Site-Specific Health and Safety Plan and Emergency Response Plan

Lusher Street Groundwater Contamination Superfund Site
Elkhart, Indiana

Lusher Street Remediation Group

GHD | 6520 Corporate Drive Indianapolis Indiana 46278

11119306 | Report No 4 | August 4, 2017

Emergency Contact List and Hospital Route Map

Emergency Contact Sheet

Lusher Street Superfund Site

Elkhart, Indiana

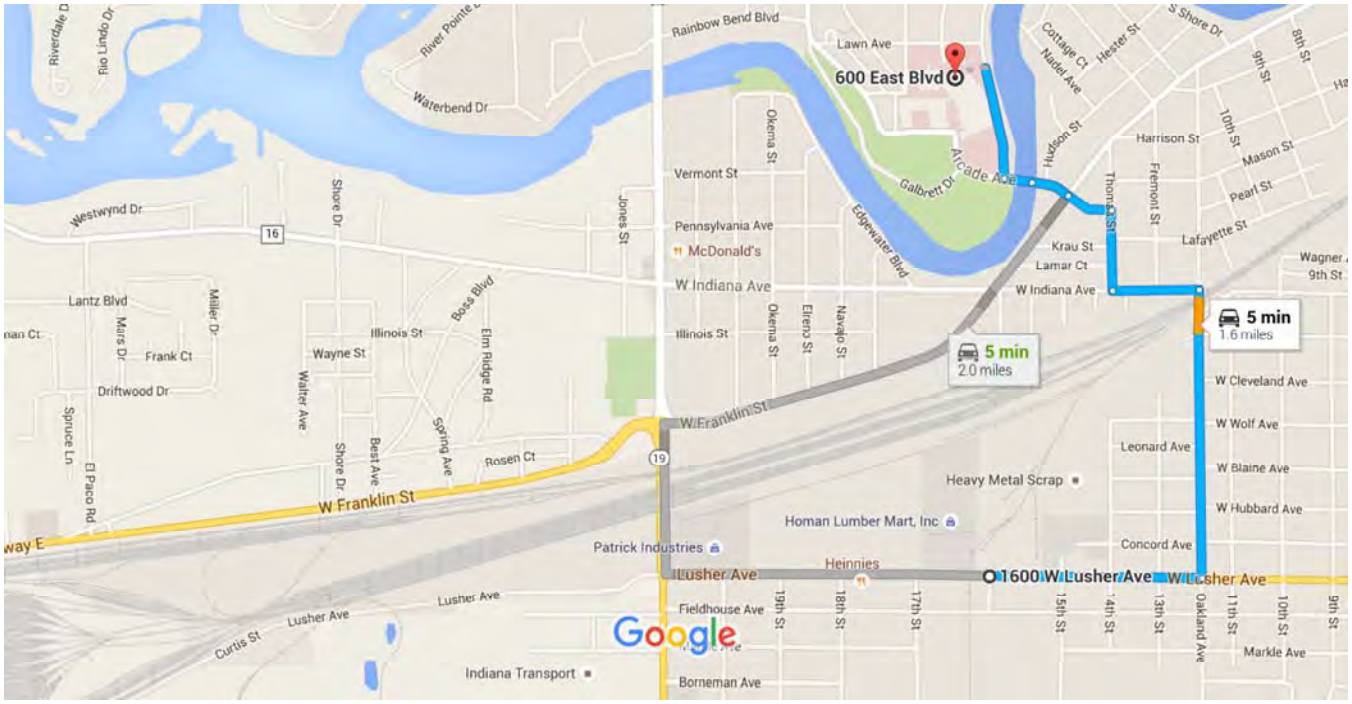
EMERGENCY INFORMATION		
Contact	**Phone Number**	**Hospital Directions**
Local Police Elkhart Police Department 135 Waterfall Drive Elkhart, Indiana 46516	**911** **574-295-7070**	Directions: 1. Head east on Lusher Ave toward 15th St; continue on Oakland Ave to Bridge St 2. Turn left onto Oakland Ave 3. Turn left onto W Indiana Ave 4. Turn right onto Thomas St 5. Turn left onto Scott St; continue on Bridge to East Blvd 6. Continue onto Bridge St 7. Continue onto Arcade Ave 8. Turn right onto East Blvd Driving Time: 5 mins Driving Distance: 1.6 miles **(See Attached Map)**
Fire Department Elkhart Fire Department 500 East Street Elkhart, Indiana 45616	**911** **574-293-8931**	
Ambulance	**911**	
Local Hospital: Elkhart General Hospital 500 East Blvd Elkhart, Indiana 45614	**574-294-2961**	
Clinic: U.S. Health Works 700 E. Beardsley Ave, Ste 100 Elkhart, IN 46514	**574-206-8010**	Driving Time: 9 mins Driving Distance: 3.4 miles **(See Attached Map)**
National Poison Center	**800-222-1222**	
Project Manager Steve Wanner Work: Cell:	 317-291-7005 317-313-6234	GHD – Incident Reporting Hotline Please call **(866) 529-4886** and provide: • Name and location of caller • Description of incident • Name of any injured persons • Description of injuries • Phone number for return call
Site Supervisor Matt Groves Work: Cell:	 317-291-7016 317-847-9644	
GHD Regional S&H Manager William (Bill) Doyle Work: Cell:	 734-453-5123 734-536-1282	
Client Contact Leo Brausch Work: Cell:	 704-246-7266 412-720-8549	
Other Contact Karen Kirchner, EPA Work: Cell:	 312-353-4669 NA	
Site Health Officer Matt Groves Work: Cell:	 317-291-7016 317-847-9644	
Person to verify hospital route (Name)	**Signature**	

* Hospital Route must be field validated before site work commences.

Google Maps

1600 W Lusher Ave, Elkhart, IN 46516 to 600 East Blvd, Elkhart, IN 46514

Drive 1.6 miles, 5 min



Map data ©2016 Google 1000 ft

1600 W Lusher Ave

Elkhart, IN 46516

1. Head east on Lusher Ave toward 15th St

48 s (0.4 mi)

Continue on Oakland Ave to Bridge St

3 min (0.9 mi)

2. Turn left onto Oakland Ave

0.5 mi

3. Turn left onto W Indiana Ave

0.2 mi

4. Turn right onto Thomas St

0.1 mi

5. Turn left onto Scott St

443 ft

Continue on Bridge St to East Blvd

23 s (0.1 mi)

6. Continue onto Bridge St

371 ft

7. Continue onto Arcade Ave

256 ft

8. Turn right onto East Blvd

Destination will be on the left

34 s (0.2 mi)

600 East Blvd

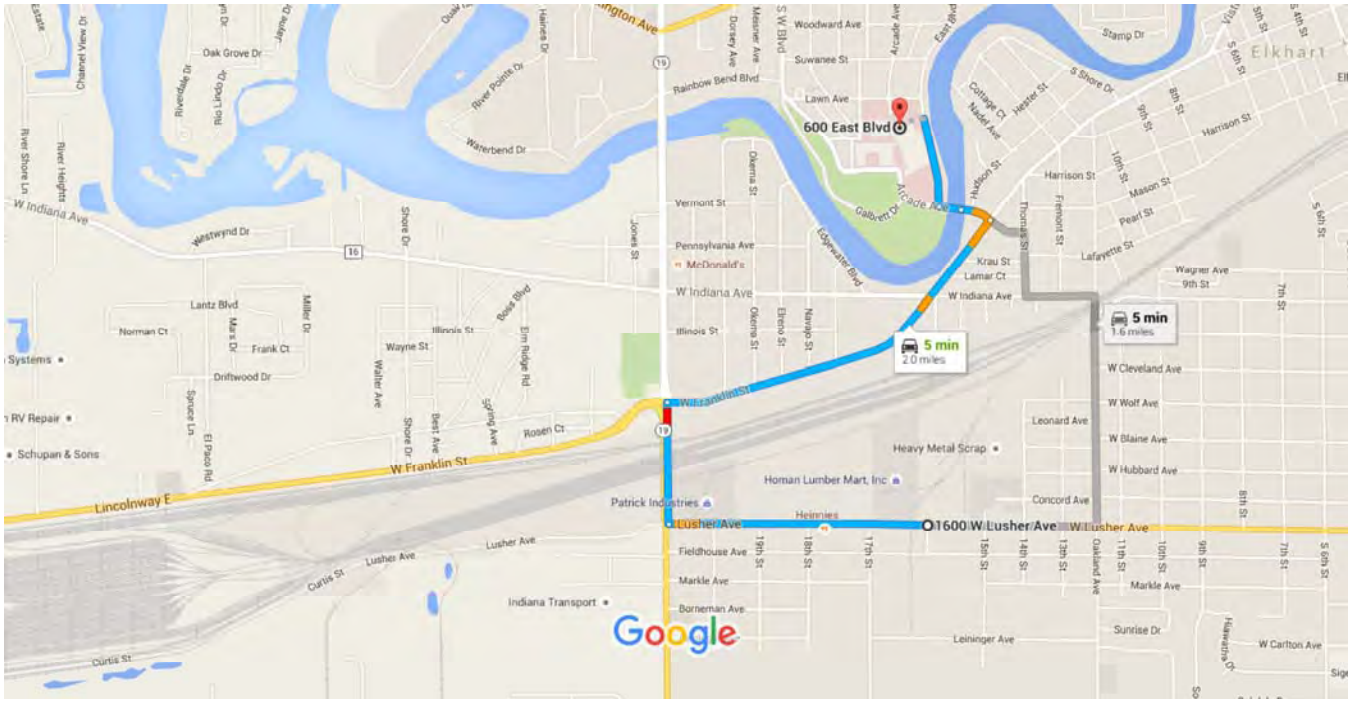
Elkhart, IN 46514

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Google Maps

1600 W Lusher Ave, Elkhart, IN 46516 to 600 East Blvd, Elkhart, IN 46514

Drive 2.0 miles, 5 min



Map data ©2016 Google 1000 ft

1600 W Lusher Ave

Elkhart, IN 46516

1. Head west on Lusher Ave toward 17th St — 0.6 mi
2. Turn right onto State Rte 19 N/S Nappanee St — 0.3 mi
3. Turn right at the 1st cross street onto W Franklin St — 0.9 mi
4. Turn left onto Bridge St — 371 ft
5. Continue onto Arcade Ave — 256 ft
6. Turn right onto East Blvd — 0.2 mi

Destination will be on the left

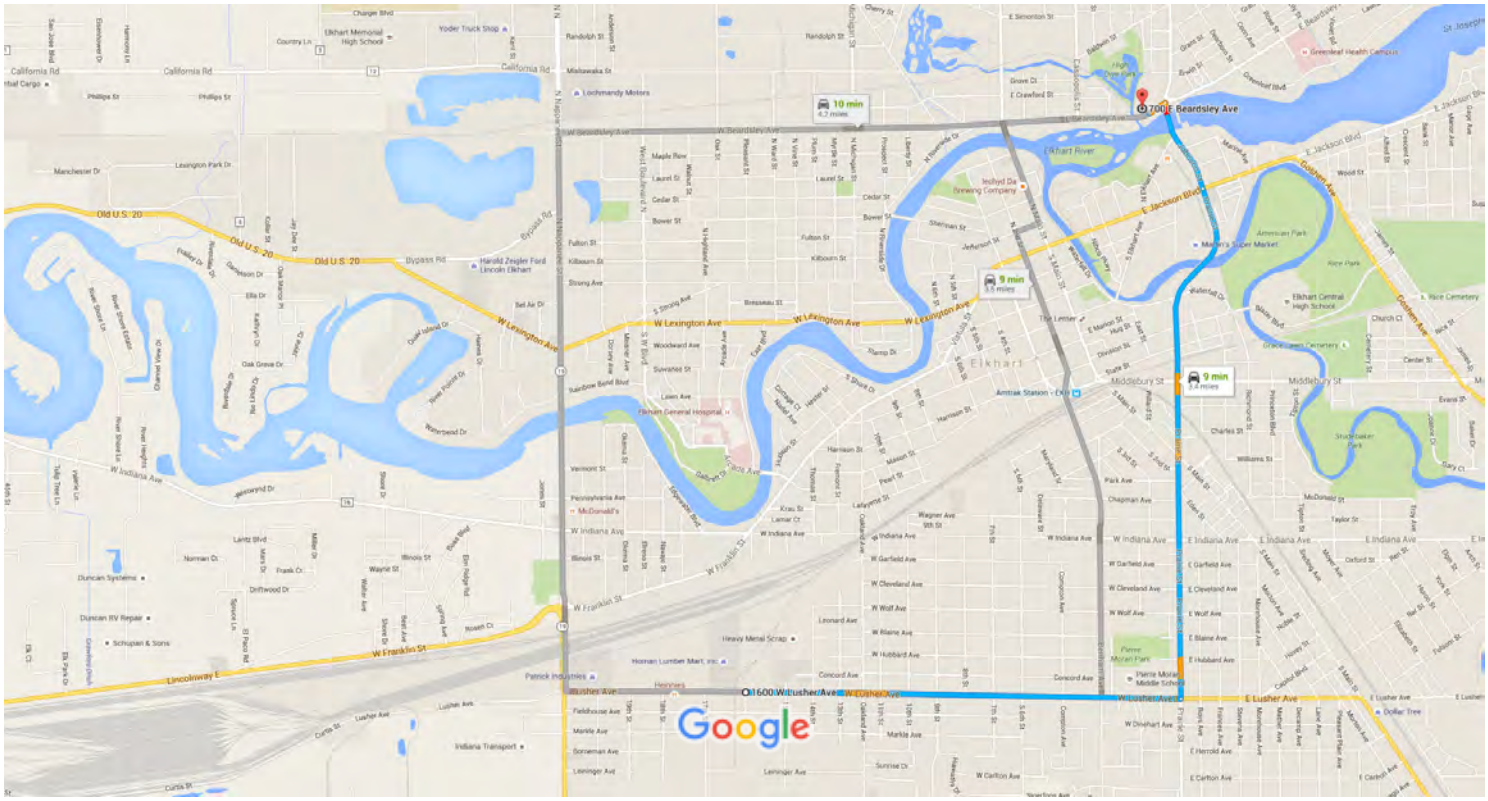
600 East Blvd

Elkhart, IN 46514

Google Maps

1600 W Lusher Ave, Elkhart, IN 46516 to 700 East Beardsley Avenue, Elkhart, IN

Drive 3.4 miles, 9 min



Map data ©2016 Google 1000 ft

1600 W Lusher Ave

Elkhart, IN 46516

1. Head east on Lusher Ave toward 15th St — 1.4 mi
2. Turn left onto Prairie St — 1.7 mi
3. Continue onto Johnson St — 0.3 mi
4. Turn left onto E Beardsley Ave — 315 ft
   Destination will be on the right

700 E Beardsley Ave

Elkhart, IN 46514

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Table of Contents

1. Introduction 1
   - 1.1 Purpose and Policy 1
   - 1.2 Stop Work Authority (SWA) 1
   - 1.3 Short Service Employee 1
   - 1.4 Project Management and Safety Organization 2
   - 1.5 Recordkeeping 4
   - 1.6 Site HASP Amendments 5
   - 1.7 Training Requirements 5
   - 1.8 Site Specific Training 5
   - 1.9 Safety Meeting/HASP Review 6
   - 1.10 Fatigue Management 6
   - 1.11 Management of Change 7
   - 1.12 Field Notes 7
2. History and Scope 7
   - 2.1 Site History/Background 7
   - 2.2 Scope of Work Tasks 8
3. Chemical Hazards 9
   - 3.1 Introduction to Chemical Hazards 9
   - 3.2 Control Measures 9
   - 3.3 Safety Data Sheets 10
   - 3.4 Container Labels 10
   - 3.5 Workers Training 10
4. Physical Hazards 10
   - 4.1 Introduction to Physical Hazards 10
   - 4.2 Heavy Equipment 10
   - 4.3 Excavations 12
   - 4.4 Utility Clearances 14
     - 4.4.1 Aboveground Utilities 14
     - 4.4.2 Underground Utilities 14
     - 4.4.3 Utility Strike Plan 15
   - 4.5 Material Handling 16
   - 4.6 Noise 17
   - 4.7 Fall Hazards 17
   - 4.8 Electrical Safety 17

Table of Contents

4.9 Heat Stress 18
4.10 Cold Stress 19
4.11 Hand and Power Tools 20
4.12 Portable Ladders 21
4.13 Slip, Trip, Hit, Fall 22
4.14 Aggressive or Menacing Behavior 22
4.15 Adverse Weather Conditions 23
4.16 Flammable & Combustible Liquids 23
5. Biological Hazards 24
5.1 Introduction to Biological Hazards 24
5.2 Biting and Stinging Insects 24
5.3 Poisonous Plants 25
5.4 Microbial Hazards 26
5.5 Aggressive Dogs 27
6. Personal Protective Equipment 29
6.1 Introduction to PPE 29
6.2 Types of Personal Protective Equipment (PPE) 30
6.3 Use of PPE 30
6.4 Respiratory Protection 31
6.5 Respirator Cleaning 32
6.6 Levels of Protection 32
7. Air Monitoring 32
7.1 Introduction to Air Monitoring 32
7.2 Types of Devices 33
7.3 Monitoring Frequency 34
7.4 Safety and Health Action Levels 34
8. Site Control 34
8.1 Introduction to Site Control 34
8.2 Communication 35
8.3 Buddy System 36
8.4 Site Security 36
8.5 Decontamination 36
8.6 Social Protection 37

Table of Contents

9. Traffic Control 39

10. Emergency Response Plan 40

10.1 Introduction Emergency Procedures 40

10.2 Incident, Injury, Illness Reporting and Investigation 40

10.3 Emergency Equipment/First Aid 41

10.4 Site Evacuations 41

10.5 Spill and Release Contingencies 41

10.6 Severe Weather 42

10.6.1 Weather Monitoring 42
10.6.2 Tornado Safety Policy and Procedures 42
10.6.3 High Winds 43
10.6.4 Lightning and Thunder 43
10.6.5 Outdoor Precautions During Severe Weather 43
10.6.6 Indoor Precautions During Severe Weather 44
10.6.7 Flash Flooding 44

Figure Index

Figure 1 Site Location Map

Figure 2 Site Layout – OU-1 Areas of Concern

Table Index

Table 1 Properties of Potential Site Contaminants

Table 2 On-Site Air Monitoring Program Action Levels

Appendix Index

Appendix A Forms

Appendix B Job Safety Analysis Tables

Appendix C Safety Data Sheets

List of Acronyms and Short Forms

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
BBS	Behavioral Based Safety
BEI	Biological Exposure Indices
CF	Correction Factors
dBA	A-weighted Decibels
°C	Degrees Centigrade
CRC	Contamination Reduction Corridor
CRZ	Contaminant Reduction Zone
°F	Degrees Fahrenheit
DOT	Department of Transportation
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
EZ	Exclusion Zone
GFCI	Ground Fault Circuit Interrupter
GHD	GHD Services Inc.
HASP	Health and Safety Plan
HAZCOM	Hazard Communication
HSE	Health, Safety and Environment
IDEM	Indiana Department of Environmental Management
JHA	Job Hazard Analysis
JSA	Job Safety Analysis
kg	Kilogram
kv	Kilovolt
lbs	Pounds
LEL	Lower Explosive Limit
LOTO	Lockout/Tagout
mph	Miles per hour
NFPA	National Fire Protection Agency

List of Acronyms and Short Forms

NIOSH	National Institute for Occupational Safety and Health
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
PC	Project Coordinator
PE	Professional Engineer
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts per Million
PACM	Potential asbestos-containing material
QSF	Quality System Form
RA	Remedial Action
RD	Remedial Design
RSHM	Regional Safety & Health Manager
ROW	Right-of-Way
SDS	Safety Data Sheets
SSO	Site Safety Officer
Site	Lusher Street Groundwater Contamination Superfund Site
SOW	Interim Remedial Design/Remedial Action Statement of Work
SS	Site Supervisor
SSE	Short Service Employee
STAR	Stop, Think, Assess, and Review
STEP	Safe Task Evaluation Process
SUV	Sport Utility Vehicle
SWA	Stop Work Authority
SZ	Support Zone
TLV	Threshold Limit Value
TTC	Temporary Traffic Control
UA	Unsafe Act
UC	Unsafe Condition

List of Acronyms and Short Forms

VI	Vapor Intrusion
VOCs	Volatile Organic Compounds
WESP	Workplace Electrical Safety Program
WBGT	Wet Bulb Globe Temperatures

1. Introduction

1.1 Purpose and Policy

The purpose of this combined site-specific Health and Safety Plan (HASP) and Emergency Response Plan (ERP) is to provide guidelines and establish procedures for reducing and controlling hazard exposure to the public, property and personnel and responding to emergencies at the site. This document is intended to comply with Sections 6.7(a) and (b) of the Interim Remedial Design/Remedial Action (RD/RA) Statement of Work (SOW) for the Lusher Street Groundwater Contamination Superfund Site (Site).

1.2 Stop Work Authority (SWA)

All GHD employees are empowered and expected to implement SWA to stop the work of coworkers, subcontractors, or other contractors if any person's safety or the environment are at risk. No repercussions will result from this action. Reporting of unsafe acts/unsafe condition (UA/UC) or SWA is documented with GHD's Unsafe Act/Unsafe Condition (UA/UC)/SWA form (Appendix A). The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated requires the removal of site personnel from that area and re-evaluation of the hazard and the levels of protection.

1.3 Short Service Employee

The Short Service Employee (SSE) is identified as having less than 6 months employment and requires supervised training while working in the field. The individual is required to wear a fluorescent orange hardhat, a reflective safety vest or another obvious indicator of SSE status. Training and mentoring allows them to gain knowledge and experience in procedures and methods. In order for a new employee to work in the field, the following minimum training requirements must be met:

1. GHD New Employee Safety & Health Orientation training
2. GHD Hazard Communications (HAZCOM) training
3. On-boarding completed with Human Resources
4. Compliance training defined on the QSF-20 as it applies to field work to be conducted

A SSE's primary mentor is their direct Supervisor. GHD Supervisors are responsible for ensuring that a SSE completes the safety, field method, and quality training as appropriate to the work they are assigned. A SSE requires an on-site mentor for all fieldwork. The on-site mentor must have experience in the work they are mentoring and they are responsible for the close monitoring of the SSE.

Project team SSE make-up requirements are:

- A one-person project team cannot be a SSE
- A two-person to five-person project team can have only one SSE

A six-person or more project team cannot have more than 20 percent SSE without a written variance from the GHD Corporate Manager of Safety & Health.

New hire employees that can provide sufficient documentation supporting previous experience in working under Behavior Based Safety Systems similar to GHD's system may be exempt from GHD's SSE Program. These exemptions are handled on a case-by-case basis and must be authorized by one of the following staff: the Corporate Manager of Safety & Health or a Senior Regional Safety & Health Manager (RSHM). Details of the exemptions are covered in the full SSE Policy.

1.4 Project Management and Safety Organization

Project Manager (PM) – GHD – Steven Wanner

The GHD Project Manager (PM) is responsible for the overall implementation, review and approval of the HASP, ensuring that qualified personnel are assigned to the project, communication with client and government representatives. The PM will also ensure that appropriate resources are provided to support the project.

Site Supervisor (SS) – GHD – Matthew Groves

The Site Supervisor (SS) is responsible for ensuring the HASP is implemented by GHD crews in the field including:

- Designating a Site Safety Officer (SSO) for each active job site
- Ensuring that the HASP is reviewed, approved and implemented by SSO.
- Consulting with the PM, SSO, and site personnel regarding appropriate changes to the HASP.
- Ensuring that behavior-based safety procedures on all activities and enforcing safe work practices for project employees.
- Maintaining communication with the PM, SSO and/or government inspectors/agencies.
- Verifying emergency phone numbers and services, including hospital and clinic locations.
- Conducting job site inspections as a part of quality assurance for safety and health.
- Reporting safety and health concerns to site and/or project management as necessary.

Site Safety Officer (SSO)

The SSO is responsible for implementing the HASP at the jobsite for which they are responsible. Due to the nature of the work, different tasks may be performed at different locations at the same time. The SSO is a qualified GHD employee placed in charge of supervising a particular job location. There may be multiple SSOs working at different job sites at the same time. Each SSO is responsible for:

- Having a copy of the HASP at an accessible location near their job site
- Ensuring that the HASP is reviewed and signed by on-site workers, and implemented by site workers.
- Communicating site requirements to site project personnel and subcontractors through site orientation. Consulting with the SS and PM regarding appropriate changes to the HASP.
- Conducting a daily tailgate safety meeting that communicates the site specific hazards. This meeting must be documented on the Tailgate Safety Meeting form in Appendix A.

- Ensuring that all necessary cleanup and maintenance of safety equipment is conducted by project personnel.
- Completing, filing and correctly submitting the forms attached to the HASP, including daily tailgate meetings, job safety analysis and daily inspection checklists.
- Observing ill effects on any crew member, especially those symptoms caused by cold/heat stress or chemical exposure.
- Overseeing the safety of visitors who enter the site.
- Maintaining communication with the PM and SS regarding safety issues.
- Providing and enforcing the use of safety equipment, personal protective equipment (PPE), and other items necessary for employee or community safety.
- Conducting job site inspections as a part of quality assurance for safety and health.
- Ordering the immediate shutdown of site activities in case of a medical emergency, unsafe condition, or unsafe practice.
- Reporting safety and health concerns to site and/or project management as necessary.

Regional Safety and Health Manager (RSHM) – GHD – William (Bill) Doyle

The RSHM is a full time GHD employee who is trained as a safety and health professional and serves in a consulting role to the PM and SS regarding potential safety and health issues. A RSHM or trained designee must review, coordinate required changes with PM and provide the final approval of the HASP prior to work beginning on site.

Site Personnel

GHD

All employees have a role in GHD's SMART program and a responsibility to implement the program. GHD personnel are responsible for:

- Engaging in all aspects of their tasks and jobs when they are prepared to do the job safely, well rested, and mentally prepared for work
- Utilizing the Stop, Think, Assess, and Review (STAR) hazard recognition process before initiating work
- Implementing SWA for any operations that may cause injury, illness or unsafe conditions to employees, subcontractors, or others
- Assisting in the development and revision of Job Safety Analysis (JSA) forms that are appropriate to their current scope of work
- Use, inspect and maintain PPE as required by JSA and site conditions
- Preparing, submitting, and reviewing behavior-based safety observations using the Safe Task Evaluation Process (STEP)
- Process STEP forms
- Inspecting tools and other equipment before each use or as manufacturer dictates and documenting any defects
- Correcting jobsite hazards when possible without endangering life or health

- Reporting safety and health concerns to the SS, SSO, PM, and RSHM

Subcontractors

Subcontractors are responsible for:

- Developing and implementing their own HASP and complying with its contents
- Attending an initial site orientation and subsequent safety meetings
- Ensuring that their employees adhere to all site personnel requirements
- Submitting required documentation to the SSO regarding federal, state or provincial requirements before beginning any work
- Obtaining approval for the use of GHD's equipment
- Observing and obeying all GHD/client requirements as well as any specific direction given by GHD's management team
- Wearing any personal protective equipment required by their HASP and GHD at all times
- Meeting all governing regulations/industry standards for equipment used on GHD projects. Verifying that all subcontractor employees have required training, medical clearance and substance abuse testing as required by project
- Not being in possession or under the influence of alcohol, incapacitating drugs or medications

In the event of conflicting safety procedures or requirements, personnel must implement those safety practices that afford the highest level of safety and protection. In addition, noncompliance with safety and health policies and procedures may subject the subcontractor to disciplinary action up to and including termination of their contract with GHD.

Equipment Operators

All equipment operators must meet all the requirements of site personnel listed above and are responsible for the safe operation of heavy equipment under their control. Operators are responsible for conducting documented daily inspections on their equipment to ensure safe performance. Brakes, hydraulic lines, backup alarms and fire extinguishers must be inspected routinely throughout the project. Equipment will be taken out of service if an unsafe condition occurs. Daily inspections must be provided to the GHD site supervisor prior to the equipment being used.

Authorized Visitors

Authorized visitors, as approved by the PM, SS, or SSO are provided with all relevant information regarding site operations and hazards as applicable to the purpose of their visit. Visitors may be required to be accompanied by authorized personnel.

1.5 Recordkeeping

The SSO will establish and maintain records of all necessary and prudent monitoring activities as described below:

- Name and job classification of the employees involved on specific tasks.
- Air monitoring/sampling results and instrument calibration logs.

- Records of training acknowledgment forms (site specific training, toolbox meetings, etc.).
- Documentation of site inspections, results of inspections, and corrective actions implemented.
- Emergency reports describing any incidents or accidents.

1.6 Site HASP Amendments

Any change to the scope of work must be evaluated for its impact on the overall health and safety of the project and associated personnel. A minor change is one that adjusts already-documented hazards within the HASP and does not expose site personnel to chemicals above exposure limits, such as the introduction of a new JSA, or PPE that does not involve a change in respiratory protection. Amendments must be documented on the Site Health and Safety Plan Amendment Form located in Appendix A, in addition to notifications to key personnel.

Significant changes to the scope of work require a rewrite by the PM and review/approval of the HASP by a RSHM.

1.7 Training Requirements

All personnel conducting work at this site shall have completed the appropriate HSE training as applicable to their job tasks/duties. Project personnel that will perform work in areas of known contamination also shall have completed hazardous waste operations-related training, as required by the OSHA Standard 29 CFR 1926.65 and 29 CFR 1910.120. Personnel who completed their training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. The required training is referenced throughout the HASP and identified on each JSA form.

In accordance with the requirements detailed in 29 CFR 1926.65 and 29 CFR 1910.134, all project personnel who will come in contact with potentially contaminated materials will have received medical surveillance by a licensed physician or physician's group.

Medical records for all project personnel will be maintained by their respective employers. The medical records will detail the tests that were taken and will include a copy of the consulting physician's statement regarding the tests and the individual's suitability for work as per the employer's medical surveillance program which is to be in accordance with 29 CFR 1926.65.

The medical records will be available to the employee or his designated representative upon written request, as outlined in 29 CFR 1910.1020.

1.8 Site Specific Training

An initial site specific training session or briefing will be conducted by the SSO prior to commencement of work activities. During this initial training session, employees will be instructed on the following topics:

- Personnel responsibilities
- Content and implementation of the HASP Site hazards and controls
- Site specific hazardous procedures (e.g., drilling, excavations, etc.) Training requirements
- PPE requirements

- Emergency information, including local emergency response team phone numbers, route to nearest hospital, incident reporting procedures, and emergency response procedures
- Instruction in the completion of required inspections and forms
- Location of safety equipment, such as portable eyewash, first aid kit, fire extinguishers, etc.

The various components of the project HASP will be presented, followed by an opportunity to ask questions to ensure that each attendee understands the HASP. Personnel will not be permitted to enter or work in potentially contaminated areas of the site until they have completed the site specific training session. Personnel successfully completing the training session will sign the HASP Acknowledgement Form, which is presented in Appendix A.

In addition to the initial site briefing conducted at the commencement of the project, supplemental brief safety meetings will be conducted to discuss potential safety and health hazards associated with upcoming tasks and necessary precautions to be taken.

1.9 Safety Meeting/HASP Review

"Tailgate" safety meetings will take place each day prior to beginning the day's work. All site personnel will attend these safety meetings conducted by the SSO. The safety meetings will cover specific safety and health issues, including the appropriate JSAs, site activities, changes in site conditions, and a review of topics covered in the site specific pre-entry briefing. The safety meetings will be documented each day with written sign in sheets containing a list of topics discussed. To assist with the compliance of documentation of the Tailgate safety meetings, there is a Tailgate Safety Meeting form located in the Appendix A.

1.10 Fatigue Management

GHD employees and subcontractors are responsible for ensuring they are both physically and mentally fit to perform their job functions safely as part of GHD's Fatigue Management Program. GHD will use the following control measures to minimize fatigue during the project:

- Alter the work schedule to reduce the overall time a worker will perform physically demanding work.
- Monitoring employee behaviors for signs of fatigue.
- Eliminate or reduce where practicable the need to work extended hours, night shifts, or overtime.
- Use work-rest patterns during repetitive tasks to control fatigue and increase mental fitness.

GHD's work/rest balance requirements are referenced based on weight of the vehicle. Less than 10,000 pounds (lbs)/4536 kilogram (kg) [passenger cars, pickup trucks, sport utility vehicles (SUVs)] will follow the following guidelines:

- Maximum working time and/or driving and working time within one work day: 14 hours (extendable up to 16 hours if drive time < 4 hours and/or airplane travel is involved; this approach can be taken three times in a 7 day period)
- Maximum continuous drive time: 3 hours followed by a 15 minute break
- Maximum drive time per day: 9 hours (extendable up to 10 hours twice in 7 day period)

Employees that drive vehicles greater than 10,000 lbs/4,536 kg must meet the requirements of the transportation agency for which they work and travel.

1.11 Management of Change

Safety incidents are known to occur when key changes are not communicated to all stakeholders related to a project. Management of Change is covered by the GHD Quality Manual Section 7.3.7 Control of Project Changes and is documented using QSF-006 Management of Change Form (see Appendix A).

The types of changes that are to be documented and communicated are:

- Project management/Resources (key personnel)
- Equipment
- Safety – this would not include daily changes to JSA when dirtied in the field
- Field Operations/SOP

1.12 Field Notes

All activities undertaken in the field must be correctly and completely recorded in bound field books, Quality System Field Data Record Forms (QSF 200, QSF 400, and QSF 500 Series D), or in some other GHD approved format (i.e., electronically, loose paper). All records will be kept in the GHD approved format specified for the activities undertaken. The formats have been established to ensure completeness and to provide consistency amongst the field staff.

Upon completion of each project, all of the field documentation is brought back and suitably stored at the GHD office in which the field staff that performed the field work is located.

2. History and Scope

2.1 Site History/Background

The Site is located in the west-central portion of the City of Elkhart, Indiana and is bounded by the St. Joseph River on the north, State Road 19 (Nappanee Street) on the west (with the exception of a small area in the far northwestern potion that lies just west of Nappanee Street), Hively Avenue to the south, and Oakland Avenue to the east (Figure 1). The estimated population living within the Site boundaries is approximately 2,600.

The Site is composed of mixed residential, commercial, and industrial areas bisected by a railroad yard and served by a mix of private wells and municipal water. Industrial and commercial activities in Elkhart include the manufacture of pharmaceuticals, recreational vehicles, mobile and modular homes, instruments (such as woodwinds), tape, corrugated containers, and foam and plastic products. Other industrial activities in the Site area include metal fabrication and scrapping, automobile salvage and repair, plating, lumber yard activities, and a former solid waste disposal area. Many of these businesses are located along Lusher Avenue and Franklin Street. Figure 2 presents a layout of the site.

The Site encompasses an area of groundwater containing volatile organic compounds (VOCs) as well as the area surrounding the VOC plume. The Site groundwater plume primarily contains

chlorinated VOCs including tetrachloroethene; trichloroethene; chloroform; 1,1-dichloroethane; and vinyl chloride. Historically, 1,1,1-trichloroethane; 1,1-dichloroethene; and 1,2-dichloroethene also have been detected in groundwater at the Site. The source or sources contributing the VOCs to the groundwater plume have not been fully identified. Currently, properties within the Site boundary obtain drinking water from private groundwater wells and the municipal water supply. Although the depths of the private wells are unknown, they are suspected to be shallow and screened in the St. Joseph Aquifer.

2.2 Scope of Work Tasks

This HASP covers the specific site field activities that will be conducted by GHD personnel as follows:

- Mobilization of personnel, materials, and equipment to and from the site
- Site reconnaissance activities
- Residential and commercial building inspections
- Communication testing
- Vapor intrusion (VI) mitigation system installation oversight
- Water main and residential water service line installation oversight
- System operations, maintenance & monitoring (OM&M)
- Air sampling
- Demobilization of personnel, materials, and equipment to and from the site

If site operations are altered or if additional tasks are assigned, an addendum to this HASP will be developed to address the specific hazards associated with these changes. All addenda are to be developed in conjunction with project management and a GHD Health, Safety and Environment (HSE) Team member.

This HASP covers the specific site activities that will be conducted by GHD personnel and their subcontractors. These activities listed here, and in the attached JSAs cover the tasks being performed onsite.

Driving, Site Reconnaissance and Walk through Activities, Mob/Demob of personnel, material, and equipment, Excavation Oversight, Decontamination of Sampling Equipment and Personnel, Land Surveying for elevation and location, Vapor Probe Installation and Sampling, Site Inspection (Construction)

If site operations are altered or if additional tasks are assigned, an addendum to this HASP will be developed to address the specific hazards associated with these changes.

All addendums will be required to be developed in conjunction with project management and a GHD safety professional.

3. Chemical Hazards

3.1 Introduction to Chemical Hazards

The Site encompasses an area of groundwater containing VOCs as well as the area surrounding the VOC plume. The primary potential routes of exposure to VOC by Site workers include direct contact with shallow groundwater during excavations, accidental ingestion of groundwater containing VOCs during construction work, and inhalation of vapors containing low levels of VOCs during construction and VI mitigation activities. A listing of the VOCs of concern is found in Table 1.

In addition to VOCs, there is a possibility that Site workers may encounter potential asbestos-containing materials (PACM), lead-based paint, and mold during water connection and vapor mitigation activities. GHD will perform pre-installation inspections and will include observations for these potential hazards.

Every effort will be made to avoid disturbing existing PACM during the design and installation phases. In the unlikely event that it becomes necessary to disturb any non-friable PACM in a manner that could result in the material becoming friable, a plan to test and, if necessary, mitigate asbestos-containing material only to the extent necessary to allow for installation of water supply and VI mitigation systems will be developed. Workers conducting asbestos testing and removal will be licensed in Indiana to perform such work.

There is a potential to encounter lead-based paint during construction and VI mitigation activities. It is unlikely that a need to disturb any significant areas of painted surfaces during the RA work. However, should this need arise in any of the individual designs, the paint will be tested. If the paint tests positive for lead, it will be removed only to the extent required to facilitate the water main connection or VI mitigation system installation and the property owner will be advised as to the presence of the lead-based paint. All removed paint will be containerized for proper characterization and disposal.

In the event that a significant amount of mold is observed at any location that may endanger the health of site workers, stop-work authority will be exercised and the property owner will be advised of the situation. Work will resume only after the property owner abates the mold.

3.2 Control Measures

Measures to control potential exposure to potential on site contaminants/chemicals include the following:

- Engineering controls such as ventilation or elimination.
- Administrative controls such as work rotation, training, or proper hygiene practices (washing facilities).
- Monitoring air concentrations with appropriate equipment in the breathing zone.
- Selecting and using PPE such as gloves or respiratory protection.

JSAs are developed and revised to list the associated hazard controls on a task-specific basis.

3.3 Safety Data Sheets

Safety Data Sheets (SDSs) are documents created by the chemical manufacturer that describe the substance. Some information found on an SDS includes: hazardous and physical characteristics, handling requirements, storage and disposal information, and signs and symptoms of exposure.

When working with hazardous chemicals, readily available and up-to-date SDSs are required for each chemical. GHD personnel and its subcontractors are responsible for obtaining and maintaining SDSs for their controlled products and for products that they are bringing onto site. The SSO is responsible for maintaining an inventory of SDS and ensuring they are made readily available to all employees and visitors.

3.4 Container Labels

All hazardous materials, hazardous waste, chemical containers and chemical storage areas are appropriately labeled indicating the chemical identity, hazards present and any relevant regulatory requirements. Labeling of all chemical containers assists emergency personnel and others in identifying hazards if a spill occurs or emergency situation arises.

Chemical container labeling is the responsibility of the individual who fills and/or uses the chemicals. All containers into which chemicals are transferred are legibly labeled in the language that can be understood by the employees who work with or in proximity (English, French, Spanish, etc.) and include the name of the chemical and appropriate hazard warnings.

3.5 Workers Training

All employees who may work in proximity to controlled products maintain current applicable training as appropriate. Records of training are readily available upon request.

4. Physical Hazards

4.1 Introduction to Physical Hazards

Physical Hazards are factors within the environment that can harm the body without necessarily touching it. Vibration and noise are examples of physical hazards. Physical hazards for this site have been identified in the following section. If the hazards change due to site conditions or additions to the scope of work, SWA must be implemented and the conditions identified to the PM and RHSM prior to proceeding with the work.

In addition, personnel must be aware that the protective equipment identified in the JSA may limit dexterity and visibility and may increase the difficulty of performing some tasks.

4.2 Heavy Equipment

Heavy equipment such as drill rigs, backhoes, trackhoes, wheel or track loaders, compactors and other similar equipment will be needed to close residential water supply wells and to install water service lines and water mains during the RA. GHD field staff should minimize time spent in close proximity to operating heavy equipment, including during set-up/teardown time. It is critical to maintain a safe work distance from the operators and crews to allow them the necessary room to

perform their tasks. GHD field personnel should only be near the heavy equipment when their work activity dictates.

The following practices are adhered to by personnel operating heavy equipment (such as backhoes, excavators, bull dozers, rock trucks) and personnel working in the vicinity of heavy equipment.

- Heavy equipment is only operated by authorized, qualified operators.
- All equipment is inspected when equipment is initially mobilized, delivered to a job site, or after it is repaired and returned to service, to ensure that it meets all manufacturer and legislative specifications. Documentation of maintenance records must be available upon request.
- The operator inspects the equipment prior to each use and documents the first use on a daily basis.
- Ensure operator conducts a 360-degree walk around of the equipment prior to entering the equipment.
- Seat belts/restraining devices are used on heavy equipment that is not designed for stand up operation.
- Equipment/vehicles that are loaded by crane, excavator, loader, etc. have a cab shield and/or canopy to protect the operator.
- Personnel only ride in equipment that is designed for transporting individuals and have a fully functional seat and available restraining devices. “Piggybacking,” such as riding on fender steps or any place outside the cab, is not allowed.
- Personnel are not raised/lowered in buckets.
- Before leaving the equipment controls, the equipment is in its safe resting position or cribbed in a “dead” or neutral position. No controls are abandoned while under load.
- Before raising any booms, buckets, etc., overhead obstructions are checked.
- A competent spotter is used when moving heavy equipment, working within 10 feet of a stationary object, encroaching overhead utilities clearance minimums, in tight quarters, or with limited visibility.
- Employees involved in the operation do not wear any loose fitting clothing, as it can be caught in moving machinery.
- Personnel must wear an approved high-visibility safety vest where any vehicular traffic occurs.
- The work site should be designed to limit the operations being performed in reverse.
- Working areas are properly delineated to keep unauthorized individuals out. All personnel should never proceed into a work zone without making eye contact and receiving authorization by the operator or spotter to cross the path of any heavy equipment. Authorization is given from outside the blind or crushing zones of the equipment.

Operators and work crews are responsible for all activities related to setup and operations. The contractors will brief GHD personnel and crew during the tailgate safety meeting on the critical safety features and identifies known hazards when working near the heavy equipment.

The GHD site supervisor ensures the following:

- All PPE and protective hazard mitigation is in place, as necessary, prior to work starting.

- JSAs are reviewed and applied.
- A daily is completed by the operator to ensure that the equipment is functioning as intended.
- The emergency switches are functional and verified to be operational during the documented daily equipment check.
- The QSF-019 Property Access/Utility Clearance Data Sheet is signed and that all utility clearances are obtained, reviewed, understood and confirmed before intrusive activities begin.
- No operators are wearing any loose fitting clothing, including untied shoe/boot laces, drawstrings, etc., due to the potential of being caught in rotating machinery.
- Overhead hazards including utility lines are checked.
- The work area is properly demarcated with rope, caution tape, and fencing, and marked or posted to keep the area clear of pedestrian traffic or spectators.
- Before leaving the vicinity of the heavy equipment, the operator shuts down the engine and secures the equipment.

4.3 Excavations

The QSF-019 Property Access/Utility Clearance Data Sheet is signed and that all utility clearances are obtained, reviewed, understood and confirmed before excavation begins. All GHD excavation and trenching operations that employees will enter will be observed by a designated competent person. The competent person will be responsible for evaluating and inspecting excavation and trenching operations to prevent possible cave-in and entrapment, and to avoid other hazards presented by excavation activities.

Each employee in an excavation will be protected from cave-ins by one of three systems:

- Sloping and benching systems
- Shoring
- Shielding systems

All excavation and trenching operations will be conducted in accordance and in compliance with Occupational Safety and Health Administration's (OSHA's) Standards for the Construction Industry, specifically outlined in GHD's Safety and Health Program for excavation and trenching activities. At a minimum, the following safety guidelines will be adhered to while conducting excavation and trenching activities:

- Excavation and trenching operations require pre planning to determine whether sloping or shoring systems are required, and to develop appropriate designs for such systems. Also, the estimated location of all underground installations must be determined before digging/drilling begins. Necessary clearances must be observed.
- If there are any nearby buildings, walls, sidewalks, trees or roads that may be threatened or undermined by the excavation, or where the stability of any of these items may be endangered by the excavation, they must be removed or supported by adequate shoring, bracing, or underpinning.
- Excavations may not go below the base of footings, foundations or retaining walls unless they are adequately supported or a person who is registered as a Professional Engineer (PE) has determined that they will not be affected by the soil removal. Civil engineers or those with

licenses in a related discipline and experience should be consulted in the design and use of sloping and shoring systems. PE qualifications must be documented in writing.

Access and Egress

Personnel access and egress from trench and/or excavations are as follows:

- A stairway, ladder, ramp or other means of egress must be provided in trenches greater than 4 feet deep and for every 25 feet of lateral travel.
- All ladders will extend 3 feet above the top of the excavation.
- Structural ramps used for access or egress of equipment will be designed by a competent person qualified in structural design or by a licensed professional engineer.

Atmosphere Monitoring and Testing

Air quality is measured using three parameters: oxygen concentration, flammability, and the presence of hazardous substances.

Employees should not be exposed to atmospheres containing less than 19.5 percent oxygen or having a lower flammable limit greater than 10 percent, and employees should not be exposed to hazardous levels of atmospheric contaminants.

Whenever potentially hazardous atmospheres are suspected in excavations and trenches, a competent person will test the atmosphere. Detector tubes, gas monitors and explosion meters are examples of monitoring equipment that may be used.

In the event that an unusual odor or liquid is suspected in excavations and trenches, the competent person will stop work on the site and arrange for an air quality assessment and mitigation, if necessary.

Atmospheric testing and monitoring will be performed in excavations in areas where hazardous materials are/were stored, or in areas where the presence of hazardous materials is suspected.

Daily Inspections

The competent person will perform daily inspections of excavations, the adjacent areas and all protective systems for situations that could potentially result in slope failure.

Additionally, the competent person will be aware of the potential for confined space situations and other hazardous work conditions.

The competent person will inspect, evaluate and complete the excavation checklist at the following intervals:

- Prior to the start of work, after each extended halt in work, and as needed throughout the shift, as new sections of the excavation or trench are opened.
- After every rainstorm and other natural or man-made event that may increase the load on the walls of the excavation, or otherwise affect their stability.

The inspections will be documented using the GHD Excavation Inspection Checklist attached to this HASP (Appendix A).

The competent person will stop the work and instruct all employees to leave the excavation or trench when any potential hazards are detected. The competent person has the authority to immediately suspend work if any unsafe condition is detected.

4.4 Utility Clearances

4.4.1 Aboveground Utilities

Extreme caution is needed when working around electrical power lines. Elevated equipment such as drill rigs, backhoes, scaffolding, ladders, etc. must remain the required distance according to the local/state/provincial regulations.

These minimum requirements are:

Occupational Safety and Health Act 1926.550(a)(15)	
Operating voltage of overhead power	Operating voltage of overhead power safe limit of approach distance for persons and equipment
<50 kv	10 feet
>50 kv	20 feet
For lines rated over 50 kilovolts (kv), minimum clearance between the lines and any part of the crane or load will be 10 feet plus 0.4 inch for each 1 kv, over 50 kv, or twice the length of the line insulator, but never less than 10 feet.	

- If any part of a machine may encroach these parameters, SWA is implemented, a review of the work scope is conducted with the PM and RHSM, and a spotter is used.

4.4.2 Underground Utilities

Underground utilities, if present, are to be clearly marked and identified prior to commencement of work. Follow applicable regulations and client requirements with regards to utility-locating requirements (e.g., Indiana 811 One Call Service).

Personnel involved in intrusive work will:

- Confirm proposed excavation(s) and heavy truck routes are not in the area of subsurface utilities. This meeting is to be documented.
- Review and adhere to GHD's Subsurface Utility Clearance Protocol SOP at a minimum. Use air knifing or vacuum truck digging techniques inside 36 inches of the outside edge of an underground utility.
- This distance can vary based on regulations, legislation, facility/client requirements, etc.
- Complete the Property Access/Utility Clearance Data Sheet (QSF 019) prior to initiating excavation activities.
- On private property, request that the owner of the service locate and mark the service.
- If a service may pose a hazard and cannot be shut off or disconnected, request that the owner of the service supervise the uncovering of the service during the work.

- Identify the work that can be conducted with the assistance of the locator line service, coordinate document/drawing review, and inspect the site for manholes, catch basins, valve boxes, etc. that may indicate the direction/depth of underground installations. Marking indicates only the approximate location of buried lines.

  The following are the Uniform Color Codes for utility locates:

White	Proposed excavation
Pink	Temporary survey marking
Red	Electrical power lines, cables, conduit and lighting cables
Yellow	Gas, oil, steam, petroleum or gaseous material
Orange	Communication, alarm or signal lines, cables or conduit
Blue	Potable water
Purple	Reclaimed water, irrigation and slurry lines
Green	Sewers and drain lines

4.4.3 Utility Strike Plan

In the event utilities accidentally are struck, work should be stopped immediately and the situation should be assessed for conditions that may jeopardize the safety of site workers or the general public. If a gas or electrical utility is struck, take the actions described in the subsections below. In the event a site worker or members of the general public may be in immediate danger, call 911 immediately to report the condition.

If another utility is struck that does not impose an immediate danger to site workers or the public (e.g., telephone, fiber optic, or television cable; water lines, etc.), the area should be secured and the appropriate utility company called to repair any damage.

If a utility strike incident occurs call the GHD Hotline at 1-866-529-4886 as soon as possible once the area is secured and any emergency response is underway.

Electric Utility Strike

In the event of an electrical utility strike, secure the area and call 911 immediately. When mobile construction equipment contacts a power line, the ground crews are most likely to be affected. The operator sitting in the cab is at the same electrical potential as the equipment. If a power line contact occurs, the operator should stay on the equipment and should not leave unless there is an extreme emergency or until advised it is safe to do so by utility company personnel. If the operator must leave the equipment because of a more immediate hazard, then this person should jump clear and move directly away from the equipment by shuffling their feet in small steps.

Do not let anyone except emergency rescue personnel go near the area or potentially energized equipment. After a power line contact, the current flows outward through the ground in a ripple pattern. Areas of high and low electrical potential fields encircle the energized equipment. If a

worker steps from an area of high electrical potential to an area of low electrical potential, the resultant flow of electricity through the body can cause injury or death. Therefore, you should not approach a potentially energized victim as you can become the next victim. You cannot tell if the situation is safe simply by looking. Rely only on emergency medical rescue professionals and/or utility company personnel to assist with a rescue.

Any worker that is standing near the equipment may be affected by electrical current. Everyone around the equipment must be very careful to not touch any part of the equipment and the ground at the same time to prevent an electrocution injury. Workers on the ground should move directly away from the area and move directly away from the equipment by shuffling their feet in small steps.

Gas Utility Strike

Natural gas has a distinct “rotten eggs” odor. If this odor is detected in the work zone then the area should be immediately evacuated and secured from the general public. Immediately shut down any energized equipment if safe to do so and move quickly away from the area to a safe perimeter. Due to the presence of flammable gas, 911 should be called as soon as you are safely away from the area so that trained responders can be dispatched to deal with any injuries and stop the flow of natural gas. Do not try to further investigate or restrict the gas flow in any fashion as any spark may ignite the gas.

In the event of a slight or non-damaging contact with a gas line, Stop Work Authority will be implemented and the utility owner will be contacted to inform the owner of the contact and request that the owner inspect the line as even light contact with a gas utility line may damage the protective covering of the line and increase the risk of a potential gas line failure.

4.5 Material Handling

Material handling and storage practices are conducted at the project site. Proper lifting reduces the hazard out of moving objects. No one person should handle, lift or move 50 pounds or more by themselves. Even if the object weighs less than 50 pounds, the configuration or shape of the object should be evaluated to see if two people should be used to lift the object.

Manual Lifting

Consider the following prior to a lift:

- Establish that you can lift the load safely
- Inspect route to be travelled, confirming sufficient clearance
- Look for any obstructions
- Inspect the object to determine how it should be grasped
- Select and use containers with handles where practical
- Look for any sharp edges, slivers, or other things that may cause personal injury
- Do not move any object that will obstruct your field of vision when transporting the load.
- When lifting objects, use proper lifting techniques. Position the body so that the weight of the body is centered over the feet, which provides a more powerful line of thrust and ensures better

balance. Start the lift with a thrust of the rear foot. Do not twist your back while lifting or moving heavy objects.

General Storage Practices

Storage of materials and supplies must not create a hazard. General storage area practices include the following:

- Bags, containers, bundles, etc. stored in tiers must be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.
- All stacked materials, cargo, etc. must be examined for sharp edges, protrusions, signs of damage, or other factors likely to cause injury to persons handling these objects. Defects are to be corrected as they are detected.
- Storage areas must be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion or pest harborage.
- Storage areas have provisions to minimize manual lifting and carrying. Aisles and passageways provide for the movement of mechanical lifting and conveyance devices.
- Stored materials do not block or obstruct access to emergency exits, fire extinguishers, alarm boxes, first aid equipment, lights, electrical control panels or other control boxes.
- Hazardous materials are stored in accordance with the details outlined in the SDS, or accepted guidelines from reputable agencies. Guidelines include details about the materials reactivity, corrosivity, flammability, etc., as well as appropriate signage.

4.6 Noise

Hearing protection is required for project activities when working in close proximity to machinery, drilling operations or impact/power tools where noise levels may exceed the decibel range of 85 A-weighted Decibels (dBA).

When hearing a coworker at normal conversation distance is difficult or the noise level is approaching or exceeding 85 dBA, hearing protection such as earplugs or muffs must be available/worn by all site personnel and visitors that may be exposed to elevated levels of noise. Individuals who wear hearing protection are to be adequately trained in the safe use and handling of hearing PPE.

4.7 Fall Hazards

GHD personnel that will use ladders and have the potential hazard of working on elevated surfaces or platforms of 6 feet or greater during project activities will follow GHD's Safety and Health Program for fall protection. A written emergency rescue plan shall be prepared prior to project personnel wearing fall protection equipment.

4.8 Electrical Safety

Employees do not accept unnecessary exposure to hazards, such as working on energized electrical installations. When possible, circuits are de-energized according to the GHD Lockout/Tagout (LOTO) program to achieve safe working conditions. When it is not possible to de-energize circuits, the Workplace Electrical Safety Program (WESP) requirements ensure that safe conditions and work practices are implemented.

To protect employees from shock and/or arc flash hazards, only individuals who are "qualified" in accordance with the National Fire Protection Agency (NFPA) 70E or CSA Z462 Standards will be allowed to perform Arc Flash Hazards Analysis, LOTO, diagnostic testing, work on live electrical circuits or perform electrical work on equipment. The term "qualified" does not relate to a job title or job assignment, but rather to the activity being performed. Employees who perform electrical work must successfully complete the “Electrical Safety for Qualified Persons” training to be authorized as “qualified”. Only persons who have received this training and are knowledgeable in the construction and operation of equipment or a specific work method, and are trained to recognize and avoid the electrical hazards that may be present with respect to that equipment or work practice are allowed to perform this type of work. Consult the GHD Workplace Electrical Safety Program for additional program requirements and permits. Project personnel who perform maintenance or repair activities on system equipment shall follow the appropriate energy control procedures for working on that equipment.

4.9 Heat Stress

Heat stress is one of the most common illnesses faced by project personnel when working in elevated temperatures and/or humidity.

Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration
- Changes in coordination
- Excessive salivation and pupillary response
- Changes in speech pattern.

Prevention

The following procedures will be carried out to reduce heat stress:

- Heat stress monitoring.
- Acclimatization.
- Sun exposures.
- Work/rest regimes (schedule of breaks).
- Humidex Heat Stress Response Plan – mandatory breaks scheduled in summer months or during high risk activities for heat stress [based on American Conference of Governmental Industrial Hygienists (ACGIH)]
- Heat stress safety PPE (e.g., cool vests, bandanas) Cool potable water available
- Use of buddy system
- Seek shade - Shade is a good source of protection, but keep in mind that shade structures (e.g., trees, umbrellas, canopies) do not offer complete sun protection.

OHCOW Humidex Heat Stress Response Plan		
°F	**°C**	**Response**
77-84°F	25-29°C	• Supply water to workers on an "as needed" basis

OHCOW Humidex Heat Stress Response Plan		
°F	°C	Response
86-91°F	30-33°C	• "Heat stress alert" notice • Encourage workers to drink extra water • Start checking hourly temperature and relative humidity
93-98°F	34-37°C	• Post "heat stress warning" notice • Notify workers that they need to drink extra water • Ensure workers are trained to recognize symptoms
100-102°F	38-39°C	• Provide 15 minutes relief per hour • Provide adequate cool (10 15°C) water, at least 1 cup (240 ml) of water every 20 minutes • Workers with symptoms should seek medical attention
104-107°F	40-42°C	• Provide 30 minutes relief per hour in addition to the provisions listed previously
109-111°F	43-44°C	• If feasible provide 45 minutes relief per hour in addition to the provisions listed above • If a 75% relief period is not feasible then stop work until the humidex is 42°C/107°F or less
113°F	45°C or over	• Stop work until the humidex is 44°C/111°F or less
Note: Humidex plan is a simplified way of protecting workers from heat stress which is based on the 2007 ACGIH heat stress TLV® (threshold limit value®) which uses wet bulb globe temperatures (WBGT) to estimate heat strain. These WBGT's were translated into humidex		

Sun Exposure

Overexposure to sunlight is a common concern when field activities occur during warm weather conditions. Overexposure can occur on clear, sunny days, as well as on overcast and cloudy days. The following steps should be taken to protect against overexposure to sunlight:

- Always use sunscreen on exposed body parts.
- Cover up.
- Wear safety-rated sunglasses.
- Limit time in the midday sun.

4.10 Cold Stress

Cold stress is similar to heat stress in that it is caused by a number of interacting factors including environmental conditions, clothing, and workload, as well as the physical and conditioning characteristics of the individual.

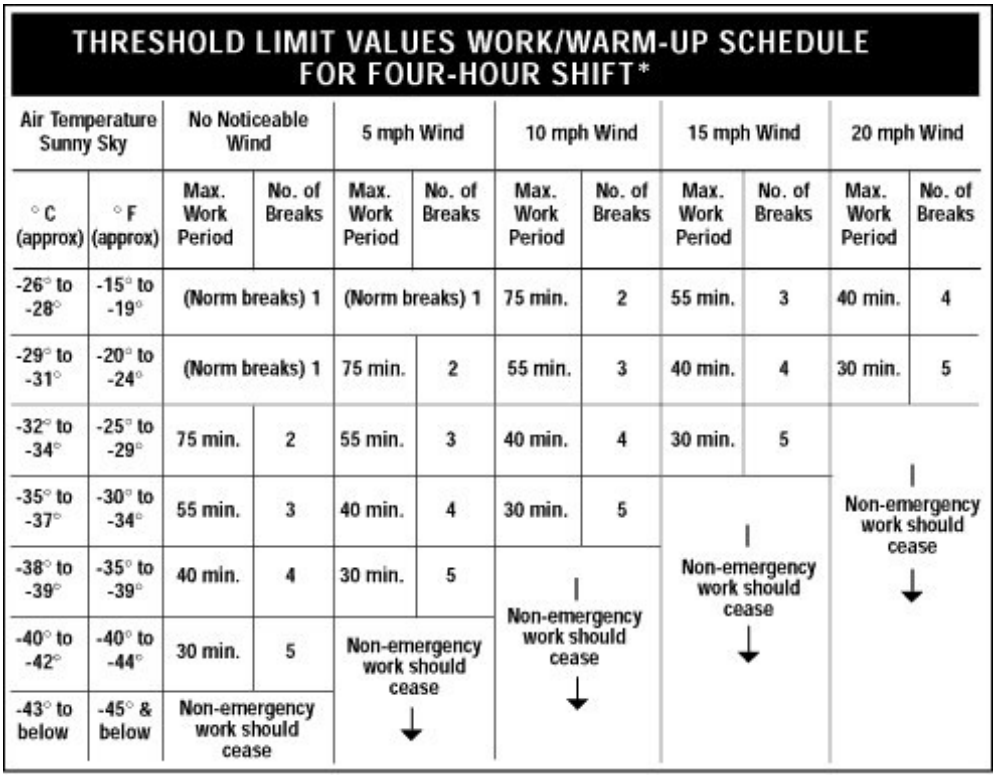
Prevention

A variety of measures can be implemented to prevent or reduce the likelihood of employees developing cold related ailments and disorders.

- Acclimatization.
- Fluid and electrolyte replenishment.
- Eat a well-balanced diet.
- Wear warm clothing.
- Follow work/rest regimes.

The parts of the body most important to keep warm are the feet, hands, head and face. As much as 40 percent of body heat can be lost when the head is exposed.

TLVs Work/Warm-Up Schedule for 4 Hour Shift



THRESHOLD LIMIT VALUES WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT*

Air Temperature Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx)	°F (approx)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm breaks) 1		(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29° to -31°	-20° to -24°	(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32° to -34°	-25° to -29°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease ↓	
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease ↓			
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease ↓					
-40° to -42°	-40° to -44°	30 min.	5	Non-emergency work should cease ↓							
-43° to below	-45° & below	Non-emergency work should cease									

*2008 TLVs and BEIs - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH), 2008

4.11 Hand and Power Tools

Hand Tools

- Hand tools must be used only for their intended use.
- Hand tools must meet the manufacturer's safety standards.
- Hand tools are not to be altered in any way.
- At a minimum, appropriate eye and face protection that meets current applicable standards [American National Standards Institute (ANSI)] must be used.
- Wrenches, including adjustable, pipe, end, and socket wrenches, are not used when jaws are sprung to the point that slippage occurs.

- Impact tools such as drift pins, wedges and chisels are kept free of mushroom heads.
- Wooden handles are free of splinters or cracks and secured tightly to the tool.
- Any damaged or defective tools are immediately removed from service and tagged for destruction.

Power Tools

- Power tools must be used only for their intended use.
- All power tools must be inspected regularly and used in accordance with the manufacturer's instructions and the tool's capabilities.
- Electric tools are not used in areas subject to fire or explosion hazards, unless they are approved for that purpose.
- Corded portable electric tools are connected to a ground fault circuit interrupter (GFCI) when working in wet areas.
- Coiled cords/extension cords are uncoiled when plugged in to allow for dissipation of heat.
- Cords/extension cords rated appropriately for the temperature are used.
- Appropriate eye and face protection that meets current applicable standards (ANSI) are used.
- Personnel are trained in the proper use of the tool.
- Any damaged or defective power tools must be immediately tagged and removed from service.
- Repairs to hand or power tools are only made by qualified individuals and in accordance with the manufacturer’s standards.
- Field or shop modifications to tools or equipment are only made by qualified individuals and in accordance with either manufacturer or engineer-approved specifications.

4.12 Portable Ladders

When portable ladders are in use on work sites, the following guidelines apply as a minimum standard.

- Use the 4 to 1 ratio. The ladder feet are 1 foot away from what it leans against for every 4 feet in height to the point where the ladder rests.
- Never use a ladder in a horizontal position as a runway or a scaffold.
- Never place a ladder in front of a door that opens toward it unless the door is locked, blocked or guarded by a person.
- Place a portable ladder so that both side rails provide secure footing on soft ground to prevent the ladder from sinking.
- Place the ladder's feet on a substantial and level base, not on a movable object.
- On uneven surfaces, use a block, wedge or ladder foot.
- Always lash, block or otherwise secure a ladder’s footing on wet or oily pavement, a smooth floor, or an icy or metal surface.
- Do not lean a ladder against unsafe backing, such as loose boxes or barrels.

- Securely lash or otherwise fasten the ladder to prevent it from slipping when using a ladder to access to high places.
- Always extend the ladder at least three rungs (3 feet) above the point of support when gaining access to a roof or elevated platform.
- Always maintain three points of contact when ascending or descending. If material must be handled, place in a bag or bucket and raise or lower it with a rope.
- Always face the ladder when ascending or descending.
- Maintain clean, dry footwear as much as possible to prevent slipping on the rungs.

4.13 Slip, Trip, Hit, Fall

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

- Spot-check the work area to identify hazards and communicate hazards to on-site personnel.
- Update the JSA to reflect changes. (This may be done with handwritten notes on the field JSA for use until formal updates can be made in the office.)
- Keep work areas clean and free of clutter, especially in storage areas and walkways.
- Secure all loose clothing and ties, and remove jewelry that may pose an entanglement hazard.
- Establish, maintain and utilize walkways that are free of slip and trip hazards.
- Utilize/install appropriate lighting for walking paths and working areas.
- Beware of slip/trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads you can see over (Refer to Material Handling for additional information).
- Refrain from the use of portable communication devices (cell phones, two-way radios) while traversing the site.
- Keep a safe buffer zone between workers using equipment and tools.

4.14 Aggressive or Menacing Behavior

When confronted by an individual whose behavior becomes aggressive or menacing, remain as calm as possible. Avoid arguing with or physically confronting the individual. Attempt to distance yourself from the individual. Advise others in the area to leave the scene and request police assistance by having someone call the emergency number listed on the Emergency Contact Sheet. Use the team approach. A staff member who is physically unable to break away from an attacker should shout for help.

The use of physical force is justified when a person believes that such force is necessary to protect themselves against the use or imminent use of unlawful physical force by another person.

Should an aggressor only be interested in the taking or damaging of property, do not interfere. Obtain a description of the individual to provide to local authorities, including height, weight, race, gender, clothing, accent, unusual markings such as tattoos, piercings, scars, hair color and weapon, if any.

Contact the Emergency Hotline and file an incident report with your immediate supervisor as soon as it is safe to do so.

4.15 Adverse Weather Conditions

Adverse weather is the existence of or impending weather conditions such as heavy rain, freezing rain, sleet, snow, high winds [30 miles per hour (mph)], dust storms, tornadoes, lightning, or any combination of weather that is not safe for employee exposure. SWA is executed prior to these conditions as soon as reasonably possible and evacuate to a safe area until conditions improve.

Based on their expertise and knowledge of manufacturer's recommendations for the equipment being operated, heavy equipment operators such as crane and drill rigs are responsible for advising the site supervisor whether it is safe to continue operations.

The site supervisor decides on the continuation or discontinuation of work based on current and pending weather conditions, the equipment manufacturer recommendations and the equipment operator's recommendations.

4.16 Flammable & Combustible Liquids

The storage, dispensing and handling of flammable and combustible liquids must be in accordance with industry standards such as NFPA guidelines. The specific flammable or combustible liquids used at the site may include gasoline, diesel, kerosene, oils and solvents.

Flammable and combustible liquids are classified according to flash point. This is the temperature at which the liquid gives off sufficient vapors to readily ignite. Flammable liquids have flash points below 100 ºF (37.8ºC). Combustible liquids have flash points above 100 ºF (37.8 ºC) and below 200ºF (93.3 ºC).

Storage

Many flammables can ignite at temperatures at or below room temperature. They are far more dangerous than combustibles when they are heated. As a result, these products must be handled very carefully. At normal temperatures, these liquids can release vapors that are explosive and hazardous to employee health. Exposure to heat can cause some of these liquids to break down into acids, corrosives or toxic gases. For this reason, flammable and combustible liquids should be stored in cool, well ventilated areas away from any source of ignition. Always consult the SDS of the product for specific information.

Flammable and combustible liquids must be stored in designated areas. Such areas must be isolated from equipment and work activity that may produce flames, sparks, heat or any form of ignition, including smoking. The most practical method is the use of one or more approved (commercially available) flammable/combustible liquid storage cabinets.

Cabinets must be labeled "Flammable – Keep Fire Away." Doors must be kept closed and labeled accordingly. Containers must be kept in the cabinet when not in use.

General Requirements:

- Keep containers of flammable/combustible liquids closed when not in use.
- Keep flammable/combustible liquids in designated areas and approved cabinets.

- Do not allow use of unapproved containers for transfer or storage. Use only approved safety cans (5 gallon maximum) with a spring closing lid and spout cover, designated to safely relieve internal pressure when exposed to heat or fire.
- Use only approved self-closing spigots, faucets and manual pumps when drawing flammable/combustible liquids from larger containers/barrels.
- Use only approved metal waste cans with lids for disposal of shop towels/oily rags. Designate "Smoking" and "No Smoking" areas.
- Designate fueling areas.
- Observe all signs indicating "No Smoking," "No Flames," and "No Ignition."

Transferring Flammable/Combustible Liquids

This seemingly routine task can be hazardous if certain precautions are not followed. Grounding and bonding must be observed at all times to prevent the accumulation of static electricity when transferring containers/barrels/drums one to another.

- Drums should be grounded to a grounding rod using a #4 copper conductor.
- Bonding is necessary between conductive containers (e.g., a barrel/drum and a 5 gallon container).

5. Biological Hazards

5.1 Introduction to Biological Hazards

GHD employees conduct numerous project activities where they may encounter biological hazards such as listed in the following table. This section identifies the problems associated with these biological hazards and the precautions to be taken if these hazards are encountered.

The biological hazards identified are applicable to this site. If you are bitten, stung or attacked by any of the listed hazards, contact the GHD Emergency Hotline at 1-866-529-4886.

5.2 Biting and Stinging Insects

Tick and Chiggers	• Wear light colored clothing •Keep clothing buttoned or zipped • Keep socks tucked in • Apply repellant containing 30% DEET to clothing and exposed skin • Check hair and clothing periodically using buddy system	• Remove tick with tweezers or fingers and tissue • Grab tick as close as possible to attachment site and pull firmly • Inspect tick to ensure that no parts remain in attachment site • Apply AfterBite containing antiseptic to affected areas • Call GHD Incident Reporting Hotline

Flying, Stinging, Biting Insects: Bees, Wasps	• Avoid wearing perfume, hairspray, cologne, and scented deodorant while working outside • If eating outside, keep all food and drinks covered; sweet foods and strong scents attract stinging insects • Never swat or swing at the insect; wait for it to leave, softly blow it away, or gently brush it aside • Inspect areas carefully as bees, wasps, and hornets can nest both in the ground and above ground • If the nests pose a threat, have them professionally removed	• Apply AfterBite containing antiseptic to affected areas or place an ice cube or ice pack over the sting to reduce pain • Remove the stinger with tweezers or scratch with a credit card (catch barbs with card and pull out) • Seek medical attention when the reaction to a sting includes swelling, itching, dizziness, and shortness of breath • Call GHD Incident Reporting Hotline
Mosquitoes	• Wear light colored clothing • Keep your body covered as much as possible; wear a hat or mosquito screen • Apply repellant containing 30% DEET to clothing and exposed skin	• Apply AfterBite containing antiseptic to affected areas • If moderate to extreme itchiness is experienced, use over the counter antihistamines
Venomous Spiders - Brown Recluse, Black Widow	• Shake out clothing and shoes before getting dressed • Practice good housekeeping skills • Exercise care when handling materials that have been undisturbed for some time; wear leather gloves • Check voids and dark cluttered areas before inserting hands • Always wear gloves	• Retain specimen of spider if possible • Apply AfterBite containing antiseptic to affected areas • Seek medical attention immediately • Do not drive if bitten by a black widow • Call GHD Incident Reporting Hotline

5.3 Poisonous Plants

Poison Ivy/Poison Oak	• Learn to identify poison ivy and poison oak (leaves of three, let them be) • Urushiol oil is in the wood portion of the plant and is active all year long • Wear proper PPE in known areas (gloves, long sleeves, long pants, safety glasses) • Proper hygiene extremely important to prevent ingestion and eye contact	• You may only have 30 minutes to get the oil off skin before it absorbs, and less time in hotter weather • Rinse with cold water, as hot water will open your pores • Apply alcohol to dissolve oils • Watch for an itchy red skin rash, which is the most common reaction; over time, large blisters may form • Use topical cream to assist with the itching (consult your pharmacy) • In severe cases, contact your doctor •Call GHD Incident Reporting Hotline

5.4 Microbial Hazards

Histoplasmosis	• Look for evidence of bird or bat colonies. • Before you work in or dig soil that's likely to harbor the fungus that causes histoplasmosis, spray it thoroughly with water. • Wear appropriate PPE for the task. • Clean footwear before leaving the site to prevent spore dissemination in cars, the office, at home, and elsewhere	• Wash hands with soap and warm water after removing your gloves. • If you have persistent flu like symptoms, see your doctor. Tell then if you have been around a bird or bat colony. • Call GHD Incident Reporting Hotline (consult your pharmacy) • In severe cases, contact your doctor • Call GHD Incident Reporting Hotline
Hantavirus	• Inspect work area for rodent droppings • For low amounts of droppings, use Level C with N95 disposable respiratory protection • For heavy accumulation, use Level C Full Face PAPR with P100 cartridge or, in severe cases, Level B • Soak dead mice, nests, and droppings thoroughly with a 1:10 solution of sodium hypochlorite (household bleach); bleach kills the virus and reduces the chance of further transmission • Place contaminated material in a plastic bag and seal for disposal • Disinfect all equipment	• Wash gloved hands with soap and water or spray a disinfectant or bleach solution on gloves before taking them off. • Wash hands with soap and warm water after removing your gloves. • If you have been around rodents and have symptoms of fever, deep muscle aches, and severe shortness of breath, see your doctor immediately • Call GHD Incident Reporting Hotline
Blood-borne Pathogens	• Exposure comes through work activities such as landfill, sewage treatment, sewers, contaminated medical waste • Virus, Bacteria, Fungus, and Parasites are considered blood- borne • Proper hygiene is extremely important to prevent ingestion • Wear proper PPE in known areas (gloves, long sleeves, long pants, safety glasses)	• All human blood and human body fluids treated as infectious • Cover all nicks and cuts to prevent cross-contamination. • Disinfect hands with sanitizer • Proper hygiene extremely important to prevent ingestion and eye contact • More information review GHD blood-borne policy • Call GHD Incident Reporting Hotline if exposed.

Psittacosis - Bird Droppings	• Breathing in the organism when the urine, respiratory secretion, or dried feces • Other sources of exposure include mouth-to-beak contact, a bite from an infected bird. • Bacteria starts an infection that varies in severity from a mild flu-like illness to severe pneumonia • PPE may include gloves, protective clothing, boots, and where appropriate, a respirator	• Adequate ventilation systems including the use of high efficiency particulate air (HEPA) filters to reduce the spread of contaminated air. • Disinfectant area with ammonium compounds, isopropyl alcohol, 70% ethanol, household bleach (diluted to 1%) • Wetting the wastes before removal decreases aerosolization. • all GHD Incident Reporting Hotline if exposed (consult your pharmacy) •In severe cases, contact your doctor • Call GHD Incident Reporting Hotline
Legionella	• Minimize water misting, stagnant water, and dead zones • Manage water temperature • Implement a preventative maintenance and inspection program to monitor equipment • Conduct Legionella testing of water systems and equipment	• If you are suffering a respiratory ailment, notify your supervisor and contact the GHD Incident Reporting Hotline

5.5 Aggressive Dogs

Aggression encompasses a range of behaviors that usually begins with warnings and can culminate in an attack. Look for warning signs. Most dogs are not aggressive, but, rather, just curious or defending what they perceive as their territory. Thus, to avoid unnecessary conflict, it is important to be able to tell if a dog is just playing or is being truly aggressive. While some breeds have been singled out as being particularly vicious, any mid-size and large dog breed can be dangerous, so do not ignore warning signs because you think a certain breed is harmless or friendly.

Watch for the common signs of aggression:

- Growling, snarling, and baring teeth are obvious displays of aggression and should be treated as such.
- An angry dog may show the whites of his eyes, especially if these aren't normally visible.
- Pulled-back ears lying flat against the head are a telltale sign of aggression, whereas normal floppy or elevated ears usually signal a dog's nonchalance.
- If the dog approaches you with its body relaxed and with a sloping curve in its midsection, the dog is probably not going to attack.
- A dog whose body is tense, straight and stiff (head, shoulders and hips aligned) could mean business.
- A loping gait means the dog is playful and checking you out. An even, steady run means the dog may be dangerous.

Assume all unknown dogs are threats. In general, the best policy when it comes to a dog attack is to do everything you can to avoid it in the first place. If you see a dog that may be dangerous, stay away. The following principles should be followed to protect against aggressive dogs:

- Avoid walking in places you know or suspect aggressive dogs may be. If you must do so, employ the buddy system and be prepared to defend yourself with a weapon such as a stick or mace.
- Dogs in packs are especially dangerous. Avoid groups of dogs that number three or more.
- Even if an aggressive dog is fenced, avoid walking right past it if possible. Stay well away from the dog's territory. Large dogs can jump fences if agitated.
- Resist approaching a stray dog or even a dog that is out walking with its owner. Ask permission before approaching the animal.
- Control your emotions as much as you can if a dog threatens to attack. Dogs can sense panic and may become even more aggressive. Make yourself rigid and motionless. When a dog approaches, stand completely still with your hands at your sides, and avert your eyes. In many cases the dog will lose interest and walk away if you ignore him.
  - Do not wave your arms around or kick with your legs; the dog may perceive these actions as threatening.
  - Stand sideways to the dog and keep him in your peripheral vision instead of facing him and making eye contact. This will signal to the dog that you are not a threat.
  - Don't open your hands and arms up to a bite by extending them. Keep your fingers curled into fists to avoid getting them bitten. The dog may come quite close, even sniffing you, without actually biting.
  - Never make direct eye contact. Keep the dog in your peripheral vision but don't look it right in the eye as dogs may perceive this as a threat.
  - Don't turn your back on a barking or charging dog.
- Do not try to run away. Running away can awaken the dog's instinct to chase and catch. He may pursue you vigorously even if his initial intent was just playful. Additionally, you won't be able to outrun most dogs if you're on foot.
- Distract the dog with another object. If the dog continues to threaten you, offer him something to chew on. This may distract him enough to give you time to escape.
- Speak to any harassing dog in a firm, calm voice. Give it commands to sit or stay. Shrieks, cries or shouts may antagonize the animal further. Don't smile or speak in a friendly, wheedling voice either.
  - When using vocal commands, deepen your voice as much as possible.
  - If a dog is running at you, turn to face the dog. Do not wave your hands or lift them in the air; instead face the dog and put your hands in front of you, palms out and fingers wide, gesturing "STOP". With a deepened voice, say loudly "STOP!" Then with one hand, point at the dog and loudly say "GO HOME!". This may confuse the dog because it will think that you maybe do have the authority to tell it what to do.
- Leave the area slowly and carefully. Once the dog loses interest in you, leave the scene of the attack slowly by backing away without sudden movements. Staying calm and stationary can be

a real test of your nerves in such a stressful situation but it's the best thing to do as long as the dog isn't actually biting you.

- If the dog starts biting you, you've got to defend yourself. Hit or kick the dog in the throat, nose, and the back of the head. This will stun the dog and give you time to get away.
  - It is okay to raise your voice at this point. Yell for help as you're fighting back. Hopefully others will hear and come to your aid. However, avoid screaming as this may lead the dog to strengthen his attack.
  - If you have a stick or another weapon, you can (and should) use it to hit the dog. Don't hit him over the top of the head, though; most dogs have very thick skulls, so this will only serve to make the dog angrier.
  - If available, mace or pepper spray also work as a good defense against an attacking dog.
  - Dog attacks can be fatal. While you certainly don't want to hurt a dog unnecessarily, you should use all of the force necessary if you are being seriously attacked.

If you are approached by an aggressive dog, report this event immediately to the police. If attacked and bitten, attend to the wounds immediately. Perform basic first aid procedures for bites suffered from a dog attack:

- Apply gentle pressure to stop minor bleeding. Use a clean cloth or sterile gauze pad. If bleeding is serious or if it won't stop after several minutes of applying pressure, seek professional medical attention.
- Wash the wound thoroughly. Use warm water and soap to gently cleanse the wound.
- Dress the wound. Use a sterile bandage (for very small cuts) or sterile bandages for larger lacerations.
- Look closely for signs of infection, including redness, warmth, increasing tenderness, or oozing pus. See a doctor if any of these symptoms arise

Remember the location of the attack and give a good description of the animal to give to the authorities. Seek medical attention promptly if bitten by a dog and contact the GHD Emergency Hotline at 1-866-529-4886.

6. Personal Protective Equipment

6.1 Introduction to PPE

Controlling a hazard at the source is the best way to protect employees. When engineering, work practice, and administrative controls are not able to protect our employees, GHD provides personal protective equipment (PPE) to its employees and ensures that the PPE is used appropriately. PPE is equipment worn as a barrier to minimize exposure to a variety of hazards.

This section covers applicable PPE requirements, which include eye, face, hand, head, foot, and respiratory protection.

6.2 Types of Personal Protective Equipment (PPE)

The type of PPE required for work varies based on the task being performed. The specific PPE required for each individual task is documented in the appropriate task-specific JSA. The recommended minimum PPE for GHD site work is as follows:

- Shirts with a minimum 6-inch sleeve.
- Long pants made from suitable sturdy fabric.
- Grade 1 protective footwear meeting ANSI Z41.1 green patched (triangle), steel-toed / puncture-resistant and electric shock-resistant sole with a 6-inch cuff, fully laced and secured, in material appropriate for weather and task.

In addition to the above, the following recommended minimum PPE is recommended in construction zones and where working around heavy equipment and traffic may be required:

- Type 1 Class E hardhat, meeting ANSI Z89.1, or Z89.1 if there is a risk of head injury.
- Safety glasses or goggles (based on the type of hazard – dust, splash, etc.), meeting ANSI Z87.1 standards.
- Hand protection such as gloves meeting standards EN 388 and ANSI 105-2000 as appropriate for the task as per JSA, with selection based on the hazards (abrasion, blade cut, tearing, puncture, and impact) associated with the task being performed.
- Reflective garment meeting ANSI 107 (as required) when working around vehicles.
- Hearing protection meeting ANSI approved NRR of at least 20 dBA if noise levels exceed 85 dBA.

Additional minimum requirements for PPE include:

- All PPE are maintained in good condition with no rips, tears, or damage that compromise integrity.
- PPE is not loose fitting as to avoid entanglement issues.
- All disposable PPE used around contaminated sites is removed before meal breaks and at the conclusion of the workday and replaced with new equipment prior to commencing work.
- Reusable equipment (safety glasses, hard hats, goggles, etc.) is cleaned and sanitized according to GHD and/or manufacturer guidelines.
- Eating, drinking, chewing gum or tobacco, and smoking are prohibited in work zones. Personnel must wash thoroughly before initiating any of the aforementioned activities.

6.3 Use of PPE

To obtain optimum usage from PPE, the following procedures are followed by all site personnel using PPE:

- When using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift
- Inspect all clothing, gloves, and boots both prior to and during use for:
  - Imperfect seams

- Non uniform coatings
- Tears
- Poorly functioning closures

- Inspect reusable garments, boots, and gloves both prior to and during use for:
  - Visible signs of chemical permeation
  - Swelling
  - Discoloration
  - Stiffness
  - Brittleness
  - Cracks
  - Any sign of puncture
  - Any sign of abrasion

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above are discarded. PPE used in areas known or suspected to exhibit elevated concentrations of chemicals are not reused.

6.4 Respiratory Protection

NOTE: This HASP is not intended for the use of supplied air operations as these activities are not anticipated during the RA. Should supplied air operations become necessary, the project manager and a GHD safety professional conduct a review of the scope of work.

Respiratory protection may be required for personnel during project activities in the unlikely event that action levels exceed the occupational exposure levels. If respirators are required, personnel shall wear air purifying respirator with a combination organic vapor and particulate cartridge and follow the procedures and guidelines in their respective written Respiratory Protection program.

At a minimum, all personnel required to use this equipment are:

- Instructed in how to properly fit a respirator to achieve the required face piece to face seal for respiratory protective purposes.
- Medically cleared for the use of respiratory protection.
- Appropriately fitted for the selected respirator through established recognized fit testing methods (quantitative/qualitative), and documentation of fit is readily available.
- Free of beards, sideburns, eyeglasses, and upper or lower dentures that could affect the face seal.

Further regulations for the use of respiratory protection include:

- Cartridges are changed prior to breakthrough, daily, or when personnel begin to experience increased inhalation resistance or breakthrough of a chemical warning property.
- Respiratory equipment and other non-disposable equipment are fully decontaminated.

- Appropriate action levels are established and documented based on the applicable occupational exposure limits.

6.5 Respirator Cleaning

Respirator decontamination is conducted once daily at a minimum. Face pieces are disassembled, the cartridges are thrown away, and all other parts are placed in a cleansing solution. After an appropriate amount of time in the solution, the parts are removed and re seated with tap water.

Face pieces are allowed to air dry before being placed in sanitized bags and stored in a clean area.

6.6 Levels of Protection

Protection levels provided by PPE selection are upgraded or downgraded based upon a change in site conditions or the review of the results of the real time air monitoring program.

When a significant change occurs, the hazards are reassessed. Some indicators of the need for reassessment are:

- Commencement of a new work phase.
- Change in job tasks during a work phase.
- Change of season/weather.
- Temperature extremes or individual medical considerations limiting the effectiveness of PPE.
- Chemicals other than those expected to be encountered are identified.
- Change in ambient levels of chemicals.
- Change in work scope that affects the degree of contact with areas of potentially elevated chemical presence MUST be re-evaluated.

All proposed changes to protection levels and PPE requirements are reviewed and approved by the SS prior to implementation.

7. Air Monitoring

7.1 Introduction to Air Monitoring

When intrusive work is performed in areas of suspected contamination that may result in inhalation hazards, air monitoring will be performed during these intrusive activities. In addition, air monitoring will be also be conducted when performing work in crawlspaces, basements, or any areas if it is suspected that potential inhalation hazards may be present. The purpose of air monitoring is to identify and quantify airborne contaminants in order to determine the level of worker protection needed. Initial screening for identification is often qualitative, but the determination of its concentration (quantification) must wait for subsequent testing.

All air monitoring instruments will be calibrated on a daily basis in accordance with the manufacturer's guidelines. Records of all calibrations and real time measurements will be kept in a bound field logbook or documented via air monitoring and calibration log sheets.

Correction factors have been determined by the air monitoring equipment manufacturers that enable the user to quantify a large number of chemicals using only a single calibration gas, such as isobutylene for PIDs and methane for LEL. Applicable Correction Factors (CF) for either LEL or PIDs must be applied for known chemicals of concern. These CFs and how to apply them can be found in the air monitoring instrument operating manual or online from the manufacturer's website under “Technical Notes”.

When air monitoring is required, the workers breathing zone(s) will be monitored and the results recorded. Additionally, when necessary, area samples at the following locations will be taken daily. Record time, location, and results of monitoring and actions taken based on the readings:

- Upwind of work areas to establish background concentrations.
- In support zone to check for contamination or migration of emissions.
- Downwind of work area to track any contaminants/emissions leaving the site.

The data collected throughout the monitoring effort will be used to determine the appropriate levels of protection. Action levels for upgrading or downgrading of PPE have been established on Table 2.

7.2 Types of Devices

Colorimetric Detector Tubes

Detector tubes are one of the most frequently used measuring methods for detecting contaminants in the work area. These are used so often because no other simple system is currently able to cover such a wide range of gases and vapors quantitatively. The major limitation of detector tubes is that their accuracy is only within 25 percent of the true concentration of the contaminants sampled. Detector tubes also are known as “colorimetric tubes” of “indicator tubes.” Detector tubes are small glass tubes filled with solid absorbents such as silica gel, activated alumina, or inert granules, and impregnated with detecting chemicals through which air is aspirated at a controlled rate. Common types of detector tubes include Draeger, Gastec, RAE, MSA, Sensidyne, etc.

Multi-Gas Meter

The Multi Gas Meter is a combination gas monitor that detects percent oxygen, carbon monoxide, hydrogen sulfide, and combustible gas, which simultaneously analyzes concentrations of each contaminant in air. When used properly, the portable oxygen indicator will read the percent oxygen in the immediate atmosphere. The normal ambient oxygen concentration is 20.9 percent at sea level. It is necessary to be apprised of such readings as the impact LEL readings.

Photoionization Detector (PID)

In areas where intrusive activities occur in areas of suspected contamination, exposure to VOCs will be monitored with a PID with required eV lamp as per Table 1. The PID has the ability to detect organic vapor concentrations from 1 part per million (ppm) to 2,000 ppm. All PID monitoring will be conducted within the breathing zone. If sustained PID readings of 1 ppm or higher above background are obtained in the breathing zone then a compound-specific detector tube for vinyl chloride will be used to identify if it is present. If vinyl chloride is not present then work may continue without respiratory protection up to 5 ppm.

7.3 Monitoring Frequency

Monitoring will be conducted continuously during ground intrusive activities or during any activity where airborne hazards (e.g., organic vapors) are expected to be present. The monitoring equipment listed in this HASP for the work activity, relates to the initial levels of protection listed on the Table 2. If the results of the first hour of monitoring indicate contaminant concentrations are non-detect, and no differing site conditions are observed, then the monitoring frequency may be decreased.

Monitoring results will be legibly documented each work day and will note project name/number, date, time, serial number, date of last calibration, and the name of person performing calibration, name of person performing monitoring, monitor location within the site, and monitoring results. Daily documentation will be kept with the SSO and included in the project file.

7.4 Safety and Health Action Levels

An action level is a point at which increased protection or cessation of activities is required due to the concentration of contaminants in the work area. All activities will be initiated as per JSA requirements. The appropriate actions are to be taken at designated action levels. The initial action level(s) for site work can be located in Table 2.

In addition to the action level, an upgrade to Level C is required if:

- Any symptoms occur, as described on the Table 1 Signs and Symptoms
- Requested by an individual performing the task
- Any irritation to eye, nose, throat, or skin occurs

A work stoppage and evacuation (cease and desist) at the specific work area is required if levels in the breathing zone exceed the protection factor of the respirator.

8. Site Control

8.1 Introduction to Site Control

The purpose of site control is to minimize potential contamination of workers and protect the public from hazards found on Site. Site control is especially important in emergency situations.

Site control and work area demarcation will be achieved through posting of signage and placement of barricades. All construction areas will have the appropriate signage posted. Barricades and warning signs will be placed to warn personnel of potential hazards. A standby person (spotter) may be utilized in place of barricades, where appropriate. The following materials may be used to barricade construction areas, crane swing radius, and control traffic:

- High visibility tape, rope, or chains
- Traffic cones
- Sawhorses

One pathway should be established for heavy equipment and a separate pathway for personnel decontamination.

The following work zones will be established during construction activities at the Site:

- The Exclusion Zone (EZ) is the area where the primary construction work occurs. This area must be clearly delineated with hazard tape, temporary fencing, or other means. Only personnel involved in the work activities are allowed in the EZ. In the event that the work is conducted in an area of known contamination, prior to entering the EZ, personnel must be suited in the designated level of protection, and a decontamination station must be established at the entrance to the EZ. All personnel leaving the EZ area must decontaminate and dispose of all disposable garments. The EZ is marked off during mobilization activities and prior to the commencement of site activities. If necessary, the size of the EZ may be increased to allow more working area or to incorporate greater area for higher levels of protection to avoid potential exposure to concentrations of hazardous chemicals.
- The Contamination Reduction Zone (CRZ) is the transition area between the contaminated area and the clean area and will only be required where work is performed in areas of known contamination. Decontamination is the main focus in this area. This area must also be clearly marked with hazard tape or delineated by other formal or informal means. A Contamination Reduction Corridor (CRC) will be located within this zone. A CRC is a pathway where decontamination takes place. One pathway is established for equipment decontamination and another for personnel. This area also serves as an access control point for personnel entering the EZ.
- The majority of site operations, as well as access to the site, could be controlled from the Support Zone (SZ). The support zone will provide for team communications, emergency response, and sanitary facilities. Appropriate safety and support equipment also will be located in the SZ. In areas of known contamination, the SZ will be located upwind of site operations if possible, and would be used as a potential evacuation point if appropriate. No potentially contaminated personnel or materials are allowed in this SZ.

8.2 Communication

Each member of the project team will be able to communicate with other team members at all times. Communications will be by way of an air horn, walkie-talkie, cellular telephones (cell phone), landline telephones, or hand signals.

The primary means for external communication are cell phones. If a team member does not have a cell phone, all team members should:

- Know the location of the nearest telephone
- Have the necessary telephone numbers readily available

Understanding of the following standard hand signals will be mandatory for all employees, regardless of other means of communication:

- Hand gripping throat — Cannot breathe
- Hands on top of head — Need assistance
- Thumbs up — OK, I'm all right, I understand
- Thumbs down — No, negative
- Gripping partner's wrist, or gripping both of your own hands on wrist (if partner is out of reach) – Leave area immediately

8.3 Buddy System

A buddy system shall be implemented when conducting intrusive activities on this site. This buddy shall be able to:

- Provide his or her partner with assistance
- Observe his or her partner for signs of chemical exposure or temperature stress
- Periodically check the integrity of his or her partner's protective clothing
- Notify emergency personnel if emergency help is needed

8.4 Site Security

Site security is necessary to prevent the exposure of unauthorized, unprotected people to site hazards and to avoid interference with safe working procedures. Security measures shall be maintained outside of the work area(s) so as to prevent unauthorized entry into the work area(s) and ensure members of the general public are to be protected from site hazards.

Visitors to the site will be required to attend a tailgate safety meeting.

8.5 Decontamination

The SS is responsible for ensuring that all personnel and pieces of equipment coming out of the known contaminated work areas are properly decontaminated according to the procedures outlined below. **Documentation of decontamination must be made in the field log notebook** and will become part of the permanent project file.

All PPE will be disposed of and/or decontaminated at the conclusion of each workday as described below. Decontamination procedures will follow the concept of decontaminating the most contaminated PPE first.

All disposable equipment shall be removed before meal breaks and at the conclusion of the workday, and will be replaced with new equipment prior to commencing work.

Procedures for decontamination must be followed to prevent the spread of contamination and to eliminate the potential for chemical exposure:

- **Personnel:** Decontamination will be initiated prior to exiting the contaminated work area and completed in the Contamination Reduction Zone.
- **Modified Level D**: First, remove outer protective wear. Remove gloves and properly dispose in designated waste container. Wash hands and face.
- **Level C**: Wash and rinse outer gloves, boots and suit, and remove; remove respirator; dispose of cartridges; wash respirator; and remove inner gloves and dispose. Wash hands and face. Handle all clothing inside out when possible.
- **Equipment:** All equipment must be decontaminated with Alconox/Liquinox solution or discarded upon exit from the contaminated area in a well-ventilated area. A temporary decontamination pad with a low-volume high-pressure washer will be set up on site during project operations. All decontamination materials will be drummed for subsequent disposal.

General Safety and Personnel Hygiene

1. Eating at the contaminated site is prohibited, except in specifically designated areas. Designation of eating areas will be identified to each employee. The location of these areas may change over the duration of the project to maintain adequate separation from the active work area(s).
2. Smoking at the site is prohibited.
4. Hands, face, neck, and other exposed areas must be washed with soap and water before eating, drinking, smoking, before using toilets, and before leaving the site.
5. All disposable coveralls and soiled gloves will be placed in covered containers at the end of every shift or sooner, if deemed necessary by the SSO. Wastes will be stored until proper disposal arrangements have been made.
6. Personnel working on site will not be permitted to wear facial hair that interferes with the mask to face seal on air purifying respirators.
7. All personnel performing or supervising work within the EZ must wear appropriate PPE, observe, and adhere to the personal hygiene related provisions of this section.

8.6 Social Protection

Security Measures

A site assessment should be made prior to performing work in high risk areas for violent crime. Additionally, it may be important to gather as much information as possible from the local officials and law enforcement describing the location and social conditions of the area where work will be performed.

Prior to conducting any door-to-door work, GHD will consult with local law enforcement officials in the City of Elkhart regarding potential sex and violent offenders in the area as the local officials have the most up-to-date information with individuals that may be of concern. GHD also will consult the Indiana Sheriffs Association's sex and violent offender online registry prior to visiting with residents. Any precautions recommended by local law enforcement will be followed but, at a minimum, would include at least two individuals visiting residences where such offenders may be present or where entry into the residence is necessary.

In the event it has been determined that this work will occur in an area of high risk, consideration will be given to providing on site security for the protection of the employee. This option may include services from a security agency, local law enforcement (if available), or the services of an off duty law enforcement officer. The Project Manager and/or Project Coordinator (PC) will be contacted and provide authorization prior to making these arrangements.

Precautions

When walking to and from your vehicle, or in and around the work site:

- Be alert to your surroundings and the people around you, especially if you are alone or it is dark
- Whenever possible, travel with a colleague
- Stay in well lighted areas as much as possible
- Walk close to the curb; avoid doorways, bushes, and alleys where someone could hide

- Walk confidently, and at a steady pace; make eye contact with people when walking
- Do not respond to conversation from strangers on the street, continue walking

Harm Reduction

Do as much as you can to avoid a confrontation "anticipation and avoidance" are the key words.

- If you get caught up in a situation, try to talk to an aggressor without provoking them.
- Try to maintain a comfortable distance between you and the aggressor.
- It may be more advisable to submit than to resist and risk severe injury or death. You will have to make this decision based on the circumstances. Be especially careful, if your attacker has a weapon. Avoid arguing with or physically confronting the individual. Attempt to distance yourself from the individual.
- Advise others in the area to leave the scene and request police assistance by having someone call the emergency number listed on the Emergency Contact Sheet. Use the team approach. A staff member who is physically unable to break away from an attacker should shout for help.
- Steady yourself if danger threatens. Panic can disable you.
- If you must fight back, adopt what police term the "bash and dash" approach. Primary targets are the eyes, nose, mouth, ears, throat, groin, knees or shins; choose whichever is easiest to get to.
- Be aware that your attacker might be stronger than you, or may take what you are using in self-defense and use it against you. It is often better just to shout loudly and run away.
- When confronted by an individual whose behavior becomes aggressive or menacing, remain as calm as possible. Avoid arguing with or physically confronting the individual. Attempt to distance yourself from the individual. Advise others in the area to leave the scene and request police assistance by having someone call the emergency number listed on the Emergency Contact Sheet. Use the team approach. If you are physically unable to break away from an attacker, shout for help.
- The use of physical force is justified when a person believes that such force is necessary to protect him or herself against the use or imminent use of unlawful physical force by another person. The use of physical force is also justified in the defense of another party, such as a coworker, who is being subjected to unlawful physical force. You can use any technique of legal self-defense in order to halt or distract an attacker until law officers arrive on the scene.
- Should an aggressor only be interested in taking or damaging property, do not interfere. Obtain a description of the individual to provide to local authorities, including height, weight, race, sex, clothing, accent, unusual markings such as tattoos, facial piercing, scars, hair color and weapon, if any.
- Stay alert and observant so that you can better describe your attacker and the assault to the police.
- Report to the GHD Hotline and work with your PM and Regional Safety and Health Manager (RSHM) to complete the investigation.

Drug Activity

GHD employees must not handle or remove any hypodermic needles or syringes. You should contact the local Police Department, Fire Department, or Health Department for removal from the job site. If you are injured by a discarded needle, you can receive a vaccination against Hepatitis B within 48 hours of the incident. Call the GHD Hotline, seek medical attention.

If an accident occurs where a needle or other sharp object has punctured the skin, then the injured person should:

- Encourage the wound to bleed gently
- Wash well with soap under cold running water
- Cover the wound with a waterproof dressing
- Call the GHD Hotline and seek medical attention as soon as possible

Carjacking

You can help prevent yourself being a victim of carjacking by:

- Keeping your doors locked in built up areas, and trying to keep the windows up, especially at traffic lights
- Being aware of what people are doing around you
- Not stopping to help someone who has broken down (if you really want to help, pull over at the next garage or police station and call for help)
- Driving to the next garage or police station and reporting them if someone tries to pull you over for no reason

A carjacker may 'accidentally' bump into your car, aiming to get you out of the car so they can steal it. If this happens, you may choose not to get out of the car – especially if you do not think it is a genuine accident. Roll the window down a little bit to talk to them if you want to.

Aggressive or Menacing Behavior

Report to the GHD Hotline and work with your PM and RSHM to complete the investigation.

9. Traffic Control

Temporary traffic control (TTC) procedures standardize and clarify minimum expectations for practices of TTC when performing field activities on or within 3 meters (10 feet) of active roadways. Following the requirements of this procedure helps to reduce the risk posed to employees from distracted drivers. Site activities in the public ROWs must be coordinated with and personnel must follow the requirements imposed by the local road jurisdiction (City and/or County of Elkhart, State of Indiana, as applicable) with regard to traffic control.

Responsibilities of supervisors and project managers include the following:

- Identify and communicate areas on site that require proper TTC
- Identify personnel who complete the work and verify that they are adequately trained in TTC procedures, including documentation of training records

- Coach and guide personnel on the proper use and care of equipment required for TTC
- Provide and maintain required TTC equipment
- Complete work site inspections to ensure compliance with TTC procedures
- Prevent unauthorized entrance into the work zone

Responsibilities of employees working on active roadways consist of the following:

- Cooperate and comply with the TTC procedures contained herein and with procedures outlined by supervisor
- Inspect road area for hazards and revise JSA/Job Hazard Analysis (JHA) as needed
- Maintain equipment used for TTC
- Communicate any issues, including equipment condition, to supervisor
- Issue a SWA when unable to adhere to this program

The levels of TTC are based on the task on hand, the proximity of the roadway, and the duration of the activity.

10. Emergency Response Plan

10.1 Introduction Emergency Procedures

Emergencies can range from minor to serious conditions. Various procedures for responding to site emergencies are listed in this section. The PM is responsible for contacting local emergency services, if necessary, for specific emergency situations. Contact information for emergency services is provided at the beginning of this HASP. Various individual site characteristics will determine necessary actions to ensure that these entry procedures are successfully implemented in the event of an emergency.

Field employees will identify the primary (on site) and secondary (off site) evacuation routes to evacuation locations prior to initiating work.

An Emergency Information Sheet containing the hospital location, directions, government agency phone numbers, emergency phone numbers, and a map with directions to the hospital is located at the beginning of this document.

10.2 Incident, Injury, Illness Reporting and Investigation

Any work-related incident, injury, illness, exposure, vehicle accident, property loss and or security issues must be reported to your supervisor, and the SSO immediately. Stop Work Authority will be implemented. Provide care for any injured persons and secure the scene.

GHD will call the GHD PM and the GHD Incident Hotline. Personnel on site should maintain the work area as it was at the time of the incident until further directions are given by the GHD PM, a GHD Safety Professional. The GHD PM and RSHM, will coordinate with on-site personnel to gather critical information. The GHD PM is responsible to contact the client and coordinate notifications to the Environmental Protection Agency (EPA) and Indiana Department of Environmental Management (IDEM), as required.

The GHD PM and RSHM above will coordinate the completion and submission of the GHD First Report of Incident and Near Miss form to the GHD PM. The report must be filed for the following circumstances:

- Incident, injury, illness, or exposure of an employee.
- Injury of a subcontractor.
- Damage, loss, or theft of property.
- Any motor vehicle accident, regardless of fault, which involves a company vehicle, rental vehicle, or personal vehicle while the employee is acting in the course of employment.
- Any sting, involving a puncture of the skin must immediately be reported to Work Care and follow all GHD reporting requirements
- Security Issues
- Environmental releases or loss of containment.

Occupational incidents resulting in employee injury or illness will be investigated by GHDS. This investigation will focus on determining the cause of the incident and modifying future work activities to eliminate the hazard.

All employees have the right and obligation to report unsafe work conditions, previously unrecognized safety hazards, or safety violations of others. If you wish to make such a report, it may be made orally to the PM, SS, SSO, RSHM, your supervisor other member of GHD management.

10.3 Emergency Equipment/First Aid

Safety equipment will be available for use by site personnel, located within 30 feet of the work area(s).

- Emergency eyewash bottles.
- Fire extinguisher (at a minimum, a 2A/10BC will be on site during construction work).

10.4 Site Evacuations

In the event of an emergency situation such as fire, explosion, or significant release of toxic gases, project personnel in the field will be notified by established communications to evacuate the area. Due to the nature of the work, work sites will move from location-to-location. Therefore, a primary mustering point will be identified at each work location by the SSO and communicated to the work crews during the Tailgate Safety Meeting, as part of the site specific training prior to commencement of work activities, and prior to any potentially threatening weather. In the event of an emergency, GHD personnel will gather at their primary mustering point for a head count. The SSO will notify GHD's PM of evacuations upon reaching the mustering point.

10.5 Spill and Release Contingencies

The most likely spill scenario associated with the site work is a release of vehicle fluids due to a rupture of containment (e.g., gasoline, diesel, hydraulic fluids, and antifreeze). The volume of such a spill is expected to be 50 gallons or less. If a spill has occurred, the first step is personnel safety, then controlling the spread of contamination, if possible. GHD's SSO will notify the GHD PM of the

spill once the area is secured. GHD's PM will activate the appropriate emergency spill procedures. To the extent possible, the spill will be contained through berming and directed away from sensitive areas such as storm drain inlets.

10.6 Severe Weather

This section outlines measures to be implemented at the Site to prevent hazards associated with extreme weather conditions.

10.6.1 Weather Monitoring

The Site Supervisor will be responsible for checking weather forecasts for the next day and week of work to provide advance notification of any severe weather conditions. Severe weather conditions (e.g., heavy rains) many cause unsafe conditions at the site and in some situations work may have to be stopped.

10.6.2 Tornado Safety Policy and Procedures

Tornadoes occur most frequently between April and October and can occur any time. In most cases, tornadoes move from a west/southwest direction. A typical tornado is a swirling storm of short duration with winds up to 300 miles per hour. It appears as a rotating funnel shaped cloud, from gray to black in color, extending towards the ground from the base of a thundercloud.

Tornadoes usually only cover a limited geographical area and give off a roaring sound. A tornado is the most concentrated and destructive potential weather event at the Site. Secondary effects of tornadoes include flash flooding, electric power outages, transportation system and communication system disruption, and fires.

Whenever weather conditions develop that indicate tornadoes are expected, the National Weather Service will issue a tornado watch to alert people in a designated area for a specific time period (normally 6 hours) to remain alert for approaching storms. The tornado watch is upgraded to a tornado warning when a funnel cloud is actually sighted or indicated by weather radar.

When a tornado is approaching, Site personnel will only have a short time to react. Therefore, Site personnel must be prepared to react during periods of severe weather. Memorize the following tornado danger signs:

i) Approaching clouds of debris can mark the location of a tornado even if a funnel cloud is not visible

ii) Before a tornado hits, the wind may die down and the air can become very still/calm

iii) It is not uncommon to see clear, sunlit skies behind a tornado as they usually occur at/near the trailing edge of thunderstorms.

Tornado Evacuation Procedures

GHD and contractor personnel monitor weather related information provided by National Weather Service. When a tornado watch has been issued by the National Weather Service, GHD's SSO will conduct a tailgate meeting with work crews to discuss preparations to evacuate the work zone(s) and identify the nearest muster point (tornado shelter).

If the National Weather Service issues a tornado warning, the SSO will activate the emergency response plan. Elkhart County has tornado sirens to warn of approaching severe weather that could

spawn tornadoes. The SSO will notify GHD's PM when they are leaving the work site and provide the location of the muster point (shelter) where personnel are going. Personnel must proceed to the Site mustering point (shelter) and wait for further instructions. Typically, this will be in the nearest public accessible building such as a police station, fire station, or municipal building. The tornado shelters most accessible to GHD personnel will be noted on the site map attached to this HASP. Directions to the shelter are to be communicated to Site personnel during initial Site safety orientation and throughout the tornado season during subsequent safety meetings. Once inside the shelter, conduct a head count to ensure that personnel are accounted for. In general, stay away from all windows and doors that lead to the outside. Remain in the shelter until the "all clear" signal is given by the SSO.

If unable to reach the designated shelter, the best protection in a tornado is usually an underground area. If an underground area is not available, consider small interior rooms on the lowest floor without windows, hallways on the lowest floor away from doors and windows, rooms constructed with reinforced concrete/brick/block with a heavy concrete floor and roof, and protected areas away from doors and windows.

10.6.3 High Winds

High winds may be encountered at the Site and these can cause hazards that may affect Site personnel health and safety. Preventative measures that will be implemented if necessary are as follows:

i) Restrict Site activities.

ii) Batten down light equipment or building materials.

iii) Partially enclose work areas.

iv) Reduce or stop work activities.

10.6.4 Lightning and Thunder

Light travels at a faster speed than sound so you can see a lightning bolt before the sound of thunder reaches you. To judge how close the lightning is count the seconds between the flash and the thunder clap. Each second represents about 328 yards/300 meters. If you can count less than 30 seconds between the lightning strike and the thunder, the storm is less than 6.2 miles/10 km away and there is an 80 percent chance the next strike will happen within that 6.2 miles/10 kilometers.

Lightning may strike several miles/kilometers away from the parent cloud and therefore precautions should be taken even if the thunderstorm is not directly overhead.

If you hear thunder or see lightning, stop work immediately and seek safe shelter. You are safe inside a car during lightning but don't park near or under trees or other tall objects, which may topple over during a storm.

Remain sheltered for 30 minutes after hearing the last thunder before returning to work.

10.6.5 Outdoor Precautions During Severe Weather

- Keep a safe distance from tall objects, such as trees, hilltops, and telephone poles.

- Avoid projecting above the surrounding landscape. Seek shelter in low lying areas such as valleys, ditches, and depressions, but also be aware of flooding.
- Stay away from water. Don't go boating if a storm threatens. Move to land as quickly as possible if you are on the water. Lightning can strike the water and travel some distance from its point of contact. Don't stand in puddles even if you are wearing rubber boots.
- Stay away from objects that conduct electricity, such as tractors, metal fences, motorcycles, lawnmowers, and tall metal objects.
- Avoid being the highest point in an open area. Holding a conductive tool, holding an umbrella, can make you the tallest object and a target for lightning.
- Be aware of downed power lines, which may be touching your vehicle.
- Be alert for flash floods, which are sometimes caused by heavy rainfall, if seeking shelter in a ditch or low lying area.
- If you feel your hair stand on end lightning may be about to hit you. Kneel on the ground immediately with feet together place your hands on your knees and bend forward. Don't lie flat.
- If you are in a group in the open, spread out, keeping people several yards/meters apart.

10.6.6 Indoor Precautions During Severe Weather

- Before the storm hits, disconnect electrical appliances including radios and television sets. Do not touch them during the storm.
- Don't go outside unless absolutely necessary.
- Stay away from doors, windows, fireplaces and anything that will conduct electricity, such as radiators, stoves, sinks and metal pipes. Keep as many walls as possible between you and the outside.
- Don't handle electrical equipment or telephones. Use battery operated appliances only.

10.6.7 Flash Flooding

Floods are one of the most common hazards in low lying areas, however not all floods are alike. Some floods develop slowly flash floods can develop in just a few minutes and without visible signs of rain. Flash floods can occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Flash floods often have a dangerous wall of roaring water carrying rocks, mud and other debris.

Be aware of flood hazards no matter where you live or work, but especially if you are in low-lying areas, near water, behind a levee or downstream from a dam. Even very small streams, gullies, creeks, culverts, dry streambeds or low-lying ground that appear harmless in dry weather can flood.

During the flood

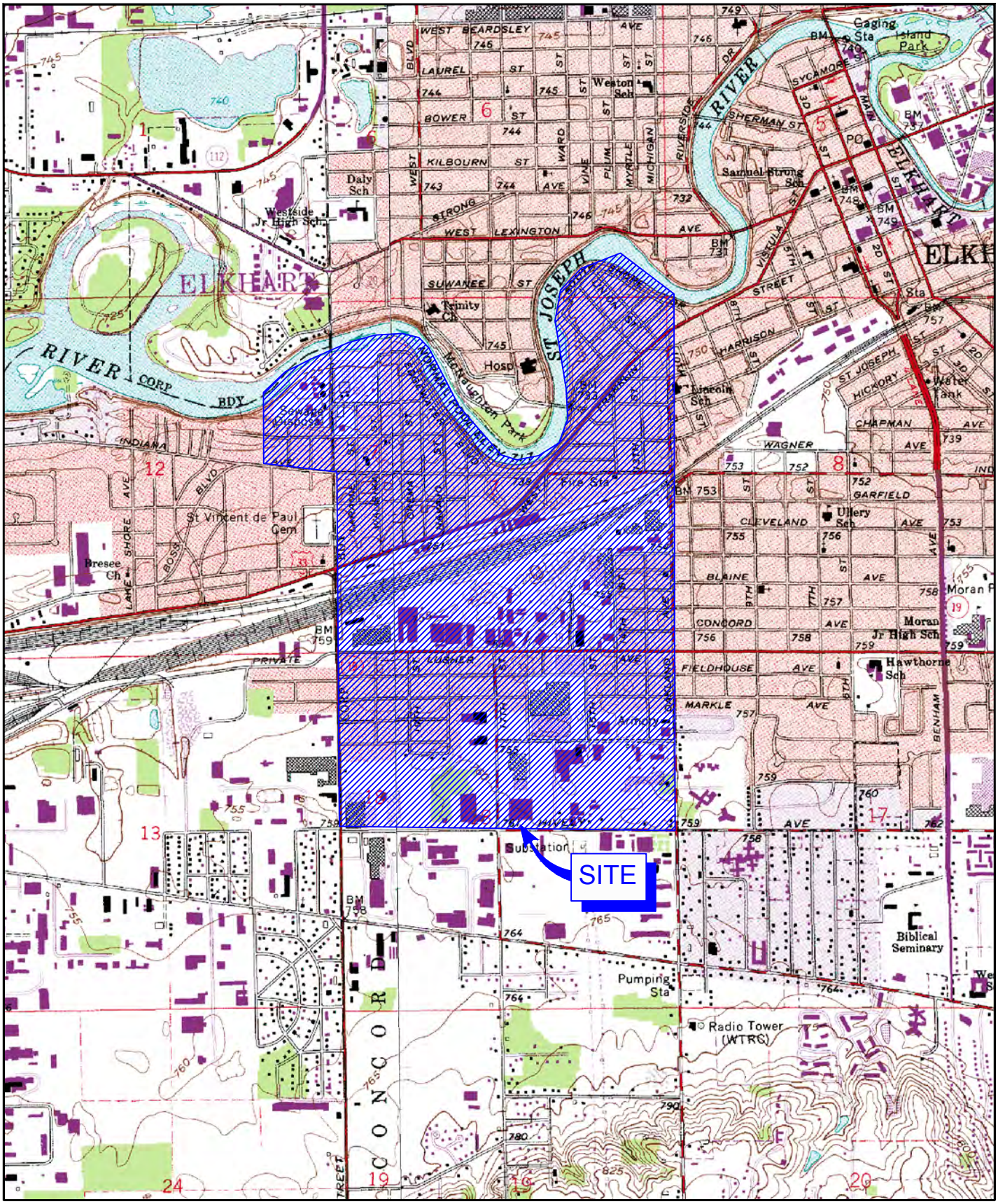
- If any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move.
- Be aware of stream and drainage channels, and other areas known to flood suddenly.

If you must prepare to evacuate, you should do the following:

- Do not walk through moving water. Six inches of moving water can make you fall.

- If you have to walk in water, walk where the water is not moving. Use a stick to check the firmness of the ground in front of you.
- Do not drive into flooded areas. If floodwaters rise around your car, abandon the car and move to higher ground if you can do so safely.
- Observe weather in the distance, rain in the hills can cause flooding in the valleys. Do not park your vehicle along streams, rivers or creeks, particularly during threatening conditions.

Figures



Source: USGS QUADRANGLE MAPS: ELKHART, IN. & OSCEOLA, IN.

0 1000 2000ft

LUSHER STREET RD/RA
ELKHART, INDIANA

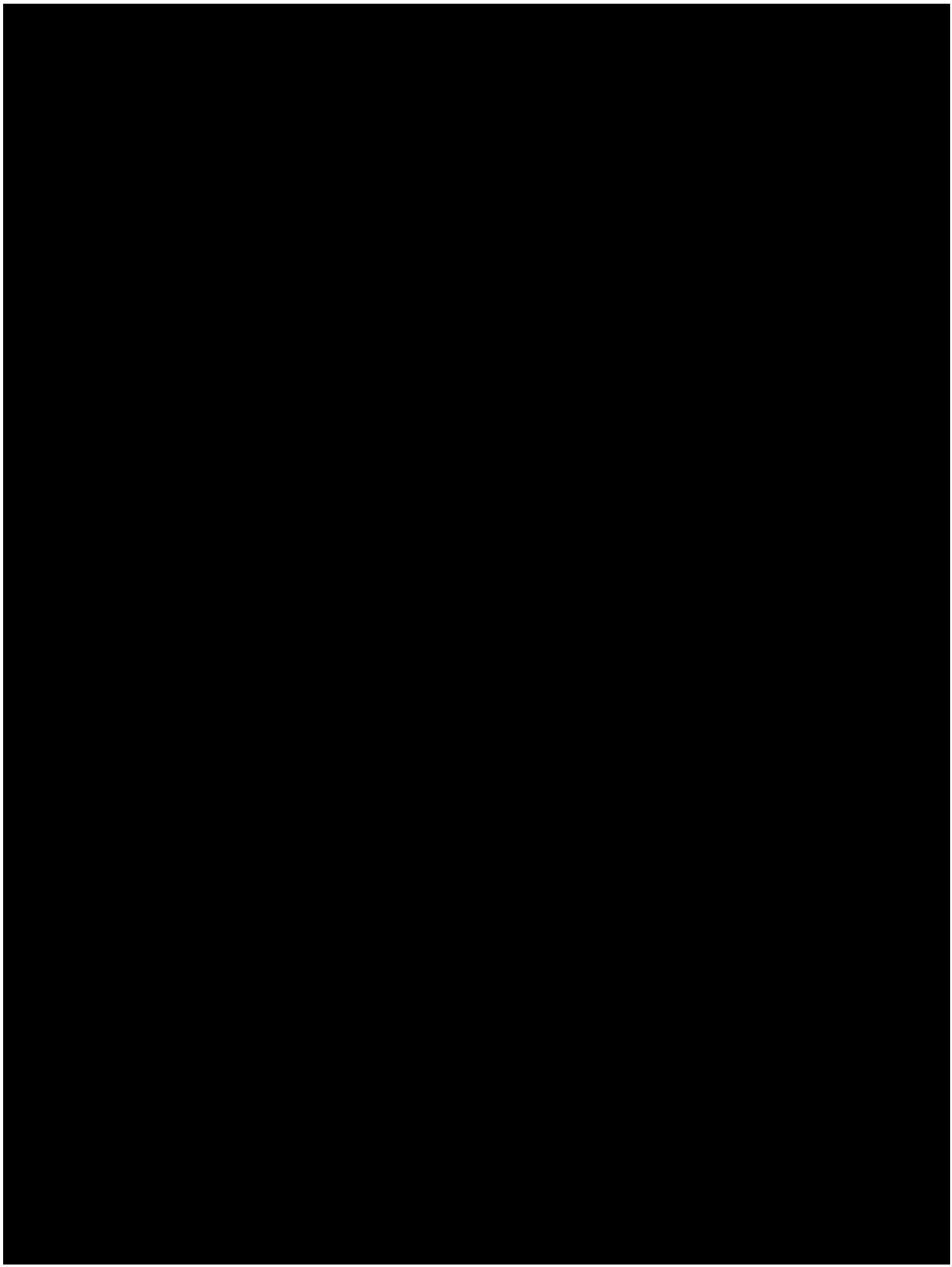
11119306-03

Aug 2, 2016

SITE LOCATION MAP

FIGURE 1

CAD File: P:\drawings\11119000s\11119306\11119306-REPORT\11119306-03(004)\11119306-03(004)GN\11119306-03(004)GN-WA001.DWG



Tables

Table 1

Properties of Potential Site Contaminants

	Chemical Name (Synonyms)	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
1,1-Dichloroethane CAS-75-34-3	1,1 Dichloroethane Ethylidene chloride CAS-75-34-3	TLV: 100 ppm PEL: 100 ppm STEL: NE IDLH: 3,000 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Central nervous system depression, irritation of skin. Exposure at high levels may result in unconsciousness. CHRONIC: Defatting of the skin. Liver and kidney damage.	(FP) 2°F (VP) 182 mm (IP) 11.06 eV (UEL) 11.4% (LEL) 5.4%	Colorless, oily liquid with a chloroform-like odor.
1,1-Dichloroethene CAS-75-35-4	1,1-Dichloroethene 1,1-DCE VDC Vinylidene chloride CAS-75-35-4	TLV: 5 ppm PEL: NE STEL: NE IDLH: NE	Inhalation Ingestion Skin contact Absorption Eye contact	ACUTE: Irritation of the eyes, skin and respiratory tract. Dizziness, headache, nausea. Ingestion may cause chemical pneumonitis. Exposure could cause lowering of consciousness. CHRONIC: Dermatitis. May cause damage to kidneys and liver. Possible human carcinogen.	(FP) -2°F (VP) 500 mm (IP) 10.00 eV (UEL) 15.5% (LEL) 6.5%	Colorless liquid or gas (>89°F) with a mild, sweet, chloroform-like odor.
1,2-Dichloroethylene CAS-540-59-0	cis-1,2-Dichloroethene Acetylene dichloride 1,2-Dichloroethylene CAS-540-59-0	TLV: 200 ppm PEL: 200 ppm STEL: NE IDLH: 1000 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritation of the eyes and respiratory tract. CNS depression. Exposure could cause lowering of consciousness. CHRONIC: Defatting of the skin. May cause damage to liver.	(FP) 36-39°F (VP) 180-265 mm (IP) 9.65 eV (UEL) 12.8% (LEL) 5.6%	Colorless liquid (usually a mixture of the cis and trans isomers) with a slightly acrid, chloroform-like odor.
1,1,1-Trichloroethane CAS-71-55-6	1,1,1 Trichloroethane Methyl chloroform Chlorothene CAS-71-55-6	TLV: 350 ppm PEL: 350 ppm STEL: 450 ppm IDLH: 700 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritating to eyes, skin and respiratory tract. May affect CNS, heart, liver and kidneys resulting in cardiac disorders and respiratory failure. High level exposure may cause death. CHRONIC: Defatting of the skin, may cause liver damage.	(FP) NE (VP) 100 mm (IP) 11.00 eV (UEL) 12.5% (LEL) 7.5%	Colorless liquid with a mild, chloroform-like odor.
Chloroform CAS-67-66-3	Chloroform Methane trichloride Trichloromethane CAS-67-66-3	TLV: 10 ppm PEL: 50 ppm C STEL: NE IDLH: 500 ppm	Inhalation Ingestion Skin contact Absorption Eye contact	ACUTE: Irritation of the eyes and skin. Dizziness, headache, nausea and confusion. CHRONIC: Enlarged liver. Possible human carcinogen.	(FP) NE (VP) 160 mm (IP) 11.42 eV (UEL) NE (LEL) NE	Colorless liquid with a pleasant odor.

Notes:

FP	FP - Flash Point
IDLH	IDLH - Immediately Dangerous to Life ord Health
IP	IP - Ionization Potential
NE	NE - Not Established (Information Not Available)
NA	NA - Not Applicable
CNS	CNS - Central Nervous System
PNS	PNS - Peripheral Nervous System
ppm	ppm - parts per million
mg/m3	mg/m3 - miligrams per cubic meter
PEL	PEL - OSHA Permissible Exposure Limit
STEL	STEL - Short Term Exposure Limit
TLV	TLV - ACGIH Threshold Limit Value
VP	VP - Vapor Pressure
C	C - Ceiling Exposure Limit
[skin]	[skin] - potential for dermal absorption
mm	mm - milimeters Hg (mercury)
eV	eV - electrovolts

Table 2

On-Site Air Monitoring Program Action Levels
Health and Safety Plan

Monitoring Device	*Action Level*	*Action*
Photoionization Detector (PID)	**TCE/PCE present in the Breathing Zone:**	Determine via Colorimetric Sampling
10.6 or greater eV lamp	<5.0 ppm	Full-Face Respirator Available
Detector Tubes	≥5.0 ppm and ≤100 ppm	Full-face air purifying respirator Level C PPE GME P100 Cartridge
	≥100 ppm	Shut down activities. Notify SHO. Implement additional engineering controls

If GHD is unable to identify/quantify the contaminants, supplied air will be required when the PID reading is greater than background, as the contaminant will be unknown and NIOSH, OSHA, and the manufacturer's use requirements for Level C (air purifying respirators) will not be met. If PID readings subside, workers can downgrade as necessary. GHD will upgrade to supplied air and attempt to obtain additional information for possible chemicals present in GHD's work area. The Owner will need to provide/obtain additional information as to the identity of the contaminant(s) in order to permit the use of Modified D and/or Level C.

Notes:

SHO Site Health and Safety Officer
PPE Personnel Protective Equipment
ppm parts per million

Appendices

Appendix A
Forms

Unsafe Act / Unsafe Condition / Stop Work Authority (SWA) Report

Reported by:		Employee's office:	
RSHM:		Date:	Time:
Employee's supervisor:		Employee's principal:	
Project related:	☐ No ☐ Yes	If yes, name of client:	
Client contact (if applicable):		Project no (if applicable):	

Re: (check all that apply) ☐ **Unsafe act** ☐ **Unsafe condition** ☐ **Stop work authority (SWA)**

Location: (check one) ☐ Driving ☐ Field ☐ Office

Date reported to supervisor/PM:		Date corrected:	
Time reported to supervisor/PM:		Time corrected:	

Describe the unsafe act, unsafe condition or SWA situation

List corrective action(s) implemented

Did the corrective action(s) mitigate the unsafe act/unsafe condition?

For SMART administrators use only:

Category:

- ☐ **PPE** Personal Protective Equipment
- ☐ **BP** Body Positioning
- ☐ **WE** Work Environment
- ☐ **OP** Operating Procedures
- ☐ **TE** Tools and Equipment
- ☐ **CU** Computer Usage
- ☐ **PD** Pre-Driving
- ☐ **OPP** Operating Procedures – Parking

Chevron category:

- ☐ **A** Person or People
- ☐ **B** Equipment
- ☐ **C** Environmental
- ☐ **D** Procedures/ Processes/
  - ☐ JSA-review/revise
- ☐ **E** Visitors

Causative factor:

- ☐ **1** Insufficient training for task
- ☐ **2** Hurrying to complete the task
- ☐ **3** Easier if proper process not followed
- ☐ **4** Took shortcuts without prior incident
- ☐ **5** Incomplete or no procedures
- ☐ **6** Procedures not known or enforced
- ☐ **7** Improper PPE
- ☐ **8** Improper tools
- ☐ **9** Improper workplace layout
- ☐ **10** Exposure to conditions

Energy source:

- ☐ **G** Gravity
- ☐ **M** Motion
- ☐ **ME** Mechanical
- ☐ **E** Electrical
- ☐ **P** Pressure
- ☐ **T** Temperature
- ☐ **B** Biological
- ☐ **C** Chemical
- ☐ **R** Radiation
- ☐ **S** Sound

Are additional actions required? ☐ No ☐ Yes If yes, what?

Field Safe Task Evaluation Process (F-STEP)

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Observer's name:	Date:	Time:
Client:	Project name :	
Observer's office:	Site location:	
Observer's supervisor:	Project no. (if applicable):	
Subcontractor: ☐ Yes ☐ No	Subcontractor company name:	

Feedback conducted by:	Date:
Observee's supervisor:	Time:

Check task being observed (if not listed here, go to columns at right)		If checking this column, write in the specific task	
☐ Air knifing	☐ Mob/demob	☐ Agricultural services	
☐ Clearing	☐ Project oversight	☐ Construction	
☐ Demolition	☐ Soil sampling	☐ Landfill	
☐ Drilling	☐ Stack testing	☐ Office operations	
☐ Electrical work	☐ Surveys & audits	☐ O&M	
☐ Excavation	☐ Traffic control	☐ Pipeline	
☐ General site cleaning	☐ UST removal	☐ Refinery	
☐ Heavy equipment operations	☐ Water sampling	☐ Treatment plants	
☐ IH sampling	☐ Well management	☐ Other	
☐ Manual lifting			

Background information (Give a brief description of task being performed and your surroundings)

Observer's positive comments

1.

2.

3.

Feedback session conclusion:
If no questionable Items: brief recap of positive actions/comments
If questionable Items: brief recap of positive actions/comments and why did the questionable item(s) occur?

Personal protective equipment	Meets work standards	???	N/A	Evaluation comments
1. Hearing protection (e.g., ear plugs)			☐	
2. Head protection (e.g., hard hat)			☐	
3. Eye protection (e.g., safety glasses/goggles)			☐	
4. Hand protection (e.g., gloves)			☐	
5. Foot protection (e.g., steel-toe boots)			☐	
6. Respiratory protection			☐	
7. Fall protection (e.g., lanyard/harness)			☐	
8. High visibility clothing (e.g., work vest)			☐	
9. First aid kit/fire extinguisher			☐	
10. Other (be specific)			☐	
Body position	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
11. Proper body positioning when exerting force (lifting/pushing/pulling)			☐	
12. Pinch points/moving equipment - hands/body placement			☐	
13. 3-points of contact			☐	
14. Other (be specific)			☐	
Work environment	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
15. Work/walk surface clear (free and clear pathway)			☐	
16. Housekeeping/equipment storage			☐	
17. Controlled work zone (e.g., warning devices, barricades, cones, flags)			☐	
18. Emergency stop/safety switches			☐	
19. Materials labeled correctly			☐	
20. Storage/disposal of waste			☐	
21. Other (be specific)			☐	
Operating procedures	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
22. Star performed/job planning			☐	
23. Stop work authority process – understood and considered			☐	
24. JSA/JLA/risk assessment reviewed and followed			☐	
25. Daily site inspection			☐	
26. High risk task specific (hot work, confined space, LOTO, excavation/ trenching)			☐	
27. Inspect work zone for hazards			☐	
28. Coordinate/communicate with site rep and/or others on site			☐	
29. Spotters used appropriately			☐	
30. Underground/overhead utilities identified			☐	
31. Other (be specific)			☐	
Tools/equipment	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
32. Hand/power tool - selection, condition, and use			☐	
33. Field/test equipment - selection, condition, and use			☐	
34. Heavy equipment - selection, condition, and use			☐	
35. Other (be specific)			☐	
Observation total occurrences			☐	
% observations to meet work standards			☐	
Item specific to work task	**Meets works standards**	**???**	**N/A**	**Evaluation comments**
Insert task/JSA/SOP Step			☐	
Insert task/JSA/SOP Step			☐	
Insert task/JSA/SOP Step			☐	

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	**CF**	**Corrective actions (Must match Causative Factor)**	**Responsible party**	**Date due**	**Date completed**	**Verified by/ Validated by**	**Date**	**Details**
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by :		
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

Driving Safe Task Evaluation Process (D-STEP)

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Observer's name:	Date:	Time:
Client:	Project name:	
Observer's office:	Site location:	
Observer's supervisor:	Project no. (if applicable):	
Subcontractor: ☐ Yes ☐ No	Subcontractor company name:	

Feedback conducted by:	Date:
Observee's supervisor:	Time:

Driving conditions			
☐ Freeway/interstate	☐ Wet	☐ Day	☐ Raining
☐ Surfaced street	☐ Dry	☐ Night	☐ Windy
☐ Dirt road	☐ Snow/ice		☐ Snowing
	☐ Mud		☐ Fog

Vehicle condition			
☐ Car	☐ Truck	☐ Van	☐ Pulling trailer
☐ Company owned	☐ Rental	☐ Personal	

Background information (Give a brief description of where you are driving from and to and your surroundings)

Observer's positive comments

1.

2.

3.

Feedback session conclusion:
If no questionable Items: brief recap of positive actions/comments
If questionable Items: brief recap of positive actions/comments and why did the questionable item(s) occur?

Pre-driving	Meets work standards	???	N/A	Evaluation comments
1. JMP/JSA/Risk Assessment developed and/or reviewed			☐	
2. STAR performed/job planning			☐	
3. Stop Work Authority – understood and considered			☐	
4. Registration/insurance/last maintenance report			☐	
5. Tire inflation and tread			☐	
6. Wipers and washer fluid/clean windows/mirrors			☐	
7. Horn/lights operation/instrument panel			☐	
8. Body damage/overall vehicle appearance			☐	
9. Under-vehicle check for leaks/obstructions			☐	
10. Secure loose items			☐	
11. Check fluid levels			☐	
12. Fire extinguisher/triangles/first aid kit/jack/spare			☐	
13. Verifies area is clear before moving vehicle			☐	
Body positioning	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
14. Adjust seat			☐	
15. Adjust head rest			☐	
16. Adjust mirrors to minimize blind spots			☐	
17. Seat belts (driver/passengers)			☐	
18. Locks doors			☐	
Operating procedures	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
19. Yields right-of-way and allows other vehicles to merge, change lanes, turn			☐	
20. Respects pedestrians, cyclists, other drivers			☐	
21. Is courteous/tolerant of others' poor driving			☐	
22. Two hands on wheel no higher than 9 and 3			☐	
23. Skill in handling distractions			☐	
24. Adjusts to traffic conditions (speed / traffic)			☐	
25. Uses turn signals (for turns and lane changes)			☐	
26. Following distance is appropriate (4-second rule)			☐	
27. Avoids sudden acceleration and deceleration			☐	
28. Before backing up, looks behind vehicle/checks for traffic, pedestrians, parked vehicles, uses spotter			☐	
29. Scans the road ahead (15-second eye lead or 2-3 blocks-1/4 mile) and anticipates actions of others to avoid sudden swerves, stops, lane changes			☐	
30. Checks mirrors every 5-8 seconds			☐	
31. Checks for hazards on the road (e.g., animals, debris, road conditions)			☐	
32. Reads and obeys traffic signals			☐	
33. Makes complete stops at signals, at a safe distance			☐	
34. Scans intersection left and right/anticipates intent of other vehicles before reaching "point of no return"			☐	
35. Covers brakes safely and adjusts speed			☐	
36. Does not use cell phone during operation of vehicle			☐	
37. Other (be specific)			☐	
Operating procedures - Parking	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
38. Looks for pull through parking before backing in			☐	
39. Uses signals, leaves adequate space before pulling back into lane			☐	
40. Obeys signs and uses signals in parking lot			☐	
41. Maintains proper speed inside the lot			☐	
42. Ensures vehicle is legally/properly parked			☐	
43. Sets parking brake and secures vehicle			☐	
44. Other (be specific)			☐	
Observation total occurrences			☐	
% Observations to meet work standards			☐	
Item specific to work task				
Insert Task/JSA/SOP Step			☐	
Insert Task/JSA/SOP Step			☐	

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	**CF**	**Corrective actions (Must match Causative Factor)**	**Responsible party**	**Date due**	**Date completed**	**Verified by/ Validated by**	**Date**	**Details**
						Verified by: **Validated by:**		
						Verified by: **Validated by:**		
						Verified by: **Validated by:**		
						Verified by: **Validated by:**		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

Near Miss Reporting Form

Note: A Significant Near Miss must be called into the Incident Reporting Hotline: 1-866-529-4886

Instructions:
1) Employee completes the Near Miss Report and submits to Supervisor.
2) Supervisor reviews and makes other comments.
3) Employee discusses Near Miss with Project Manager.
4) Submit to applicable SMART Reporting submission address

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Section 1

A. Employee Identification ☐ **GHD Employee** ☐ **Temporary Employee** ☐ **Subcontractor**			
Employee No.	Last Name	First Name	Employee's Company - if Subcontractor
Date of Hire	Position/Title	Supervisor	Home Office Location - if GHD Employee

B. General Information	
Where did the Near Miss occur? ☐ Office ☐ Project Site ☐ Other _____ ☐ Canada ☐ United States ☐ UK	Type of Near Miss (Check all that apply) ☐ Employee Injury/Illness ☐ Vehicle Accident ☐ Property Damage ☐ Environmental
Address of Near Miss (City, State/Province/County, Postal/Zip Code)	Specific Location of Near Miss (e.g., where on site)

Date and Hour of Near Miss		Date and Hour Reported to GHD		Time Employee Began Work
Month Day Year	a.m. p.m.	Month Day Year	a.m. p.m.	a.m. p.m.
Witnesses? ☐ Yes ☐ No	Witness Name and Telephone Number			

C. Project Information (Project Related Near Miss Only): Project Related: ( ) Yes ( ) No				
Project #	Project Name	GHD Project Manager	Client	Client Contact
Was the Client Advised of the Near Miss? ☐ Yes ☐ No ☐ N/A	Name:	Date and Time Month Day Year Time		

Section 2

A Details of the Near Miss
1. What job/task was being performed when the Near Miss occurred? (Example: collecting groundwater samples).
2. Provide a detailed description of the employee's specific activities at the time of the Near Miss. Include details of equipment/materials being used, including the size and weights of objects being handled, and weather conditions at time of the Near Loss. If necessary, attach additional pages to the report.

Section 2 (continued)

B. Near Miss Investigation	
Conduct a 5-Why Root Cause Analysis Investigation. In addition, if there was the potential for a significant injury or loss, report the Near Miss to the Incident Hot Line (this will determine if a Tap Root Cause Analysis is necessary).	
HASP prepared? ☐ Yes ☐ No ☐ N/A Submit a PDF of HASP to Investigation Team. If yes, was the HASP on site? ☐ Yes ☐ No	Did the safety plan identify and provide safety procedures for the specific tasks being performed when the Near Miss occurred? ☐ Yes ☐ No If no, why not? (Explain) _____ Did the employee utilize the STAR process before initiating the task? ☐ Yes ☐ No If no, why not? (Explain) _____

5-Why Root Cause:	Additional information: Attach photos, witness statement(s), affected employee statement, as applicable, to the end of this document.
1. Why did "above" happen?	
2. Why did "1" happen?	
3. Why did "2" happen?	
4. Why did "3" happen?	
5. Why did "4" happen?	See Section 3 Below: Corrective Actions/ Verification and Validation
6. Why did "5" happen?	

C. Accountability		
Initial Report Date Month Day Year	Initial Report Prepared by: (please print)	Initial Report Prepared by: (signature)
Investigation Team	Company	Position/Title
Final Report Date Month Day Year	Final Report Prepared by: (please print)	Final Report Prepared by: (signature)

D. Stewardship		
Will a Near Miss Summary be Prepared? ☐ Yes ☐ No If yes, by:		
Quality Review By:	Date:	Findings:

Section 3 (continued)

Corrective Action					Validation & Verification		
CF	**Corrective Actions (Must match Causative Factor)**	**Responsible Party**	**Due Date**	**Date Completed**	**Verified By/ Validated By**	**Date**	**Details**
					Verified By		
					Validated By		
					Verified By		
					Validated By		
					Verified By		
					Validated By		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

HASP Acknowledgment Sheet

Project Name:_____ Project Number: _____

This is to certify that I have received a pre-entry briefing regarding this HASP, and I understand its contents. My failure to follow and comply with the requirements contained in this plan may result in disciplinary action and/or termination.

Print Name	Signature	Date

Tailgate Safety Meeting Form
Large Group Format - Single Day

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Site personnel in attendance:

Print Name	Signature	Company

Tailgate Safety Meeting Form
Small Group Format - Multiple Days

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Print Name	Signature	Company

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Print Name	Signature	Company

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Print Name	Signature	Company

Health and Safety Plan Amendment Form

This document is to be completed for ANY changes that occur within the Site Health and Safety Plan (HASP). This document is to be sent to the Regional Safety & Health Manager (RSHM) for review, verification and sign off of the HASP.

Amendment #	
Site Name/Project ID	
Date	
Client Contact (same/change)	
Reason for Amendment (SOW change, JSA addition, Chemical, etc.)	
Alternate or Additional Safeguard Procedures	
Required changes in PPE	
Additional Comments:	

Project Manager Notified	☐
RSHM Notified	☐
Client PM Notified (if necessary)	☐

Site HSE Officer (sign above)	Date

The Project Manager is ultimately responsible for the accuracy of the information on this amendment and ensuring any changes to the original HASP is discussed with all affected site personnel prior to commencing work

This original form must be placed in the project file and a copy needs to be attached to the Site Health and Safety Plan (HASP).

Safety Inspection Checklist – Mobile Equipment Safety

	Week Ending:	Job No.:	Equipment:

(This form is to be completed daily by the operator. Deficiencies should be addressed immediately.)

Superintendent: _____

	Date:	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Comments
Equipment Hours:	***Start:***								
	Stop:								
Fluid Levels*:*									
	Oil								
	Hydraulic								
	Transmission								
	Radiator								
	Grease Fittings								
	Fuel								
Safety Checks:									
	Fire Extinguisher								
	Seat and Safety Belts								
	Warning Devices (backup alarms, lights, etc.)								
	Housekeeping								
	Brakes								
	Mirrors								
	Windshield and Wipers								
	Steering								
	Horn								
	Lights								
	Tires								
	Guards								
	Instruments								
	Exhaust System								
Accessories:									
	Boom or Mast								
	Controls								
	Level Indicators								
	Tracks								
	Other								
Sign-Off:									
	Operator's Initials								
	Supervisor's Initials								

Additional Comments: (Please write any additional comments here. Use the back of this form if necessary.)

√ = OK NR = Needs Repair NA = Not Applicable

Energized Work Plan [Sample]

Date:	/ /	CRA Office:	
Site Name:			
Project Number:		Project Manager:	

Section 1: Scope

Section 2: Personnel Requirements

Section 3: Materials, Tools And Equipment Requirements

Section 4: Scheduling

Section 5: Hazard Analysis - Electrical

Maximum Working Voltage:
Maximum Working Amps:

Shock Hazard

Determine *Shock Approach Boundaries:*

Limited Approach Boundary:	_____	inches
Restricted Approach Boundary:	_____	inches
Prohibited Approach Boundary:	_____	inches

Note: *Unqualified Person to remain outside the Limited Approach Boundary*

Arc Flash Hazard

Maximum *Incident Energy Level:*	_____ cal/cm^2
Arc Flash Protection Boundary:	_____ inches
Working Distance for Work Task:	_____ inches
Electrical Work Zone barricading established at what distance:	_____ inches

Note: *Establish the Electrical Work Zone barrier at the Arc Flash Protection Boundary or Limited Approach Boundary, whichever is further away.*

Section 6: Hazard Analysis - Other

Signatures:

_____ _____
Originator Date

_____ _____
PM Date

_____ _____
QTPR Date

Safety **Inspection Checklist for Excavations**

This checklist is to be completed by the competent person at the start of work and as needed throughout the shift (i.e., after rain events, etc.).

(A competent person has been trained in the current OSHA excavation standard, is knowledgeable about soil analysis and protective systems, and has the authority to shut down the job.)

Site Location:				**Project #**	
Date:		Time:		Competent Person:	
Were visual soil tests made? If Yes, what type?			☐ Yes	☐ No	Type:
Were manual soil tests made? If Yes, what type?			☐ Yes	☐ No	Type:
Soil Type:					
Soil Classification:					
Excavation Depth:			Excavation Width:		
Protective System Used:					
Signature:					

In the following table, please place a **Y** for Yes**, N** for No, or **N/A** for Not Applicable in the right hand column for each item.

If No, place the date of correction.

Subject		Y, N, N/A	Date Corrected
General Inspection of the Job Site:			
1	Does the competent person have the authority to remove employees from the excavation immediately?		
2	Are surface obstructions removed or supported?		
3	Are employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation?		
4	Are hard hats worn by all employees?		
5	Are excavated soil, materials, and equipment placed at least 2 feet from the edge of the excavation?		
6	Are walkways and bridges over excavations 4 feet or more in depth equipped with standard guardrails and toe-boards?		
7	Are warning vests or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic?		
8	Are employees required to stand away from vehicles being loaded or unloaded?		
9	Is a warning system established and used when mobile equipment operates near the edge of the excavation?		
10	Are employees prohibited from going beneath suspended loads?		
11	Are employees prohibited from working on the faces of sloped or benched excavations above other employees?		
Utilities			
12	Were utility companies contacted and/or utilities located?		
13	Are the exact locations of the utilities marked?		
14	Are underground installations protected, supported, or removed when excavation is opened?		
Means of Entering and Exiting Trench			
15	Is the distance along the trench to an exit no greater than 25 feet in excavations 4 feet or more in depth?		
16	Is a support system, such as underpinning, being used?		
17	Are ladders used in excavations secured and extended 3 feet above edge of the trench?		
18	Are structural ramps used by employees designed by a competent person?		
19	Are structural ramps used for equipment designed by a registered professional engineer?		
20	Are employees protected from cave-ins when entering or exiting		

Subject		Y, N, N/A	Date Corrected
	the excavation?		
Wet Conditions			
21	Is water removal equipment monitored by a competent person?		
22	Is surface water or runoff diverted or controlled to prevent accumulation in the excavation?		
23	Are inspections made after every rainstorm or other hazard-increasing occurrence?		
Hazardous Atmosphere			
24	Is the atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency, combustible, or other harmful contaminant exposing employees to a hazard?		
25	Are adequate precautions taken to protect employees from exposure to an atmosphere containing less than 19.5 percent oxygen and/or other hazardous atmospheres?		
26	Is ventilation provided to prevent employee exposure to an atmosphere containing flammable gas 10 percent above the lower explosive limit of a gas?		
27	Is testing conducted often to ensure that the atmosphere remains safe?		
28	Is emergency equipment, such as breathing apparatus, safety harness and lifeline, and/or basket stretcher readily available where hazardous atmospheres could or do exist?		
Support Systems			
29	Are materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads?		
30	Are materials and equipment used for protective systems inspected and in good condition?		
31	Are protective systems installed without exposing employees to the hazards of cave-ins (including end walls), collapses, or threat of being struck by materials or equipment?		
32	Are excavations below the level of the base, or footing supported, approved by a registered professional engineer?		
33	Does the removal of support systems progress from the bottom and members are released slowly? Note any indication of possible failure.		
34	Is the excavation of material a level no greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth?		
35	Is there a shield system placed to prevent lateral movement?		

Lockout/Tagout Periodic Inspection Form

Project Name:			Project Number:		
Name of Facility:			Maintenance or Repair Activity:		
Equipment Name:			Equipment Serial Number:		
Energy Sources Present					
☐ Electrical	☐ Chemical	☐ Mechanical	☐ Pneumatic	☐ Hydraulic	☐ Thermal
☐ Other: _____					
Are changes to the procedure required? ☐ Yes ☐ No					
If Yes, identify:					
Employees included in the inspection:					
_____ Supervisor (Print Name)			_____ Signature		
Date of Inspection:					

Work Site Safety Inspection Checklist

GHD Project #	
Location:	
Conducted on:	
Date of Inspection:	

Subcontractor(s):	

Number of Items That Require Follow-Up Action (see page 5 for details of deficiencies):

O - Project Manager should be satisfied through **observation** to support a 'yes' answer.

D - **Documentation** is needed to support a 'yes' answer. Viewing the relevant documentation would be sufficient.

S - **Sampling** of the employees is needed to support a 'yes' answer.

**Note - This checklist is a guideline intended to address the basic requirements of incident prevention. It is not to be considered a document that relieves a contractor or worker of any obligation under pertinent OH&S legislation that covers worker's health and safety at the work site.

	Policies & General Requirements		Yes	No	N/A	Remarks
1.	Is there a copy of the current GHD HSE Management System Manual on-site?	(D)	☐	☐	☐	
2.	Is there a copy of the current Provincial OH&S Act & Regulations on-site?	(D)	☐	☐	☐	
3.	Has a GHD Work Site Hazard Assessment Form and Site-Specific H&S Plan been completed?	(D)	☐	☐	☐	
4.	Have all GHD employees and sub-contractor personnel been given a safety orientation?	(D)	☐	☐	☐	
5.	Was there a daily on-site safety meeting?	(D/S)	☐	☐	☐	

	Policies & General Requirements		Yes	No	N/A	Remarks
6.	Check with one worker to see if he participated in the daily safety meeting that day? *(Can worker explain at least one positive benefit of safety meeting)*?	(S/O)	☐	☐	☐	
7.	Is there a record of the weekly on-site safety meeting? *(if applicable)*	(D/S)	☐	☐	☐	
8.	Are general site safety rules being followed (e.g., no smoking, personal protection equipment, appropriate use of cellular phones)?	(O)	☐	☐	☐	
9.	Have applicable Job Procedures/Safe Work Practices been discussed?	(D)	☐	☐	☐	
10	Are emergency procedures and numbers posted and known by all workers (Horns, Alarms, Equipment Shut-off, Escape Routes, etc.)?	(D/S)	☐	☐	☐	
11.	Check with one worker if he knows the location of emergency plan and contact list?	(O/S)	☐	☐	☐	
12.	Is there a qualified first aid person on-site? Does that person have a proof of certification?	(D)	☐	☐	☐	
13.	Is there an adequate first aid kit on-site (see checklist on Page 5)?	(O)	☐	☐	☐	
14.	Is first aid location clearly identified or location known and accessible for smaller projects?	(O/S)	☐	☐	☐	
15.	Do all workers have WHMIS training and proof of certification?	(D/S)	☐	☐	☐	
16.	Are all persons wearing approved safety gear as per Site-Specific H&S Plan (i.e., Safety footwear, Hard Hat, Gloves, Hearing Protection, etc.)?	(O/S)	☐	☐	☐	
17.	Are all persons in possession of appropriate gloves and are they being used (e.g., cut, chemical and vibration resistant, general work, etc.)?	(O/S)	☐	☐	☐	
18.	Do GHD personnel have complete Safety Kit Bags on-site (see checklist on Page 5)?	(O)	☐	☐	☐	
19.	Are all workers trained appropriate to their specific trade or task as per OH&S:					**May vary by Province**
	Skilled trades (TSSA, electrician, plumber, gasfitter, welder, sheet metal, carpenter, crane, operator)	(D/S)	☐	☐	☐	**(i.e., certification vs. competent worker)**
	Fall protection, power elevated work platforms	(D/S)	☐	☐	☐	
	Explosive actuated fastening tools (e.g., Hilti gun)	(D/S)	☐	☐	☐	

	Policies & General Requirements		Yes	No	N/A	Remarks
20.	Has a kick-off meeting/tailgate safety orientation meeting been conducted?	(D)	☐	☐	☐	
21.	Are there appropriate SDS sheets available on-site for all hazardous materials as required by WHMIS?	(D)	☐	☐	☐	**Verify all are current to within 3 years.**

	Operation Integrity		Yes	No	N/A	Remarks
22.	Have overhead/underground services been checked and documented?	(D)	☐	☐	☐	
23.	Are there appropriate site specific Job Safety Analysis (JSA), Safety Method Statements (SMS) or Safe Work Procedures/Practices available on-site?	(D/O)	☐	☐	☐	**Identify number of JSAs/SMS received:**
24.	Did GHD personnel and/or any workers who are involved in hazardous tasks, sign off on the SMS/JSA?	(D/O)	☐	☐	☐	
25.	Are Safe Work Permits/Checklists being used daily?	(D/O)	☐	☐	☐	
26.	Can “Site Specific SMS/JSAs” be clearly followed to ensure minimal risk to GHD employees, sub-contractors, equipment, property, and public? Test with one worker to verify preparation, sign-off and use of SMS/JSA for work being carried out.	(D/S)	☐	☐	☐	
27.	Are SMS/JSAs reviewed and signed off daily by supervisor and/or workers?	(D/S)	☐	☐	☐	

	Housekeeping		Yes	No	N/A	Remarks
28.	Are there adequate toilet facilities on-site?	(O)	☐	☐	☐	
29.	Are sufficient waste containers provided, used and emptied regularly?	(O)	☐	☐	☐	
30.	Are work areas kept free of slipping, tripping hazards and debris, including excessive electrode stubs and cut-off pieces (lumber, pipe, angle, etc.)?	(O)	☐	☐	☐	
31.	Is the site office kept in orderly condition (if applicable)?	(O)	☐	☐	☐	
32.	Are storage areas segregated, well maintained, and in safe condition	(O)	☐	☐	☐	

	Housekeeping		Yes	No	N/A	Remarks
33.	Are roads, walkways, and passageways kept clear of materials and debris?	(O)	☐	☐	☐	
34.	Is site adequately secure at all times, even when no one is on-site?	(O)	☐	☐	☐	
35.	Are adequate fire extinguishers provided and are they accessible and of a suitable type?	(O)	☐	☐	☐	
36.	Have fire extinguishers been inspected, labeled and seals maintained? (Check once yearly at a minimum and seal must be intact).	(O)	☐	☐	☐	
37.	Are combustible and flammable materials segregated and clearly identified?	(O)	☐	☐	☐	
38.	Are tools fitted with guards where required?	(O)	☐	☐	☐	
39.	a) Are motor vehicle, mobile equipment and pedestrian traffic controls being managed effectively for safety of workers and public?	(O)	☐	☐	☐	
	b) Does back-up alarm on mobile equipment operate properly (trucks <1 ton exempt) and is equipment in good repair?	(O)	☐	☐	☐	
	c) Are heavy material lifting equipment (cranes, fork lifts, etc.) and operating personnel in compliance with regulations and labeling (certification, inspection, capacity)?	(O/D)	☐	☐	☐	
40.	Are electric power tools properly grounded or double insulated and are extension cords in good repair?	(O)	☐	☐	☐	
41.	Are tools being used properly and in good condition?	(O/S)	☐	☐	☐	

	Public Safety/Security		Yes	No	N/A	Remarks
42.	Does site have adequate fencing / barricades / traffic cones against public access?	(O)	☐	☐	☐	

Safety Kit Bag Checklist	
☐	#2 First Aid Kit (see First Aid Checklist)
☐	Safety glasses/goggles (over glasses)
☐	Flashlight
☐	Safety vest
☐	Fire Extinguisher (Date of expiry:_____)
☐	OH&S Act
☐	GHD HSE Management System Manual
☐	2 Pairs of Work Gloves
☐	Safety blanket
☐	Hand/foot warmers
☐	Extra hard hat
☐	Hearing protection
☐	Shell booklets, as applicable
☐	Chin straps
☐	Eye wash kit (Date of expiry:_____)
☐	Respirator

#2 First Aid Kit Checklist	
☐	1 First Aid guide
☐	1 First Aid record book
☐	1 pencil
☐	12 safety pins
☐	1 splinter tweezers, blunt nose
☐	1 pair of 100 mm scissors
☐	2 pairs of disposable latex gloves
☐	2 sterile bandage compresses (100 mm x 100 mm)
☐	24 sterile adhesive dressings (25 mm wide)
☐	16 sterile pads (75 mm x 75 mm)
☐	6 triangular bandages (1 m)
☐	2 roller bandages (50 mm wide)
☐	1 roll of adhesive tape (25 mm wide x 2.5 m long)
☐	1 @ 100 ml bottle of antiseptic (peroxide) or 12 towelettes with antiseptic
☐	24 hand cleaners
☐	1 marked plastic bag for biohazardous waste disposal
☐	1 airway barrier device for rescue breathing

INSPECTION RATINGS: **A = Immediate Concern Rectify Immediately** **B = Important Rectify within 20 days** **C = Minor Rectify within 60 days**

	Deficiency Identified	Priority	Description	Corrective Action Completed	Date
1.					
2.					
3.					

Signature: _____ **Date:** _____
Auditor

Signature: _____ **Date:** _____
Auditor

Form initiated by: _____ Date initiated: _____

Initiator's role/responsibility: _____ Project number: _____

Affected location(s): _____

Client's management of change documentation attached, if required or applicable: ☐ Yes ☐ N/A

Type of change:

- ☐ Field operations/SOPs
- ☐ Equipment
- ☐ Safety
- ☐ Project management/resources

Duration of change:

- ☐ Permanent
- ☐ Temporary (specify how long change will be in place): _____
- ☐ Emergency

Describe the change:

Describe the procedure/task(s) required to complete the change:

Who needs to know about the change and how will you communicate this to them?

Is additional training for GHD people required as a result of this change? ☐ Yes ☐ No

If yes, please describe training needs and those who require it:

Coordination with Business School Learning Centre underway: ☐ Yes ☐ No

Identify any associated risks/hazards/impacts as a result of this change:

This completed form is a quality record

Does the change need to be approved by a client? ☐ Yes ☐ No

If Yes, state client's name: _____

Client role/responsibility: _____

Date authorized by client: _____
(mm/dd/yyyy)

Change approved by project manager: _____
(please print)

_____ _____
(signature) (approval date – mm/dd/yyyy)

Summary:

Item	Completion date	Confirmed by
1. Task(s) to execute change have been completed		
2. Those who need to know have been notified		
3. Additional training has been completed		
4. Risk(s) have been mitigated		
5. Change has been approved by all required parties		

Notes:

Scope: GHD may use the Management of Change Form (QSF-006) to identify and record project additions, revisions, changes, or updates regarding field operations, field SOPs, equipment, safety, resources, or project management.

Detail: The level of detail to a documented project change is ultimately determined by the project manager and/or any client expectations.

File location: Correspondence folder of the project file.

Temporary Traffic Control Plan

(Directions: Describe the Signs, Channelization Devices (tapers), Barriers and Interim Pavement Markings etc. that you will use in each of the four work zone areas as presented below. Refer to the 2009 Edition of the Manual of Uniform Traffic Control Devices (MUTCD), as necessary. Do not forget to address pathways for pedestrians, if necessary. All references identified below are from the 2009 Edition of the MUTCD.
http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm

The Advanced Warning Area

(See Section 6C.04 and Table 6C-1 for distances related to the placement of Advanced Warning Signs. See Figure 6C-2 for types of tapers and Tables 6C-3 and 6C-4 for distances related to placement of tapering devices.)
Describe the set up of this area-

The Transition Area

(In addition to Figure 6C-2, Tables 6C-3 and 6C-4, see Section 6C.08 for distances related to the placement of tapers.)
Describe the set up of this area-

The Activity Area

(See Figures 6C-1 and 6C-2 regarding Lateral Buffer Spacing and Figure 6C-2 for Longitudinal Buffer Zones)
Describe the set up of this area-

Temporary Traffic Control Plan

The Termination Area

(Post an END ROAD WORK sign or use a Longitudinal Buffer Zone)
Describe the set up of this area-

For Additional Information On:

Pathway for Pedestrians see Section 6D.01
Flagger Control see Section 6E
Temporary Traffic Control Zone Devices (e.g., signs) see Section 6F
Type of Temporary Traffic Control Zone Activities (e.g., duration of set up) see Section 6G
Typical Applications see Section 6H

Underground Utilities Checklist

(QSF-019)

Pre-Drilling/Excavation Checklist and Utility Clearance Log

Project number:	**Project name:**
Date:	**Project location:**
Public utility locator:	**Public utility locator phone number:**
Date of public utility locator request:	**Public locator call reference number:**
Private utility locator (If applicable):	**Private utility locator phone number:**

Utilities (indicate that location/utility presence was checked)

Borehole/ Excavation location	Date (mm/dd/yyyy)	Telephone	Water	Storm sewer	Sanitary sewer	Process sewer	Gas	Electrical	Cable	Overhead utilities	Other	Comments/Warnings
Utility owner												

Instructions: This checklist is to be completed by GHD personnel prior to initiation of field activities as a safety measure, to ensure that all underground utility lines, other underground structures, and above-ground power lines are clearly marked in the area selected for boring or excavation.

Notes: _____

Client: _____ **Client representative:** _____ **Phone number:** _____

Client or property owner acknowledgement of utility clearance: _____ **(Client, property owner, or authorized agent signature)**

Subcontractor acknowledgement of utility clearance: _____ **(Subcontractor or subcontractor representative signature)**

GHD field representative name: _____ **Signature:** _____

GHD project manager's review/confirmation of locate completion: _____

In the event that client or property owner acknowledgement cannot be obtained, it is strongly encouraged that all boreholes be hydro vacuumed and the costs passed on to the client.
Attach any clearance documentation from utility owner/operator to this document.

Underground Utilities Checklist for GHD Personnel

Pre-Drilling/Excavation Checklist and Utility Clearance Log

Drilling or excavation work may not proceed if any of the questions answered below are answered "No." Implement stop work authority and contact the GHD project manager to discuss and resolve any concerns or issues. Document the reason for a "No" answer in the comments section below.

Yes	No	N/A	Pre-Mobilization
☐	☐	☐	1. Has a utility locator request been completed within the last 30 days (verify time limit with state or provincial law)? If no, stop work and comment below.
☐	☐	☐	2. Is a scaled site plan, map or drawing showing the proposed borehole locations attached to this form?
☐	☐	☐	3. Does each borehole and excavation location allow for clear entry and exit, adequate workspace, and a clear path for raising the mast (or boom) and operating the drill rig and all support equipment? Ensure that the minimum OSHA/state/provincial utility clearance requirements between the mast or boom and the power line(s) are met. For instance, OSHA requires a minimum approach distance of 10 feet for systems below 50 kV and an increase of 4" for every 10 kV over 50 kV. Confirm if additional permits are required if the boom or mast will be working 5 meters (15 feet) or less from the electrical lines.
☐	☐	☐	4. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface or above-ground utilities shown on client's building plans? Check here ☐ if plans not provided by client (therefore not applicable to this job.
☐	☐	☐	5. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface or above-ground utilities shown on public right-of-way street improvement or other public property plan or site map?
☐	☐	☐	6. Has the site representative, familiar with the site, indicated no knowledge of any subsurface or above-ground utilities within 3 metres (10 feet) of the proposed borehole and excavation locations? (Review locations with site representative)
☐	☐	☐	7. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface utilities identified during a geophysical survey? Check here ☐ if no geophysical survey has been completed (therefore not applicable to this job).
☐	☐	☐	8. Have all utility locating service providers, notified by the public line locator, marked out their facilities in the vicinity of the borehole and excavation locations or otherwise notified us that they do not have any facilities near the proposed locations? (Attached confirmation and utility locate sheets from public locator)
☐	☐	☐	9. Are all proposed borehole and excavation locations at least 1.5 meters (5 feet) from a visual line connecting two similar looking manhole covers?
☐	☐	☐	10. Are all proposed borehole and excavation locations at least 1.5 meters (5 feet) from a visual line perpendicular to the street from the water, gas, and electrical meters?
☐	☐	☐	11. Are all proposed boring and excavation locations clear of pavement joints, curbs, crash posts, or other engineered structures?
☐	☐	☐	12. Does the ground surface/pavement lack signs of previous excavation (e.g., no pavement subsidence, no differences in pavement texture or relief, no pavement patching)?
			Pre-Drilling and Excavation
☐	☐	☐	13. Has it been verified that the proposed drilling or excavation work will not affect any work currently in progress?
☐	☐	☐	14. Has the drill rig or heavy equipment been inspected prior to use and documented? (See Drill Rig Inspection Checklist or Mobile Equipment Safety Inspection Checklist)
			15. Have barricades been erected to prevent unauthorized access, where applicable?
☐	☐	☐	16. Have all known live electrical or product lines within 3 meters (10 feet) of the dig path been visually verified? If no, comment below.
			17. For boreholes that have not been cleared or are within 3 meters of a utility:
☐	☐	☐	a. Before drilling have you cleared a hole to 2.4 meters (8 feet) below grade using an air-knife, or equivalent, before drilling and is the diameter of this hole greater than the final outside diameter of the boring? If not required comment below.
☐	☐	☐	b. Does the soil you encountered in the hand-dug hole appear to be native material (i.e., free of clean gravel, clean sand, aggregate base [gravelly sand ~ 10% fines] or other non-native looking material)? If not required comment below.

Have the above concerns been discussed with the GHD project manager?	☐ Yes	☐ No	☐ Not Applicable
Has the start of subsurface work been communicated to the GHD project manager?	☐ Yes	☐ No	☐ Not Applicable
Have the above concerns been discussed with the client?	☐ Yes	☐ No	☐ Not Applicable
Has the scope of work been approved by the client?	☐ Yes	☐ No	☐ Not Applicable

Comments: _____

_____

_____

_____

_____

GHD field representative name: _____ **Date:** _____

Appendix B
Job Safety Analysis Tables

Job **Safety Analysis (JSA)**

Air Monitoring

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Construction activities				
Key equipment:	Select (four gas or five gas monitors, PID}				
Task-specific training:	Training and understanding of specific model of meter being used				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒ Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Prepare to enter work area	• Low oxygen levels • Flammable or explosive conditions • Organic vapors	• Consult the site specific HASP to identify known and suspected chemicals or concern • Ensure the gas meter selected is correct for the items identified • Ensure meter has been properly calibrated and documented • Ensure the meter is fully charged or the correct style and type of replacement battery is available • Document readings at appropriate intervals • Enter area to perform work only when you are certain conditions are safe • If uncertain or untrained on the specific meter being used or if you have concerns over meter functioning correctly or you receive readings of concern, exercise SWA, relocate to a safe area, and contact your site supervisor or regional safety supervisor • Reference Table 2 of the HASP for Action Levels		
2	Continued monitoring of work area	• Low oxygen levels • Flammable or explosive conditions • Organic vapors	• While performing work tasks keep meter with you and record readings at predetermined times • If job conditions change or meter alarms exercise SWA, move to a safe location, notify the site supervisor, and re-evaluate the task • Re-enter only when certain safe conditions exist		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Completion of work or end of work day	• Low oxygen levels • Flammable or explosive conditions • Organic vapors	• Document readings and time • If work complete return meter to stores • If work is continuing clean, inspect, and recharge meter • Store meter in a safe place in clean dry conditions		
4	Continued meter use	• Low oxygen levels • Flammable or explosive conditions • Organic vapors	• Ensure meter is charged or replacement batteries are available • Perform daily checks and meter calibrations required for the specific meter being used • Record checks and calibrations – If meter is good, proceed with use as above – If meter does not perform or is suspect, do not use, inform site supervisor, and do not enter work area until a working meter is available		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Corded Power Drill

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Hand drilling holes				
Key equipment:	corded drill, portable GFCI unit. Additional or specific PPE may be appropriate based on what material is being drilled (ex: concrete – face shield, respiratory protection from silica and particulates, etc. .				
Task-specific training:	SMART (BBS) Training, 8-Hour Refresher, Hazard Communication. Supervisor shall be training in CPR, First Aid, and have Supervisor Training. Hand and Power tool training. **Operator will review the Manufacturer's Operating instructions prior to use.**				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☒ Required	☐ Haz cat 4	☐ R95		☒Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA Process. Discuss Emergency Evacuation Plan and Review JSA	• Stakeholder encounters • Miscommunication • Unsafe acts/conditions by others • Fire/Explosion on refinery • Inclement weather	• All personnel will clearly understand SWA. • Follow stakeholder communications guide • Communicate mustering points • Follow emergency notifications from Main Gate. Stop all work as directed when lightning or severe storms are in the area. Personnel must wait till an ALL CLEAR has been announced over the radio before resuming work.		
2	Inspect Drill -**refer (review) to the specific equipment's equipment manufacturer's operating manual before using the equipment.** **Inspect area to be drilled to ensure utilities will not be encountered and that punch through will not injure individuals or damage other equipment.**	• Cracked, missing or broken parts • Broken Bits • Accidental start • Improper Bit	• **Wear EN 388 Cut/Abrasion Level 2 or greater gloves and other required PPE** • Complete a Hand and power tool safety checklist. Report defects to supervisor immediately. Do not use until replaced or repaired. • Unsure Tool doesn't have a "locked on" switch and meets Client and GHD requirements or that the "locked on" switch is never used • Inspect power cord on tool. • A portable GFCI unit must be used in between power cord and extension cord. • Test the GFCI unit. Run tool and hit the trip button on GFCI. Ensure GFCI works • Unplug tool before making any adjustments to drill.		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Set up material to be drilled	• Slips/trips/ falls • Personal injury • Property damage • Strains • Pinch points	• **Wear EN 388 Cut and Puncture, Level 3 Med/Hvy duty Impact gloves.** • Use a mechanical assist or the buddy system if material needs to be lifted and placed off the ground and is bulky, awkward, or weighs 50lbs or greater. • Keep hands out of pinch point areas when placing material. • Use proper body posture when lifting using your legs, slight bend in knees and back straight.		
4	Drill Operations (warm up muscles to be used prior to initiating drill operation.) – rotate personnel frequently to ensure active recovery time is provided to each drill operator. Take breaks.	• Excessive force • Blade breakage • Vibrations • Body strains • Fatigue • Musculoskeletal/ergo issues • Cuts • Caught by • Visibility • Electrocution	• **Wear EN 388 Cut and Puncture, Level 3 Med/Hvy duty Impact gloves.** • Use both hands when operating the drill. No one-handed operation. Always hold drill at designated insulated grip points. • Never use your feet to support or hold down material being drilled. • When bit becomes dull, replace to avoid excessive force using your hands and arms. • Rotate drill operations to a fresh operator frequently-allow for active recovery. • Take concurrent breaks so all team members can recover. • Warm up muscles prior to beginning drill operation and after any extended break periods. • Stretch arms, shoulders, wrists, and neck throughout breaks and as needed. • Release trigger on drill immediately after making hole. Keep drill off the ground and put away when completed. • Secure all loose fitting clothing. • Unplug device when changing bit. • Do not use in wet conditions		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Excavation Oversight

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Excavation oversight				
Key equipment:	Excavator; Excavation Safety Checklist;				
Task-specific training:	40-Hour and 8-Hour HAZWOPER; PPE; Mobile Equipment Operations; Excavation Safety Training; Excavation Competent Person; Confined Space Entry				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Perform the STAR process; discuss SWA; verify Permit to Excavate and Utility Clearance Form is completed (overhead and underground); verify excavation layout	• Underground utility strike • Overhead utilities	• QSF 019 and Permit to Excavate Forms completed and signed off • Utility Locate Ticket number on file within 10 days of excavation startup? • Mark work area and safe distances for overhead lines; use spotter as necessary		
2	Set up necessary work area and traffic controls	• Fall-in • Caught-between • struck-by • Lifting hazards • Manual material handling • Back injury	• Demarcate site and work areas to ensure that personnel and truck/equipment traffic is maintained safely and smoothly • Stockpile and laydown area are set up properly • Perform a pre start meeting, inform subcontractor of safe lifting practices • Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves when setting up barricades • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Hand digging and potholing activities (where/if necessary based on utility locates)	• Underground utility strike	• Use preventive techniques • Maintain proper utility clearances with heavy equipment and use hand digging/potholing when necessary • Refer to step 2 and the HASP for additional lifting information		
4	Heavy equipment operations to excavate and handle soils and waste materials	• Caught-between and struck-by hazards • Underground/overhead utilities	• Stay out of swing radius • Use spotters to verify clear route of travel and work area • Maintain eye contact with operator and/or signal operator • Keep soil 2 feet from edges • Inspect heavy equipment and document inspection • Ensure the above utility clearances and safe work protocols are followed		
5	Excavating activities	• Soil cave-in • Noise hazard • Struck-by/against hazards • Potential contact with chemical waste material, organic vapors, and particulate	• Keep proper distances from edge of excavation • Limit equipment operations in trench area • Keep work area free of trip hazards • Perform necessary soil classification • Use hearing protection as necessary • Wear designated PPE and conduct air monitoring		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
6	Excavation entry activities (if required)	• Soil cave-in • Struck-by/against hazards • Hazardous atmospheres • Slip/trip/fall hazards • Emergency egress	• Keep proper distances from edge of excavation • Limit equipment operations in trench area • Keep work area free of trip hazards • Perform necessary soil classification • Use daily inspection form to document/meet competent person inspection requirements • Inspect trench after any change in conditions (e.g., rain, equipment vibrations) • Provide fall protection measures • Utilize shoring equipment properly – ensure that tabulated data sheet is on site • Use 4 gas monitor and PID to screen excavation air prior to and during entry • Ladder safety and proper slope of ladder • Use harness and lifeline when entering trenches over 5 feet deep		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Heavy Equipment Spotting

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Spotting Heavy Equipment and Delivering Trucks				
Key equipment:	Air horn, high visibility Type 2 shirt/vest				
Task-specific training:	Heavy and/or Mobile Equipment Safety Training				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Perform STAR Process and discuss SWA with operators, delivery drivers and spotters	• Site personnel not aware of STAR and SWA • Personnel not aware of blind spots	• Conduct a pre task meeting to establish and address any safety concerns • Inform subcontractors and delivery drivers of SWA and discuss emergency STOP signal(s) a clenched/closed fist will dictate that all activity is to cease immediately		
2	Discuss any hand signals to be used – assign one spotter to each activity. Operator will not take signals from multiple sources.	• Struck by – crushing • Property damage • Inappropriate/unknown signals	• Do not stand between equipment and immovable objects • Always stay within operator's line of sight – if operator loses view of spotter, implement SWA immediately • Do not permit equipment operation within 2 feet of immovable objects/walls • Review/use signals that operator is familiar with and understands • No cell phone use while driving, operating, or spotting • Spotters will have no other assigned duties while spotting		
3	Determine accepted path of travel and walk prior to use – note all hazards. Determine safe loading/unloading zones – do not setup under/near/over utility lines.	• Slip/trip/fall hazards • Property damage • Uneven ground • Stuck equipment or trucks	• Use STAR process and watch where you walk • Note any obstructions to be avoided • If necessary set up traffic signage/delineators to indicate safe paths of travel		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Know height restrictions of any overhead utilities. A) Spotters will not locate equipment and/or trucks under overhead utilities during material handling (loading/unloading) activities. B) Operators will not work within utility clearance limits.	• Property damage • Electrocution • Contact with/against	• Know the height of the vehicle as to avoid overhead utilities • If vehicle will not clear utilize proper stopping hand signal or air horn to get driver's attention – know emergency stop signal • Spotter should stay within viewing distance of equipment and utilities but far enough away to avoid danger from shock, tip over, falling loads • Ensure vehicle has adequate clearance of utility		
5	Make/maintain eye contact with driver/operator using side-view mirrors while backing up	• Struck by • Slip/trip/fall hazards • Property damage • Loss of communication	• Once communication and eye contact are initiated, maintain throughout process • Do not stand next to a truck while its dumping tip over • Maintain a safe, but reasonable, distance away from moving vehicle (in order to maintain eye contact)		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Small Gasoline Powered Equipment Setup and Operation

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Setup and operation of small gas powered equipment (generators, pumps, etc)				
Key equipment:	Safety fuel can and funnel, appropriate accessories; Goggles as necessary; abrasion/cut resistant gloves (leather or equivalent); chemical resistant gloves needed				
Task-specific training:	Review the manufacturer's recommendations for each specific piece of equipment; hand tools				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☒ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☒ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☒ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Use the STAR Process; refer to the specific equipment's equipment manufacturer's operating manual before using the equipment.	• Slip/trip/fall hazards • Situational risks	• Verify personnel's training is sufficient for the scheduled task(s) • Is job instruction training (hands on training) necessary? • Employees should remove finger rings, necklaces, or jewelry, which may be hazardous in equipment operation		
2	Equipment safety checklist	• Frayed or damaged pull cord • Faulty cord or hose connections • Damaged cords or hoses and fittings • Shock/Electrical Hazards	• Inspect pull cord for signs of fraying or damage, replace as necessary • Replace worn or damaged cord or hoses and connectors • Replace cord or hose connections with operational connections • Perform an overall inspection of the equipment for defects or signs of damage • Use GFCIs as appropriate.		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Equipment setup	• Slip/trip/fall hazards • Uneven terrain • Wet, icy, and muddy conditions • Lifting hazards • Manual material handling • Back injury • Struck-by and line of fire • Pinch points	• Be aware of your surrounding conditions (footing, weather conditions, etc.) • Reduce distance traveled when carrying materials • Make sure grip is adequate; use project specific or mechanics gloves to enhance grip when necessary • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Grab the equipment only at designated handles or, if none are available, at locations where the hands and fingers will not get caught in the equipment or smashed • Test the weight of the equipment before lifting • Place equipment on level area • Straighten out cords or hoses before connection and keep them out of high traffic areas • Be aware of “stored energy” hazards presented by hoses		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Equipment fueling/refueling	• Fires • Explosions • Chemical hazard	• Turn off equipment before fueling • No smoking while fueling • Do not use cell phones while fueling • Store fuel in proper safety containers only • Always use a funnel when transferring fuel from can to tank on pump • If transferring fuel from large vessels into portable cans, use proper grounding or bonding techniques • Do not fuel the equipment when it is hot • Wear gloves and wash hands after fueling		
5	Starting the equipment	• Back/arm strain • Slippery conditions • Release of Haz. energy	• DO NOT START ELECTRICAL GENERATORS WITH CORDS/LOADS ATTACHED! Unplug all connections • Check engine oil. • Ensure fuel line shut off lever is turned “on” and the engine on/off switch is “on” • Make sure the starting pull cord is free pulling; test the cord before pulling • Adjust choke as required • Maintain straight posture when pulling the recoil starter cord • Firmly grasp pull cord, slowly take up slack until resistance is felt, pull cord rapidly up and away. • Do not over exert when pulling the cord • Be aware of your surrounding conditions • Make sure slip/trip/fall hazards were properly identified and corrected		
6	Equipment operation	• Electrical Hazards • Splash hazards • Hot surfaces • Noise	• Use GFCIs on generators • Remove worn or damaged cords and/or hoses until they can be repaired or replaced • Keep hands away from the exhaust or hot components of the equipment • Be aware of any unguarded moving parts on the equipment • Wear required PPE (hearing protection, splash protection, etc.) • After engine is shut down, switch the fuel lever to the “off” position		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Vacuum Truck Operation Oversight

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Vacuum Truck Operation Oversight				
Key equipment:	Vacuum Truck; High visibility vest, fit for purpose hand protection, hard hat, safety glasses, and steel toe boots				
Task-specific training:	GHD SMART (BBS) Training, 40-Hour HAZWOPER, 8-Hour Refresher, Hazard Communication. Supervisor shall be trained in CPR, First Aid, and have Supervisor Training.				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☒ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Obtain necessary permits, agreements, and bonds; coordinate inspections and subcontractors, and notify stakeholders	• Fines, law suits, delays, or added work	• Coordinate with project manager to ensure all approvals are obtained (well, encroachment, access agreements, traffic control plans, etc.) and owner, tenant, subcontractors, and agencies are notified of start date		
2	Mobilize with proper equipment/supplies	• Delay or improper performance of work due to improper equipment on site	• Make sure subcontractors are aware of their responsibilities for safety, labor, equipment and supplies • Provide subcontractor with minimum checklist (they can use their own if more protective) and ensure equipment has been checked and meets expected standards before it mobs to the site. • Review the HASP and permit conditions and gather necessary PPE		
3	Meet with Property Manager (or designee) on start date before commencing work	• Unknown traffic or other work hazards • Lack of communication between all interested parties	• Explain planned activities • Confirm locations to be cleared and tentative schedule • Locate emergency product shut-off switch for facilities with potential hydrocarbon exposures. Communicate that location to all personnel		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Perform STAR and tailgate safety meeting upon arrival at site	• Consider worst-case scenario (including weather conditions) • Loud conditions (hearing protection and communications with crew)	• Review the HASP with co-workers • Highlight aspects identified by SPSA and, if necessary, add to HASP and modify JSAs • Have all co-workers sign the HASP • Discuss crew communication in high noise environments, have communications means on hand (air horn, whistle, etc.) • Ensure that all site workers have donned PPE and it is in good condition • Confirm all necessary subcontractor certifications and keep copies on site		
5	Verify necessary traffic control	• Accident during placement or as a result of improper traffic control equipment placement	• Use buddy system for placing traffic control • Reference traffic control plan section of the HASP (may include specific requirements based on encroachment permit)		
6	Verify exclusion zone(s) and establish work areas/heavy equipment pathways	• On-site vehicular accident with heavy equipment • Injury or exposure to public or other on-site personnel • Slip/fall hazards	• Use orange fencing, delineators with flags at least 4 feet tall, and caution tape • Implement exclusion zone setup instructions of the HASP • Set up clear walking paths between workstations		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
7	Verify set up of vacuum truck	• Damage caused by vac rig while accessing setup locations • Overhead or underground utilities	• Make sure subcontractor ensures clear pathway to location to be cleared • Provide as-needed hand signals and guidance to driver to place rig • Visually inspect vehicle (fire extinguisher on board, no oil or other fluid leaks, pressurized hoses secured with whip-checks or adequate substitute, water tank not leaking?) • Confirm local utility locations • Visually verify bonding and grounding have been performed • Verify that all gauges work, determine when relief valves were last serviced, that all drains/valves open/close as needed and document and perform function check of emergency shutdown switch • Post person at one of the emergency shutdown switches to shut down operation if unplanned events happen with the rig or that could affect the project		
8	Observe operation of vacuum truck	• Eye injury from flying debris • Exposure to chemical hazards • Hearing damage • Catastrophic equipment failure • Damage to adjacent structures and vehicles • Personal or property damage due to accidental activation of vac rig • Back strain	• Don any additional PPE and make sure all people not associated with work at hand are a safe distance from equipment and far enough away that they are safe from flying debris • Ensure that the stinger is safely secured when not in use by shutting off or blocking pressure supply to prevent accidental activation • Use proper lifting techniques and tools		
9	Verify the removal of all traffic control devices and inspect site for cleanliness	• Traffic • Nuisance or safety hazard left on site • Possible spills	• Use buddy system as necessary to remove traffic control • Leave site clean of refuse and debris • Clearly mark/barricade any holes that need later topping off or curing • Notify station personnel of departure • Map locations and note any cuttings/purge water left on site		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Sub-Slab Installation Using a Hammer Drill and Sampling Using SUMMA Canisters

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	April 15, 2016	**Client:**			
Project number:	11119306	**Created by**	Kevin Burns	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, Indiana				
Specific task	Installing sub slab vapor probes ,sampling with SUMMA canisters with mass flow controllers, purging probe with low flow pump				
Key equipment:	SUMMA canisters, mass flow controllers, low volume pump, sub slab probes, drill; Wear safety glasses and reflective vest in wooded areas or along busy road ways/highways				
Task-specific training:	Training in setting up summa canisters, training in pump calibration, training on the installation of sub slab probes, experience in drilling through concrete slabs				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☒ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Kevin Burns				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	The concrete slab is drilled with a ½" drill bit until it punctures through the bottom of the slab. When selecting a ½" drill bit, choose a bit that is several inches longer than what is required to puncture through the bottom of the slab	• Kick back from the drill, flying concrete debris, rebar • Loud noise from drilling and coring concrete slab • Inadequate working space/confined space.	• Ensure adequate working space for drilling procedure, select sample location in an open space • Wear safety goggles to protect eyes from any debris. Wear safety boots to protect your feet should the drill slip. Drill as straight as possible to reduce the risk of the drill bit getting stuck • Keep legs bent and outward, if the drill kicks back your legs/knees will not be hit by the drill		
2	Use a 2" drill bit to drill 2" into the concrete slab directly above the ½" drilled hole to facilitate working space to install the probe	• Kick back from the drill, flying concrete debris, rebar • Loud noise from drilling and coring concrete slab • Inadequate working space/confined space.	• Wear safety goggles to protect eyes from any debris. Wear safety boots to protect your feet should the drill slip. Drill as straight as possible to reduce the risk of the drill bit getting stuck • Ensure adequate working space for drilling procedure, select sample location in an open space • Keep legs bent and outward, if the drill kicks back your legs/knees will not be hit by the drill		
3	Install sub slab vapor probe in ½" hole Secure with Rockite Cement	• Rockite cement dries quickly and can adhere to skin • Pinch points/poking injuries from clip used to hold probe in place	• Wear gloves to protect hands and skin from cement • Clip fits snugly on probe- insert probe on clip holding the clip away from the body to reduce the risk of poking injuries		
4	Once sub-slab probe has been installed, purge three volumes of ambient air from probe. Purge with low volume pump at 100 mls/min for appropriate length of time to remove the three volumes of air from the probe	• Pinch points, objects falling	• Ensure pump is placed on a flat surface to avoid tipping or falling		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
5	One end of the tubing is attached to the inlet of the pump, the other is placed in the sub- slab probe. Leak testing can be performed at the same time using a helium shroud	• Tubing tangled, pump falling • Compressed gas tank tipping over	• Ensure tubing does not tangle, keep straight to prevent pump from falling • Ensure eye ware is on when using gas • Keep gas on a stable surface so the tank does not fall over		
6	One purging is complete, prepare summa canister for sampling. Place summa canister on a level flat surface	• Canister can fall or slip during installation process	• Wear steel toed boots and insure canister is placed securely on a flat level surface, big enough to support the bottom of the canister		
7	Remove swage nut from top of canister and attach the mass flow controller to the top of the canister, ensure controller is secured tightly to prevent leaking	• Pinch points	• Use correct size wrench to remove swage nut and secure controller		
8	Open valve of canister all the way and once sampling time is complete, close valve on canister	• Pinch points, canister falling	• Valve should be open and tighten by hand, not a wrench • Ensure canister is on a level surface, wear steel toed boots to protect feet		
9	One valve is closed securely, remove mass flow controller with wrench and replace swage not on top of canister	• Pinch points	• Use appropriate size wrench to remove the controller and to tighten the swage nut once sampling is complete		
10	Replace canister and mass flow controller in appropriate boxes for shipping	• Pinch points and falling objects	• Wear steel toed boots , to minimize pinch points, place equipment in boxes that they were shipped in for delivery to lab		
11	Sub-slab probes will stay installed in the slab for another sampling event-cover hole with flush mount monitoring well cover	• Pinch points/trips and falls	• Cover hole carefully, ensure fingers are not trapped beneath cover. Secure covers with appropriate hardware to prevent trips and falls		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Breaker Energize and De-Energize

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Breaker Energize and De-Energize				
Key equipment:	Hard hat, safety glasses, Lock(s), Tags, Gang Bars; Face Shield, safety shoes, electrically isolated gloves, volt meter, electrically isolated tools. LOTO gear				
Task-specific training:	40 Hour HAZWOPER, LOTO, WHMIS				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☒ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒ Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Wayne St. Denis				
Mark Molinary				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
	De-Energizing a Breaker will be performed when: • An individual is working on a component that is or may become energized; • A Tap change is required on the PDS; and • Shut Down operation	• Electrical hazards • **Energizing or De-Energizing a breaker will not be performed outside in moderate or heavy rain, or in electrical storms**	• Adhere to JSA and safety procedures in this JSA	O&M Technician	
1	Tailgate safety meeting	• Not identifying all hazards while performing tasks • Personal Injury • Property damage	• Discuss work to be performed and associated hazards with GHD personnel and subcontractors • Include discussion on hospital route, evacuation procedures, and emergency contacts; complete daily tailgate forms • Discuss site-specific requirements for working on facility • Refer to task-specific JSAs for other O&M activities	O&M Technician	
2	Discuss STAR and SWA	• Site personnel (GHD and subcontractors) not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Determine whether current procedures and JSAs are adequate for the task at hand; if procedures/JSAs are not adequate, GHD personnel will need to re-evaluate and develop proper procedures and JSAs before proceeding with tasks • Use SWA to stop any work that is unsafe	O&M Technician	
3	Gather and inspect tools: Voltmeter	• Electrical hazards	• Test voltmeter following manufacturer requirements to ensure proper working order	O&M Technician	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Perform a Step & Touch Potential test on the control panel Test on the location of the breaker if within 30' of treatment area	• Slips, trips, falls • Electrical hazards	• Ensure area is free from debris and trip/slip hazards • Use care when stepping over hoses or leads • Perform a Step & Touch Potential test on the control panel • If > 15 Volts, cease operations, leave area and contact MC2	O&M Technician	
5	Ensure that all load is removed from the device: • For PDS, deactivate electrodes and sub systems • For WCS, deactivate solenoid valves	• Electrical hazards • Arc Flash	• Review and adhere to the JSA for PDS Shut Down Instructions • Review and adhere to the JSA for WCS Shut Down Instructions	O&M Technician	
6	De-Energize the breaker	• Electrical hazards • Arc Flash	• Open cabinet doors • Stand off to opposite side of the door hinge of the breaker to be de-energized • Using the palm of your hand, place it on top of the breaker handle • Place the other hand behind your back • With your face turned away push the breaker handle downward • Attach LOTO lock and tag • Attempt to test start equipment to ensure the proper breaker has been disconnected • **Energizing or De-Energizing a breaker will not be performed outside in moderate or heavy rain, or in electrical storms** • **For Breakers 480V or greater Electrically Isolated Gloves must be worn** • If strong winds are present, secure cabinet doors open preventing them from swinging into you	O&M Technician	
7	Close cabinet doors	• Electrical hazards • Arc Flash	• Ensure cabinet door is closed properly	O&M Technician	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
8	Lock-out cabinet door(s)	• Electrical hazards • Arc Flash	• All personnel performing work in the well field area must place there lock onto LOTO box or Single Source LOTO clasp • LOTO will remain on until work is completed and inspected	O&M Technician	
9	Energizing a Breaker	• Electrical hazards • Arc Flash	• Once work is completed, inspect the well field to make sure no tool or parts are not leaning up against the header pipe and ground • Ensure that all individuals have completed working on that component and LOTO is removed • **Energizing or De-Energizing a breaker will not be performed outside in moderate or heavy rain, or in electrical storms** • **For Breakers 480V or greater Electrically Isolated Gloves must be worn** • Identify the breaker to that component locked out • Open cabinet doors • Stand off to the opposite side of the door hinge of the breaker to be energized • Using the palm of your hand place it on bottom of the breaker handle • Place the other hand behind your back • With your face turned away push the breaker handle upward	O&M Technician	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Decontamination of Sampling Equipment and Personnel (PPE Level D)

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Decontamination of sampling equipment and personnel (PPE Level D)				
Key equipment:	Alconox/Liquinox, brushes				
Task-specific training:	Decontamination/Site Control; Quality Control/Sampling Plan				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Decontamination of sampling equipment (including pumps, bailers, tubing, etc.)	• Contaminant exposure • Pinch points • Slip/trip/hit/fall hazards • Lifting hazards • Back injury • Manual material handling	• Set up decon station to capture any spills to avoid cross-contamination and manage wastes • Wear appropriate PPE • Scrub equipment clean then rinse and verify it is clean and free of contamination • Avoid putting hands in or near pinch points • Maintain good housekeeping and be aware of surroundings • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical means, such as a dolly, cart, or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Refer to the HASP for additional lifting techniques	Sampling personnel	
2	Decontamination of personnel	• Contaminant exposure • Slip/trip/hit/fall hazards	• Refer to the HASP for specific procedures but in general start with most contaminated article and remove until inner gloves are the last item left • Dispose of used PPE in accordance with site requirements • Wash hands and face before eating, drinking, or using tobacco products • Take care when removing PPE (boots, gloves, etc.); sit down to remove/change boots as necessary	Sampling personnel	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Management of waste derived from decontamination activities	• Contaminant exposure • Lifting hazards • Back injury • Manual material handling	• Containerize decon waste (e.g., water, used PPE) as required • Properly dispose of decon fluids (e.g., sediments) • Refer to step 1 and the HASP for additional lifting information	Sampling personnel	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Initial Site Recon and Walkthrough

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Site walkthrough to assess and inventory hazards posed by site work activities				
Key equipment:	Basic PPE, hand/power tools based on site condition, site inspection checklist or notebook, JSA forms, pens; Insect repellant, flashlight. Coveralls may be necessary based on type of brush/plants/insects in work area(s) being inspected. Protective gloves if overgrown vegetation or rundown buildings.				
Task-specific training:	SMART Safety training (STAR), JSA development, Poison Plant Identification				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☒ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA to stop any work that is unsafe	All persons on project team	
2	Check weather	• Unexpected storm, fog; rain; snow; lightening, thunder • Heat/cold stress	• Check local weather forecast • Discuss weather issues and precautions to take while driving and on site during the pre-job safety meeting • If weather conditions (e.g., fog, rain, snow) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightning/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Assessor	
3	Sign in	• Site Manager and Operator not aware of GHD staff presence in facility or on grounds	• Sign in at front desk • Ask to speak to Site Manager or alternate designate	Assessor	
4	Don necessary GHD and client required PPE	• Contact with recyclable material or equipment	• Wear all required PPE (hard hat, vest, boots, and glasses) at all times while in the facility	Assessor	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
5	Unload equipment from vehicle	• Lifting hazards • Back injury • Manual material handling • Cuts • Pinch points • Hand/foot injury • Forgotten equipment • Damaged equipment	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Wear leather/cotton gloves and avoid placing hands/fingers in pinch point locations • Wear steel-toed boots • Verify requested equipment against warehouse form • Load equipment in an organized manner to prevent shifting during transport or use cargo netting	Assessor	
6	Complete site inspection and walkover of the property and work areas – Note any hazards that will impact site personnel and/or their operations	• Slip/trip/fall hazards • Insects/reptiles • Pedestrian injury • Poison plants	• Check in with site personnel and sign appropriate visitor or safety log (may require watching safety video [i.e., plant]) • Check with site contact to determine safely accessible areas and areas where PPE are required • Wear PPE as directed by site personnel or dependent upon your evaluation of conditions • If building(s) looks dilapidated or in poor condition, do not enter • Watch for vehicles or other mobile equipment moving around • Make sure areas are well lit and you are accompanied by a site representative (if applicable) • Watch where you step on pavement (potholes, dips, or obstructions) and in	Assessor	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
			vegetated/wooded areas (dips, holes, branches, vines, etc.) • Do not take photographs while walking • Do not talk on cell phone while walking • If in vegetated or wooded areas, watch for beehives, wear insect repellent (if area and season dictate) as needed, be mindful of gopher holes/tunnels, small animal dens, snakes, stray dogs/cats, transient/homeless individuals, poison ivy/oak/sumac, etc.		
7	Sign out	• Site Manager and Operator not aware that GHD staff have left facility	• Sign out at front desk • Ask to speak to Site Manager or alternate designate	Assessor	
8	Demobilization	• Collision • Injury or death to vehicle occupants or other parties	• Perform perimeter vehicle check • Maintain awareness of pedestrian/vehicular traffic when exiting the site • Utilize defensive driving techniques • Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency	Assessor	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Hand Tools (Non-Powered)

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Multiple tasks involving hand tools (all types and sizes)				
Key equipment:	Hand Tools (Non-Powered): Wrenches, screwdrivers, hammers, cold and wood chisels, shovels, utility knifes, metal files (square or round), sockets, saws, post hole digger, T-post driver, wire cutters, come-a-long, pickaxe, racks, grease guns, bottle/floor jack, tire wrench, first aid kit, etc.; Fire retardant coveralls				
Task-specific training:	Basic Hand Tools (Non-Powered) Principals and Common Sense, CPR, First-Aid				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Perform STAR process	• Unsafe acts • Property damage • Personal injury • Utilities • Electrical components	• Stop, Think, Act, and Review • Identify hazards; change JSA accordingly and discuss task and expectations of the task with supervisor • Select appropriate PPE requirements (at minimum safety glasses and hand protection) • Identify all utilities if conducting work using tools for dirt work (e.g., construction fence, silt fence, trenching, tree planting) • Personnel must be trained on "Control of Hazardous Energy (Lockout/Tagout)"		
2	Hand tool selection	• Injury to body, hands, face • Lacerations • Lack of knowledge • Taking short cuts • Missing, cracked, or broken • Chemicals	• Use the appropriate tool for the task; do not take shortcuts by using one tool to perform another tool's effective and safe capabilities • Ensure you understand the tool usage and purpose for each one selected • Understand the dangers associated with the tools (e.g., spark producers) • Ensure the tool(s) selected are of solid integrity • If proper tool(s), for the task is not available, utilize the STAR process and discuss obtaining the proper tool with your Supervisor		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Inspect tool(s)	• Flying objects/projectile • Pinch Points • Cuts • Cracked, chipped, or broken • Fatigue or stress • Grease/oil • Dull blades (utility, wood, metal)	• Wear appropriate hand and eye protection • Wear Kevlar gloves when working with cutting/saw tools • Check tools for missing, broken, cracked, chipped, spilt, knurled, beveled, bent, mushroomed, condition; remove unsafe tool(s) from service immediately by tagging out and/or properly disposing of • Check all wood handled tools; do not use if cracked, split, or severely gouged; replace handle as needed or applicable • Ensure tool(s) are clean and free of oil, grease, adhesives (Silicone) for sure gripping capabilities • Check cutting type tools for dullness; replace or have sharpened by qualified person		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Use of tool(s)	• Tool loss/damage • Smashed fingers • Pinch points • Blisters • Cuts/scrapes • Bruises • Flying debris • Ergonomics • Strains • Repetitive motions • Slip/trip hazards • Utilities	• Wear appropriate hand and eye protection • Keep hands and fingers out of "line of fire" • Use proper body positioning and solid footing • Use hearing protection; refer to HASP "Hearing Conservation Program" • Take frequent breaks to avoid joint and muscle numbness/fatigue; stretch and circulate as necessary • Don't force or exceed the tools limitations • Confirm with your supervisor that utilities have been cleared (Note: Shovels, post hole diggers, pickaxe, and T posts). A QSF 019 must be completed as due diligence. • If task is requiring additional tools, use the STAR process and determine proper tool selection and use the tool designed for the task • Never use a tool near, in, or against "live" electrical components		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
5	End of tool usage	• Overhead • Damaged • Theft • Poor housekeeping • Cuts/punctures	• Place tools on firm solid surfaces or in tool box when not in use • Do not create an overhead or trip hazard with the tools • Return tools back to their proper storage (e.g., shop, warehouse, tool box, tool crib, cabinet) • Be courteous! Ensure all tools are wiped clean of grease, oil, adhesives, etc.) • Tools must be of good working condition for the next person to use • Damage tools must be taken out of service and tagged; report this to your Field Equipment Manager, Supervisor, or both • Be responsible!. Secure all tools to prevent theft • Properly dispose of disposal blades that are no longer useful		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Mobilization/Demobilization

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	April 15, 2016	**Client:**			
Project number:	11119306	**Created by**	Kevin Burns	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Loading/unloading vehicle, and driving to and from the Site				
Key equipment:	360-degree topper				
Task-specific training:	Defensive driving				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Kevin Burns				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA to stop any work that is unsafe		
2	Check weather	• Unexpected storm • Fog, rain, snow; lightening/thunder • Heat/cold stress	• Check local weather forecast • If adverse weather conditions are likely, prepare a contingency plan for lodging, etc. with project manager • Discuss weather issues and precautions to take while driving and on site during the pre-job safety meeting • If weather conditions (e.g., fog, rain, snow, etc.) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightening/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Load equipment into vehicle	• Lifting hazards • Manual material handling • Back injury • Cuts • Pinch points • Hand/foot injury • Forgotten or damaged equipment • Materials or equipment leaving the vehicle bed during travel create hazards for other drivers	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Maintain neutral back posture - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and make sure to shift with the feet rather than twisting at the back • Maintain neutral wrist posture when lifting, carrying, pushing or pulling. The wrist is the strongest and most stable when it is straight. • Avoid one-handed carrying if possible; maintain awareness of footing • Avoid placing hands/fingers in pinch point locations • Wear safety-toed boots • Verify requested equipment against warehouse form • Load equipment in an organized manner to prevent shifting during transport or use cargo netting • Secure materials or equipment with cargo netting. Ensure netting does not loosen during travel by securing the straps with plastic wire ties or equivalent measures.		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Complete GHD Daily Operator Vehicle Checklist	• Damaged vehicle lights, tires, windows, mirrors, horn • Inadequate vehicle documents and/or safety items	• Review other pertinent JSAs (Driving) • Review Journey Management Plan if drive time is greater than 4.5 hours • Check for fluid leaks under vehicle • Test operation of headlights, front/rear turn signals, backup lights, brake lights, and emergency flashers • Visually check the pressure/wear of tires • Ensure the vehicle has a spare tire • Assure windshield and window glass is clean and free from obstructions • Test the windshield wipers and horn • Verify vehicle registration, insurance card, and inspection sticker is present and valid • Ensure the vehicle contains a first aid kit, fire extinguisher, and road hazard kit • Check immediate vehicle perimeter and initial path of travel for obstructions		
5	Check and adjust seat, steering wheel, headrest, and mirrors	• Back/body strain • Blind spot • Impaired vision	• Adjust seat, headrest, and steering wheel height so body is fully supported/comfortable and pedals are within easy reach • Ensure mirrors are properly adjusted		
6	Fasten seat belt(s) and ensure passenger(s) seat belts are fastened	• Serious injury, ejection, or death from collision and/or traffic citation	• Verify driver and passenger(s) seat belts are in good condition and properly latched		
7	Ensure vehicle doors are locked	• Serious injury, ejection, or death from collision • Unwanted intrusion • Lost equipment	• Manually lock all doors to vehicle		
8	Start engine and check gauges and warning lights	• Vehicle breakdown	• Verify sufficient fuel and other hazard lamps (e.g., battery, oil, and temperature) are not lit		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
9	Mobilize to site	• Arriving late • Collision • Injury or death to occupants or other parties	• Do not use cell phones or perform other distracting activities while vehicle is in motion • Constantly scan intersections, move eyes, check mirrors, and assess traffic lights (fresh vs. stale) • Maintain safety cushion around vehicle (front, sides, and rear) and 4-second following distance • Utilize all driving defensive techniques		
10	Arrive at site	• Pedestrian injury • Collision	• Maintain awareness of pedestrian/vehicular traffic when entering site and traveling to work zone		
11	Park vehicle	• Pedestrian injury • Collision • Property damage	• Maintain awareness of pedestrian/vehicular traffic • Park vehicle in pull-through parking space or facing the exit • Parking in a parking space that is not a designated parking space will require the placement of the 360-degree topper on the hood of the vehicle • Use caution and mirrors/spotter when backing vehicle • Set parking brake		
12	Demobilization	• Collision • Injury or death to occupants or other parties	• Check immediate vehicle perimeter and initial path of travel for obstructions • Maintain awareness of pedestrian/vehicular traffic when exiting site • Utilize defensive driving techniques • Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards.

Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Driving

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	April 15, 2016	**Client:**			
Project number:	11119306	**Created by**	Kevin Burns	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	Lusher Ave., Elkhart, IN				
Specific task	Travel to/from site with company/rental/personal vehicles without trailers or equipment				
Key equipment:	Vehicle, valid driver's license, 360-degree topper; seatbelt				
Task-specific training:	Defensive Driving				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☐ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Kevin Burns				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Review Journey Management Plan if drive time is greater than 4.5 hours. • Discuss route, concerns, and alternate routes with passenger and drivers of other vehicles • Use SWA to stop any work that is unsafe • Ensure proper vehicle selected for travel (use a truck if going to construction site or area with rough conditions that would damage a small vehicle?)	Driver and passenger	
2	Check weather	• Unexpected storm • Fog; rain; snow; lightning/thunder • Heat/cold stress	• Check local weather forecast • Discuss weather issues and precautions to take while driving and on site during the pre-job safety meeting • If weather conditions (e.g., fog, rain, snow, etc.) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightning/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Driver or Passenger	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Complete GHD Daily Operator Vehicle Checklist	• Damaged vehicle lights, tires, windows, mirrors, horn • Inadequate vehicle documents and/or safety items	• Check for fluid leaks under vehicle • Test operation of headlights, front/rear turn signals, backup lights, brake lights, and emergency flashers • Visually check the pressure/wear of tires • Ensure the vehicle has a properly inflated spare tire and associated tools to install • Assure windshield and window glass is clean and free from obstructions • Assure all fluids are topped off (e.g., windshield wiper fluid) and scheduled routine maintenance has occurred (e.g., oil changes). • Test the windshield wipers and horn • Verify vehicle registration, insurance card, and inspection sticker is present and valid • If the vehicle contains a first aid kit, fire extinguisher, and road hazard kit, verify that all items with expiration dates are current and that fire extinguisher has had documented monthly check • Do not use vehicle if any safety device is found not functioning	Driver or Passenger	
4	Check and adjust seat, steering wheel, headrest, and mirrors	• Back/body strain • Blind spot • Impaired vision	• Adjust seat, headrest, and steering wheel height so body is fully supported/comfortable and pedals are within easy reach • Ensure mirrors are properly adjusted	Driver or Passenger	
5	Fasten seat belt(s) and ensure passengers' seat belts are fastened	• Serious injury, ejection, or death from collision and/or traffic citation	• Verify driver and passenger(s) seat belts are in good condition and properly latched	Driver or Passenger	
6	Ensure vehicle doors are locked	• Serious injury, ejection, or death from collision • Unwanted intrusion • Lost equipment	• Manually lock all doors to vehicle prior to starting the vehicle	Driver	
7	Start engine and check gauges and warning lights	• Vehicle breakdown	• Verify sufficient fuel and other hazard lamps (e.g., battery, oil, and temperature) are not lit	Driver	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
8	Driving – Use defensive driving techniques and stay alert	• Arriving late • Collision • Blind spots of other vehicles • Injury or death to occupants or other parties	• Acknowledge and comply with all traffic regulations, laws, and ordinances • Do not use two-way communicating devices or perform other distracting activities while vehicle is in motion • Constantly scan intersections, move eyes, check mirrors, and assess traffic lights (fresh vs. stale) • Recognize other vehicle's blind spots and minimize time spent within these zones • Maintain safety cushion around vehicle (front, sides, and rear) and 4-second following distance (add an extra second for each hazardous condition, triple following distance in poor weather conditions) • Signal well in advance before changing lanes or turning • Utilize all driving defensive techniques	Driver	
9	Arrive at site	• Pedestrian injury • Collision	• Maintain awareness of pedestrian/vehicular traffic when entering site and traveling to work zone	Driver	
10	Park vehicle – assign a spotter if necessary (when in doubt use a spotter)	• Pedestrian injury • Collision • Property damage	• Maintain awareness of pedestrian/vehicular traffic • Park vehicle in pull-through parking space or facing the exit • Parking in a parking space that is not a designated parking space will require the placement of the 360-degree topper on the hood of the vehicle • Use caution and mirrors/spotter when backing vehicle • Set parking brake	Driver	
11	Demobilization – conduct a vehicle walk-around inspection paying particular attention to path(s) of travel	• Collision • Injury or death to occupants or other parties	• Perform perimeter vehicle check • Maintain awareness of pedestrian/vehicular traffic when exiting site • Utilize defensive driving techniques • Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency	Driver or Passenger	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
12	Report maintenance or mechanical problems upon returning vehicle	• Conditions worsen leading to mechanical failure resulting in collision and injury	• Report vehicle problems immediately to company representative or rental car agency • Schedule and/or perform repairs as soon as possible	Driver	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Residential Inspections

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	April 15, 2016	**Client:**			
Project number:	11119306	**Created by**	Kevin Burns	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	Lusher Ave, Elkhart, Indiana				
Specific task	Residential Pre- and Post System Installation Inspections				
Key equipment:	Appropriate PPE, tools and materials, including a flashlight				
Task-specific training:	Knowledge/understaning of vapor migaration system assembly/installation				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Kevin Burns				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Pre-system installation residential inspection	• Head, eye, foot injuries • Slip/trip/fall/hazards • Use of ladders • Overhead clearance	• Conduct a pre-task safety briefing with any subcontractors • Wear proper PPE to protect against common hazards associated with residential crawl spaces, basements, and sub-basements • Use proper fall protection measures when using ladders • Maintain awareness of possible slip/trip/fall hazards; including wet floors, wiring, piping, household items, et al., • Use the buddy system		
2	Post-system installation residential inspection	• Head, eye, and foot injuries • Slip/trip/fall/hazards • Use of ladders • Overhead clearance • Electical	• Ensure that all electrical equipment within the work area are equipped with ground-fault interrupters (GFIs) before entering the work area • Wear proper PPE to protect against common hazards associated with residential crawl spaces, basements, and sub-basements • Use fall protection measures when using ladders • Maintain awareness of possible slip/trip/fall hazards; including wet floors, wiring, piping, household items, et al., • Use the buddy system throughout the inspection process		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Routine OM&M Activities

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	April 15, 2016	**Client:**			
Project number:	11119306	**Created by**	Kevin Burns	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave., Elkhart, IN				
Specific task	Routine O&M activities				
Key equipment:	Hearing protection, leather or nitrile gloves				
Task-specific training:	40-hour HAZWOPER or 8-hour Refresher, HAZComm, PPE				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Kevin Burns				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Tailgate Safety Meeting	• Not identifying all hazards while performing tasks • Injury • Property damage	• Discuss work to be performed and associated hazards with GHD personnel and subcontractors • Include discussion on hospital route, evacuation procedures, and emergency contacts; complete daily tailgate forms • Discuss site-specific requirements for working on facility • Refer to task-specific JSAs for other O&M activities	GHD project personnel on site	
2	Discuss STAR and SWA	• Site personnel (GHD and subcontractors) not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Determine whether current procedures and JSAs are adequate for the task at hand; if procedures/JSAs are not adequate, GHD personnel will need to re-evaluate and develop proper procedures and JSAs before proceeding with tasks • Use SWA to stop any work that is unsafe	GHD project personnel on site	
3	Routine O&M activities	• Slip/trip/fall hazards	• Keep work areas and walkways free of excess materials and debris to reduce trip hazards • Keep all work surfaces dry when possible	GHD project personnel on site	
		• Heat and cold stress	• Take breaks if you feel tired or start to sweat excessively • Consume adequate food/beverage – keep hydrated	GHD project personnel on site	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3, continued	Routine O&M activities, continued	• Biological hazards	• Inspect work area upon arrival to identify biological hazards (snakes, insects, poisonous plants, etc) • Open enclosures slowly and cautiously while looking for the possible presence of biological hazards	GHD project personnel on site	
		• Fire/explosion	• Do not smoke in work area • Ensure that there are two 20-pound fully charged fire extinguishers in the trailer (as per owner's requirements) and perform monthly inspection of each unit • Ensure that a fire watch is implemented for activities that involve hot work and ensure that the fire watch procedure meets the requirements of the facility	GHD project personnel on site	
		• Equipment containing impact, high temperature, or pressurized liquids and gases (pneumatic pumps, compressors, piping, etc.)	• Perform Lock-out/Tag-out (LOTO) procedures • Drain and relieve pressure from lines before opening or loosening fittings • Wear appropriate PPE require for task at hand • Inspect tools prior to use, if faulty, do not use • Avoid potential hot surfaces and ensure that potential hot surfaces are labeled	GHD project personnel on site	
		• Contaminated materials	• Wear appropriate PPE required for task at hand	GHD project personnel on site	
		• High noise levels	• Hearing protection must be worn while working around operating equipment	GHD project personnel on site	
		• Moving equipment	• Keep hands and loose clothing away from moving equipment	GHD project personnel on site	
		• Sharp materials	• Wear appropriate PPE including leather gloves, hard hat	GHD project personnel on site	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3, continued	Routine O&M activities, continued	• Lifting hazards • Manual material handling • Back injury	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing	GHD project personnel on site	
		• Electric/battery contact	• Ensure electrical service has been shut down and follow LOTO procedures to ensure power remains off prior to opening panel or working on electrical components • Inspect power tools/electrical cords prior to use, if faulty do no use until repaired or replaced • Electrical cords must be grounded and inserted into a GFCI outlet	GHD project personnel on site	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Land Surveying

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project number:	11119306	**Created by**	Matt Groves	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, IN				
Specific task	Land surveying				
Key equipment:	Off-road vehicle; flag or paddle				
Task-specific training:	Motor Vehicle Safety; Task-specific Training; Personal Protective Equipment; Utility/ATV Training (as necessary)				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☒ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Mob equipment to surveying area with GHD vehicle: • Plan route of travel before leaving • Review weather conditions and plan accordingly • Fasten seatbelt and obey all traffic rules	• Lifting hazards • Manual material handling • Back injury • Pinch points • Moving or flying projectiles inside vehicle while transporting equipment • Slip/trip/fall hazards • Biological hazards	• Reduce travel distance when there is a need to carry/lift materials. • Make sure grip is adequate; wear leather/cotton gloves. • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required. • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position. • Avoid one-handed carrying if possible; maintain awareness of footing. • Review JSA and HASP – Revise JSA as necessary “Dirty JSA”. • Practice STAR. • Properly secure all equipment inside the vehicle. • Use defensive driving techniques. • Do not drive while fatigued. • Park in a safe area; be aware of surroundings. • Inspect work area and note hazards (mitigate if necessary).	Survey Team	
2	Note traffic flow (on-site and off-site vehicles and heavy equipment)	• Struck by oncoming traffic • Slip/trip/fall hazards • Biological hazards • Threatening dogs	• Stage the GHD vehicle to aid in the protection of the survey crew if they need to set up a Temporary Traffic Control Zone (TTCZ). • Review JSA and HASP; document accordingly. • Practice STAR.	Survey Team	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Develop the Temporary Traffic Control Plan (TTCP) and set up the Temporary Traffic Control Zone (TTCZ) as necessary	• Struck by oncoming traffic • Slip/trip/fall • Biological hazards • Threatening dogs • Lifting hazards • Manual material handling • Back safety • Heat/cold stress	• Review the requirements of the TTCP ahead of time. • Make sure that all temporary traffic control equipment (signs/cones/etc.) is available. • Carefully set up TTCZ using the buddy system. • Refer to step 1 and HASP for additional lifting methods/information. • Position GHD's truck with flashers on for added protection. • Follow heat/cold stress procedures presented in the HASP. • Review JSA and HASP. • Practice STAR.	Survey Team	
4	General use of hand tools and surveying equipment (setup, staking, measuring, locating – these tasks could involve working on slopes or other uneven/rough terrain	• Struck by oncoming traffic • Slip/trip/fall hazards • Heavy lifting • Biological hazards • Threatening dogs • Potential injuries from misuse of tools or use of tools in disrepair	• Wear ANSI Class II reflective safety vest, safety-toed boots, leather work gloves, and hard hat. • If it's not safe then use SWA and review work. • Use buddy system and team lifting; do not lift more than 40 pounds by yourself; avoid excessive body twisting motions. • Do not use old or faded PPE. • Inspect tools – use the proper tool for the task. • Repair/replace tools as necessary. • Store tools and equipment properly after use. • Practice STAR – review work area for safer means to work.	Survey Team	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
5	Conduct survey activities – this work will involve: • traversing uneven or rough terrain – inspect/review work area and path of travel for hazards • minor clearing activities during "line clearing" – review weed/brush cutting JSA; use and store machete properly	• Struck by oncoming traffic • Slip/trip/fall hazards • Biological hazards • Pinch points • Cuts/abrasions/slivers • Threatening dogs • Equipment damage	• Surveyor will enter roadway after clearance from flagman. • Surveyor will maintain contact with flagman during survey. • Make sure that proper PPE is being worn. • Review JSA and HASP. • Practice STAR; if it's not safe then use SWA to review work. • Inspect work area and note hazards (use RCA to mitigate as necessary). • Avoid climbing over fences and over rough/uneven terrain as much as possible. • Avoid log/brush/rock piles. • Use insect repellant as directed and if necessary review PPE for stinging/biting insects (mosquito nets, face hoods, etc.). • Wisk machete in front of you away from body parts; keep in sheath when not in use. • Choose a safe path of travel; work smart. • Protect equipment during use and store properly after use.	Survey Team	
6	Exit roadway and/or heavy equipment traffic pattern	• Struck by oncoming traffic • Slip/trip/fall • Biological hazards • Threatening dogs	• Surveyor should exit roadway first, followed by flagman nearest oncoming traffic (spotter). • Review JSA and HASP. • Practice STAR.	Survey Team	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Vapor Mitigation System Installation Oversight

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	April 15, 2016	**Client:**			
Project number:	11119306	**Created by**	Kevin Burns	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	Lusher Ave, Elkhart, Indiana				
Specific task	Conducting vapor mitigation system installation oversight				
Key equipment:	Appropriate PPE, tools and materials				
Task-specific training:	Knowledge/understaning of vapor migaration system assembly/installation				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Kevin Burns				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Work Area Set Up	• Head, eye, foot injuries • Slip/trip/fall/hazards • Use of ladders • Heavy lifting • Back injury • Manual material handling	• Ensure adequate working space for material storage • Material storage areas are properly set up • Conduct a pre-task safety briefing with any subcontractors • Use proper fall protection measures when using ladders • Reduce travel distances when there is a need to carry/lift heavy objects • Make sure adequate grip is maintained when lifting/carrying heavy and/or oversize objects • Lift with legs (bend at the knees) to avoid lower back injuries • Seek assistance (mechanical or buddy lift) for oversize/odd-shaped oblects and/or objects weighing more than 50lbs • Avoid one-handed carrying if possible		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
2	Mitigation system installation and materials handling	• Head, eye, and foot injuries • Slip/trip/fall/hazards • Use of ladders • Heavy lifting • Material handling • Electical • Noise • Potential chemical exposure	• Ensure adequate working space for system installation • Reduce travel distances when there is a need to carry/lift heavy objects • Use fall protection measures when using ladders • Ensure adequate grip is maintained when lifting/carrying heavy and/or oversize objects • Seek assistance (mechanical or buddy lift) for oversize/odd-shaped oblects and/or objects weighing more than 50lbs • Ensure all electrical equipment is properly grounded to prevent potential electrical shock • Wear proper hearing protectuion when noise levels approach and exceed the 85db noise threshold • Wear the appropriate PPE to miminize the potential for chemical exposures		
3	Work Area Cleanup	• Head, eye, and foot injuries • Slip/trip/fall/hazards • Use of ladders • Heavy lifting • Material handling • Electical • Noise	• Ensure adequate working space for system installation • Reduce travel distances when there is a need to carry/lift heavy objects • Use fall protection measures when using ladders • Ensure adequate grip is maintained when lifting/carrying heavy and/or oversize objects • Seek assistance (mechanical or buddy lift) for oversize/odd-shaped oblects and/or objects weighing more than 50lbs • Ensure all electrical equipment is properly grounded to prevent potential electrical shock • Wear proper hearing protectuion when noise levels approach and exceed the 85db noise threshold		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Job Safety Analysis (JSA)

Portable/Extension Ladders

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	July 26, 2016	**Client:**			
Project Number:	11119306	**Created By**	Matt Groves	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project Address:	Lusher Ave, Elkhart, IN				
Specific Task	Transporting, set up and use				
Key equipment:	Step ladders (4,6,8,10 ft. and extension ladders)				
Task-specific training:	Ladder safety training, fall protection awareness, SMART program.				

Hard Hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (Top Impact)	☐ Chemical Protective (i.e. Nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full Face Mask	☐ Class II	☐ Coveralls
☐ Type II (Side Impact)	☐ Level 1 Light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half Face Mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 Light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-Static	☐ High viz clothing
☐ Class G	☐ Level 3 Medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 Heavy duty			☐ N95	☐ PFD	☐ Long sleeve shirts
Foot Protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.Cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz Cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*			☐ Specialty/other*		

Project Development Team		Modified by	Reviewed by	Date
Name	Signature			

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Perform the STAR process	Overhead utilities • Electrical • Mechanical • Chemical • Restricted/limited spaces • Unstable/uneven ground surfaces • Wet surfaces • Property damage	• Conduct a hazard analysis of the work site to determine if any unsafe conditions exist for which the ladders will be set up. • Mitigate any unsafe conditions. • Determine the proper size and load rating of the ladder. • Confirm any known overhead utilities or obstructions.		
2	Inspect the Ladder	• Cracked or missing components • Slips and falls • Improper load rating-breach if overloaded (human weight + materials) • Defective, worn or missing rungs	• Perform a thorough inspection of ladder and document. • Tag out of service if defective, missing or broken components are present. Replace ladder. • Confirm the Type and load rating. Ensure ladder is rated to support total human weight plus any material handling while ascending/descending the ladder. • Adhere to warning labeling from the manufacture.		
3	Transporting the Ladder	• Back strain • Stationary objects • Pinch points • Overhead objects • Property damage	• Determine the path of travel. • Transport ladder by using both hands. Keep hand/fingers out of pinch points. • Keep ladder close to body and at waist level. • Get assistance when handling larger ladders (>10 ft.).		

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Set-up • Indoors • outdoors	• Overhead objects • Property damage • Inclement weather • Struck by/against • Strains • Unstable ground surface	• Always look up first before setting ladders upright. • Confirm stable and level ground. • Ensure proper clearance is made to maintain 4:1 ratio for extension ladders. • Ladder to extend 3 ft. above leading edge (outdoors) and secured. • Ensure to ALWAYS lock the spreader on step ladders. • Do not prop step ladders in the closed position against structures. All 4 legs/rails must be set.		
5	Ascending/descending the ladder	• Falls • Slips • Unstable ground • Overloading • Tipping over	• Maintain 3 points of contact at all times. • Keep soles of work boots free of debris, mud and have proper traction/tread. • Carry supplies in tool pouch or bucket. • Keep body position with the center of the ladder. • Never overextend or reach causing the ladder to slide or tip over. Descend ladder and re-position. • Always face towards the ladder during ascending and descending. • Do not stand on the top step.		

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor Signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): _____

Supervisor signature documenting daily debrief has been completed: _____

Appendix C
Safety Data Sheets

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer
Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Supplier
Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

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

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower:** **Explosion limit upper:**	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C:**	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density:**	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density:**	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities:**	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water):**	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature:**	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature:**	Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

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

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

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.

NFPA: 1-0-0

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number : 115-11-7

Product code : 001031

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	**ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140.7°C (-221.3°F)

Critical temperature : 144.75°C (292.6°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -76.1°C (-105°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.6845

Gas Density (lb/ft ^{3}) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.263 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

SADT : Not available.

Section 9. Physical and chemical properties

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Isobutylene	2.34	-	low

Section 12. Ecological information

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Isobutylene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : Not determined.

Section 15. Regulatory information

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Canada

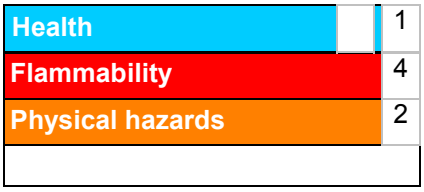
WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Liq. Gas, H280	Expert judgment Expert judgment

History

Date of printing : 7/11/2016

Date of issue/Date of revision : 7/11/2016

Date of previous issue : No previous validation

Section 16. Other information

Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Nonflammable Gas Mixture: Carbon Monoxide / Methane / Nitrogen / Oxygen

Section 1. Identification

GHS product identifier : Nonflammable Gas Mixture: Carbon Monoxide / Methane / Nitrogen / Oxygen

Other means of identification : Not available.

Product use : Synthetic/Analytical chemistry.

SDS # : 002093

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention : Not applicable.

Response : Not applicable.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

CAS number : Not applicable.

Section 3. Composition/information on ingredients

Product code : 002093

Ingredient name	%	CAS number
Nitrogen	79.4 - 99	7727-37-9
oxygen	0.0001 - 19.5	7782-44-7
methane	0.0001 - 5	74-82-8
carbon monoxide	0.0001 - 0.0999	630-08-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Nitrogen	Oxygen Depletion [Asphyxiant]
oxygen	None.
methane	Oxygen Depletion [Asphyxiant]
carbon monoxide	**ACGIH TLV (United States, 3/2015).** TWA: 29 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **NIOSH REL (United States, 10/2013).** CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 10 hours. TWA: 35 ppm 10 hours. **OSHA PEL (United States, 2/2013).** TWA: 55 mg/m³ 8 hours. TWA: 50 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 8 hours. TWA: 35 ppm 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Section 8. Exposure controls/personal protection

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas.

Color : Not available.

Melting/freezing point : -187.6°C (-305.7°F) This is based on data for the following ingredient: methane. Weighted average: -210.43°C (-346.8°F)

Critical temperature : Lowest known value: -146.95°C (-232.5°F) (nitrogen).

Odor : Not available.

Odor threshold : Not available.

pH : Not available.

Flash point : Not available.

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Highest known value: 1.1 (Air = 1) (oxygen). Weighted average: 0.98 (Air = 1)

Gas Density (lb/ft ^{3}) : Weighted average: 0.07

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Section 10. Stability and reactivity

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
carbon monoxide	LC50 Inhalation Gas.	Rat	3760 ppm	1 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
carbon monoxide	Category 1	Not determined	Not determined

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Section 11. Toxicological information

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Nitrogen	0.67	-	low
oxygen	0.65	-	low
methane	1.09	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1956	UN1956	UN1956	UN1956	UN1956
UN proper shipping name	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	-	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): All components are listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: methane

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Nitrogen	79.4 - 99	No.	Yes.	No.	No.	No.
oxygen	0.0001 - 19.5	No.	Yes.	No.	No.	No.
methane	0.0001 - 5	Yes.	Yes.	No.	No.	No.
carbon monoxide	0.0001 - 0.0999	Yes.	Yes.	No.	Yes.	Yes.

State regulations

Massachusetts : The following components are listed: OXYGEN (LIQUID); NITROGEN; METHANE

New York : None of the components are listed.

New Jersey : The following components are listed: OXYGEN; NITROGEN; METHANE

Pennsylvania : The following components are listed: OXYGEN; NITROGEN; METHANE

California Prop. 65

WARNING: This product contains less than 1% of a chemical known to the State of California to cause birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
carbon monoxide	No.	Yes.	No.	No.

International regulations

International lists

National inventory

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : Not determined.

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Canada

Section 15. Regulatory information

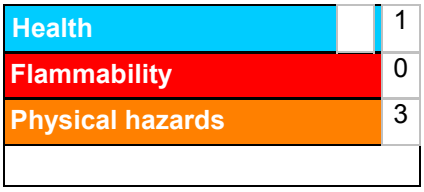
WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: The following components are listed: Methane
Canadian ARET: None of the components are listed.
Canadian NPRI: The following components are listed: Volatile organic compounds
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280	On basis of test data

History

Date of printing : 7/5/2016

Date of issue/Date of revision : 7/5/2016

Date of previous issue : 7/5/2016

Version : 1.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient

Section 16. Other information

MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.