge of hazard identification, near loss, and loss reporting and has participated in multiple near loss investigations
- Demonstrates the ability to intervene when required during project execution
- Leads Toolbox Safety Meetings as part of project execution

III. Approval of Employee to Participate in SSE Program as a Mentor

Based upon the employee's demonstration of the above attributes, the employee's Supervisor / OM indicated below has been convinced that the employee is capable of being an effective Mentor as part of the SSE Program.

_____ _____

Supervisor / Office Manager Date

APPENDIX K

Ergonomics Management Program

ERGONOMICS MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile, CIH
EFFECTIVE DATE	:	07/17
REVISION NUMBER	:	0

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APPENDICES

1.0 PURPOSE AND BACKGROUND

Roux Associates, Inc. (Roux Associates) has instituted the following program to aide in preventing back injuries and other work-related musculoskeletal disorders (WMSDs) or cumulative trauma injuries to personnel. Ergonomic issues involving WMSDs can arise not only in the office but also in the field and when driving. WMSDs are disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, blood vessels, or spinal discs. WMSDs may include muscle strains and tears, ligament sprains, joint and tendon inflammation, pinched nerves, and spinal disc degeneration.

2.0 SCOPE AND APPLICABILITY

This program applies to all tasks where Roux personnel and contractors perform manual lifting and have the potential for material handling and ergonomic stresses. It is the responsibility of the Corporate Health and Safety Manager (CHSM) to aide in developing and training Office Health and Safety Managers (OHSM) and Site Health and Safety Officers (SHSO) to implement this program.

3.0 PROCEDURES

3.1 Safe Lifting Practices Management

A. Evaluate all assignments to assess if they can be completed without risk of back injury e.g., moving boxes, computers, equipment, etc.).
B. Require that heavier items are stored on lower shelving units; ideally between knee and shoulder height.
C. Recognize lifting-intensive tasks (poor lift design, high frequency, and/or excessive weight) and provide the means by which personnel can perform lifting duties without risk of injury e.g., carts, dollies, trucks with lift gates).
D. Secure outside assistance if personnel cannot safely accomplish the job e.g., additional staff, contract movers).
E. Contact the OHSM or SHSO when assistance is necessary to evaluate a lifting task that may pose a back-injury/WMSD risk to assigned personnel.
F. Ensure that personnel receive the required training outlined below.

3.2 Training Management

A. Personnel who may have lifting or other ergonomic issues receive training that includes the following topics:

B.

1. Recognizing potential hazards and how to correct and prevent them.
2. Proper workstation set up and maintenance.
3. How to avoid unnecessary physical stress and strain.
4. How to comfortably handle lifting jobs without undue strain.
5. Proper use of equipment.
6. Stretching and strengthening exercises to minimize risk of injury.

3.3 Office Moves and Relocations

A. Utilize professional movers for moving office furniture for both offsite moves and interoffice moves.
   1. Desks, file cabinets, bookcases, etc.
   2. Intensive moving of file boxes
   3. Any other heavy equipment or materials.

B. Ensure that the moving contractor is appropriately evaluated and insured.

C. Assure as applicable that all unstable items (e.g., bookcases) are secured to prevent tip over in transit, and when placed.

3.4 Workplace Evaluations

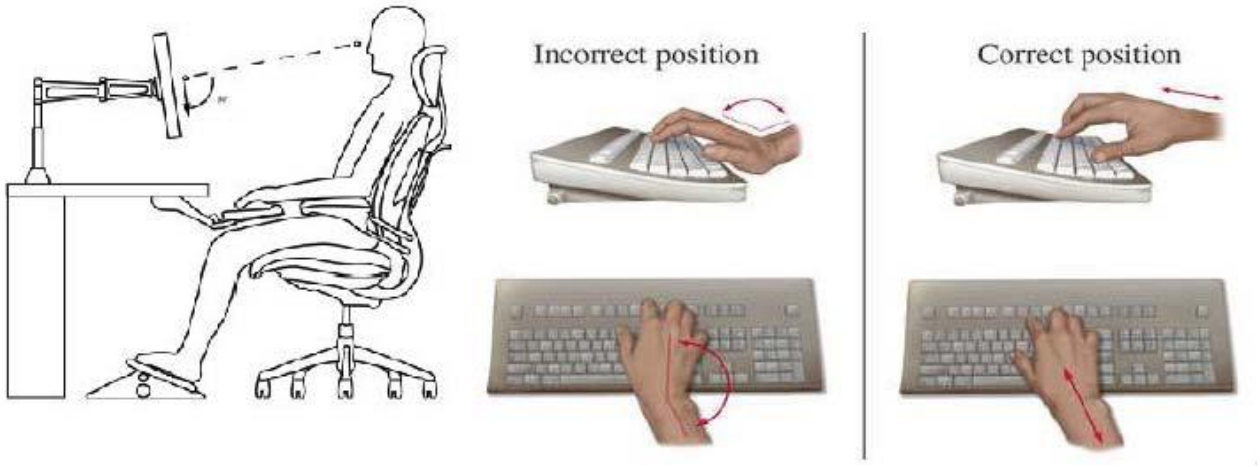
At the request of personnel, workstation evaluations of office workstations are available through the OHSM. As it relates to site-specific activities, guidelines will be specified within site-specific Job Safety Analyses (JSA) that are covered prior to any work activity. JSAs include information on the procedural steps, hazards and how to control specific hazards as it relates to specific tasks. Ergonomic hazards are identified and controls are recommended depending upon the specific activity.

4.0 OFFICE ERGONOMICS

There is no single "correct" posture that will fit everyone. An ergonomic injury or illness can be easily avoided however through ergonomic education and following basic design goals of an office desk.

Repetitive motions are one of the key causes for ergonomic injuries/illnesses and working at an office desk for a prolonged time significantly increases the potential for an ergonomic injury or illness. Highly repetitive tasks that involve long periods of static posture may require several short rest breaks called "micro breaks". During these breaks, employees are encouraged to stand, stretch, and move around. This provides rest and allows muscles time to recover. Alternately the employee can try to vary their work tasks throughout the day to breakup highly repetitive tasks.

4.1 Office Ergonomic Set-up Recommendations



- Top of the monitor should be at, or just below eye level to avoid awkward neck posture, and positioned directly in front of you.
- Head and neck should be balanced and in-line with torso.
- Elbows should be close to the body and supported by arm rests.
- Hips and knees should be approximately at a 90-degree angle. The back of the knee should be slightly higher than the seat pan to allow blood to circulate freely.
- The lumbar curve of the back should be supported.

- Keep your wrist and hands in-line with forearms.
- Avoid crossing legs. Feet should be firmly on the ground or on a footrest.
- Keep monitor and keyboard as close as possible, this will keep you in a sound posture.
- The mouse should be located on the same level as the keyboard.
- Take advantage of how your chair can be adjusted to your body.
- Vary work task to cut down on repetitive motion.
- Take short breaks to stretch muscles and to rest the eyes.
- Keep items most frequently used close to you.

5.0 DRIVING ERGONOMIC GUIDANCE

5.1 Typical Problems from Frequent Driving

- Neck, Back and shoulder pain;
- Cramps, pressure points and poor circulation in the legs and buttocks;
- Immediately after driving, there is an increased chance of low back injury from lifting; and
- Long-term potential for degeneration of spinal discs and disc herniation.

5.2 Chronic Back and Neck Injuries from Driving are Caused by Two Main Risk Factors

- Sitting for long periods of time; and
- Whole-body vibration.

5.3 Long Term Sitting

When you sit, your pelvis rolls backward and the small of your back flattens out. This increases the pressure in the discs of the spine. (In this position, the discs are less prepared to handle the vibrations from your car.)

Ligaments in your back help to hold the spine together as you move. These ligaments will stretch and slacken if you sit down for a long time. After standing up, they remain slack for a while and cannot support the spine as they normally do.

If your seat is not correctly adjusted, you could develop pressure points in the buttocks and back of the legs and muscle strain in the low back.

Continuous upper back and neck muscle work is often required to hold the head in position, especially if vibration is present. Continuous muscle activity can lead to muscle strain.
Holding a foot pedal down over a long period may cause stiffness and spasm in the legs and low back.

5.4 Whole-body Vibration

Whole-body vibration stimulates bursts of back muscle activity. This causes neck and back muscles to tire more quickly and decreases the support these muscles can give to the spine. Even if the muscles are working very lightly, activity for an extended time without rest will lead to fatigue and increase the risk of back injury.

Long-term exposure to whole-body vibration is a common way to develop a herniated disc in your back. The increased disc pressure from sitting speeds up this process.

5.5 Ergonomic Driving Tips

1) Before you even get into your car, remove everything from your pocket - anything that can add pressure points to your body while you drive.
2) Move your car seat all the way to the back, get in and begin adjusting until you feel comfortable. Have the seat adjusted to approximately a 100° angle which decreases pressure on your lower back.
3) If your seatbelt is too tight or uncomfortable, pick up some soft, thick fabric and wrap it around your seatbelt.
4) If the back of the seat is uncomfortable, a lumbar support pillow can be used.
5) Adjust all mirrors to fit your body and line of sight. You shouldn't have to crane your neck to see what's going on around you. For blind spots, small mirrors can be purchased and placed on the side-view mirrors or dashboard to help you see.

1)) Keep items you may need while driving in the front seat, such as tissue paper and sunglasses. Twisting and reaching in the car are awkward postures, not to mention the danger it leads to while operating a vehicle.
2)) If you are on a long driving trip, take frequent breaks; get out of the car and stretch. Take a quick walk if possible. It's also a good idea to rest your eyes for a bit.
3)) The best posture for gripping the steering wheel is keeping two hands on the wheel except when shifting gears. Change your hand postures frequently to improve circulation and reduce fatigue.

a. <u>Common Postures to be avoided:</u>

i. **Death Grip** – Your grip should be light. If your knuckles are white, you are gripping too hard.
ii. **The one arm cool dude** – One wrist at the 12 o'clock position on the wheel with the fingers over the top. This causes compression of the soft tissues of the wrist, as well as reducing circulation of the neck and shoulder (and also will result in bone-to-bone contact with your face in the event the air bag were to deploy).
iii. **Arms straight out** – You should be able to drive with your shoulders relaxed and your arms close to the sides of your body.
iv. **One arm propped on your window** – This posture decreases circulation at the neck and shoulder and may compress soft tissue on the arm/wrist.

Appendix A- Symptom Solver

Symptom Solver

Discomfort Associated with Hands or Wrists

Possible Cause of Symptoms	Suggested Solutions
• Resting heavily on the hand, forearm or elbow that hurts. • Heavy use of a calculator. • High force when using the space bar. • Mouse size is too big or too small. • Heavy use of the mouse with one hand. • Heavy use of the number pad on the keyboard. • "Planting" your palms or wrists in a fixed position when typing or using the mouse. • Dropping your wrists to the work surface when typing • Resting wrists when typing. • Working surface or keyboard is too high or too low. • The wrist rest is too high or the edges are square and hard. • Typing or mousing on hard work surfaces with blunt edges. • The keyboard is sloping towards you.	• Do not rest heavily on either hand. • Use a wrist rest for your calculator. • Avoid high force when using the space bar. • Change mouse to one that fits you correctly. • Alternate hands using the mouse and switch to keyboard shortcuts (page 5). • Use proper keyboard and mouse techniques (page 5). • Use auto-text entries to minimize typing (page 5). • Use the wrist rest correctly (page 6). • Adjust the keyboard, keyboard platform or desk surface to just below your elbow height with the upper arm in line and comfortable against the body. • Adjust the keyboard so the keyboard lies flat.

Discomfort Associated with Headaches or Blurry Vision

Possible Cause of Symptoms	Suggested Solutions
• Image on the screen is not clear. • Staring or concentrating on your monitor for long periods of time. • Dry eyes.	• Position your monitor to reduce reflection. • Adjust the brightness and contrast settings to fit you. • Rest your eyes occasionally by switching tasks or looking away from the monitor. • The distance between your eyes and your monitor should be one arm's length away from you. • Blink frequently to keep your eyes lubricated when doing computer work.

Discomfort Associated with Head or Neck

Possible Cause of Symptoms	**Suggested Solutions**
• Holding your head at an awkward angle. • Monitor is too high and/or is not centered with your keyboard. • Looking up and down between the keyboard and screen as you type. • Leaning forward to view the monitor. • Tilting your head back to accommodate your eye glasses. • Cradling the telephone between your head and shoulder. • Twisting your neck to look at a copy on your desk.	• Adjust the monitor correctly. (Pg. 6) • Take a touch-typing course. • Enlarge the font size. • Center the monitor with your keyboard. • Do not cradle the telephone. Hold the phone, use a headset or use your speaker phone. • Use a copy holder to avoid twisting your neck as you type.

Discomfort Associated with the Forearms or Elbows

Possible Cause of Symptoms	**Suggested Solutions**
• The position of your mouse or keyboard is causing you to extend your reach. • Leaning on your work surface while typing or using the mouse. • Resting your forearms heavily on the arms of your chair. • Extended reach of the mouse.	• Position the mouse close to and on the same level as your keyboard. • Sit up straight and allow your hands to "float" above the keyboard without resting your wrists. • Adjust the arm rests of the chair so your forearms are just barely touching them. • Do not lean heavily on arm rests.

Discomfort Associated with the Shoulders

Possible Cause of Symptoms	**Suggested Solutions**
• The position of your mouse is causing you to extend your reach. • Leaning to one side while you are using the keyboard or mouse. • Cradling the telephone between your head and shoulder. • Extended reaching ether side or behind you for the telephone.	• Position the mouse to and on the same level as the keyboard. • Sit up straight with your back against the back of your chair with your feet on the ground. • Center the keyboard with your monitor. • Hold the telephone, use a headset or use speaker phone. • Reposition frequently used items closer to you.

Discomfort Associated with Upper and Lower Back

Possible Causes of Symptoms	**Suggested Solutions**
• Leaning forward to type or write. • Improperly supported back. • Cradling the phone between your head and shoulder.	• Adjust the monitor correctly. • Adjust the chair so that your lumber back is supported by the chair. • Position your keyboard and mouse close to the body. • Do not cradle the telephone. Hold the phone, use a headset, or use speaker phone. • Sit with your shoulders and hips directly in front of the keyboard and monitor. • Sit up straight with your back against the back of your chair with your feet on the ground or on a footrest.

Discomfort Associated with Legs/Feet

Possible Causes of Symptoms	**Suggested Solutions**
• Awkward posture of your feet or legs. • Tucking your feet under your legs or chair. • Feet not touching the floor or your legs are extended out in front of you.	• Sit up straight and do not lean to one side or the other. • Adjust the chair seat pan so there is space between your knees and the seat. • Place feet flat on the floor. • Use a footrest if your feet do not reach. • Clear the area below your desk so there is room for your legs and feet.

APPENDIX L

Hearing Conservation Management Program

HEARING CONSERVATION MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Joseph W. Gentile, CIH**
EFFECTIVE DATE	**:**	**07/17**
REVISION NUMBER	**:**	**3**

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1.0 PURPOSE

The Hearing Conservation Management Program (HCMP) has been established to evaluate noise exposures in the work place and to implement measures to prevent exposures equal to or in excess of the Occupational Safety and Health Administration (OSHA) standard of 90 decibels on the A-weighted scale (dBA) and monitor exposures equal to or greater than 85 dBA. Although noise on a project site is not usually considered to be the primary hazard, it still represents a danger to persons on the site, particularly those working around vehicles and machinery. There is also the danger of an explosion that can lead to serious hearing damage for those in close proximity. Testing for noise levels should be done periodically if there are any doubts that noise levels are lower than OSHA standards.

Work involving heavy equipment and vehicles often creates excessive noise. The effects of noise can include:

- Workers being startled annoyed or distracted;
- Physical damage to the ear, pain, and temporary and/or permanent hearing loss; and
- Communication interference that may increase potential hazards due to the inability to warn of danger and the proper safety precautions to be taken.

There are three main techniques employed to protect workers' hearing:

- Engineering Controls: Those physical means to lower the impact of sound damage, such as mufflers, enclosures and design innovations.
- Administrative Controls: Limiting the amount of exposure by decreasing the exposure time or positioning oneself at greater distance from the noise source.
- Hearing Protection Devices (HPDs): Devices that either fit in the ear, both disposable and reusable, or on the head covering the ears (See Appendix B).

The best approach is provided by engineering controls which eliminates the problem so that administrative controls or hearing protection are not needed.

2.0 SCOPE AND APPLICABILITY

The practices and procedures described here constitute the program by which employees will be made aware of the hazards associated with occupational noise exposure.

The OSHA Occupational Noise Exposure standards at 29 CFR 1910.95, 1926.52 and 1926.101 apply to all employees exposed to occupational noise. Employees subjected to noise levels exceeding an 8-hour time-weighted-average sound level of 90 dBA trigger the requirement to implement feasible engineering or administrative controls. If these controls fail to reduce the noise exposure to below the 90 dBA threshold, HPDs must be supplied to reduce the exposure to below the 90 dBA threshold. In addition, whenever employee noise exposures equal or exceed an 8-hour time-weighted-average sound level of 85 dBA (not including attenuation provided by the HPD), a continuing effective HCMP must be administered as described in the OSHA standards at 29 CFR 1910.95 and 1926.52.

3.0 CAUSES OF HEARING LOSS

3.1 Types

There are two types of hearing loss: conductive and sensory. Conductive loss involves the outer and middle ear while sensory loss involves the inner ear, auditory nerve, or brain. A conductive loss results in a decrease in loudness but not clarity. This would be similar to turning down the volume on a radio. Sensory losses are associated with a loss in clarity. Using our radio example, this would be similar to static on a radio station making it more difficult to understand speech.

3.2 Causes of Loss

There are many causes of conductive hearing loss. Many of these disorders can be medically or surgically treated and should be evaluated by an ear specialist. Some of the disorders include: middle ear infections, perforation of the ear drum, fixation of the ossicular chain, and osteosclerosis. Sensory hearing loss also has many causes and they are often more difficult to treat medically. Causes of sensorineural impairment include: Congenital: hereditary and damage to fetus and Acquired: aging, noise, disease, injury, and drugs.

3.3 Effects of Noise on Hearing

The effect of noise is subtle and we do not always know when noise may be damaging our hearing. Most noise induced hearing loss is a slow, gradual process and it may take years before hearing difficulties are recognized. Excessive noise can affect the inner ear (which sends the impulse to the brain) by destroying some of the hair (cilia) cells. Once the hair cells cannot regenerate and are therefore destroyed, they never function again. Initial exposure to high noise levels will cause fatigue of certain hair cells and a temporary loss in the higher frequency range. Hearing usually returns to normal after a period away from the noise (about 14 hours). This type of noise-induced hearing loss is referred to as a temporary threshold shift (TTS) in hearing. Most of us have experienced this after being in a noisy environment such as a rock concert. You may even have noticed ringing in the ears -- another sign of temporary threshold shift.

If you are repeatedly exposed to high noise levels for a prolonged period of time, changes may result in a permanent threshold shift (PTS). Permanent noise-induced hearing loss is irreversible. As exposures to high noise levels continue, the permanent loss also continues across more frequencies, eventually making it difficult to understand speech.

The effect of noise on hearing depends upon the following factors: intensity (loudness) of the noise, frequency of the noise, length of exposure, characteristics of the noise (continuous, impulse or intermittent), time intervals between exposures, and individual susceptibilities.

4.0 HEARING PROTECTION

At many sites, different activities may result in appreciable noise levels. It is required that a noise hazard assessment be conducted prior to initiating investigation, remediation, O&M, or other on-site activities. Types of activities that may produce excessive noise levels include but are not limited to: drilling; operation of heavy machinery; use of generators, pumps, and power tools; use of blowers; use of drop and vibration hammers; and field activities in or near noisy areas such as railroads and airports.

If these activities or other activities or conditions result in excessive noise exposure, hearing protection requirements will be included in the site-specific HASP. If a PM or SHSO is unsure as to whether or not hearing protection is needed, the most conservative approach (i.e., use of HPDs) will be used. If a person's exposure exceeds an 8-hour time weighted average (TWA) sound level of 85 dBA, personnel must be included in a hearing conservation management program in accordance with 29 CFR 1910.95. High noise operations will be evaluated by the SHSO and noise exposure will be controlled through the use of hearing protection such as ear plugs or ear muffs or by maintaining set-backs from high noise-producing equipment as warranted. A rule-of thumb that can be applied in the field is if you must raise your voice to be understood at arm's length, your noise level is approximately 85 dBA.

Hearing protectors will be made available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors will be replaced as necessary. Employees will be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors and training in the use and care of hearing protectors.

Hearing protector attenuation will be evaluated for the specific noise environment in which the protector will be used and the hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted-average of 90 decibels. For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below.

5.0 MONITORING

Roux Associates program is to implement administrative controls or the use of HPDs whenever personnel will be exposed to noise levels greater than 85 dBA. Where situations arise that indicate the need for a monitoring program to be developed and implemented, the following factors should be considered:

- All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels must be integrated into the noise measurements.

- Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures.
- Each employee exposed at or above the 8-hour time-weighted-average sound level of 85 dBA shall be notified of the results of the monitoring.

6.0 AUDIOMETRIC TESTING

An audiometric testing program is in effect for all personnel involved in field activities. Audiometric testing is included as part of each employee's pre-employment and annual physical examinations. The program is provided at no cost to employees and the audiometric tests are performed by a licensed or certified audiologist, otolaryngologist or physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

Audiometric testing is the best and most accurate method for determining early hearing loss. The test determines the ability to hear pure tones at 500, 1,000, 2,000, 3,000, 4,000 and 6,000 Hertz. The poorer the ability to hear, the louder the pure tones will need to be. Each person scheduled to be tested is informed of the requirement not to be exposed to workplace noise for at least 14 hours prior to testing. After obtaining a valid baseline audiogram from affected employees, annual audiograms will be taken and compared to the baseline. If a comparison of the annual audiogram to the baseline audiogram determines a standard threshold shift, the employee will be informed of this fact in writing within 21 days of the determination. As defined in the OSHA regulations, a standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 decibels or more at 2,000, 3,000, and 4,000 Hertz in either ear. Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the following steps are taken when a standard threshold shift occurs:

- Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.
- Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.
- The employee will be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if there is a suspicion that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.
- The employee is informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protection is suspected.

7.0 TRAINING

All employees exposed to noise levels at or above an 8-hour time-weighted-average of 85 decibels are required to participate in a training program. The training program will be repeated annually for each employee included in the hearing conservation management program. Each employee will be informed of the following:

- the effects of noise on hearing;
- the purpose of hearing protectors, the advantages, disadvantages and attenuation of various types, and instructions on selection, fitting, use and care; and
- the purpose of audiometric testing, and an explanation of the test procedures.

8.0 RECORDKEEPING

An accurate record of all employee exposure measurements will be retained and maintained by the CHSM. All employee audiometric test records will be retained and maintained by the HR Department. Noise exposure measurement must be retained for two years but should be maintained with the project records. Audiometric test records must be retained for the duration of the affected employee's employment. Audiometric tests taken as part of the medical surveillance program under 29 CFR 1910.120 will be maintained for length of employment plus 30 years. All records will be provided to employees, former employees, representatives designated by individual employees and the Assistant Secretary of Labor for OSHA upon request.

APPENDIX D

Roux Standard Operating Procedures

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to explain the quality control (QC) measures taken to ensure the integrity of the samples collected and to establish the guidelines for the collection of QC samples. The objective of the QC program is to ensure that water-quality data of known and reliable quality are developed.

Because valid water-chemistry data are integral to a hydrogeologic investigation that characterizes water-quality conditions, the data will be confirmed by QC samples. Without checks on the sampling and analytical procedures, the potential exists for contradictory or incorrect results. The acceptance of water-quality data by regulatory agencies and in litigation-support investigations depends heavily on the proper QC program to justify the results presented. The QC sampling requirements must be determined by the project manager and be clearly defined in the work plan. If data validation (for in-house purposes or for compliance with the United States Environmental Protection Agency [USEPA] regulations) is stipulated as part of the hydrogeologic investigation, QC sampling must be conducted.

2.0 QUALITY CONTROL SAMPLES

2.1 Samples taken for analysis of compounds require the use of quality control samples to monitor sampling activities and laboratory performance. Types of quality control samples may include replicate and/or replicate split, trip blank, field equipment blank, matrix spike and matrix spike duplicate, and fortification. A discussion pertaining to each quality control sample follows:

a. Replicate and Replicate Split - Replicate sample analysis is done to check on the reproducibility of results either within a laboratory or between laboratories. A replicate sample is called a split sample when it is collected with or turned over to a second party (e.g., regulatory agency, consulting firm) for an independent analysis. Replicate samples are aliquots (equal portions) from a sample in a common container.

To collect a replicate sample, water from the bailer or pump will be distributed first to fill one container and then to fill the second container. Adequate water should be available to fill the bottles completely before they are capped. If the water is insufficient to fill all the bottles at once, then incrementally fill each bottle with water from two or more bailer volumes or pump cycles.

For some test substances, water may have to be accumulated in a common container and then decanted slowly into the sample bottles. The work plan should be checked for a description of how replicate samples are to be collected. Additionally, in the case of wells that recover slowly and

produce insufficient water to fill all the replicate sample containers, the containers should be filled incrementally and kept on ice in the cooler in between filling periods.

b. Trip Blank - A trip blank sample is a sample bottle that is filled with "clean" (e.g., distilled/deionized) water in the laboratory, and travels unopened with the sample bottles. (The USEPA now uses the phrase "demonstrated analyte free water.") It is opened in the laboratory and analyzed along with the field samples for the constituent(s) of interest to detect if contamination has occurred during field handling, shipment, or in the laboratory. Trip blanks are primarily used to check for "artificial" contamination of the sample caused by airborne volatile organic compounds (VOCs) but may also be used to check for "artificial" contamination of the sample by a test substance or other analyte(s). One trip blank per cooler containing VOC samples, or test substance of other analyte(s) of interest would accompany each day's samples.

c. Field Equipment Blank - A field equipment blank (field blank) sample is collected to check on the sampling procedures implemented in the field. A field blank is made with "clean" (e.g., distilled/deionized/demonstrated analyte free) water by exposing it to sampling processes (i.e., the clean water must pass through the actual sampling equipment). For example, if samples are being collected with a bailer, the field blank would be made by pouring the clean water into a bailer which has been decontaminated and is ready for sampling, and then pouring from the bailer into the sample containers. If a metals equipment blank is to be made, and the water was filtered, then the sample must be filtered (i.e., exposed to the sampling process). One equipment blank would be incorporated into the sampling program for each day's collection of samples and analyzed for the identical suite of constituents as the sample. In some situations one equipment blank will be required for each type of sampling procedure (e.g., split-spoon, bailer, hand auger).

A special type of field blank may be needed where ambient air quality may be poor. This field blank sample would be taken to determine if airborne contaminants will interfere with constituent identification or quantification. This field blank sample is a sample bottle that is filled and sealed with "clean" (e.g., distilled/deionized/demonstrated analyte free) water in the analytical laboratory, and travels unopened with the sample bottles. It is opened in the field and exposed to the air at a location(s) to check for potential atmospheric interference(s). The field blank is resealed and shipped to the contract laboratory for analysis.

d. Matrix Spike and Matrix Spike Duplicate - Spikes of compounds (e.g., standard compound, test substance, etc.) may be added to samples in the laboratory to determine if the ground-water matrix is interfering with constituent identification or quantification, as well as a check for

systematic errors and lack of sensitivity of analytical equipment. Samples for spikes are collected in the identical manner as for standard analysis, and shipped to the laboratory for spiking. Matrix spike duplicate sample collection, and laboratory spiking and analysis is done to check on the reproducibility of matrix spike results.

e. Fortification - A fortification, which is performed in the field, is used to check on the laboratory's ability to recover the test substance (analyte) added as well as its stability between fortification and analysis.

A field fortification (spike) is prepared by filling the container(s) with field or distilled/deionized/demonstrated analyte free water (as specified by the laboratory) to a predetermined volume (as specified by the laboratory) and adding the spike (supplied by the laboratory). The predetermined volume of water is measured with a clean (decontaminated) graduated cylinder. Field spikes will be prepared following the collection, labeling, and sealing of nonspiked samples in a separate cooler. The spike is kept at a safe distance from the sampling point (e.g., in the hotel room).

2.2 The work plan must be referred to for details regarding the type of QC samples to be collected and the QC sample collection method.

3.0 PROCEDURE

3.1 Implement QC sampling as outlined above, depending on the type of QC sample(s) specified in the work plan.

3.2 Ensure unbiased handling and analysis of replicate and blank QC samples by concealing their identity by means of coding so that the analytical laboratory cannot determine which samples are included for QC purposes. Attempt to use a code that will not cause confusion if additional samples are collected or additional monitoring wells are installed. For example, if there are three existing monitoring wells (MW-1, 2 and 3), do not label the QC blank MW-4. If an additional monitoring well were installed, confusion could result.

3.3 Label matrix spike and field fortification (spike) QC samples so that the analytical laboratory knows which samples are to be spiked in the laboratory and which samples were fortified (spiked) in the field, respectively. In certain situations, the field fortification will be "blind" or undisclosed to the laboratory to independently verify their analytical ability.

3.4 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," and placed in its appropriate container (holder) in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the analytical laboratory. Consult the site work plan to determine if a particular ice is specified as the preservative for transportation

(e.g., the USEPA prefers the use of wet ice because they claim that blue ice will not hold the samples at 4° Centigrade/Celsius).

3.5 Document the QC samples on the appropriate field form and in the field notebook. On the chain-of-custody form, replicate and blank QC samples will be labeled using the codes (Number 3.2, above), and matrix spike and field fortification QC samples will be identified as such (Number 3.3, above).

3.6 Follow standard shipping procedures for samples (i.e., retain one copy of the chain-of-custody form, secure the cooler with sufficient packing tape and a custody seal, forward the samples via overnight [express] mail or hand deliver to the designated analytical laboratory preferably within 24 hours but no later than 48 hours after sampling). However, check the site work plan for information on the analyte(s), as some have to be analyzed immediately (e.g., CN).

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide procedures and standards for record keeping and maintenance, for all field activities conducted by Roux Associates, Inc. (Roux Associates).

Strict quality assurance/quality control (QA/QC) is necessary to properly and accurately document and preserve all project-related information. Quality assurance is implemented to corroborate that quality control procedures are followed. Quality control provides a means to monitor investigation activities (e.g., sampling and laboratory performance) as a check on the quality of the data.

Valid data and information are integral to all aspects of Roux Associates' field activities. These aspects include, but are not necessarily limited to, activities that involve: drilling; sediment, sludge, and soil sampling (lithologic, and soil-quality and analysis); well construction and development; aquifer testing and analysis; water-quality sampling and analysis (surface water and ground water); free-product sampling and analysis; air-quality sampling and analysis; geophysical testing; demolition activities; waste removal operations; engineering installations; etc. The data will be confirmed by QA/QC methods established and set forth in the work plan/scope of work. Without checks on the field and analytical procedures, the potential exists for contradictory results, and associated incomplete or incorrect results from the interpretation of potentially questionable data.

Documentation will be entered in the field notebook and must be transcribed with extreme care, in a clear and concise manner, as the information recorded will become part of the permanent legal record. Because field notes are the legal record of site activities, they must be taken in a standard and consistent manner. If abbreviations are used, then they must first be spelled out for clarity (i.e., to avoid ambiguity and misunderstanding). All entries must be dated and initialed, and the time (military time) of the entry included. Field notebooks and forms must be assigned to an individual project and properly identified (i.e., client name, project number, location and name of site, individual recording information, dates, times, etc.). Change of possession of field notebooks or forms must be documented with the date and time, and initialed by both individuals. Following each day's entries, the field notebook or form must be photocopied in the event that the original documentation is lost or stolen. All field notebooks must have the company name and address legibly printed in indelible ink along with the message "If found, then please forward to Roux Associates, Inc. at the above address - REWARD OFFERED."

Information must be recorded while onsite because it may be difficult to recall details at a later date. Furthermore, information must be documented immediately as it provides unbiased information which will be used for writing the report when the field activities are completed. Project-related documentation is an irreplaceable, important record for

other individuals who may become involved in the project, and provides the project manager with a complete history of project-related activities. Written information must be accompanied by maps, sketches, and photographs where appropriate, especially if these supplemental sources of information assist in the documentation process. A new page must be used in the field notebook for each new day's entries (i.e., unused portions of a previous page must have an "X" placed through it). The end of the day's records must be initialed and dated.

As part of record keeping and QA/QC activities, state and federal regulatory agencies should be contacted to check if special or different protocols are required and/or if particular or unconventional methods are required for the given field activity. Thus, the record keeping and QA/QC activities implemented by Roux Associates are based on technically sound standard practices and incorporate Roux Associates own, extensive experience in conducting hydrogeologic field activities.

2.0 MATERIALS

In order to track investigation activities, specific materials are required. These materials include the following:

a. A bound, waterproof field notebook.

b. Appropriate Roux Associates' forms (e.g., daily log, geologic log, monitoring well construction log, well sampling data form, location sketch, chain of custody, telephone conversation record, meeting notes, etc.).

c. Appropriate labels (e.g., sample, Roux Associates' Custody Seal, etc.)

d. Work plan/scope of work.

e. Health and safety plan (HASP).

f. Appropriate Roux Associates' SOPs.

g. Black pens, and indelible markers.

h. Camera and film.

3.0 DOCUMENTATION

3.1 Before the Roux Associates personnel leave the field, they must ensure that their field notes include comprehensive descriptions of the hydrogeologic conditions, and all investigation-related activities and results (onsite and offsite). This will safeguard against the inability to reconstruct and comprehend all aspects of the field investigation after its completion, and will serve to facilitate the writing of an accurate report. Properly documented information provides the QA/QC tracking (back-up) required for all Roux Associates' projects. General types of

information that must be recorded (where pertinent to the investigation being conducted) include, but may not necessarily be limited to, the following:

a. List of Roux Associates personnel on site.

b. Name, date, and time of arrival on site by Roux Associates personnel, including temporary departures from, and returns to, the site during the work day.

c. Client and project number.

d. Name and location of study area.

e. Date and time of arrival on site by non-Roux Associates personnel (names and affiliation) and equipment (e.g., subcontractors and facility personnel, and drilling equipment, respectively, etc.), including temporary departures from, and returns to, the site during the work day, and departure at the end of the work day.

f. List of non-Roux Associates personnel on site.

g. Weather conditions at the beginning of the day as well as any changes in weather that occur during the working day.

h. Health and safety procedures including level of protection, monitoring of vital signs, frequency of air monitoring, and any change (i.e., downgrade or upgrade) in the level of protection for Roux Associates and other on-site personnel (e.g., subcontractors, facility personnel, etc.).

i. Health and safety procedures not in compliance with the HASP (for all on-site personnel).

j. Site reconnaissance information (e.g., topographic features, geologic features, surface-water bodies, seeps, areas of apparent contamination, facility/plant structures, etc.).

k. Air monitoring results (i.e., photoionization detector [PID], etc. measurements).

l. Task designation and work progress.

m. Work-related and site-related discussions with subcontractors, regulatory agency personnel, plant personnel, the general public, and Roux Associates personnel.

n. Delays, unusual situations, problems and accidents.

o. Field work not conducted in accordance with the work plan/scope of work, and rationale and justification for any change(s) in field procedures including discussions with personnel regarding the change(s) and who authorized the change(s).

p. QA/QC procedures not conducted in accordance with the QA/QC procedures established in the work plan/scope of work and rationale and justification for any change(s) in QA/QC procedures including discussions with personnel regarding the change(s) and who authorized the change(s).

q. Equipment and instrument problems.

r. Decontamination and calibration procedures.

s. Activities in and around the site and work area by any and all on-site personnel which may impact field activities.

t. Sketches, maps, and/or photographs (with dates and times) of the site, structures, equipment, etc. that would facilitate explanations of site conditions.

u. Contamination evidenced as a result of work-related activities (e.g., visible contaminants [sheen] in drilling fluids or on drilling equipment; sheen on, or staining of, sediments; color of, or separate [nonaqueous] phase on, water from borehole or well; vapors or odors emanating from a borehole or well; etc.); make all observations as objectively as possible (e.g., grey-blue, oil-like sheen; black and orange, rust-like stain; fuel-like odor; etc.) and avoid using nontechnical or negative-sounding terms (e.g., slimy, goopy, foul-smelling).

v. Date and time of final departure from the site of all personnel at the end of the work day.

3.2 In addition to the general types of information that must be recorded (as presented in Section 3.1), task-specific information must also be properly documented. Task-specific information which is required is provided in each respective task-oriented SOP, and the documentation procedures outlined in each SOP must be followed.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample

characteristics may dictate that glass cannot be used. For example, in the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. The bottles must be carefully packed to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). If additional

coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap", and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any

exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for using steel measuring tapes. A steel tape is used to measure the depth to ground water below an established (surveyed) measuring point (MP) and/or to sound a well (i.e., to measure the depth of well). Measuring the depth to water (DTW) below the surveyed MP provides information for calculating ground-water elevations needed to construct ground-water elevation maps and determine the direction of ground-water flow. A well is sounded to determine the total depth of the well (i.e., to provide information regarding potential siltation problems [filling-in with sediment]). This can be used to eliminate possible confusion concerning identification of the well in cases where there are several similar, adjacent, unlabeled wells. Depth to water and sounding data can also be used to calculate the volume of standing water in the well (which is a prerequisite for purging a well before well sampling, and will be addressed in respective SOPs).

A steel tape is the preferred water-level measuring device because it is the most accurate, especially when measurements are taken under static conditions. However, this technique may be inappropriate under nonstatic (changing) conditions such as aquifer tests when water levels may be changing rapidly or when water is cascading into a well. These conditions would require the use of an electronic sounding device (refer to SOP for Measuring Water Levels using an Electronic Sounding Device (M-Scope).

2.0 DECONTAMINATION

The steel tape must be precleaned (decontaminated) using a non-phosphate, laboratory-grade solution and rinsed with copious amounts of distilled or deionized water. This process is repeated before each measurement and following the final measurement.

3.0 PROCEDURE

3.1 If the well is not vented, then remove the cap and wait several minutes for the water level to equilibrate. Take several measurements to ensure that the water level measured is in equilibrium with the aquifer (i.e., not changing substantially).

3.2 The tape will be equipped with a weight to ensure the tape is held vertically and is kept taut when lowered into the well. Measure and record the distance from the bottom of the tape to the bottom of the weight to ensure the proper depth is measured when sounding a well.

3.3 If a water-level measurement is to be taken, then apply chalk (e.g., carpenter's chalk) to the bottom few feet of the tape and lower it into the water.

3.4 The top of the tape is held at an even-foot increment at the MP. This is the "held" value, and is recorded as such.

3.5 The tape is rolled up, and the cut (i.e., the mark between the dry and wet chalk) is noted. This "wet" value is measured accurately to the nearest 0.01 foot, and is recorded as such. The difference between the "held" value and the "wet" value is the DTW.

3.6 After measuring all wells in an area, always re-measure at least one well, preferably the first well measured, to see if the static water level has changed (e.g., due to pumping in the area, tidal effects, etc.). If a significant change has occurred, it may be necessary to re-measure the wells.

3.7 If there are previous water-level measurements available for the wells, then have these data available to compare the measurements with those just taken. Use these data to see if water levels are similar or if they have changed. If water levels have changed, then check if the changes are consistent (i.e., all up or all down) and make sense.

3.8 Water-level elevations are calculated by subtracting the DTW from the MP and a water-elevation map is constructed (contoured) on a well location map. This also provides a check to evaluate if the water levels make sense (or anomalies are evidenced). Remeasure the well(s) where anomalies are found as a check on the initial measurement(s).

3.9 If anomalies persist or water-level trends are different from the historical database, then check to see if hydrogeologic conditions and/or stresses have changed (e.g., discharge areas, pumping and/or injection wells, etc.).

3.10 If the well is being sounded (depth measured), then lower the tape to the bottom of the well and measure its length accurately from the MP to the nearest 0.01 foot. Compare the sounded depth to the as-built well construction log (diagram). This will determine if siltation has occurred and redevelopment is necessary to establish a good hydraulic connection between the well screen and the aquifer.

3.11 All pertinent data will be recorded in the field notebook and on appropriate field forms, and initialed and dated.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for using m-scopes. A m-scope is an electronic sounding device used to measure the depth to ground water below an established (surveyed) measuring point (MP). Measuring the depth to water (DTW) below the surveyed MP provides information for calculating ground-water elevations needed to construct ground-water elevation maps and determine the direction of ground-water flow.

M-scopes can be less accurate than a steel tape because the wire can kink, measurement increment marks can shift, and the tip may have been cut off and replaced without proper documentation. Thus, it is mandatory that a m-scope be calibrated before use.

2.0 DECONTAMINATION

The m-scope must be pre-cleaned (decontaminated) using a non-phosphate, laboratory-grade solution and rinsed with copious amounts of distilled or deionized water. This process is repeated before each measurement and following the final measurement.

3.0 CALIBRATION

The m-scope must be calibrated before being used to measure water levels. Calibration is accomplished by measuring the water level with the m-scope followed by a measurement using a steel tape. This dual measurement procedure is continued until the individual is confident that measurements taken using both devices are similar and the m-scope is reliable. The calibration procedure is documented in the field notebook or on an appropriate field form, and initialed and dated.

4.0 PROCEDURE

4.1 If the well is not vented, then remove the cap and wait several minutes for the water level to equilibrate. Take several measurements to ensure that the water level measured is in equilibrium with the aquifer (i.e., not changing substantially).

4.2 The manufacturer's model must be noted because some have switches, lights, beepers, or a combination of the above.

4.3 The 1-foot or 5-foot marked intervals on the electrical line must be checked to ensure that they have not shifted, and the bottom of the probe has not been cut. Check on a periodic basis that the cord has not kinked.

4.4 The water-level measurement is taken by lowering the probe into the well until the instrument-specific detection method (e.g., light, beeper, or both) is activated by contacting the water.

4.5 The electrical line is held at the MP and, using a ruler (e.g., carpenter's folding ruler) or an engineer's scale, the distance from the "held" point to the nearest marked interval is measured. The distance measured is added to, or subtracted from, the marked interval reading. The result is the DTW.

4.6 Measurements will be taken accurately and to the nearest 0.01 foot.

4.7 After measuring all wells in an area, always re-measure at least one well, preferably the first well measured, to see if the static water level has changed (e.g., due to pumping in the area, tidal effects, etc.). If a significant change has occurred, it may be necessary to re-measure other wells.

4.8 If there are previous water-level measurements available for the wells, then have these data available to compare the measurements with those just taken. Use these data to see if water levels are similar or if they have changed. If water levels have changed, then check if the changes are consistent (i.e., all up or all down) and make sense.

4.9 Water-level elevations are calculated by subtracting the DTW from the MP and a water-elevation map is constructed (contoured) on a well location map. This also provides a check to evaluate if the water levels make sense (or anomalies are evidenced). Re-measure the well(s) where anomalies are found as a check on the initial measurement(s).

4.10 If anomalies persist or water-level trends are different from the historical database, then check to see if hydrogeologic conditions and/or stresses have changed (e.g., discharge areas, pumping and/or injection wells, etc.).

4.11 All pertinent data will be documented in the field notebook, and initialed and dated.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for purging a well prior to the collection of a ground-water sample. Purging (evacuating) a well involves the removal of the standing column of water in the well to allow "fresh" (representative) formation water to enter the well. Two conventionally used methods for well purging include: 1) discharge of a specified number of casing volumes of water (which is more commonly used); and 2) pumping until specific indicator parameters (e.g., specific conductance, pH, temperature) stabilize. Wells must be purged prior to sampling to ensure the collection of representative formation ground water for water-quality analysis.

For accepted, existing sampling and analysis programs, the same purging method will be used each time to maintain consistency. For new sampling and analysis programs, the basis for the purging technique(s) will be site-specific field conditions, client input, the experience of Roux Associates, Inc. and regulatory agency(ies) guidelines (e.g., some states permit purging a low-yield well to dryness while others insist that some water remains in the well).

2.0 EQUIPMENT AND MATERIALS

2.1 The following equipment may be needed to purge a monitoring well before sampling:

a. Bailers.

b. Centrifugal pumps.

c. Electrical submersible pumps.

d. Peristaltic pumps.

e. Positive gas-displacement devices.

f. Bladder pumps.

g. Hand-operated diaphragm or bilge pump(s).

h. Teflon™ tape, electrical tape.

i. Tape measure (stainless steel, steel, fiberglass) with 0.01-foot measurement increments and chalk (e.g., blue carpenter's) or m-scope.

j. Appropriate discharge hose and valves.

k. Appropriate discharge tubing (e.g., polypropylene) if using a peristaltic pump.

l. Appropriate compressed gas if using bladder-type or gas-displacement device.

m. Extension cord(s) or portable generator (and fuel) if using an electric submersible pump.

n. Non-absorbent cord (e.g., polypropylene, etc.), cotton (absorbent) cord.

o. Tripod(s).

p. Water Well Handbook.

q. Explosimeter.

r. Flow meter.

2.2 Bailers or centrifugal pumps are recommended for shallow, small diameter monitoring wells. For deep wells, or large diameter wells, a submersible pump is recommended.

3.0 DECONTAMINATION

Each piece of equipment that is used to evacuate wells (e.g., bailers, pumps, hoses) will be decontaminated thoroughly prior to the introduction of the equipment into the well and prior to leaving the site. Additionally, disposable items (e.g., cord, tubing) will be changed between each well purged and discarded in an appropriate manner.

4.0 PROCEDURE

4.1 The depth to water (DTW) is measured and subtracted from the sounded (total) depth of the well to calculate the length of the column of standing water in the well (in feet).

4.2 The volume of the standing water in the well is calculated by multiplying the length of standing water by a coefficient which equates the diameter of the well to gallons per linear foot. (Refer to the attached table from the Water Well Handbook for the coefficient or use the following equation [$V=(7.48\ gal/ft^3)(r^2h)$, where V is volume of water in gallons, r is the radius of the well casing in feet, and h is the height of the water column in the well in feet].)

4.3 If purging is performed by evacuating a specified number of casing volumes, then three to five volumes are purged (typical regulatory agency requirement).

4.4 If wells are screened in low permeability formations, then the well may go dry prior to removing the specified volume of water. If the recovery rate is fairly

rapid and time allows, then remove more than one casing volume; otherwise, the evacuation of one casing volume may suffice. (Refer to the site sampling and analysis plan [SAP] for details of purging a low-yield well.)

4.5 Evacuation will occur from the top of the water column in the well to ensure that "fresh" formation water enters the bottom of the well through the screen, moves up as standing water is removed from the top, and all standing water is removed (i.e., only representative formation water is in the well).

4.6 The volume of water purged from the well must be measured and can be calculated directly by discharging into containers of known volume or can be calculated by multiplying rate of flow by time.

4.7 If a submersible or centrifugal pump is used, then the intake is set just below the dynamic (pumping) water level in the well. The rate of flow in gallons per minute (gpm) can be measured using a calibrated bucket (e.g., 5-gallon) if the rate is relatively low, or a 55-gallon drum if the rate is relatively high, and a watch capable of measuring time in second intervals. A precalibrated flow meter may also be used if available.

4.8 After the specified number of casing volumes have been evacuated from the well, the pump intake is lifted slowly until it breaks suction to confirm that any standing water above the intake has been purged.

4.9 If a bailer is used, then the bailer is lowered only deep enough to remove water from the top of the water column and a 5-gallon bucket is used to measure the volume of water evacuated.

4.10 If purging is not executed by evacuating a specified number of well volumes, then purging is performed by pumping or bailing the well until specific indicator parameters (e.g., specific conductance, pH, temperature) stabilize. The volume of water removed is documented on an appropriate field form or in the field notebook.

4.11 Water purged from the well will be disposed of in accordance with the appropriate method outlined in the site SAP.

4.12 If historic site data indicate that explosive gases could be present and accumulate in the well, then an explosimeter will be used to check vapor concentrations in wells at the site prior to beginning the purging procedure. Vapor concentrations in a well that exceed the 25 percent lower explosive limit (LEL) will require specific precautionary measures to allow purging the well without danger of explosion or fire (e.g., use of cotton cord for bailers or lowering pumping devices, non-electric powered pumps). These conditions will be addressed in the site health and safety plan (HASP) and/or SAP.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for the sampling of ground-water monitoring wells for dissolved constituents. As part of the SOP for the sampling of ground-water monitoring wells, sample collection equipment and devices must be considered, and equipment decontamination and pre-sampling procedures (e.g., measuring water levels, sounding wells, and purging wells) must be implemented. Sampling objectives must be firmly established in the work plan before considering the above.

Valid water-chemistry data are integral to a hydrogeologic investigation that characterizes ground-water quality conditions. Water-quality data are used to evaluate both current and historic aquifer chemistry conditions, as well as to estimate future conditions (e.g., trends, migration pathways). Water-quality data can be used to construct ground-water quality maps to illustrate chemical conditions within the flow system, to generate water-quality plots to depict conditions with time and trends, and to perform statistical analyses to quantify data variability, trends, and cleanup levels.

2.0 EQUIPMENT AND MATERIALS

2.1 In order to sample ground water from monitoring wells, specific equipment and materials are required. The equipment and materials list may include, but not necessarily be limited to, the following:

a. Bailers (Teflon™ or stainless steel).

b. Pumps (centrifugal, peristaltic, bladder, electric submersible, bilge, hand-operated diaphragm, etc.).

c. Gas-displacement device(s).

d. Air-lift device(s).

e. Teflon™ tape, electrical tape.

f. Appropriate discharge hose.

g. Appropriate discharge tubing (e.g., polypropylene, teflon, etc.) if using a peristaltic pump.

h. Appropriate compressed gas if using bladder-type or gas-displacement device.

i. Portable generator and gasoline or alternate power supply if using an electric submersible pump.

j. Non-absorbent cord (e.g., polypropylene, etc.).

k. Plastic sheeting.

l. Tape measure (stainless steel, steel, fiberglass) with 0.01-foot measurement increments and chalk (blue carpenter's).

m. Electronic water-level indicators (e.g., m-scope, etc.) or electric water-level/product level indicators.

n. Non-phosphate, laboratory-grade detergent.

o. Distilled/Deionized water.

p. Potable water.

q. Paper towels, clean rags.

r. Roux Associates' field forms (e.g., daily log, well inspection checklist, sampling, etc.) and field notebook.

s. Well location and site map.

t. Well keys.

u. Stop watch, digital watch with second increments, or watch with a second hand.

v. Water Well Handbook.

w. Calculator.

x. Black pen and water-proof marker.

y. Tools (e.g., pipe wrenches, screwdrivers, hammer, pliers, flashlight, pen knife, etc.).

z. Appropriate health and safety equipment, as specified in the site health and safety plan (HASP).

aa. pH meter(s) and buffers.

bb. Conductivity meter(s) and standards.

cc. Thermometer(s).

dd. Extra batteries (meters, thermometers, flashlight).

ee. Filtration apparatus, filters, pre-filters.

ff. Plasticware (e.g., premeasured buckets, beakers, flasks, funnels).

gg. Disposable gloves.

hh. Water jugs.

ii. Laboratory-supplied sample containers with labels.

jj. Cooler(s).

kk. Ice (wet, blue packs).

ll. Masking, duct, and packing tape.

mm. Chain-of-custody form(s) and custody seal(s).

nn. Site sampling and analysis plan (SAP).

oo. Site health and safety plan (HASP).

pp. Packing material (e.g., bubble wrap)

qq. "Zip-lock" plastic bags.

rr. Overnight (express) mail forms.

3.0 DECONTAMINATION

3.1 Make sure all equipment is decontaminated and cleaned before use (refer to the SOP for Decontamination of Field Equipment for detailed decontamination methods, summaries for bailers and pumps are provided below). Use new, clean materials when decontamination is not appropriate (e.g., non-absorbent cord, disposable gloves). Document, and initial and date the decontamination procedures on the appropriate field form and in the field notebook.

a. Decontaminate a bailer by: 1) wearing disposable gloves, 2) disassembling (if appropriate) and scrubbing in a non-phosphate, laboratory-grade detergent and distilled/deionized water solution, and 3) rinsing first with potable water and then distilled/deionized water.

b. Decontaminate a pump by: 1) wearing disposable gloves, 2) flushing the pump and discharge hose (if not disposable) first with a non-phosphate, laboratory-grade detergent and potable water solution in an appropriate container (clean bucket, garbage can, or 55-gallon drum) and then with

distilled/deionized water or potable water, and 3) wiping pump-related equipment (e.g., electrical lines, cables, discharge hose) first with a clean cloth and detergent solution and then rinsing or wiping with a clean cloth and distilled/deionized water or potable water.

3.2 Note that the decontamination procedures for bailers and pumps are the minimum that must be performed. Check the work plan to determine if chemicals specified by individual state regulatory agencies must also be used for decontamination procedures (e.g., hexane, nitric acid, acetone, isopropanol, etc.).

4.0 CALIBRATION OF FIELD ANALYSIS EQUIPMENT

Calibrate field analysis equipment before use (e.g., thermometers, pH and conductivity meters, etc.). Refer to the specific SOP for field analysis for each respective piece of equipment. Document, and initial and date the calibration procedures on the appropriate field form, in the field notebook, and in the calibration log book.

5.0 PROCEDURE

5.1 Document, and initial and date well identification, pre-sampling information, and problems encountered on the appropriate field form and in the field notebook as needed.

5.2 Inspect the protective casing of the well and the well casing, and note any items of concern such as a missing lock, or bent or damaged casing(s).

5.3 Place plastic sheeting around the well to protect sampling equipment from potential cross contamination.

5.4 Remove the well cap or plug and, if necessary, clean the top of the well off with a clean rag. Place the cap or plug on the plastic sheeting. If the well is not vented, allow several minutes for the water level in the well to equilibrate. If fumes or gases are present, then diagnose these with the proper safety equipment. Never inhale the vapors.

5.5 Measure the depth to water (DTW) from the measuring point (MP) on the well using a steel tape and chalk or an electronic sounding device (m-scope). Refer to the specific SOPs for details regarding the use of a steel tape or a m-scope for measuring water levels. Calculate the water-level elevation. Document, and initial and date the information on the appropriate field form and in the field notebook.

5.6 Measuring the total depth of the well from the MP with a weighted steel tape. Calculate and record the volume of standing water in the well casing on the appropriate field form and in the field notebook.

5.7 Decontaminate the equipment used to measure the water level and sound the well with a non-phosphate, laboratory-grade detergent solution followed by a distilled/deionized water rinse.

5.8 Purge the well prior to sampling (refer to the SOP for Purging a Well). The well should be pumped or bailed to remove the volume of water specified in the work plan. Usually three to five casing volumes are removed if the recharge rate is adequate to accomplish this within a reasonable amount of time.

If the formation cannot produce enough water to sustain purging, then one of two options must be followed. These include: 1) pumping or bailing the well dry, or 2) pumping or bailing the well to "near-dry" conditions (i.e., leaving some water in the well). The option employed must be specified in the work plan and be in accordance with regulatory requirements.

If the well is purged dry, then all the standing water has been removed and upon recovery the well is ready for sampling. However, depending on the rate of recovery and the time needed to complete the sampling round, one of the following procedures may have to be implemented: 1) the well may have to be sampled over a period of more than one day; 2) the well may not yield enough water to collect a complete suite of samples and only select (most important) samples will be collected; or 3) the well may not recover which will preclude sampling. Regardless of the option that must be followed, the sampling procedure must be fully documented. When preparing to conduct a sampling round, review drilling, development and previous sampling information (if available) to identify low-yielding wells in order to purge them first, and potentially allow time for the well to recover for sampling.

5.9 Record the physical appearance of the water (i.e., color, turbidity, odor, etc.) on the appropriate field form and in the field notebook, as it is purged. Note any changes that occur during purging.

5.10 If a bailer is used to collect the sample, then:

a. Flush the decontaminated bailer three times with distilled/deionized water.

b. Tie the non-absorbent cord (polypropylene) to the bailer with a secure knot and then tie the free end of the bailer cord to the protective casing or, if possible, some nearby structure to prevent losing the bailer and cord down the well.

c. Lower the bailer slowly down the well and into the water column to minimize disturbance of the water surface. If a bottom-filling bailer is used, then do not submerge the top of the bailer; however, if a top-filling bailer is used, then submerge the bailer several feet below the water surface.

d. Remove and properly discard one bailer volume from the well to rinse the bailer with well water before sampling. Again, lower the bailer slowly down the well to the appropriate depth depending on the bailer type (as discussed above in 5.11 c). When removing the bailer from the well, do not allow the bailer cord to rest on the ground but coil it on the protective plastic sheeting placed around the well. Certain regulatory agencies require that the first bailer volume collected be utilized for the samples.

5.11 If a pump is used to collect the sample, then use the same pump used to purge the well and, if need be, reduce the discharge rate to facilitate filling sample containers and to avoid problems that can occur while filling sample containers (as listed in Number 5.14, below). Alternately, the purge pump may be removed and a thoroughly decontaminated bailer can be used to collect the sample.

5.12 Remove each appropriate container's cap only when ready to fill each with the water sample, and then replace and secure the cap immediately.

5.13 Fill each appropriate, pre-labeled sample container carefully and cautiously to prevent: 1) agitating or creating turbulence; 2) breaking the container; 3) entry of, or contact with, any other medium; and 4) spilling/splashing the sample and exposing the sampling team to contaminated water. Immediately place the filled sample container in a ice-filled (wet ice or blue pack) cooler for storage. If wet ice is used it is recommended that it be repackaged in zip-lock bags to help keep the cooler dry and the sample labels secure. Check the work plan as to whether wet ice or blue packs are specified for cooling the samples because certain regulatory agencies may specify the use of one and not the other.

5.14 "Top-off" containers for volatile organic compounds (VOCs) and tightly seal with Teflon™-lined septums held in place by open-top screw caps to prevent volatilization. Ensure that there are no bubbles by turning the container upside down and tapping it gently.

5.15 Filter water samples (Procedure 4.6) collected for dissolved metals analysis prior to preservation to remove the suspended sediment from the sample. If water samples are to be collected for total metals analysis, then collect a second set of samples without field filtering.

In the event that the regulatory agency(ies) want unfiltered samples for metals analysis, a second set of filtered samples should also be collected. Because unfiltered samples are indications of total metals (dissolved and suspended) they are not representative of aquifer conditions because ground water does not transport sediment (except in some rare cases). Thus, the results for dissolved metals in ground water should be based on filtered samples even if both filtered and unfiltered sets are presented in a report.

5.16 Add any necessary preservative(s) to the appropriate container(s) prior to, or after (preferred), the collection of the sample, unless the appropriate preservative(s) have already been added by the laboratory before shipment.

5.17 Collect quality control (QC) samples as required in the work plan to monitor sampling and laboratory performance. Refer to the SOP for Collection of Quality Control Samples.

5.18 Conduct field analyses after sample collection is complete by measuring and recording the temperature, conductivity, pH, etc. (as called for in the work plan). Note and record the "final" physical appearance of the water (after purging and sampling) on an appropriate field form and in the field notebook.

5.19 Wipe the well cap with a clean rag, replace the well cap and protective cover (if present). Lock the protective cover.

5.20 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," placed in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the analytical laboratory.

5.21 Decontaminate bailers, hoses, and pumps as discussed in the decontamination SOP. Wrap decontaminated equipment with a suitable material (e.g., clean plastic bag or aluminum foil). Discard cords, rags, gloves, etc. in a manner consistent with site conditions.

5.22 Complete all necessary field forms, field notebook entries, and the chain-of-custody forms. Retain one copy of each chain-of-custody form. Secure the cooler with sufficient packing tape and a custody seal.

5.23 Samples collected from Monday through Friday will be delivered within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Consult the work plan to determine if any of the analytes require a shorter delivery time.

END OF PROCUDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for the field filtration of groundwater samples for dissolved metals analysis prior to sample preservation. Filtering is implemented when the water sample contains suspended fine-grained materials (fines) that cannot be prohibited from entering the water sample by well development or well design. However, as fines are not always distinctly visible in the water sample, all water samples to be analyzed for dissolved metals will undergo filtration. Groundwater samples from bedrock formations to be analyzed for dissolved metals must also be filtered.

It should be noted that filtration of groundwater for metals analysis has been a standard practice with the United States Geological Survey (USGS) for many years. However, it should also be noted that certain regulatory agencies insist that groundwater samples for metals analysis are not filtered. In this case, the analytical results are actually representative of total metals (i.e., dissolved and suspended). Nevertheless, in order to quantify the concentrations of dissolved metals in groundwater, filtration will be employed.

Within this framework, filtration refers to the filtering of water either directly or at the end of a filtration series through a 0.45 micrometer (micron) membrane filter. The presence of a large quantity of fines may require the prefiltering of the sample with a larger-size membrane filter prior to the 0.45 micron filter to avoid clogging the 0.45 micron filter and using an exorbitant amount of time to filter the sample.

Filtration must be done as soon as possible after a water sample is collected, preferably at the same time that the water is produced. If there is a delay between the time that the water sample is collected and the time that filtration occurs, then the time lag and reason for the delay must be documented. The filtering equipment and membrane must be suitable for the intended analysis. Where permitted by regulatory agencies, disposable in-line filters and disposable funnel-type filters may be used. Depending upon the sampling needs, sterile disposable filtering devices may be preferable since they eliminate the need for field decontamination. Materials known to adversely affect the analytical procedure must not be used. The site sampling and analysis plan (SAP) must be referred to for these and other site specific filtration conditions.

In the event that surface water is being analyzed for dissolved metals, the filtration process described below is also used.

2.0 MATERIALS AND EQUIPMENT

To field filter groundwater samples, specific equipment and materials are required. The equipment and materials listed below may be needed in addition to the materials and equipment listed in various sampling SOPs.

a. Non-phosphate, laboratory-grade detergent.

b. Distilled/Deionized water.

c. Potable water.

d. Field forms (e.g., daily log, sampling, etc.) and field notebook.

e. Filtration apparatus (e.g., disposable plastic filtering apparatus, disposable in-line filters, Gelman apparatus, Buchner funnel, etc.), filters, prefilters.

f. Plasticware (e.g., premeasured buckets, beakers, flasks, funnels).

g. Teflon™ tape.

h. Vacuum pump (e.g., hand-operated or electric).

i. Appropriate tubing and fittings.

j. Disposable gloves.

k. Sample jars with appropriate preservative (e.g., nitric acid) and labels.

3.0 DECONTAMINATION

3.1 Decontamination is not necessary if sterile, disposable plastic filtering equipment is utilized. If applicable, it may be useful to collect a distilled water field blank through a representative disposable filter to demonstrate proper "decontamination." If re-usable filtering equipment is being used, the following is the minimum decontamination procedure:

a. Wear disposable gloves while cleaning filtering equipment to avoid contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and distilled or deionized water in a bucket.

c. Remove vacuum tubing from flask.

d. Remove filter membrane from funnel.

e. Disassemble filtering apparatus (flask and funnel) and scrub each piece of equipment with a brush and solution.

f. Rinse with potable water.

g. Rinse with copious amounts of distilled or deionized water.

h. Allow to dry and wrap equipment with a suitable material (e.g., clean plastic bag) in preparation for the next use.

3.2 The decontamination procedure must consider regulatory agency(ies) specifications which must be provided in the site SAP, and may include decontamination variations such as nitric acid rinses, acetone rinses, etc.

4.0 PROCEDURE

4.1. Ensure that the filtering equipment is disposable and dedicated or is properly decontaminated before each use.

4.2. Assemble the filtering apparatus (funnel and flask), and connect the vacuum pump in case it is needed to augment gravity filtration.

4.3. Place a clean (new) 0.45-micron pore-size filter in the funnel. Use larger, pore-size filters if prefiltering is required (i.e., if significant suspended sediment is present that would quickly clog the 0.45-micron filter and prevent continuous filtration or result in excessive time for filtration).

4.4. Obtain the water sample using an appropriate, decontaminated sample-collection device (e.g., bailer, pump).

4.5. Pass the unpreserved water sample through the 0.45 micron filter into the flask. If the sample contains significant sediment, then pass it through a prefilter before using the 0.45 micron filter. Apply a vacuum using the vacuum pump if needed to facilitate filtering.

4.6. Transfer the filtered water sample to the appropriate, prelabeled sample container containing the preservative (e.g., nitric acid) being careful not to overfill the container and dilute the preservative.

4.7. Follow standard operating procedures for sample documentation, shipping, and tracking (i.e., record keeping).

4.8. Decontaminate all reusable filtering (and sampling) equipment that came in contact with the water sample. Properly disposal of all non-reusable equipment in a manner appropriate with site conditions.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for measuring the thickness of floating separate-phase organic liquids in a well, tank or drum. Measuring the thickness of floating, separate-phase organic liquids requires special health and safety considerations, equipment, and procedures.

Separate-phase layers can either be "floaters" or "sinkers". "Floaters" (non-aqueous phase liquids [NAPLs]) are separate-phase liquids that are less dense than water and float on the ground-water surface. "Sinkers" (dense non-aqueous phase liquids [DNAPLs]) are separate-phase liquids that are more dense than water and tend to migrate downward through aquifers due to gravitational forces until a low permeability layer is encountered (i.e., they accumulate at the bottom of the aquifer). For the purpose of this SOP, only measuring the thickness of floating separate-phase liquids will be addressed.

The objectives for measuring separate-phase organic liquids may include the following: 1) determination of the thickness of the free product in a well, tank or drum; 2) estimation of the volume of free product to be removed from a well before sampling, or from a tank or drum before removal; and 3) calculation of the "true" (non-free product depressed) elevation of the water table.

2.0 CONSIDERATIONS

The primary considerations when measuring the thickness of floating separate-phase liquids are health and safety, and proper equipment selection.

2.1 Health and Safety

All separate-phase products must be assumed to possess health and safety hazards equivalent to the most hazardous suspected on-site source. For example, if fuel oil is being measured in wells where polychlorinated biphenyls (PCBs) are known (or suspected) to be present, then the potential for PCBs to be present in the fuel oil must be considered. When measuring the thickness of flammable materials, it is imperative that all possible sources of ignition be eliminated. Minimum requirements include (NO EXCEPTIONS) no smoking or open flames, use of intrinsically safe downhole monitoring equipment, use of static free bailing cord (e.g., absorbent cord [cotton]), and use of properly vented and grounded product collection containers. When product collection containers will be stored onsite, the local fire code official must be consulted regarding product storage requirements (e.g. venting, grounding, labeling, permits, secondary containment, etc.). A detailed, comprehensive explanation of health and safety procedures must be outlined in the site health and safety plan (HASP).

2.2 Equipment Selection

There are several methods which may be employed to measure the thickness of separate-phase petroleum product in a monitoring well, tank or drum. The actual method to be utilized should be outlined in the work plan. Considerations in selecting a method shall include: the type and consistency of the product; the level of accuracy desired; the expected depth and thickness of the product; and the diameter of the well or port.

Measurements of floating separate-phase product thicknesses can be performed using 1) an electronic oil/water interface probe; 2) a graduated, clear acrylic bailer; or 3) a weighted steel measuring tape (or graduated "stick") in conjunction with oil and water paste.

An oil/water interface probe is capable of providing rapid and accurate (±0.01 foot) results under most field situations. However, viscous product or oil/water emulsions may interfere with performance by coating the probe and/or disguising the interface. In these situations, a clear, acrylic bailer may be used in wells, or oil and water paste in a tank or drum.

A clear, acrylic bailer may be used if simply the presence or absence of product or an approximate product thickness is desired. In certain situations (e.g., viscous product or product/water emulsions) a clear acrylic bailer may be the best available method. However, when product thicknesses are greater than approximately three feet, a bailer will be unable to provide approximate product thickness measurements. If the oil/water interface probe will not work, and the product thickness is too great to be measured by a bailer, then the best available technique may be oil and water paste.

A graduated "stick" or weighted steel tape in conjunction with oil and water paste may be appropriate for measuring residual water or product in a tank or drum. This method is not recommended for use in monitoring wells because of possible cross-contamination from the paste itself. In certain situations where no other method can provide the necessary data, oil and water paste may be used in monitoring wells containing product. This method is less accurate than an oil/water interface probe, but frequently more accurate than a clear, acrylic bailer.

It should be noted that erroneous data may be collected by all three methods when measurements are collected through the fill ports of tanks which are equipped with drop tubes. Whenever possible, product thickness measurements should be collected from ports with unobstructed access to the tank contents. When measurements must be collected from a fill port with a drop tube, it should be understood that there may be significant differences between the drop tube measurements and the actual thicknesses of the water and product in the tank.

3.0 CALIBRATION

3.1 Oil/Water Interface Probe

There is no specific calibration procedure for an oil/water interface probe. However, you should verify that the unit operates properly prior to taking it out in the field by testing it in a jar containing product and water. This jar should be stored in a flammable liquid cabinet and be dedicated to oil/water interface probe testing. Since most oil/water interface probes have a heavy probe assembly and a rigid graduated tape, kinking, stretching or twisting of the tape is not a significant concern. In order to ensure proper operation, the unit should be kept warm prior to use (e.g. hotel room or cab of truck).

3.2 Clear Acrylic Bailer

There is no specific calibration procedure for an acrylic bailer. However, since you only get one chance to measure the thickness correctly, you should verify that the check valve operates properly with distilled water. Based on previous data, if available, you should ensure that the length of the bailer is sufficient to measure the entire thickness of the product.

3.3 Oil/Water Paste

There is no specific calibration procedure for using oil and water paste. However, these pastes may not behave reliably if they are old or have been exposed to extreme temperatures. The pastes should be tested prior to taking them out in the field to confirm they work. The stick measure or weighted steel tape should be carefully examined to confirm that it is properly graduated and has not been damaged or modified.

4.0 DECONTAMINATION

4.1 Complete decontamination of a clear acrylic bailer which is dedicated to the measurement of separate-phase product thicknesses can be very difficult. Decontamination should involve removal of gross contamination before entering and exiting the site or moving to different areas of separate-phase product accumulation. Special care must be taken to make sure that a “product bailer” never enters a “clean” well which does not contain separate-phase product. This can be ensured by measuring separate-phase thickness in all wells before starting bailing operations. The oil/water interface probe must be thoroughly cleaned according to the field equipment decontamination SOP before entering each well. If historical data are available, then the order of measuring separate-phase thickness should be from the cleanest well to the dirtiest well to further reduce the potential for cross-contamination. If samples are also being collected for constituent or characterization analysis, then a disposable, dedicated bailer may be necessary for product collection.

5.0 EQUIPMENT AND MATERIALS

Depending on the method used to measure the thickness of separate-phase organic liquids, both method-specific and general equipment and materials are needed.

5.1 Regardless of the method used, general equipment and materials will include, but may not necessarily be limited to, the following:

a. Site Health and Safety Plan (HASP).

b. Appropriate health and safety equipment, as specified in the HASP.

c. Roux Associates' field forms and field notebook.

d. Non-phosphate, laboratory-grade detergent.

e. Distilled/deionized water.

f. Potable water.

g. Paper towels, clean rags.

h. Plastic sheeting.

i. Sorbent pads.

j. Well location and site map.

k. Well keys.

l. Disposable gloves.

m. Calculator.

n. Black pen and indelible marker.

o. Tools (e.g., pipe wrench, screw drivers, hammer, pliers, flashlight, pen knife, etc.).

p. Buckets for decontamination.

5.2 Clear Acrylic Bailer - the following will also be needed:

a. Clear acrylic bailer

b. Non-static cotton cord

c. Steel tape (10 foot)

5.3 Oil/Water Interface Probe - the following will also be needed:

a. Oil/water interface probe

5.4 Oil/Water Paste - the following will also be needed:

a. Oil paste

b. Water paste

c. Graduated stick or weighted steel tape

6.0 PROCEDURE

6.1 Oil/Water Interface Probe

6.1.1 Make sure the bottom five (5) feet of the probe and measuring tape have been decontaminated according to the field equipment decontamination SOP before entering each well.

6.1.2 Based on previous data, if any, ensure that non-product wells are measured prior to product wells to reduce the possibility of cross-contamination.

6.1.3 Remove the well cap or plug and clean the top of the well with a clean rag. Place the cap or plug on clean plastic on the ground to protect it from potential contamination.

6.1.4 Slowly lower the thoroughly decontaminated probe to the product surface. A distinct tone or beep will indicate the presence and level of product. The depth to product (DTP) from the measuring point will be recorded in the field notebook and on appropriate field forms. Continue lowering the probe until the tone or beep indicates the presence of water. The oil/water interface is best measured by lowering the probe about six inches into the water and then raising it to the interface. The depth to water (DTW) from the measuring point will be recorded in the field notebook and on appropriate field forms. The product thickness is the difference between the DTW and DTP.

6.1.5 Replace locking and/or protective caps on the well.

6.1.6 Thoroughly clean the probe and the portion of the tape which entered the product according to the field equipment decontamination SOP.

6.2 Clear Acrylic Bailer

6.2.1 Make sure all equipment is cleaned of gross contamination before entering and exiting the site or moving to different areas of product accumulation.

6.2.2 Remove the well cap or plug and clean the top of the well with a clean rag. Place the cap or plug on clean plastic on the ground to protect it from potential contamination.

6.2.3 Slowly lower a clear, decontaminated bottom-filling acrylic bailer into the well until the bottom of the bailer contacts the fluid surface.

6.2.4 Using a reference point on the bailer line, slowly lower the bailer into the fluid a distance less than the bailer length so that at its deepest point the top of the bailer remains above the air/fluid contact.

6.2.5 Slowly raise the bailer out of the well.

6.2.6 The thickness of the floating free product will be approximated by placing a tape measure along side the bailer. The data will be documented in the field notebook and on appropriate field forms.

6.2.7 Dispose of the product in an appropriate manner as specified in the work plan. This may include draining the product back into the well or tank, or containerization if the measurement is in conjunction with bailing for removal purposes.

6.2.8 Replace locking and/or protective caps on the well.

6.2.9 Thoroughly clean the bailer as described in Section 6.2.1. Discard the cotton cord in an appropriate manner. Wrap decontaminated bailer in a suitable material (e.g., clean plastic bag, aluminum foil).

6.2.10 If the free product is extensive or thicker than the height of the bailer, then an electronic interface probe should be used to measure product thickness.

6.3 Oil/Water Paste - (Generally not applicable for monitoring wells)

6.3.1 Make sure all equipment is decontaminated and cleaned before use according to the field equipment decontamination SOP.

6.3.2 Secure access to the tank or drum to be measured only after the contents are known and properly addressed in the HASP. Attempt to estimate the depth and thickness of product and the depth to water so the entire stick or weighted steel tape does not have to be coated with oil and water paste.

6.3.3 Coat one side of the stick or steel tape with oil paste and the other with water paste. Since these are typically different colors, confusion should not result. Depending upon information needs, lower the tape to just below the water interface or to the bottom of the tank or drum.

6.3.4 If only DTP and DTW data is required, then the top of the tape is held at an even-foot increment at the measuring point (MP). This is called the

"held" value, and is recorded as such. If the depth to the bottom of the tank is also required, then the held value can't be specifically selected at an even-foot increment.

6.3.5 The steel tape or graduated stick is removed and the "water cut" and "product cut" levels are recorded. The difference between the "held" value and the "product cut" value is the DTP. The difference between the "held" value and the "water cut" is the DTW. The difference between the "product cut" and the "water cut" is the product thickness. If the diameter of a horizontal tank is desired, then the difference between the "held" value (to the bottom of the tank) and the depth of the fill pipe is required.

6.3.6 All pertinent data will be recorded in the field notebook and on appropriate field forms.

6.3.7 Make sure all equipment is decontaminated before use in the next tank or drum according to the field equipment decontamination SOP. All disposable materials must be discarded in a manner consistent with site conditions.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for the collection of soil samples for laboratory analysis. This SOP is applicable to soil samples collected from split-spoon samplers during drilling, hand auger samples, grab samples from stockpiled soils, surface samples, test pit samples, etc.

2.0 CONSIDERATIONS

Soil samples may be collected in either a random or biased manner. Random samples can be based on a grid system or statistical methodology. Biased samples can be collected in areas of visible impact or suspected source areas. Soil samples can be collected at the surface, shallow subsurface, or at depth. When samples are collected at depth the water content should be noted, since generally "soil sampling" is restricted to the unsaturated zone. Equipment selection will be determined by the depth of the sample to be collected. A thorough description of the sampling locations and proposed methods of sample collection should be included in the work plan.

Commonly, surface sampling refers to the collection of samples at a 0 to 6 inch depth interval. Certain regulatory agencies may define the depth interval of a surface sample differently, and this must be defined in the work plan. Collection of surface soil samples is most efficiently accomplished with the use of a stainless steel trowel or scoop. For samples at greater depths a decontaminated bucket auger or power auger may be needed to advance the hole to the point of sample collection. Another clean bucket auger should then be used to collect the sample. To collect samples at depths of greater than approximately six feet the use of a drill rig and split spoon samples will usually be necessary. In some situations, sample locations are accessed with the use of a backhoe.

3.0 MATERIALS/EQUIPMENT

a. A work plan which outlines soil sampling requirements.

b. Field notebook, field form(s), maps, chain-of-custody forms, and custody seals.

c. Decontamination supplies (including: non-phosphate, laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents, aluminum foil, plastic sheeting, etc.).

d. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

e. Stainless steel spoons or spatulas.

f. Disposable sampling gloves.

g. Laboratory-supplied sample containers with labels.

h. Cooler with blue or wet ice.

i. Plastic sheeting.

j. Black pen and indelible marker.

k. Zip-lock bags and packing material.

l. Tape measure.

m. Paper towels or clean rags.

n. Masking and packing tape.

o. Overnight (express) mail forms.

4.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and plastic sheeting will be changed after each use and discarded in an appropriate manner.

5.0 PROCEDURE

5.1 Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to the decontamination SOP. If samples are to be collected at depth, then the boring must be advanced with thoroughly cleaned equipment to the desired sampling horizon and a different thoroughly cleaned sampler must be used to collect the sample.

5.2 Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, measure the recovery, and separate the wash from the true sample. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

5.3 Place the sample in a laboratory-supplied, pre-cleaned sample container. This should be done as quickly as possible and this is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents.

5.4 The sample container will be labeled with appropriate information such as, client name, site location, sample identification (location, depth, etc.), date and time of collection, and sampler’s initials.

5.5 Using the remaining portion of soil from the sampler, log the sample in detail and record sediment characteristics (color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc.).

5.6 If soil samples are to be composited in the field, then equal portions from selected locations will be placed on a clean plastic sheet and homogenized. Alternately, several samples may be submitted to the laboratory for compositing by weight. The method used is dependent upon regulatory requirements. Specific compositing procedures shall be approved by the appropriate regulatory agency and described in the work plan. Samples to be analyzed for VOCs will not be composited unless required by a regulatory agency.

5.7 After the sample has been collected, labeled, and logged in detail, it is placed in a zip-lock bag and stored in a cooler at 4°C.

5.8 A chain-of-custody form is completed for all samples collected. One copy is retained and two are sent with the samples in a zip-lock bag to the laboratory. A custody seal is placed on the cooler prior to shipment.

5.9 Samples collected from Monday to Friday are to be delivered to the laboratory within 24 hours of collection. If Saturday delivery is unavailable, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if any analytes require a shorter delivery time.

5.10 The field notebook and appropriate forms should include, but not be limited to the following: client name, site location, sample location, sample depth, sample identification, date and time collected, sampler's name, method of sample collection, number and type of containers, geologic description of material, description of decontamination procedures, etc. A site map should be prepared with exact measurements to each sample location in case follow-up sampling is necessary.

5.11 All reusable sampling equipment must be thoroughly cleaned in accordance with the decontamination SOP. Following the final decontamination (after all samples are collected) the sampling equipment is wrapped in aluminum foil. Discard any gloves, foil, plastic, etc. in an appropriate manner that is consistent with site conditions.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for screening soil samples for volatile organic vapors using a portable photoionization detector (PID). This SOP is applicable to soil samples collected from split-spoon samplers during drilling, hand auger samples, and grab samples from stockpiled soils.

2.0 CONSIDERATIONS

The primary objective of photoionization screening of soil samples is to obtain a qualitative understanding of the distribution of volatile organic compounds (VOCs) in soil. The proper design of an organic vapor screening program requires an understanding of site hydrogeology, potential source areas, and potential constituents of concern. Sample locations and frequency must be fully defined in the work plan. The work plan should outline the type of lamp to be utilized in the PID based on the ionization potentials and response factors of the constituents of concern. The work plan must also clearly describe the heating or equilibration procedures to be employed if they differ from those described in this SOP. Regardless of the specific equilibration procedure employed, it is imperative that each sample be treated identically to allow the photoionization results from different locations to be compared. Observations such as water, clay, and organic content should be noted to facilitate interpretation of the data. Every effort should be made to collect a representative portion of soil from the sampling device.

3.0 MATERIALS/EQUIPMENT

a. A work plan which outlines photoionization screening requirements.

b. Decontamination supplies (including: non-phosphate, laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents [e.g., acetone, nitric acid, hexane, etc.], aluminum foil, plastic sheeting, etc.).

c. Field notebook, field form(s), maps, chain-of-custody forms.

d. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

e. Stainless steel spoons or spatulas.

f. Disposable plastic spoons.

g. Plastic sheeting.

h. Aluminum foil.

i. Mason jars or driller's jars.

j. Water bath (hot plate, extension cord, water tray, thermometer).

k. Photoionization detector with charging unit.

l. Calibration gases with regulator.

m. Indelible marker.

n. Masking tape.

o. Disposable sampling gloves.

4.0 DECONTAMINATION

Where possible, thoroughly pre-cleaned and wrapped sampling equipment must be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and sample jars will be changed after each use and discarded in an appropriate manner. If only photoionization results are to be obtained, then split-spoon samples and hand augers may be cleaned with a soap and water wash and potable water rinse or steam cleaning, and a final distilled water rinse. However, if samples are to be collected concurrently for laboratory analytical results, then all reusable sampling equipment must be thoroughly decontaminated according to the SOP for decontamination of field equipment.

5.0 CALIBRATION

The PID must be calibrated according to the manufacturer's specifications at a minimum frequency of once per day prior to collecting photoionization readings. In addition, periodic checks (e.g., every 2 hours or every ten samples) with the standard gas will be conducted to confirm that the calibration has not drifted. The time, date, and calibration procedure must be clearly documented in the field notebook and the calibration log. If at any time the photoionization results appear erratic or inconsistent with field observations, then the unit must be recalibrated. If calibration is difficult to achieve, then the unit's lamp should be checked for dirt or moisture and cleaned, as necessary. During humid or wet conditions, the unit should be calibrated on a more frequent basis as determined by field personnel.

6.0 PROCEDURE

6.1 Extract the soil sample from the sampler, quickly measure the recovery, and separate the wash from the true sample by using a dedicated, stainless steel spatula. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

6.2 Place the sample in a pre-cleaned glass jar (as quickly as possible to avoid loss of VOCs) filling the jar half full. Place an aluminum foil seal between the glass and metal cap and screw tight.

6.3 Label jars with the boring number, depth of sample, date of collection and blow counts. In addition, the field personnel will ensure the following: samples are taken at appropriate depths; unrepresentative portions of the sample are discarded properly; that the sampler is decontaminated properly between use; and the driller uses proper methods during sample collection and does not use oil or grease on tools entering the borehole.

6.4 Log the sample in detail and record sediment characteristics (color, odor, moisture, texture, density, consistency, organic content, and layering).

6.5 After the sample has been collected, heat the sample under controlled conditions in a water bath for a 2 minute period.

6.6 Ensure that the PID has been calibrated and that the calibration information is documented in the field book. Pierce the aluminum foil seal with the probe from the PID and measure the relative concentration of VOCs in the headspace of the soil sample. The initial (peak) reading must be recorded.

6.7 Record the PID reading in the field notebook, on an appropriate field form, and on the base map, if appropriate.

6.8 Place any material not representative of the interval sampled in a pile with the other cuttings from the borehole.

6.9 If only photoionization results are to be obtained, then reusable sampling devices may be cleaned with a soap and water wash and a potable water rinse. The sampler will then be rinsed with distilled water, assembled and placed on plastic sheeting for reuse. A more rigorous decontamination procedure is required when samples are also being collected for laboratory analysis. Refer to the SOP for collection of soil samples for laboratory analysis for additional information.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for measuring the pH of water in the field. The pH is measured in the field using a pH meter which should have the ability to compensate for temperature (automatically or manually). The pH will be measured in standard units (SU) and can be recorded with or without the SU designation. The conventional means of recording a pH value is without a unit designation (e.g., 7.0); however, the SU designation may be used provided the term is defined as standard units when first referenced. The manufacturer's instrument manual for each particular pH meter, which is maintained with the instrument, will be referred to for calibration, use, repair, maintenance, or trouble-shooting operations.

The pH is measured in the field to provide the pH of the water under ambient (in situ) conditions. The pH is a measure of acidic (<7.0) or basic (>7.0) nature of the water and is used to assist in evaluating the mobility of contaminants. In addition, pH measurements can be used during well purging to help determine when sufficient ground water has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer). The determination is made when pH readings have achieved stabilization or near-stabilization.

2.0 CALIBRATION

2.1 Calibration of the pH meter is to be performed at the beginning and end of each day's use in accordance with the manufacturer's specific instructions. Usual procedures are given below.

2.2 Recalibration must occur if: 1) the pH of the samples being measured is outside the previous calibration range; 2) the procedure or use conditions warrant frequent calibrations; 3) four or more hours have elapsed; or 4) the instrument has been moved from one area to another (e.g., offsite or out of the study area).

2.3 Two buffer calibrations bracketing the expected pH range of samples are to be performed prior to its use in a study. Three pH buffers (4.0, 7.0, and 10.0) are read after standardization at pH of 7.0 to evaluate the linearity and electrodes.

2.4 The measurements of sample and buffers are made while stirring. The samples and buffers are measured at the same temperature; therefore, the pH meter must be temperature compensated. If not, then record the temperature.

2.5 The following information is documented in the calibration logbook at the time of calibration:

a. Date.
b. pH meter identification.

c. Calibration results using pH standards.
d. Initials of the individual performing calibration.

3.0 PROCEDURE

3.1 A warm-up period may or may not be necessary for the instrument, depending on instrument requirements. The manufacturer's instrument manual must be followed.

3.2 The pH electrodes must be kept in good working order as follows:

a. Proper levels of electrolyte solution are maintained. The electrolyte solution level should be at least 1 inch above the solution being measured.

b. The electrodes must be carefully rinsed with distilled or deionized water before each measurement.

3.3 The water sample (approximately 500 milliliters [ml]) is placed in a clean container and the temperature and pH are measured immediately.

3.4 The temperature of the sample is measured and the pH meter is compensated for the water temperature. If compensation is not possible, then record the temperature.

3.5 The electrodes are immersed in a water sample and stirred continuously until the pH reading equilibrates. The pH will be measured and recorded in increments of 0.1 or 0.1 SU.

3.6 Pertinent data are documented in the field notebook or appropriate field form, and initialed and dated.

3.7 The electrodes are rinsed with distilled or deionized water and the unit stored properly in accordance with the manufacturer's instructions (e.g., capping and storing in a buffer such as altex electrode storage solution). The electrodes are not to be stored in potable water, or distilled or deionized water.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for measuring the electrical conductance (conductivity) of water in the field. The conductivity is measured in the field using a conductivity meter which compensates for temperature (automatically or manually). Some conductivity meters measure directly in micromhos/ centimeter (µmhos/cm) while others have to be converted to this unit. Conductivity will be recorded in µmhos/cm. The manufacturer's instrument manual of each particular conductivity meter, which is maintained with the instrument, will be referred to for calibration, use, repair, maintenance, or trouble-shooting operations.

The specific conductivity is measured in the field as a measure of the total dissolved solids (TDS) in the ground water or surface water. TDS data can then be used as a qualitative measure of contamination and to assist in evaluating electrical resistivity and borehole geophysical data. In addition, specific conductivity measurements can be used during well purging to help determine when sufficient ground water has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer). The determination is made when conductivity readings have achieved stabilization or near-stabilization.

2.0 CALIBRATION

2.1 Calibration is in accordance with the manufacturer's specific directions.

2.2 Calibration of the conductivity meter is to be performed at the beginning and end of each day's use.

2.3 Recalibration must occur if: 1) the specific conductivity of samples being measured is outside the calibration standard solution range; or 2) the instrument has been moved from one area to another (e.g., offsite or out of the study area).

2.4 Choose a conductivity calibration solution that is near the conductivity of the water samples to be measured.

2.5 Select the appropriate conductivity calibration solution and adjust the span on the instrument to the conductivity calibration solution value.

2.6 Rinse the probe in distilled or deionized water and store the probe according to the manufacturer's specifications (e.g., distilled or deionized water, or a buffer solution).

2.7 The following information is documented in the calibration logbook:

a. Date.

b. Conductivity meter identification.

c. Initials of individual performing calibration.

d. Calibration results.

3.0 PROCEDURE

3.1 The conductivity electrodes must be kept in good working order as specified by the manufacturer.

3.2 The water sample is placed in a clean, appropriate container(s) and the temperature and conductivity are measured immediately.

3.3 The temperature of the sample is taken and the conductivity meter is compensated for the water temperature.

3.4 The probe is immersed in a water sample until the meter equilibrates.

3.5 In reading the conductivity meter scale, one or more of the following may have to be considered:

a. The reading may have to be multiplied appropriately (e.g., the reading is expressed in micromhos/centimeter).

b. If the conductivity meter is not capable of compensating for temperature differences, then note that the conductance measurements are not temperature compensated and document the temperatures.

c. If the conductivity meter can be compensated for temperature, then adjust the temperature control before reading the conductance measurement. (Some meters automatically compensate for temperature, and this should be documented.)

3.6 Conductivity measurements are recorded in the field notebook and on the appropriate field form, and initialed and dated. Units of µmhos/cm are used to represent conductivity.

3.7 The probe will be cleaned with distilled or deionized water after each use and will be stored according to the manufacturer's specifications (e.g., conductivity cells may have to be stored in distilled or deionized water, or a buffer solution).

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for measuring water temperature in the field. Temperature measuring devices may include thermometers, and pH and/or conductivity meters equipped with a temperature probe. The temperature measuring device must be rapidly equilibrating, precision-grade, and meet or exceed National Bureau of Standards (NBS) specifications for accuracy. Temperature will be measured and recorded in degrees Celsius/Centigrade (° C). If the temperature measuring device is a meter, then the manufacturer's instrument manual, which is maintained with the instrument, will be referred to for calibration, use, repair, maintenance, or trouble-shooting operations.

Temperature data is collected in the field to determine the temperature of the water sample under ambient (in situ) conditions. Temperature data can be used to evaluate the mobility of compounds in ground water and flow conditions. In addition, temperature measurements can be used during well purging to help determine when sufficient ground water has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer). The determination is made when temperature readings have achieved stabilization or near-stabilization.

2.0 CALIBRATION

2.1 Calibration of thermometers and temperature measuring meters will be performed before entering the field and checked upon return to the office.

2.2 Temperature measuring devices will be calibrated against a NBS-traceable thermometer.

2.3 If a thermometer is used to measure temperature, then the thermometer must read within 1° C to 1.5° C of the NBS-traceable thermometer. If the thermometer does not read within this range and the thermometer cannot be calibrated, then it will not be used for temperature measurements and will be disposed of in an appropriate manner. If the thermometer does not read within this range and the thermometer can be calibrated, then the thermometer will be calibrated to the NBS-traceable thermometer.

2.4 If a temperature measuring meter is used to measure temperature, then the meter must read within 1° C to 1.5° C of the NBS-traceable thermometer. If the meter does not read within this range and the meter cannot be calibrated, then it will not be used for temperature measurements and will be sent to the manufacturer for service and repair. If the meter does not read within this range and the meter can be calibrated, then the meter will be calibrated to the NBS-traceable thermometer.

2.5 The following information is documented in the calibration logbook at the time of calibration:

a. Date.

b. Thermometer and/or Meter identification.

c. Calibration results relative to NBS-traceable thermometer.

d. Initials of individual performing calibration.

3.0 PROCEDURE

3.1 The water sample (approximately 500 milliliters [ml]) is placed in a clean container and the temperature is measured immediately.

3.2 If a thermometer is used, then the thermometer is first rinsed with distilled or deionized water and is then immersed in water until the temperature equilibrates. The temperature is read in °C. The thermometer is rinsed again after measuring the temperature.

3.3 If a temperature measuring meter is used, then the probe is first carefully rinsed with distilled or deionized water. The probe is then immersed in water according to the manufacturer's specifications (e.g., specified submergence, stirred) until the temperature equilibrates. The temperature is read in °C. The probe is rinsed again after measuring the temperature.

3.4 Temperature data are recorded in the field notebook or appropriate field form, and initialed and dated.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during drilling, and soil and water sampling. The objective of decontamination is to ensure that all drilling, and soil-sampling and water-sampling equipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements and because of variability in the requirements of individual states. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non acceptance (invalidation) of the work undertaken and data collected.

2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

2.1 The rig and all associated equipment should be properly decontaminated by the contractor before arriving at the test site.

2.2 The augers, drilling casings, rods, samplers, tools, rig, and any piece of equipment that can come in contact (directly or indirectly) with the soil, will be steam cleaned onsite prior to set up for drilling to ensure proper decontamination.

2.3 The same steam cleaning procedures will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the study.

2.4 All on-site steam cleaning (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc.

2.5 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.6 Containment of decontamination fluids may be necessary (e.g., rinseate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federal procedures.

3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.2 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.3 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.4 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.5 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.6 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.7 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.8 Reassemble the cleaned sampler, as necessary.

3.9 Transfer the sampler to the driller (or helper) making sure that this individual is also wearing clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil.

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble bailer (if applicable) and discard cord in an appropriate manner, and scrub each part of the bailer with a brush and solution.

d. Rinse with potable water and reassemble bailer.

e. Rinse with copious amounts of distilled or deionized water.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

h. Rinse bailer at least three times with distilled or deionized water before use.

4.2 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution, and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to describe the considerations and procedures, and to establish the guidelines for drilling (soil borings, wells, or piezometers) and formation sampling activities in unconsolidated formations. There are several drilling techniques available which include hollow-stem auger, cable tool, hydraulic rotary, cased-hole rotary, and air rotary. Formation (sediment/soil) sample collection include disturbed (drill cuttings), intact (split-spoon), and undisturbed (Shelby-tube or Denison-core). Borehole abandonment (closure) procedures will also be addressed in this SOP.

The objective of drilling is to collect accurate subsurface information and to prepare a borehole for potential completion as a well or piezometer. Consequently, the lithologic data is the all important, most essential information that can be collected. The lithologic data characterizes subsurface conditions, describes hydrogeologic coefficients qualitatively and/or quantitatively, and identifies optimum locations for screen zones if wells are constructed.

Data can be obtained through the physical examination and testing of formation samples, as well as knowledge regarding ground-water levels. Thus, drill fluid mix, fluid loss, rate of drilling, lengths of split-spoon and Shelby-tube/Denison-core recovery, etc. must be monitored by the on-site hydrogeologist or geologist.

2.0 DRILLING TECHNIQUE-SELECTION

Verify that the drilling technique is the one specified in the investigation work plan, and that the drilling equipment mobilized by the driller is in good condition and proper working order. Do not permit the driller to use a drilling rig that appears to be substandard, in disrepair, etc., and/or is questionable as to whether or not the rig has the capabilities to accomplish the goals of the drilling program. The drilling rig must be capable of:

a. Penetration of all anticipated subsurface materials and formations at a desired rate, and construction of a borehole of desired diameter (for the anticipated well, if applicable, including the placement of a gravel or sand pack through a tremie pipe and necessary formation sealing material such as bentonite or cement).

b. Identification of lithology for development of a geologic log of all unconsolidated formations and materials penetrated, including physical characteristics and visual description of color, grain sizes, sorting and mineralogy.

c. Collection of samples of aquifer fluids during the drilling process and prior to well construction, while at the same time minimizing potential for cross-contamination. The method used should prevent cross-contamination between surface soils and ground water or between different hydrogeologic units.

d. Collection of intact and/or undisturbed soil samples from the center line or sidewall of the borehole. This objective requires the drilling to be halted while soil samples are taken from the bottom or side of the incomplete borehole.

e. Completion of the borehole into a well (monitoring or observation) or piezometer during the initial construction process (i.e., constructing a well or piezometer as the borehole is drilled, or constructing a well or piezometer in the borehole immediately after the drilling tools are removed).

f. Implementation of borehole geophysical logging (when applicable and possible) to enable more accurate vertical and horizontal extrapolation of borehole data to the lithology of the hydrogeologic system.

g. Completion of a well or piezometer, if applicable, in the borehole following a time lapse for interpretation of geologic or geophysical data from the borehole.

3.0 DRILLING TECHNIQUE - DESCRIPTION

3.1 Hollow-Stem Auger - This drilling method is rapid and extremely effective in most cohesive sediments but less so in loose sandy material. Penetration may be up to 150 feet below land surface (bls) depending on the size of the rig, drilling conditions, and the diameter of the auger flight; however, depths up to 250 feet bls have been achieved under compatible conditions. A major advantage of this technique is that normally no fluids are introduced into the formation. If the auger flights can be removed and the integrity of the borehole maintained, then electrical and radiation (e.g., gamma, neutron, etc.) geophysical logs can be run. If the auger flights must remain in the borehole, then only radiation geophysical logs can be run. Casing, screen, and sampling devices can then be lowered through the hollow stem by removing the removable plug at the bottom of the auger flights, and gravel packing and cementing can be accomplished within the hollow stem. However, this can be difficult especially below the water table. Auger flight outside diameters (OD) range from 5 inches (in.) to 12 in. The diameter of a well that can be constructed inside the hollow stem is limited, however, to about 4 in.

3.2 Cable Tool (Percussion) - This drilling method is slow because the borehole is advanced by lifting and dropping a heavy string of drilling tools. Cuttings accumulate in the drill casing and are removed by a sand bailer. A steel casing is driven in as the hole is deepened. Cable-tool rigs can be used in unconsolidated sediment and bedrock to depths of hundreds or thousands of feet and often

employ telescoping techniques for drilling deep boreholes. Electrical geophysical logs cannot be run through the steel cased borehole, but radiation logs (e.g., gamma, neutron, etc.) can be run. Well casing and screen can be installed within the cased hole after which the outer casing is pulled back (removed). Because the boring is cased as it is being drilled, cross-contamination between various depths is practically eliminated. The method provides an excellent means to collect good, representative formation samples.

3.3 Hydraulic Rotary - This drilling method uses a rotating bit to drill (advance) the borehole. Drill cuttings are removed using a recirculating drilling fluid (mud or water). Although setting up the drilling equipment is slow, the drilling process is reasonably fast. In the mud-rotary method, drilling mud forms a cake on the borehole wall which prevents excessive loss of fluid to the formation being drilled. The hydrostatic pressure combined with the weight and density of the mud slurry keeps the hole open. This allows the drill rods to be removed from the borehole and geophysical logs (electric and radiation) to be run in the open borehole.

In reverse hydraulic rotary drilling, the drilling fluid moves downward through annular space and then upward inside the drill pipe. If the drilling fluid does not contain mud, then sufficient water flow is required as make-up water because the borehole wall is not sealed; therefore, significant water loss can occur to the formation being drilled. The borehole is held open by hydrostatic pressure only. A serious obstacle to this drilling method occurs when the static water level is less than 15 feet below land surface because of insufficient hydrostatic head difference between the borehole and the water table. However, the problems of excessive water loss and shallow depths to water may be overcome by using mud as the drilling fluid.

In mud-rotary drilling, the drilling fluid (mud) moves downward through the drill pipe and then upward through the annular space. Therefore, the borehole is held open by hydrostatic pressure and the mud cake lining the wall of the borehole. The mud-rotary method can be used to construct moderate to deep wells in unconsolidated (and consolidated material), while the reverse rotary technique can be used to construct moderate to deep wells in unconsolidated materials. The principal disadvantage may be the difficulty in removing mud cake from the formation at the screened zone. Extensive well development may be required to remove the mud cake.

3.4 Cased-Hole Rotary - Several new rotary drilling techniques have been developed in which a steel casing is advanced with an air-rotary or mud-rotary drill. This technique is highly desirable for use in exploratory drilling at monitoring sites because water and soil samples may be collected under conditions which preclude contamination from shallower depths. Furthermore, this technique is extremely

effective in boulder or cavernous zones which would inhibit or preclude drilling using other techniques. Drilling results are comparable to cable-tool drilling but with greatly enhanced speeds. In all the cased-hole techniques, the main benefit is that the only portion of the borehole which is open, is at the bottom of the drill casing; thus, no soil or water from shallower depths can move down and impact the depth drilled and/or sampled. Electrical geophysical logs cannot be run through the steel-cased borehole, however, radiation logs (e.g., gamma, neutron, etc.) can be run.

Presently, there are three cased-hole rotary techniques which include:

a. The drill-thru casing hammer technique in which the casing is advanced by percussion with a casing hammer or vibratory driver similar to the method used in a borehole drilled by the air-rotary method. The casing hammer can also pull out the casing (air drilling only).

b. The Odex™ Drilling System (European system) which "pulls" the casing using a fixture attached to an air-hammer type drill bit (air drilling only).

c. The Barber™ Drilling System in which drilling is done with a top-head drive and a rotary table that spins casing into the ground. Casing can be fitted with a carbide "shoe" to cut boulders and an air hammer can be used above the bit. Air or mud rotary can be used to lift cuttings.

Two potential problems may be encountered using the cased-hole rotary technique which include: 1) "sand heave" when drilling stops (which can be quickly drilled or bailed out) and 2) possible aeration of water in the cased borehole if volatiles are being tested (which can be overcome by pumping or bailing the standing water out before sampling). The minimum drill casing diameter is 6 inches and depth is limited to approximately 450 feet.

3.5 Air Rotary - This drilling method uses a rotating bit to drill, and high-velocity compressed air to remove cuttings from the borehole. A pneumatic down-hole hammer is often used to add percussion to the rotary drilling action. This drilling method is very fast and, although it is most suitable for penetrating hard bedrock, it can be used in unconsolidated formations. The borehole may be cased or uncased depending on geologic conditions. If an open borehole is drilled, then electrical and radiation (e.g., gamma, neutron, etc.) geophysical logs can be run. If a cased borehole is drilled, then only radiation geophysical logs can be run.

Four potential problems may be encountered when using the air-rotary technique:

a. When a prolific aquifer is tapped, the compressed air may not be able to lift the water to the surface.

b. Aeration of water in the borehole (and finished well) immediately prior to sampling can interfere with a number of inorganic and organic water-quality parameters.

c. Low yield water entry zones may not be identified because the air pressure prevents water from entering the borehole. Care should be taken to prevent overdrilling of the borehole.

d. Air rotary drilling can induce the migration of volatile organics to the surface or adjacent structures causing potential aesthetic or health and safety concerns.

If the air-rotary technique is used then the following special procedures will be implemented:

a. The type of air compressor and lubricating oil will be documented on an appropriate field form and in the field notebook and a 1-pint sample of the oil will be retained for characterization in the event organic compounds are detected in a well sample.

b. An air line oil filter will be required and changed per manufacturer's recommendations during operation with documentation of this maintenance on an appropriate field form and in the field notebook. More frequent oil filter changes will be made if oil is visibly detected in the filtered air.

c. The use of any additive will be prohibited, except approved water (e.g., potable water) for dust control and cuttings removal.

4.0 DECONTAMINATION

Drilling equipment decontamination procedures are outlined in the field equipment decontamination SOP. Proper decontamination in accordance with regulatory guidelines must be clearly documented in the field notebook.

5.0 PROCEDURE FOR DRILLING

5.1 Document all drilling-related activities (e.g., starting, stopping, footage, problems, decontamination, etc.) on the daily log form and in the field notebook. Record dates and times of activities, and names of Roux Associates personnel providing oversight.

5.2 Monitor and record drill fluid mix, speed of rotation, pressure on the drill fluid, rate of drilling, and length of drill rods or casing in the borehole.

5.3 Confirm that the drill rods and core barrel are straight, or discontinue drilling.

5.4 Pay particular attention to the advancement of the boring because differences in the rate of drilling may be indicative of differences in subsurface geologic conditions (e.g., sand and gravel versus clay).

5.5 Maintain a continuous dialogue with the driller to track and keep informed of all drilling activities (e.g., the speed of the drill and drilling pressure, difficult and easy drilling conditions, etc.).

5.6 Collect formation samples as described below in Section 6.0. Sample jars must be labeled appropriately (e.g., project number and name, site location, boring number, date, sample interval, blow counts, and initials of Roux Associates personnel collecting sample).

5.7 Record geologic information in the geologic log form and in the field notebook.

5.8 Handle and ship split-spoon sample jars carefully to avoid breakage and handle and ship tubes or cores carefully to prevent disturbance.

6.0 PROCEDURE FOR FORMATION SAMPLING

6.1 Intact formation sampling will be implemented using split-spoon samplers (which are driven), Shelby-tube samplers (which are pushed), or Denison-core samplers (which are rotated) depending on the drilling technique employed. Formation samples will be retained in suitable size (e.g., 1-pint or 0.5-pint) jars for physical descriptions and potential physical and chemical analysis. The appropriately labeled jars and tubes will be stored in a safe place to avoid breakage, agitation, and freezing. Intact formation samples will be collected as described in the work plan at specified intervals (e.g., at 5-foot increments below land surface) and at each major change in subsurface materials. Hydrogeologic information will be recorded on a geologic log form and in the field notebook. Detailed descriptions of the type(s) of intact sample(s) collected, sampling intervals and conditions, and objective(s) of the sample collection will be provided in the work plan.

6.2 Disturbed formation samples (drill cuttings) will be examined continuously throughout the entire depth of the borehole. If applicable to the study and/or stated in the work plan, borehole cuttings will be collected from the circulating auger flights which lift cuttings to land surface (hollow-stem auger technique), from the sand bailer (cable-tool technique), from the recirculating drilling fluid (mudflume) which transports cuttings to land surface (mud-rotary and related techniques), or from the compressed air used to carry cuttings to land surface (air-rotary and related techniques). Formation samples will be retained in appropriate size (e.g., 1-pint or 0.5-pint), properly labeled jars and stored in a safe place to

avoid breakage, agitation, and freezing. Hydrogeologic data will be recorded on a geologic log form and in the field notebook.

6.3 The soil cores from the wells drilled at the site are used for lithologic identification. The first 18 inches of soil for each borehole will be collected intact using a split-spoon sample, Shelby-tube sampler, or Denison-core sampler. Split-spoon samples may be collected continuously from boreholes for cluster wells; single well and/or piezometer boreholes may be split-spooned throughout drilling or at specified intervals or changes in lithology. The conditions for sampling will be specified in the work plan.

6.4 Before collecting and retaining soil and/or sediments collected with the split-spoon sampler, the top several inches will be removed from the sampler and discarded to eliminate any sediment that may have caved into the bottom of the borehole.

6.5 Sediment sampling equipment such as split-spoon samplers, spatulas, etc. (but not including Shelby-tube or Denison-core samplers, which area not re-usable) will be decontaminated by steam cleaning and/or a non-phosphate, laboratory-grade and distilled/deionized wash followed by a distilled/deionized water rinse. (Refer to the SOP for Decontamination of Field Equipment for a detailed description of minimum and special decontamination procedures.) Decontamination of sediment sampling equipment will take place prior to the collection of the first sample and following the collection of each subsequent sample.

7.0 BOREHOLE ABANDONMENT OR CLOSURE

7.1 Upon the completion of the investigation, a determination will be made as whether to maintain the borehole (for a well or piezometer) or to close it (i.e., abandon and seal it). If the client and Roux Associates agree to abandon the borehole, then the state will be notified and a request will be presented for borehole abandonment. Upon state approval to seal the borehole, appropriate state borehole abandonment forms will be completed, if required. Following state approval, the abandonment of any borehole (or boring) will be in accordance with local, state and/or Federal regulations.

7.2 For each abandoned borehole, the procedure will be documented on an appropriate field form or in the study notebook. Documentation may include, where appropriate, the following:

a. Borehole designation.

b. Location with respect to the replacement borehole, if replaced (e.g., 30 ft north and 40 ft west of Borehole B-1). A location sketch should be prepared.

c. Open depth prior to grouting and any other relevant circumstances (e.g., formation collapse).

d. Drill casing left in the borehole by depth, size, and composition.

e. A copy of the geologic log.

f. A revised diagram of the abandoned borehole using a supplemental geologic log form.

g. Additional items left in hole by depth, description, and composition (e.g., lost tools, bailers, etc.).

h. A description and daily quantities of grout used to compensate for settlement.

i. The date of grouting.

j. The level of water or mud prior to grouting and the date and time measured.

k. Any other state or local well abandonment reporting requirements.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to describe the considerations and procedures for constructing ground-water monitoring or observation wells in unconsolidated (e.g., gravel, sand, silt, and clay) formations. Well development and well abandonment (closure) procedures will also be addressed in this SOP. The United States Environmental Protection Agency (USEPA), the United States Geological Survey (USGS), and state regulatory agency procedures will be reviewed and considered in conjunction with the extensive experience of Roux Associates, Inc. (Roux Associates) to determine appropriate well construction and abandonment procedures. Discussions will be held with appropriate agencies to resolve conflicting procedures and finalize well construction or abandonment methods. The well construction plan and, if necessary, abandonment will be detailed in the work plan.

Monitoring wells will be completed in unconsolidated formations for the purposes of measuring ground-water levels and collecting ground-water samples. Ground-water level data will be used to calculate ground-water elevations which will be used, to construct water-level elevation and ground-water flow direction maps to illustrate head and flow relationships. Ground-water samples will be used to quantify water-quality conditions.

Observations wells will be completed in unconsolidated formations for the purpose of collecting water-level data from aquifer tests. Slug tests, step-drawdown tests, and constant-rate pumping tests (refer to the respective SOPs) may be conducted to qualitatively or quantitatively characterize flow system hydraulic parameters and/or intra-aquifer and inter-aquifer hydraulic connection.

2.0 PROCEDURE FOR WELL CONSTRUCTION

The installation of each unconsolidated well will begin immediately after borehole completion (and geophysical logging, if implemented). Once well installation has begun, no breaks in the process will be made until the well has been completed and secured against unauthorized access. In cases of unscheduled delays, such as personal injury, equipment breakdowns or sudden inclement weather, installation will be resumed as soon as practical.

2.1 The well will be constructed of appropriate type and diameter casing and screen (stainless steel and/or PVC) and will be at least 2 inches in diameter to accommodate most water-sampling and water-level measuring devices. However, if the well's purpose is multiple (pumping tests, remote sensing, water-level recorder station, etc.), a larger diameter monitoring well (4 inches, 6 inches, or greater) may be needed to accommodate pumps, floats, or sensors. The preferred minimum diameter for a well is 4 inches because larger diameter wells (greater

than 2 inches) facilitate well purging and sampling procedures (e.g., they can accommodate pumps which 2-inch diameter wells may not).

2.2 Fittings (couplings) will not restrict the inside well diameter, as stainless steel casing will be welded and/or flush-joint threaded, and PVC joints will be internally threaded. Glues, solvents, or chemical cleaners will not be used in the construction of the wells. All casings, fittings, and screens will be new material. The well screens will be fabricated and have an inside diameter equal to the well casing. The lengths of casing and screen will be measured and recorded on an appropriate field form and in the field notebook by the field hydrogeologist prior to installation.

2.3 Wells in unconsolidated formations will be installed as described below unless depth to water or total depth require modifying the thickness of emplaced materials.

a. The screen and casing will be lowered into the borehole to the appropriate depth. Screen and casing materials may be either stainless steel or PVC. A bottom plug, well cap, and flush-joint sections will be used.

b. A gravel pack (quartz sand or pea gravel) will be filled in around the screen from a few feet below the bottom of the screen to several feet (approximately 5) above the screen to avoid applying the weight of the casing on the screen. The size of the uniformly graded gravel pack will be selected based on the grain size of the formation material in the screened interval. The placement of the gravel pack may require the use of a tremie pipe.

c. A 1-foot to 3-foot layer of clean, fine-grained silica sand may be placed above the selected gravel pack to isolate the coarse-grained gravel pack (below) from the fine-grained bentonite seal (above). Again, a tremie pipe may be used in the placement of the sand layer.

d. Several feet (approximately 1-3) of bentonite (powder or pellets) will be placed on top of the sand layer to seal the top of the gravel-packed screen zone.

e. The remainder of the annulus will be grouted to within a few feet of land surface. If PVC casing is used for the construction of deep wells, then extreme care must be taken in grouting the annular space in lifts (specified lengths) to avoid deformation of the PVC casing by the heat of curing and/or the weight of the grout. This is especially important if there are large voids which will serve as reservoirs for the grout.

f. A locking steel protective casing or curb box will be set over the well and cemented in place or welded to the steel casing to prevent water from

ponding at the top of the well or directly entering the well, and safeguard the well from accidental damage or vandalism.

2.4 Each well will be properly identified with the appropriate information (e.g., local well number, state permit number [if applicable], etc.). The top of the well casing will serve as the measuring point (MP) for ground-water level measurements. The measuring point will be surveyed to the nearest 0.01 foot relative to a common datum (e.g., mean sea level) by trained Roux Associates personnel or a professional, state-licensed surveyor as defined in the work plan.

2.5 If required, well clusters will be constructed. A well cluster is defined as a group of two or more wells, located adjacent to or very near each other, which penetrate different depths of the aquifer or formation. Each well is screened at a different depth to obtain data defining the vertical distribution of water levels and quality in the aquifer or formation. In the event that a well cluster is drilled, then one large-diameter (e.g., 6-inch, 8-inch, 10-inch, etc.) borehole may be drilled and each well in the cluster will be individually cased within that one borehole; however, the preferred method is to drill individual boreholes for each well in the cluster.

2.6 Each well will have a location sketch, a well construction log, and a geologic log showing the casing placement and materials used to fill the annular space between the well casing and borehole. The appropriate log will show the depths of each casing material and discuss the geologic variability at the site. A description of the surface soils and unsaturated zone materials down to and including the water table is required.

The following information, if applicable, will be included on the well log:

a. Project number.

b. Date and initials of scientist documenting the well information.

c. Date and time of construction.

d. Well location.

e. Well and permit numbers.

f. Borehole diameter.

g. Well depth.

h. Casing material.

i. Screen material.

j. Screen slot size and length.

k. Gravel pack type and size (depths from _____ to _____).

l. Sand pack (depths from _____ to _____).

m. Bentonite pellets (depths from _____ to _____).

n. Bentonite grout (depths from _____ to _____).

o. Cement grout (depths from _____ to _____).

p. Ground-surface elevation.

q. Measuring point elevation.

r. Well height above or depth below land surface.

s. Depth where ground water was encountered.

3.0 DESCRIPTION OF WELL DEVELOPMENT

3.1 Before a newly constructed well can be used for water-quality sampling, measuring water levels, or aquifer testing, it must be developed. Well development refers to the procedure used to clear the well and formation around the screen of fine-grained materials (sands, silts, and clays) produced during drilling or naturally occurring in the formation. Well development continues until the well responds to water-level changes in the formation (i.e, a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical.

3.2 Depending on the drilling technique used, composition of the formation screened, and well diameter and construction materials, well development may include one or more of the following techniques.

a. Bailing.

b. Pumping (centrifugal, submersible, or air).

c. Backwashing.

d. Surging (mechanical).

e. Jetting.

f. A combination of the above.

3.3 A 1-pint sample of the last water removed during development will be obtained and inspected by the field hydrogeologist for relative clarity to determine whether development is complete. A turbidimeter may be used to evaluate the clarity of the water removed from the well during development (and its use may also be stipulated by a regulatory agency). Well development procedures will be recorded on the well construction log form and in the field notebook.

3.4 Dispersing agents, acids, disinfectants, or other additives will not be used during development nor will they be introduced into the well at any other time unless specifically stipulated in the work plan. During development, water will be removed from the entire column of water standing in the well by periodically lowering and raising the pump intake. Well development will include the rinsing of the interior well casing above the water column in the well using only water from that well.

4.0 WELL ABANDONMENT OR CLOSURE

4.1 Upon the completion of the investigation, a determination will be made whether to maintain the well or to close it (i.e., abandon and seal it). If the client and Roux Associates agree to abandon the well, then the state will be notified and a request will be presented for well abandonment. Upon state approval to seal the well, appropriate state well abandonment forms will be completed. Following state approval, the abandonment of any well will be in accordance with local, state and/or Federal regulations.

4.2 For each abandoned well, the procedure will be documented on an appropriate field form and in the field notebook. Documentation may include, where appropriate, the following:

a. Well designation.

b. Location with respect to the replacement well, if replaced (e.g., 30 ft north and 40 ft west of Monitoring Well MW-1). A location sketch should be prepared.

c. Open depth prior to grouting and any other relevant circumstances (e.g., formation collapse).

d. Well casing left in the borehole by depth, size, and composition.

e. A copy of the geologic log.

f. A revised diagram of the abandoned well using the well construction log form.

g. Additional items left in hole by depth, description, and composition (e.g., lost tools, bailers, etc.).

h. A description and daily quantities of grout used to compensate for settlement.

i The date of grouting.

j. The level of water prior to grouting and the date and time measured.

k. The remaining casing, size, and composition above or below ground surface reported in depths or heights from ground surface.

l. Any other state or local well abandonment reporting requirements.

END OF PROCEDURE

APPENDIX E

Groundwater Sampling for Emerging Contaminants

Groundwater Sampling for Emerging Contaminants

April 2018

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

Implementation

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

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

Analysis and Reporting

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

The work plan should explicitly describe analysis and reporting requirements.

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

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

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

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

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

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

Full PFAS Target Analyte List

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

Bold entries depict the 6 original UCMR3 chemicals

Labs Certified for PFOA and PFOS in Drinking Water				
LAB ID	NAME	CITY	STATE	METHOD
10311	SUFFOLK	HAUPPAUGE	NY	EPA 537
10391	TESTAMERICA	SOUTH BURLINGTON	VT	ISO 25101
10670	EUROFINS	LANCASTER	PA	EPA 537
10730	AMERICAN	BELLEVILLE	IL	EPA 537
10756	MAXXAM	MISSISSAUGA	ON	EPA 537
10763	NYSDOH ORG	ALBANY	NY	EPA 537
10763	NYSDOH ORG	ALBANY	NY	ISO 25101
10899	CON-TEST	EAST LONGMEADOW	MA	EPA 537
10899	CON-TEST	EAST LONGMEADOW	MA	ISO 25101
11320	EUROFINS	MONROVIA	CA	EPA 537
11398	EUROFINS	SOUTH BEND	IN	EPA 537
11411	VISTA	EL DORADO HILLS	CA	EPA 537
11411	VISTA	EL DORADO HILLS	CA	ISO 25101
11501	GEL	CHARLESTON	SC	EPA 537
11608	PACE	ORMOND BEACH	FL	EPA 537
11627	ALPHA	WESTBOROUGH	MA	EPA 537
11666	TESTAMERICA	WEST SACRAMENTO	CA	EPA 537
11666	TESTAMERICA	WEST SACRAMENTO	CA	ISO 25101
11685	SGS NORTH	WILMINGTON	NC	EPA 537
11867	REGIONAL	NEW HAVEN	CT	EPA 537
12022	SGS NORTH	ORLANDO	FL	EPA 537
12060	ALS	KELSO	WA	EPA 537
12073	BSK ASSOCIATES	FRESNO	CA	EPA 537

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

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

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

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

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

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

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

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

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

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

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