Field Safety Instructions

Prepared for

Baton Rouge Department of Public Works,
Sewer System Overflow Program Management
Baton Rouge, Louisiana

AUGUST 2009

CH2MHILL

HSSE
Target Zero
World-Class Performance

1.0 Commitment

CH2MHILL

HSSE Target Zero World-Class Performance

Health, Safety, Security, and Environment Policy

Protection of people and the environment is a CH2M HILL core value. It is our vision to create a culture within CH2M HILL that empowers employees to drive this value into all global operations and achieve excellence in health, safety, security, and environment (HSSE) performance. CH2M HILL deploys an integrated, enterprise-wide behavior-based HSSE management system to fulfill our mission and the expectations of our clients, staff, and communities based on the following principles:

- We require all management and supervisory personnel to provide the leadership and resources to inspire and empower our employees to take responsibility for their actions and for the actions of their fellow employees to create a safe, healthy, secure, and environmentally-responsible workplace.
- We provide value to clients by tailoring HSSE processes to customer needs and requiring all CH2M HILL employees and subcontractors to deliver projects with agility, personal service, and responsiveness and in compliance with HSSE requirements and company standards to achieve health, safety, security, and pollution prevention excellence. Our performance will aspire to influence others and continually redefine world-class HSSE excellence.
- We systematically evaluate our design engineering and physical work environment to verify safe and secure work conditions and practices are established, consistently followed, and timely corrected.
- We continually assess and improve our HSSE program to achieve and maintain world-class performance by setting and reviewing objectives and targets, reporting performance metrics, and routinely reviewing our progress.
- We care about the safety and security of every CH2M HILL employee and expect all employees to embrace our culture, share our core value for the protection of people and the environment, understand their obligations, actively participate, take responsibility, and "walk the talk" on and off the job.

The undersigned pledge our leadership, commitment, and accountability for making this policy a reality at CH2M HILL.

Dated the 2nd day of September 2008.

Ralph R. Peterson, Chairman of the Board & Chief Executive Officer

Robert C. Allen, Senior Vice President & Chief Human Resources Officer

Garry M. Higdem, President, Energy & Chemicals

Mark A. Lasswell, President & Chief Executive, Civil Infrastructure

Thomas G. Searle, President & Chief Executive, International

Bob C. Card, Chairman, CH2M HILL International

Lee A. McIntire, President & Chief Operating Officer; President & Chief Executive, Energy

Don S. Evans, Vice Chair, Board of Directors; Chief Marketing Officer

Catherine Santee, Senior Vice President & Chief Financial Officer

Michael E. McKelvy, President & Chief Executive, Industrial

Nancy R. Tuor, President & Chief Executive, Federal

Jacqueline Rast, President & Chief Executive, CPE

Keith Christopher, Senior Vice President, Health, Safety, Security, and Environment

1.1 CH2M HILL

1.1.1 Safe Work Policy

It is the policy of CH2M HILL to perform work in the safest manner possible. Safety must never be compromised. To fulfill the requirements of this policy, an organized and effective safety program must be carried out at each location where work is performed.

CH2M HILL believes that all injuries are preventable, and we are dedicated to the goal of a safe work environment. To achieve this goal, every employee on the project must assume responsibility for safety.

Every employee is empowered to:

- Conduct their work in a safe manner
- Stop work immediately to correct any unsafe condition that is encountered
- Take corrective actions so that work may proceed in a safe manner

Safety, occupational health, and environmental protection will not be sacrificed for production. These elements are integrated into quality control, cost reduction, and job performance, and are crucial to our success.

1.1.2 Health and Safety Commitment

CH2M HILL has embraced a philosophy for health and safety excellence. The primary driving force behind this commitment to health and safety is simple: employees are CH2M HILL's most significant asset and CH2M HILL management values their safety, health, and welfare. Also, top management believes that all injuries are preventable. CH2M HILL's safety culture empowers employees at all levels to accept ownership for safety and take whatever actions are necessary to eliminate injury. Our company is committed to world-class performance in health and safety and also understands that world-class performance in health and safety is a critical element in overall business success.

CH2M HILL is committed to the prevention of personal injuries, occupational illnesses, and damage to equipment and property in all of its operations; to the protection of the general public whenever it comes in contact with the Company's work; and to the prevention of pollution and environmental degradation.

Company management, field supervisors, and employees plan safety into each work task in order to prevent occupational injuries and illnesses. The ultimate success of CH2M HILL's safety program depends on the full cooperation and participation of each employee.

CH2M HILL will exceed safety standards as we work to be a model in our industry. CH2M HILL management extends its full commitment to health and safety excellence.

1.2 Project-Specific Health, Safety, and the Environment Goals

All management and employees are to strive to meet the project-specific Health, Safety, and the Environment (HS&E) goals outlined below. The team will be successful only if everyone makes a concerted effort to accomplish these goals. The goals allow the project to stay focused on

optimizing the health and safety of all project personnel and, therefore, making the project a great success.

The Project has established eleven specific goals and objectives:

- Create an injury-free environment
- Have zero injuries or incidents
- Provide management leadership for HS&E by communicating performance expectations, reviewing and tracking performance, and leading by example
- Ensure effective implementation of the Field Safety Instructions (FSIs) through education, delegation, and team work
- Ensure 100 percent participation in training programs, Personal Protective Equipment (PPE) use, and HS&E compliance
- Continuously improve our safety performance
- Maintain free and open lines of communication
- Make a personal commitment to safety as a value
- Focus safety improvements on high-risk groups
- Continue strong employee involvement initiatives
- Achieve health and safety excellence

2.0 Field Safety Instructions Applicability

These FSIs apply to:

- All CH2M HILL staff, including subcontractors and tiered subcontractors of CH2M HILL working on the project site.
- All visitors to the project site in the custody of CH2M HILL (including visitors from the Client, the Government, the public, and other staff of any CH2M HILL company)

These FSIs do not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M HILL.

These FSIs define the procedures and requirements for the health and safety of CH2M HILL staff and visitors when they are physically on the project site. The project site includes the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon (as applicable).

These FSIs will be kept on the project site (or in the field vehicle) during field activities and will be reviewed as necessary. The FSIs will be amended or revised as project activities or conditions change or when supplemental information becomes available. The FSIs adopt, by reference and as appropriate, the Standards of Practice (SOPs) in the CH2M HILL Corporate Health and Safety Program. In addition, these FSIs may adopt procedures from the project Work Plan and any other governing regulations. If there is a contradiction between these FSIs and any governing regulation, the more stringent and protective requirement shall apply.

All CH2M HILL staff and subcontractor supervisors must sign the employee sign-off form included in this document as Attachment 1 to acknowledge review and receipt of this document. Copies of the signature page will be maintained onsite by the Safety Coordinator (SC).

3.0 General Information

3.1 Project Information and Description

Project Number:	**350589**
Client:	Baton Rouge Louisiana Department of Public Works
Project Name and Address:	Baton Rouge Sanitary Sewer Overflow Program multiple locations throughout Baton Rouge, Louisiana
CH2M HILL Project Manager:	Michael Ellis
CH2M HILL Office:	BTR
Date (FSI) Prepared:	August 12, 2009
Dates of Site Work:	June 2007 – December 2014

3.1.1 Site Description and History

This is a Capital Improvement Program, with a total cost to the Client of $1.2B to be completed by December 2014 under a DOE Consent Decree. This project consists of design and construction on 26 rehabilitation projects, 57 capacity improvement projects and four wastewater treatment improvement/storage projects (covered under a separate FSI). For further information, refer to the Program Delivery Plan located on the project web-site at http://www.brprojects.com/sewer/pages/Sewer.htm.

3.1.2 Description of Specific Tasks to be Performed by CH2M HILL Inc.

The Sanitary Sewer Overflow Program involves:

- Field investigations (pump stations and neighborhoods for the rehab of lines), conducting progress meetings with consultants and lift stations
- Construction Management Services during pipe and backup generator installations.

CH2M HILL employees conducting field work for this project include:

Employee Name/Office	Responsibility	Worker Category	Duration Onsite
Michael Ellis/BTR	Program Manager	PMSS	NA
Mike Uchniat/BTR	CM, Sewer Line Upgrades	CSW, SCC	As needed
Lanre Dina/BTR	CM, Sewer Line Upgrades	CSW	Daily
Jason Moore/BTR	CM, Sewer Line Upgrades	CSW	Daily

CH2M HILL has contracted with Sigma Consulting Group for civil engineering and CMS for some sewer line upgrades projects. The Client contracts with various contractors for the sewer upgrades and backup generator construction work.

This project entails frequent site work involving hazardous materials or construction.

4.0 Project Organization and Responsibilities

4.1 Client

Contact Name: Bryan Harmon, Director of Engineering
Phone: (225) 389-3186

4.2 Project Management Staff

4.2.1 Project Manager

Michael Ellis
(225) 381-7281, x218
(225) 907-4528

The CH2M HILL project manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HS&E management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this document:

- Incorporate standard terms and conditions, and contract-specific HS&E roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors)
- Select safe and competent subcontractors
- Obtain, review, and accept or reject subcontractor pre-qualification questionnaires
- Ensure that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award
- Incorporate HS&E information in subcontract agreements, and ensure that appropriate site-specific safety procedures, training, and medical monitoring records are reviewed and accepted prior to the start of subcontractor's field operations
- Maintain copies of subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures in the project file accessible to site personnel
- Provide adequate oversight of subcontractor HS&E practices per the site-specific safety plan
- Manage the site and interface with third parties in a manner consistent with our contract and subcontract agreements and the applicable standard of reasonable care
- Ensure that the overall, job-specific HS&E goals are fully and continuously implemented

4.2.2 Health and Safety Manager

Alan Cyrier
SEW, Regional Health & Safety Manager
Phone: (770) 331-2829
Fax: (678) 579-8138

The CH2M HILL HS&E manager is responsible to:

- Review and accept or reject subcontractor pre-qualification questionnaires
- Review and accept or reject subcontractor training records and site-specific safety procedures prior to start of subcontractor's field operations
- Support the SC's oversight of subcontractor (and lower-tier subcontractors) HS&E practices and interfaces with onsite third parties per the project-specific safety plan
- Visit the project as needed to assess site conditions and review HS&E program implementation
- Assist with program implementation as needed

4.2.3 Safety Coordinator - Construction (Safety Officer)

Mike Uchniat
(225) 663-5276
(210) 861-7217

The SC shall be onsite as necessary to provide adequate oversight of project activities and is responsible to:

- Make safety integral to each operation by promoting worker involvement in the work planning and hazard identification process
- Maintain active and visible involvement using open communication with employees regarding safety items on the project
- Review and understand contractual obligations regarding HS&E
- Manage the site and interface with third parties in a manner consistent with our contract agreements and the applicable standard of reasonable care
- Verify these FSI are current and amended when project activities or conditions change
- Verify CH2M HILL site personnel and subcontractor supervision read these FSI and sign the Employee Signoff Form in Attachment 1 prior to commencing field activities
- Verify and document that CH2M HILL team members have completed any required specialty training (e.g., fall protection, confined space entry) and medical surveillance.
- Assure that the workforce is trained and qualified based on their worker category
- Conduct an HS&E orientation for all CH2M HILL team members prior to entering the project work areas

- Verify compliance with the requirements of these FSI and applicable contractor health and safety plan(s) and any federal, state, and local regulations
- Act as the project "Hazard Communication Coordinator" and perform the responsibilities outlined in the FSI
- Act as the project "Emergency Response Coordinator" and perform the responsibilities outlined in the FSI
- Post required information onsite. The OSHA job-site poster is required at sites where project field offices, trailers, or equipment-storage boxes are established; posters can be obtained by calling 800/548-4776 or 800/999-9111
- Verify that safety meetings are conducted and documented in the project file as needed throughout the course of the project (e.g., as tasks or hazards change)
- Verify that project health and safety forms and permits are being used as outlined in the FSI
- Perform assessments of contractor HS&E practices per the site-specific safety plan and verify that project activity self-assessment checklists are being used by CH2M HILL team members.
- Verify that project files available to site personnel include copies of executed contracts and certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures prior to start of subcontractor's field operations
- Coordinate with the HSM regarding CH2M HILL and subcontractor operational performance, and third party interfaces
- Verify appropriate PPE use, availability, and training
- Conduct safety briefings as needed for CH2M HILL team members and subcontractor supervisors
- Notify the HSM of injuries immediately and follow up on injured employee's progress
- Conduct accident investigations including root cause analysis
- Maintain HS&E records and documentation
- Facilitate Occupational Safety and Health Administration (OSHA) or other government agency inspections including accompanying inspector and providing all necessary documentation and follow-up
- Deliver field HS&E training as needed based on project-specific hazards and activities
- Ensure that programs are effectively functioning to prevent and control hazards on the project

4.2.4 Subcontractor Safety Responsibilities

Subcontractors must comply with the following activities, and are responsible to:

- Comply with all local, state, and federal safety standards
- Comply with project and owner safety requirements
- Actively participate in the project safety program and attend all required safety meetings
- Provide a qualified safety representative to conduct and document weekly safety inspections for your work
- Maintain a first aid kit onsite
- Maintain and replace safety protection systems damaged or removed by the subcontractor's operations
- Notify the SC of any accident, injury, and/or incident immediately and submit reports to CH2M HILL within 24 hours
- Install contractually required general conditions for safety (example: handrail, fencing, fall protection systems, floor opening covers, etc.)
- Conduct and document weekly safety inspections of project-specific tasks and associated work areas
- Conduct weekly employee safety toolbox meetings and copy CH2M HILL
- Conduct site-specific orientations for all subcontractor employees

4.2.5 Employee Responsibilities

All personnel are assigned responsibility for safe and healthy operations. This concept is the foundation for involving all employees in identifying hazards and providing solutions. For any operation, individuals have full authority to stop work and initiate immediate corrective action or control. In addition, each worker has a right and responsibility to report unsafe conditions/practices. This right represents a significant facet of worker empowerment and program ownership. Through shared values and a belief that all accidents are preventable, our employees accept personal responsibility for working safely.

Each employee is responsible for the following performance objectives:

- Perform work in a safe manner and produce quality results
- Perform work in accordance with company policies, and report injuries, illnesses, and unsafe conditions
- Complete work without injury, illness, or property damage
- Report all incidents immediately to supervisor
- Report all hazardous conditions and/or hazardous activities immediately to supervisor for corrective action
- Complete an HS&E orientation prior to being authorized to enter the project work areas

4.2.6 Employee Authority

Each employee on the project has the obligation and authority to shut down any perceived unsafe work and during employee orientation, each employee will be informed of their authority to do so.

4.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HSE-215, *Contracts, Subcontracts, and HS&E Management Practices*)

4.3.1 Subcontractor List

Subcontractor	**Scope**
Sigma Consulting Group; Gregg Gautreaux O: (225) 298-0111, x141 ggautreaux@sigmacg.com	Construction Management Services (sewer pipeline upgrades)

The subcontractors listed above are covered by this FSI and must be provided a copy of this document. If subcontractors have specific hazards associated with their type of work that are not covered by this FSI, the subcontractors are responsible to submit the procedures to cover these hazards to CH2M HILL for review before the start of field work. Subcontractors must comply with the established health and safety plan(s) of the project. The CH2M HILL SC should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL's oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL team members should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observation of hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SC is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's task specific safety procedures and applicable self-assessment checklists. Self-assessment checklists, provided in this document in Attachment 6, are to be used by the SC to review performance.

Health and safety-related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors and employees on the provisions of this plan, and require them to sign the Employee Signoff Form, included in Attachment 1
- Request subcontractor(s) to brief project team on the hazards and precautions related to their work
- When apparent, non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action—the subcontractor is responsible for determining and implementing necessary controls and corrective actions
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented
- When an apparent imminent danger exists, immediately remove all affected personnel, notify subcontractor safety representative, stop affected work until adequate corrective measures are implemented, and notify the Project Manager, HS&E Manager, and SC as appropriate
- Document all verbal health and safety-related communications in project field logbook, daily reports, or other records

4.4 Client Contractors

(Reference CH2M HILL SOP HSE-215, *Contracts, Subcontracts and HS&E Management Practices*)

4.4.1 Third Party Contractor List

Subcontractor	Scope
Grady Crawford	Sewer Upgrades (Point Repair; Manhole Rehab, Gurney Road-Joor Road; Staring Lane-Boone Drive
Insituform Tech	Cured-In-Place Lining
Video Industrial Services	Video Inspection
Allen & LeBlanc	Jefferson Highway-Hoo Shoo Too Road; RMAP1-Kleinpeter Area Upgrades; Gardere Lane-Burbank Road
Nottingham	RMAP1-PS 136 Area Upgrades
BRH Garver	RMAP1-Industriplex Area Upgrades
Hemphill	Comite Road-Foster Road; Foster Road-Hooper Road;
Don M Barron	Multiple PS-Lovett Road Area

These instructions do not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work, and we must never assume such responsibility through our actions (e.g., advising on health and safety issues). In addition to these instructions, CH2M HILL team members should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Self-assessment checklists, contained in Attachment 2, are to be used by the SC and CH2M HILL team members to review the contractor's performance ONLY as it pertains to evaluating our exposure and safety. The HSM is the only person who is authorized to comment on or approve contractor safety procedures.

Health and safety-related communications with contractors should be conducted as follows:

- Request the contractor to brief CH2M HILL team members on the precautions related to the contractor's work
- When an apparent contractor non-compliance/unsafe condition or practice poses a risk to CH2M HILL team members:
  - Notify the contractor safety representative
  - Request that the contractor determine and implement corrective actions
  - If necessary, stop affected CH2M HILL work until contractor corrects the condition or practice
  - Notify the client, Project Manager, and HS&E Manager as appropriate
- If apparent contractor non-compliance/unsafe conditions or practices are observed, inform the contractor safety representative (CH2M HILL's obligation is limited strictly to informing the contractor of the observation—the contractor is solely responsible for determining and implementing necessary controls and corrective actions)

- If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative (CH2M HILL's obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of the observation—the contractor is solely responsible for determining and implementing necessary controls and corrective actions)
- Document all verbal health and safety-related communications in project field logbook, daily reports, or other records

5.0 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL team members and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL team members who do not understand any of these provisions should contact the SC for clarification. Each person onsite is required to follow these rules and regulations.

5.1 Project-Specific Safety Hazards and Controls

In addition to the controls specified in this section, there are forms that may need to be completed for specific activities:

- **Task Hazard Analysis (THA) and Safety Pre-Task Planning (SPTP) Forms** are contained in Attachment 3. For certain hazardous activities, the THA and SPTP may be required. In a THA, each basic step of the overall task is examined to identify potential hazards and to determine the preventative measures and the safest way to do the job. The THA must be completed and reviewed by the Project Team prior to performing the hazardous activity. THAs must be submitted to the Safety Coordinator and maintained onsite. A SPTP identifies the day's activities to be performed, the required equipment, tools materials to be used, the potential hazards anticipated and the safety precautions to take to perform the activity safely. The SPTP must be completed and reviewed with the crew before the work begins. Any activity-specific training needed is given at this time. Each work crew's SPTP must be signed by the crew members and the supervisor. The crew supervisor keeps the SPTP in the work area, revises it, and briefs the work crew when additional tasks are to be performed or when unanticipated hazards are encountered that were not listed on that day's SPTP. The crew supervisor monitors the work crew's compliance with the hazard control measures listed in the SPTP.
- **Hazard Communication** forms are contained in Attachment 4. The **Chemical Product Hazard Communication Form** must be completed prior to performing activities that expose personnel to hazardous chemicals or products. Upon completion of this form, the Safety Coordinator will verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained. This training is documented on the **Chemical-Specific Training Form**. Project-Specific **Material Safety Data Sheets** are also contained in Attachment 4.
- **Confined Space Entry Permits** are contained in Attachment 5. These permits are required to be completed by the entry supervisor and reviewed by the attendant(s) and entrant(s) prior to any confined space entry, including permit-required, alternate and non-permit confined spaces. During the confined space entry, the attendant(s) should document entrants as they enter and exit the space, keeping an accurate log of actual entrants at all times. After the confined space entry, the entry supervisor should review the permit and cancel it. Subcontractors are responsible for completing confined space entry permits for their own entries.

- **Project-Activity Self-Assessment Checklists** are contained in Attachment 6. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records, and be promptly submitted to the HSM.

Project-specific frequency for completing:

- **Self-Assessment Checklists:**
  - **Confined Space Entry, Excavations** - Prior to each entry or use.
  - **Cranes –** Initially when setup onsite.
  - **Earthmoving Equipment, Traffic Control –** Initially then Monthly.
- **Confined Space Entry Permits:** Prior to each confined space entry.
- **THA and SPTP:** prior to each confined space entry

Project-Specific Training Required:

- **All Field Staff:**
  - Confined Space Entry Training (prior to any confined space entry)
  - Traffic Control (when working in traffic work zones)
  - Field Awareness Safety Training/OSHA 10 Hour Construction
- **Project Manager:**
  - Project Manager Training
  - Initial Safety Coordinator
  - Field Awareness Safety Training/OSHA 10 Hour Construction
- **Safety Coordinator:**
  - OSHA 10 Hour Construction/Field Awareness Safety Training
  - Bloodborne Pathogens
  - CPR/FA
  - Dangerous Goods Shipping
  - Environmental Awareness
  - Fire Extinguisher
  - Initial Safety Coordinator/Safety Coordinator Construction
  - Waste Management

5.2 Restricted Areas/Activities & Facility-Specific Requirements

The following areas/activities are not covered and must not be entered or performed under these instructions. If any of these areas/activities must be entered or performed, contact the Regional Health and Safety Manager (Alan Cyrier, (770) 331-2829) for assistance.

- Barricaded areas (unless with prior approval from facility representative)
- Exposed energized electrical equipment (unless accompanied by qualified individual)
- Areas where there is an unprotected (e.g., no guardrail) fall exposure greater than 4'
- Areas where health hazards exist above action levels (such as Asbestos, Lead)
- Activities requiring respiratory protection
- Activities requiring personal protective equipment that personnel have not been trained to use
- Activities requiring the use of scaffolding, aerial lifts or hoisted personal platforms
- Any other areas where special access requirements exist (training, medical monitoring, security, etc.)

5.3 Project-Specific Hazards

5.3.1 Buried Utilities Location

National Mark-Out Service

Name: National Call Before You Dig, Common Ground Alliance
Phone: 811

www.call811.com

Local Utility Mark-Out Service

Name: Louisiana One Call System, Inc.
Phone: (800) 272-3020

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change n advancement of auger or split spoon).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SC should confirm that arrangement.

Do not begin subsurface activities (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings and utility company searches must be supplemented with a geophysical or other survey by a qualified, independent survey contractor to identify additional and undiscovered buried utilities.

Examples of the type of geophysical technologies include:

- **Ground penetrating radar (GPR),** which can detect pipes, including gas pipes, tanks, conduits, cables etc, both metallic and non-metallic at depths up to 30 feet depending on equipment. Sensitivity for both minimum object size and maximum depth detectable depends on equipment selected, soil conditions, etc.
- **Radio frequency (RF)** involves inducing an RF signal in the pipe or cable and using a receiver to trace it. Some electric and telephone lines emit RF naturally and can be detected without an induced signal. This method requires knowing where the conductive utility can be accessed to induce RF field if necessary.
- **Dual RF** a modified version of RF detection using multiple frequencies to enhance sensitivity but with similar limitations to RF
- **Ferromagnetic detectors** are metal detectors that will detect ferrous and non-ferrous utilities. Sensitivity is limited, e.g. a 100 mm iron disk to a depth of about one meter or a 25 mm steel paper clip to a depth of about 20 cm.
- **Electronic markers** are emerging technologies that impart a unique electronic signature to materials such as polyethylene pipe to facilitate location and tracing after installation. Promising for future installations but not of help for most existing utilities already in place.

Procedure

The following procedures shall be used to identify and mark underground utilities during subsurface activities on the project:

- The survey contractor shall determine the most appropriate geophysical technique or combinations of techniques to identify the buried utilities on the project, based on the survey contractor's experience and expertise, types of utilities anticipated to be present and specific site conditions.
- The survey contractor shall employ the same geophysical techniques used on the project to identify the buried utilities, to survey the proposed path of subsurface construction work to confirm no buried utilities are present.
- Identify customer specific permit and/or procedural requirements for excavation and drilling activities. For military installations contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.
- Contact utility companies or the state/regional utility protection service at least 2 working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation.
- Schedule the independent survey.
- Obtain utility clearances for subsurface work on both public and private property.
- Clearances are to be in writing, signed by the party conducting the clearance.
- Underground utility locations must be physically verified by hand digging using wood or fiberglass-handled tools when any adjacent subsurface construction activity (e.g., mechanical drilling, excavating) work is expected to come within 5 feet of the marked underground system. If subsurface construction activity is within 5 feet and parallel to a

marked existing utility, the utility location must be exposed and verified by hand digging every 100 feet.

- Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.
- Conduct a site briefing for employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation.
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon during drilling or change in color, texture or density during excavation that could indicate the ground has been previously disturbed).

5.3.2 Cement/Lime Dust

(Reference CH2M HILL SOP 302, *Concrete and Masonry*)

- Cement/lime dust may be corrosive to moist, damp skin.
- The routes of entry are: skin contact, inhalation, eyes, ingestion.
- Inhalation of cement/line dust may cause sore throat, coughing, choking and dyspnea.
- Treat mild, acute skin contact with soap and water.
- If clothing becomes saturated with wet cement/lime dust, it should be removed and replaced with clean, dry clothing.
- Gauntlet style work gloves are required to be worn at all times at the site.
- Wear impervious clothing (tyvek or cotton coveralls) with long sleeves and pants to eliminate skin contact. If walking or working in dry or wet cement kiln dust, wear impervious boots taped at the top of the pants let to keep dust or liquids from entering the boot.
- Employees must have medical clearance and training in the proper use of respirators if the PEL and TLC are exceeded.
- Immediately after working with cement kiln dust, workers should clean their skin thoroughly with soap and water.

5.3.3 Clearing and Grubbing Operations

(Reference CH2M HILL SOP HS&E - 602, *Chainsaw Operations*)

By many measures, clearing, grubbing and logging operations can be the most dangerous activities on a project site. The tools and equipment used these type of tasks, such as chain saws, logging machines, and other heavy equipment pose hazards wherever they are used. As loggers use their tools and equipment, they are dealing with massive weights and irresistible momentum of falling, rolling, and sliding trees and logs. The combinations of these hazards present a significant risk to employees working in clearing and grubbing operations.

- Prior to clearing and grubbing operations clearly identify and mark all existing utilities in the task area.
- Chainsaw operators shall read and follow all instructions contained in the chainsaw operator's manual and shall receive a demonstration of how the chainsaw operates, including its safety features, from the place of rental or from an experienced chainsaw operator.
- Before starting a chainsaw check the controls, chain tension, and all bolts and handles to ensure they are functioning properly and adjusted according to the manufacturer's instructions.
- Only chainsaws equipped with a spark arrestor and fully functioning chain brake or "safety chain" shall be used.
- The following safety equipment shall be readily available while operating a chainsaw:
  a) Chainsaw operator's manual
  b) Fully stocked first aid kit.
  c) Multipurpose fire extinguisher.
  d) Foreign voltage detector (FVD) when topping utility poles.
  e) Grounded extension cord approved for outdoor use and ground fault circuit interrupter (GFCI) for electrical-powered chainsaws.
  f) Approved safety gasoline container and funnel or flexible nozzle for refueling gasoline-powered chainsaws
  g) Sledge hammer and non-metallic wedges when necessary to prevent pinching of the chain.
- The following personal protective equipment shall be worn while operating chainsaws:
  a) Safety glasses with side shields and face shield to prevent injury from wood chips, sawdust, or other flying objects.
  b) Hard hat with properly fitted suspension to prevent head injury from falling debris.
  c) Steel-toed safety shoes or boots to prevent foot injury from falling objects and accidental contact with the moving chain.
  d) Hearing protection to prevent permanent damage to hearing. Ear muffs or plugs will have a decibel noise reduction rating (NRR) assigned to them. The higher the rating, the greater the protection offered.
  e) Appropriate hand protection to prevent hand injury from abrasions, splinters and cuts.
  f) Clothing that is well-fitted and free of loose edges that could become entangled in the saw.
  g) For chainsaw use, protective chaps or leggings that cover the area from the groin to about 2 inches above the ankles shall be used. These chaps are made from synthetic fabrics (ballistic nylon, polyester, Kevlar, Engtek, etc.) that are designed to prevent the running saw chain from coming in contact with your legs.
- Adequate separation of between different chainsaw or clearing and grubbing operations must be observed while maintaining visual or audible contact between personnel. Employees must be spaced and the duties of each employee must be organized so the actions of one employee will not create a hazard for any other employee.

- Generally, employees must not approach a feller or mechanical felling operation any closer than 2 tree-lengths of the trees being felled, until the feller or felling machine operator has acknowledged that it is safe to do so.

5.3.4 Concrete and Masonry Construction

(Reference CH2M HILL SOP 302, *Concrete and Masonry*)

- Wear appropriate personal protective equipment (eye/face protection, gloves, rubber boots) when in areas where concrete is being poured.
- Protruding reinforcing steel (rebar), onto which personnel could fall, must be guarded to eliminate the hazard of impalement.
- Stay as clear as possible of all hoisting operations. Loads, including concrete buckets, shall not be hoisted overhead of personnel.
- Maintain a safe distance from formwork and shoring being removed from concrete structures.
- Maintain a safe distance from precast and lift-slab concrete being lifted into position until physically secured.
- Do not stand behind the tensioning jacks during post-tensioning.
- Do not ride concrete buckets.
- Do not enter limited access zones during concrete or masonry wall construction.

5.3.5 Confined Space Entry

(Reference CH2M HILL SOP 203, *Confined Space Entry*)

The following requirements must be met prior to confined space entry:

- Confined space entrants, attendants, and entry supervisors must complete the CH2M HILL 8-Hour Confined Space Entry training.
- A Confined Space Entry Permit (CSEP), Alternative Procedure Certificate (APC), or Nonpermit Certificate (NPC) must be completed and posted near the space entrance point for review. These forms/permits have been included in Attachment 5.
- Each confined space entrant and attendant must attend a pre-entry briefing conducted by the entry supervisor.
- Each confined space entrant and attendant must verify that the entry supervisor has authorized entry and that all permit or certificate requirements have been satisfied.
- Only individuals listed on the Authorization/Accountability Log are permitted to enter the space.
- Each confined space entrant and attendant must verify that atmospheric monitoring has been conducted at the frequency specified on the permit or certificate and that monitoring results are documented and within acceptable safe levels.

The following requirements must be met during confined space entry:

- Communication must be maintained between the attendant and entrants to enable the attendant to monitor entrant status.
- Entrants must use equipment specified on the permit or certificate accordingly.

- All permit or certificate requirements must be followed.
- Entrants must evacuate the space upon orders of the attendant or entry supervisor, when an alarm is sounded, or when a prohibited condition or dangerous situation is recognized.
- Entrants and attendants must inform the entry supervisor of any hazards confronted or created in the space or any problems encountered during entry.

5.3.6 Demolition

(Reference CH2M HILL SOP HS&E-305, *Demolition*)

- Some clients, local government, or state government may require a demolition permit prior to beginning demolition operations.
- An engineering survey shall be completed prior to start of demolition operations. The survey shall determine the condition of the structure framing, floors, and walls; the presence of asbestos, polychlorinated biphenyls (PCBs), lead paint, or other regulated hazardous substances; the presence of hazardous materials in tanks, pipes, and equipment; and the possibility of unplanned collapse of any portion of the structure. Any adjacent structure where personnel may be exposed shall also be similarly evaluated. The survey shall be conducted by a competent person and a written record of the survey findings shall be maintained at the project site.
- All regulated hazardous substances, such as asbestos, PCBs, lead paint, and other chemicals that could affect disposal, shall be removed prior to demolition. All applicable regulations shall be followed, including notification of the proper authorities, proper removal, and disposal. Any deviation of this policy shall be included in the written engineering survey.
- Remain a safe distance from the demolition zone to reduce exposure to fragmentation of glass, steel, masonry, and other debris during demolition operations
- Do not enter the demolition zone unless completely necessary, and only after the competent person has assessed the condition of the structure and has authorized entry
- Personnel shall be aware of and follow all requirements established by the competent person. The competent person shall inform personnel of the areas that are safe to enter and the areas where entry is prohibited.
- When possible, the competent person should escort personnel while in the demolition zone
- All demolition activities that may affect the integrity of the structure or safety of personnel must cease until personnel have exited the demolition zone
- Stay as clear as possible of all hoisting operations
- Loads shall not be hoisted overhead of personnel
- Personnel shall wear the appropriate PPE. Minimum protection includes safety-toed shoes/boots, hard hats, safety glasses, high visibility vest (clothing) and work gloves. Safety shoe inserts that protect against punctures should be worn when demolition involves wood frame structures. Hearing protection may be needed when working in proximity to heavy equipment.
- A daily safety briefing/meeting shall be conducted with all demolition personnel to discuss the work planned for the day and the HS&E requirements to be followed.
- Demolition equipment shall be inspected each day, before use, to ensure safe operational condition.

- The competent person shall inspect the demolition area as work progresses to detect hazards resulting from weakened or deteriorated floors, walls, or loosened material. Personnel shall not be permitted to work in areas where such hazards exist until they are corrected by shoring, bracing, or other effective means.
- Appropriate warning and instructional safety signs shall be conspicuously posted where necessary. In addition, a signalman shall control the movement of motorized equipment in areas where the public might be endangered.
- A temporary fence shall be provided around the perimeter of the demolition zone adjacent to public areas. Perimeter fences shall be at least 6 feet high. When the fence is adjacent to a sidewalk near a street intersection, at least the upper section of fence shall be open wire mesh from a point not over 4 feet above the sidewalk and extending at least 25 feet in both directions from the corner of the fence or as otherwise required by local authorities.
- Barricades, where required, shall be secured against accidental displacement and shall be maintained in place except where temporary removal is necessary to perform the work. During the period a barricade is temporarily removed for the purpose of work, a watch shall be placed at all openings.
- Warning lights shall be maintained from dusk to sunrise around excavations, barricades, or obstructions in the demolition zone. Illumination shall be provided from dusk to sunrise for all temporary walkways adjacent to the demolition zone.
- Fugitive dust must be controlled during demolition by using water sprays or other methods.
- Noise must be monitored and controlled as required by state or local regulations.

5.3.7 Driving Safety

- Practice defensive driving:
  - Defensive driving starts from the moment you get behind the wheel.
  - Always be alert to the hazards around you, including changing weather.
  - Driving defensively means taking every possible precaution to avoid an accident, despite the hazards around you.
  - Inspect your vehicle before a trip. Make sure tires are properly inflated, loads are securely tied down, and if trailers are used that they are securely hitched.
  - Anticipate hazards so you can take action before you encounter a hazard. For example, if you are on a wet, slippery road and an upcoming traffic light has been green for some time, assume it will be red by the time you reach the intersection and begin slowing down well in advance.
  - Let problem drivers move ahead of you. Do not challenge them.
  - A common cause of motor vehicle incidents to CH2M HILL employees is being struck from behind by another vehicle. To lower the risk of someone running into the rear of your vehicle:
    - Check your brake lights often to make sure they are clean and working properly
    - Know what is going on around you. Use your rearview mirrors.
    - Signal well in advance for turns, stops and lane changes.
    - Slow down gradually. Avoid sudden actions.
    - Drive with the flow of traffic (within the speed limit); driving too slow can be as dangerous as driving too fast.

  - To avoid striking the vehicle in front of you, keep at least two seconds following distance, using the two second rule (3 seconds in some states); 1:20 people need more than 2 seconds to react.
  - For bad road or weather conditions, double your safe driving distance.
  - If the vehicle behind you is driving too close to you, especially in bad road or weather conditions, switch lanes or pull over to let the vehicle safely pass.
  - At 40 mph, the safe driving distance for good conditions is 120 feet (180 feet 3SR).
- Car rental must meet the following requirements:
  - Dual air bags
  - Antilock brakes
  - Be midsize or larger.
- Familiarize yourself with rental vehicle features.
  - Mirror adjustments
  - Seat adjustments
  - Cruise control features, if offered.
  - Pre-program radio stations.
- Always wear seatbelt while operating vehicle.
- Eliminate or reduce hazards whenever possible. Make sure that no loose items are on the dashboard or by your feet, or that items are not piled to high on seats or floors.
- Bring a mobile phone with you if for no other reason for emergencies.
- Do not use a mobile phone while operating vehicle. A good practice is to turn off your mobile phone while driving.
- Know that some prescription and over-the-counter medications can make you sleepy behind the wheel; if you are taking medications, read the side effects and recommended precautions carefully, and follow their instructions.
- Avoid distractions such as eating, drinking, or changing CD's.
- Adjust headrest to proper position.
- Tie down loose items if utilizing a van.
- Maintain both a First Aid kit and Fire Extinguisher in the field vehicle at all times.
- Close car doors slowly and carefully. Fingers can get pinched in doors or the truck.
- Take shelter in the field vehicle in the event of rain, especially lightning, if an enclosed structure is not available.
  - Listen to car radio for predictions of tornado or lightning.
- Park vehicle in a location where it can be accessed easily in the event of an emergency.
- Always stay alert. If you feel drowsy, pull over and do not attempt to drive.
- All vehicles should be equipped with basic emergency response and safety equipment including:
  - Potable water
  - First aid kit
  - Flashlight with extra batteries
  - Anti-bacterial wipes
  - Fire extinguisher, and
  - Minimal personal protective equipment necessary for work at the destination, appropriate for the expected exposures.

5.3.8 Electrical

(Reference CH2M HILL SOP 206, *Electrical)*

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
  - Equipped with third-wire grounding.
  - Covered, elevated, or protected from damage when passing through work areas.
  - Kept out of water.
  - Protected from pinching if routed through doorways.
  - Not fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.
- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

5.3.9 Excavations

(Reference CH2M HILL SOP 307, *Excavations*)

- CH2M HILL Staff exposed to excavation hazards must complete initial excavation training by completing either the CH2M HILL 10-Hour Construction Safety Awareness training course or the Excavation Safety computer-based training module.
- You do not have to enter an excavation for it to pose a hazard to you; unprotected excavation walls, particularly those with a sheer slope, may become unstable and collapse. Persons or materials standing at the edge may be exposed to falls and crushing injuries. Never stand next to an excavation edge that is not protected against cave in.
- Do not enter the excavations unless completely necessary, and only after the competent person has completed the daily inspection and has authorized entry.
- Follow all excavation entry requirements established by the competent person.

- Sloping, benching, shoring, shielding, or other protective systems are required to protect personnel from cave-ins except when the excavation is made entirely in stable rock or is less than 5 feet deep and there is no indication of possible cave-in, as determined by the excavation competent person.
- Trenches greater than 4 feet deep shall be provided with a ladder, stairway, or ramp positioned so that the maximum lateral travel distance is no more than 25 feet.
- Guardrails, fences, or barricades shall be installed at excavations 6 feet or deeper when the excavations are not readily visible because of plant growth or other visual obstruction.
- Do not enter excavations where protective systems are damaged or unstable.
- Do not enter excavations where objects or structures above the work location may become unstable and fall into the excavation.
- Do not enter excavations with the potential for a hazardous atmosphere until the air has been tested and found to be at safe levels.
- Do not enter excavations with accumulated water unless precautions have been taken to prevent excavation cave-in.
- H&S Self-Assessment Checklist – Excavations, found in Attachment 6 of this plan, is an example of the type of evaluation that shall be used to inspect excavation activity prior to entry.

5.3.10 Office Safety & Ergonomics

(Reference CH2M HILL SOP HSE&Q-115, *Office Ergonomics*, CH2M HILL SOP HSE&Q-114, *Office & Warehouse Safety*)

At CH2M HILL, between one-half and three-quarters of our workplace injuries occur in the office. We can have the most impact on ensuring that our employees go home healthy and uninjured if we reduce the number of incidents that occur in the office. The two biggest areas of concern for our office workers are ergonomics and lifting.

Ergonomic Evaluations and Support

The office safety program includes implementation of an ergonomics program. Corporate HS&E will provide the necessary training, tools, and technical assistance to complete this task.

Employees are responsible for:

- Completing the new employee orientation training which contains the ergonomics awareness training module located on CH2M HILL's Virtual Office within one month of coming to work at CH2M HILL.
- Implementing the knowledge gained from the ergonomics awareness training course regarding workstation set-up and safe work practices.
- Setting up their workstation in the most ergonomically correct manner possible, with the tools and equipment available in the workplace.
- Taking breaks from keying, mousing, blackberry use and sedentary work as recommended in the ergonomic awareness training module.
- Implementing all reasonable precautions to prevent an ergonomic injury.
- Notifying their local Ergonomic Evaluator or HSE staff of any ergonomic issues that may be associated with their workstation.
- ***Workstation Setup*** – To learn more how to setup your workstation review the Ergonomics Workstation Set Up information on the HSSE site on the VO: https://www.int.ch2m.com/intrnl/voffice/corp/health/HowDoI/ergnew.asp (or from the

HSSE home page, from the menu on the left select: "How Do I?" > "Get an ergonomic evaluation?".

- ***Ergonomic Evaluation*** – If you are experiencing discomfort, complete the Ergonomic Evaluation Worksheet and forward it to the Ergonomics Support Team (ErgnomicSupport@ch2m.com), found on the Ergonomics Website.
- ***Ergonomic-Related Questions, or a Minor Issue*** – Contact the Ergonomics Support Team (ErgnomicSupport@ch2m.com, or 720-286-ERGO (3746)).
- ***Project Assistance*** – If you are on a project and need ergonomic assistance, contact your Regional Health & Safety Manager (Alan Cyrier 770-331-2829).
- For office workers, go online and perform a self ergonomic evaluation within the first 30 days of working in the office.
- Requesting an ergonomic evaluation, if appropriate, when job duties change, workstation location changes or if experiencing discomfort that may be associated with their workstation set-up, equipment or overexertion.
- Following the guidance provided by the Ergonomic Evaluator, RHSM or occupational physician regarding ergonomic issues and recommendations on work habits and workstation design.
- Providing immediate verbal communication to their direct supervisor regarding any ergonomic injuries or illnesses that may be work-related.
- Once your supervisor has been notified, immediately contacting the Injury Management/Return to Work Program Administrator to report a work-related injury or illness (in the United States or Puerto Rico).

Supervisor/PM is responsible for:

- Set up project office spaces with desks, chairs and computer equipment so they promote good ergonomic practices.
- Participating in efforts to educate employees to recognize ergonomic hazards and perform safe work practices.
- Upon notification that an employee may have experienced a work-related ergonomic injury or illness, ensuring that the employee contacts the Injury Management/Return to Work Program Administrator (in the United States or Puerto Rico).
- Completing and submitting an Hours and Incident Tracking System (HITS) Incident Report Form (IRF) for employees under their supervision who have experienced an ergonomic injury.
- For employees sustaining an ergonomic injury or illness, working with the employee, RHSM and the Injury Management/Return-to Work Coordinator to verify that any physician's recommendations for workstation design and work practices are implemented.

The following are some of the other office safety hazards:

- Opening several drawers of a file cabinet at once and having it tip forward.
- Leaving filing cabinet drawers open creating a tripping hazard.
- Cluttering the floor of your office creating a tripping hazard for yourself and individuals that enter your office.
- Standing on chairs to reach high shelves instead of using a step stool or stepladder.
- Slipping and falling because of slippery surfaces.
- Using the office as a storage unit for chemicals.
- Tripping over electrical cords across walkways.

- Using makeshift tools to fix something.
- Running or carrying objects in both hands on stairways.
- Being careless with paper cutters.

The office safety program has the following program objectives:

- Reduce the number and severity of office-related injuries and illnesses
- Increase office safety awareness and involvement, and improve health, safety, and environmental protection (HS&E) communications
- Compliance with regulatory requirements specific to the office environment

Everyone is responsible for keeping the office environment free of potential hazards and for performing their work in a safe manner. Each office has either an office safety committee or an office safety coordinator responsible for implementing an office safety program in your location that meets the requirements of HSE SOP-114. The office safety committee is responsible for executing the program elements of the office safety program and providing documentation that the requirements of each element have been implemented. When a non-committee implementation plan is used, the staff who work on office safety issues are responsible for the same responsibilities of an office safety committee, including documentation that the requirements of each element have been implemented.

Office Assessments

The office safety program includes conducting periodic office assessments. The purpose of office assessments is to identify and eliminate potential workplace hazards and unsafe practices before they cause injury. Assessments are fact finding and not fault finding. Staff must be made aware of office hazards and unsafe practices and be informed of safer methods of performing the same activity. The assessment should also acknowledge safe practices that are observed. Appropriate corrective action must be taken for all identified hazards and a schedule for corrective action determined. A method of distributing assessment findings to all affected staff members shall be determined by each individual office to prevent unsafe conditions/practices from taking place elsewhere in the office. A checklist for documenting the office HS&E self-assessment process is provided in Attachment 6.

Hazard Communication

The office safety program includes implementation of a hazard communication program, see Section 5.1 of this plan. This program includes conducting chemical inventories, maintaining material safety data sheets, verifying material containers are properly labeled, and verifying staff exposed to chemical hazards have received the appropriate hazard communication training.

Emergency Response Plans

The office safety program includes implementation of an office emergency response plan, see Section 9 of this plan. The plan must include emergency alarm activation, outside emergency response notification, building evacuation, assigned emergency coordinators, designated assembly areas, methods to account for staff, and disaster relief supplies (food, water, etc.) if considered necessary for a particular office.

The office safety program will provide a method to verify that there are adequate CPR/first aid trained staff for each office. The number of trained staff needed will vary with the size and configuration of each office. An adequate number is approximately 10 percent of the total staff in the office, with at least one trained person in each building and/or floor. The office safety program will also provide a method to verify that adequate supplies of first aid materials are provided.

5.3.11 Overhead Utilities

Soil within 10′ of a pole or anchor are not to be disturbed, and operations within 10′ of overhead lines shall not be initiated until operations are coordinated with the utility officials. Also the areas between the structures and it's anchors must be avoided. Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:

- Power has been shut off and positive means have been taken to prevent lines from being energized in coordination with the local power utility; or
- Equipment, or any part of the equipment, does not have the capability of coming within the following minimum clearance from energized overhead lines, or the equipment has been positioned and blocked so that no part, including cables, can come within the following minimum clearances:

Power lines nominal system (kv)	Minimum required clearance
0-50	10 feet
51-100	12 feet
101-200	15 feet
201-300	20 feet
301-500	25 feet
501-750	35 feet
751-1000	45 feet

5.3.12 Personal Security and Crime Prevention

Remember you are a valuable resource to CH2M HILL. While conducting your work stay alert, become familiar with your surroundings, report any activity/circumstances that you feel is unusual and always stay in frequent contact with other project personnel. Use the following to help protect yourself from danger while in/out of your vehicle, working alone or in an unsafe area:

- Prior to working in a high crime area, contact local law enforcement. Notify them of the work to be performed and duration, and request any specific tips and recommendations they may have.
- Avoid working alone as much as possible.
- When working at night on the project, plan for extra precautions such as additional lighting, security, police presence and escorts when leaving the project.
- If you are a witness or the victim of a crime, an accident or suspicious/threatening circumstances, report it to the Police as soon as possible.
- Always lock your car doors while driving, and roll windows up far enough to keep anyone from reaching inside.
- At stop signs and lights keep the car in gear, windows rolled up, doors locked and stay alert.

- Travel well-lighted, busy streets. You can spare those extra minutes it may take to avoid an unsafe area.
- Keep your wallet/purse, laptop, and other valuable out of sight, even when you are driving in your locked car.
- Park in safe, well-lighted areas near your destination.
- Always let a project member know where you are and your destination if you must travel alone.
- Always lock your car, even for a short absence. And before unlocking your car, quickly check to make sure no one is hiding on your seats or floors of your vehicle.
- If your car should break down:
    - Get off the roadway, out of the path of oncoming traffic, even if you have to drive on a flat tire. The tire is replaceable.
    - Turn on your emergency flashers.
    - If a motorist stops to render assistance, it is better to remain in the car, and ask them to get help.

5.3.13 Uneven Walking Surfaces

- Employees walking in ditches, swales and other drainage structures adjacent to roads or across undeveloped land must use caution to prevent slips and falls which can result in twisted or sprained ankles, knees, and backs.
- Whenever possible observe the conditions from a flat surface and do not enter a steep ditch or side of a steep road bed.
- If steep terrain must be negotiated, sturdy shoes or boots that provide ankle support should be used. The need for ladders or ropes to provide stability should be evaluated.

5.3.14 Vehicular Traffic, Exposure to Public Vehicular Traffic

(Reference CH2M HILL SOP 216, *Traffic Control*)

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear the appropriate ANSI/ISEA 107-1999 high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route -- behind an established barrier, parked vehicle, guardrail, etc.

- Always pay attention to moving traffic – never assume drivers are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a "buddy system" should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor's traffic control plan.
    - ANY activity that places itself in the roadway or within 15 feet (4.6 metres) of a highway or freeway must be reviewed prior to the operation, to determine if traffic control measures are needed to protect workers and the public.
    - For cities, ANY activity that places itself in the roadway or ditch, curb, or gutter must be reviewed to determine if traffic control measures are needed to protect workers and the public.
    - Any activity that will block public sidewalks or eliminate the ability for bicycles to travel in bicycle lanes must be reviewed to determine if traffic control measures are needed.
    - A competent person with a background in Traffic Control Safety shall make the determination if traffic control measures are needed.
    - For those operations requiring traffic control measures, a competent person will prepare a traffic control plan in advance of the work operation.
    - Traffic control plans that restrict traffic continuously for 3 or more days will be designed by a Traffic Control Engineer.
    - Traffic control plans for operations that restrict traffic for less than 48 hours will be drawn by a competent person who has completed a Traffic Control Supervisor course or similar training.
    - Before conducting work in travel lanes or along right of way, the appropriate road authority will be notified and any required permit to work in the roadway or right of way will be obtained. In many cases, if traffic control services are subcontracted out the subcontractor will obtain the permit.
    - Traffic conflicts should be minimized by not scheduling work at peak travel times.
    - Only trained personnel should be working within roadways – CH2M HILL personnel must take the traffic control training found on the VO.
    - A copy of the traffic control plan will be on site during work activities.
    - Only competent personnel will set up traffic control devices in accordance with the traffic control plan.
    - Personnel will not commence work operations until the Traffic Control provider has installed all signs and devices according to the plan.
    - Crews working in or near active traffic should know the emergency procedures for the work location, this includes having an escape route out of the work area.
    - Night work operations must be planned and proper lighting must be a priority.
    - All flaggers on site will possess a valid Flagger Training card and obey the procedures for the state in accordance with the training they have received

    - Work will be suspended if the traffic control plan is not effective in protecting the workers in the travel lane or the public.
    - A copy of the traffic control plan used will be filed in the project file along with a copy of all flagger cards for those flaggers used.
- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion (TMCC). All vehicles within 40 feet of traffic should have an orange flashing hazard light atop the vehicle.
- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.

5.4 Equipment Hazards

Equipment operations may pose hazards during project activities. The following sections summarize these hazards.

5.4.1 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knock over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.
- Cylinders must be appropriately labeled and stored away from access /egress.

5.4.2 Cranes

(Reference CH2M HILL SOP 303, *Cranes, Hoists, and Rigging*)

- Only certified crane operators are permitted to operate cranes.
- Maintain safe distance from operating cranes and stay alert of crane movement. Avoid positioning between fixed objects and operating cranes and crane pinch points, remain outside of the crane swing and turning radius. Never turn your back on operating cranes.
- Approach cranes only after receiving the operator's attention. The operator shall acknowledge your presence and stop movement of the crane. Never approach operating cranes from the side or rear where the operator's vision is compromised.
- When required to work in proximity to operating cranes, wear high-visibility vests to increase visibility to operators. For work performed after daylight hours, vests shall be made of reflective material or include a reflective stripe or panel.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Cranes shall not be used to lift or lower personnel.
- If crane becomes electrically energized, personnel shall be instructed not to touch any part of the crane or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the crane.
- Do not exceed hoist load limits.
- Ensure load is level and stable before hoisting
- Inspect all rigging equipment prior to use. Do not use defective rigging for any reason.
- Only use rigging equipment for the purpose it was designed and intended.

5.4.3 Earthmoving Equipment (Operating Heavy Equipment)

(Reference CH2M HILL SOP HSE-306, *Earthmoving Equipment*)

- When in the proximity of heavy equipment, wear high visibility vests.
- Always get the attention of equipment operator before approaching equipment, and only when the equipment has ceased operation.
- If equipment back up alarms are not working, leave the area immediately until they are fixed.
- Only authorized, licensed drivers shall be permitted to operate equipment; the Earthmoving Equipment Operator Evaluation Form (Attachment 11) shall be used to document the CH2M HILL earthmoving equipment operator evaluation process
- Operators shall wear seatbelts
- Equipment must be checked at the beginning of each shift to ensure the equipment is in safe operating condition and free of apparent damage (the check should include: service brakes, parking brakes, emergency brakes, tires, horn, back-up alarm, steering mechanism, coupling devices, seat belts and operating controls); the Earthmoving Equipment Inspection Form, Attachment 12, shall be used when CH2M HILL employees are operating earthmoving equipment

- All defects in equipment shall be corrected before the equipment is placed in service
- Documentation of equipment inspection must be maintained onsite at all times (CH2M HILL equipment operators shall use the Earthmoving Equipment Inspection Form, Attachment 12)
- All contractors will be required to provide CH2M HILL with their heavy equipment preventative maintenance schedules for the heavy equipment they will use on the project
- Equipment shall not be used to lift personnel; loads shall not be lifted over the heads of personnel
- All equipment controls shall be in a neutral position, with the motors stopped and brakes set
- Equipment which is operating in reverse must have a reverse signal alarm distinguishable from the surrounding noise or a signal person when the operators view is obstructed
- When equipment is used near energized power lines, the closest part of the equipment must be at least 10 feet (3 m)from the power lines < 50 kV; provide an additional 0.4 inch (1cm) for every 1 kV over 50 kV
- A person must be designated to observe clearances of energized power lines and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means
- All overhead power lines must be considered energized until the electrical utility authorities certify that it is not an energized line and it has been visibly grounded
- Underground utility lines must be located before excavation begins
- Operators loading/unloading from vehicles are responsible for seeing that vehicle drivers are in the vehicle cab or in a safe area
- The parking brake shall be set whenever equipment is parked, wheels must be chocked when parked on inclines
- When not in operation, the blade/bucket must be blocked or grounded; the master clutch must be disengaged when the operator leaves the cab
- When equipment is unattended, power must be shut off, brakes set, blades/buckets landed, and shift lever in neutral

5.4.4 Forklifts

(Reference CH2M HILL SOP HSE-309, *Forklifts*)

- Only certified forklift operators are permitted to operate forklifts on CH2M HILL projects—if a CH2M HILL employee is required to operate a forklift, they must first complete training and an evaluation process to become a certified forklift operator; the HSM shall be contacted to obtain forklift operator certification or to approve previously held certificates
- Subcontractors operating forklifts are responsible for complying with all applicable HS&E training requirements and for providing the training necessary to complete their tasks safely; proof of forklift operator certification shall be provided to CH2M HILL before operating the forklift

- A daily safety briefing/meeting shall be conducted with all forklift operators to discuss the work planned for the day and the HS&E requirements to be followed
- Forklifts and associated components shall be inspected each day, before use, to ensure safe operational condition
  - All defective components shall be corrected before the vehicle is placed in service
  - If forklifts are used on multiple shifts, an inspection shall be done on each shift
  - Forklifts operated by CH2M HILL employees shall be inspected using the Forklift Inspection Form presented in Attachment 19
  - Subcontractors operating forklifts are required to document daily forklift inspections
- The rated capacity of the forklift shall be clearly posted in a location visible to the operator
  - Any modifications to the forklift that affect the capacity or safe operation of the forklift shall have written approval from the manufacturer
  - All decals, labels, and nameplates shall be changed accordingly and maintained in a legible condition
  - If the forklift uses front-end attachments other than factory installed, the forklift shall be marked to identify the attachments and the operating parameters for the attachment
- All high-lift forklifts shall have overhead guards and vertical load backrests; overhead guards are intended to offer protection from the impact of small packages and boxes, but not the impact of a falling capacity load
- Seat belts shall be provided for forklifts except for forklifts designed only for standup operation
- Forklifts shall be equipped with a backup alarm that is operational when the forklift is used in reverse; a spotter may be used to guide reverse movement when backup alarms are not in operation
- Forklifts shall be equipped with a horn, distinguishable from the surrounding noise level, that shall be operated as needed when the machine is moving in either direction
- Forklifts shall have a service braking system capable of stopping and holding the forklift fully loaded
- When general lighting is less than adequate, forklifts shall be equipped with directional lighting
- Concentrations of carbon monoxide from forklift operation shall not exceed the permissible exposure limit (PEL) of 50 parts per million (ppm)
- At least one fire extinguisher shall be available for use at the forklift operating area

5.4.5 Gas Powered Sump Pumps and Generators

- Never refuel a gas engine until it is cooled off! Fires regularly are caused from fueling hot engines.
- Store extra fuel in a metal fuel can.
- Have a fire extinguisher on site.
- If the gas powered equipment is loud wear hearing protection while working near that location.

- Remove rings while starting the pump. There have been cases where someone used his left hand to stabilize a gas engine while starting it and the ignition sparked to his wedding ring and caused 3rd degree burns.

5.4.6 Hand and Power Tools

(Reference CH2M HILL SOP 210, *Hand and Power Tools*)

- The employer is responsible for complying with all applicable HS&E training requirements relating to hand and power tool safety and for providing any additional training necessary to complete their tasks safely.
- Operate all tools according to the manufacturer's instructions and within design limitations
- All hand and power tools shall be maintained in a safe condition
- Tools are to be inspected and tested before use—if a tool is found to be defective it is to be tagged "Do Not Use" and removed from service until repaired
- Personal protective equipment, such as gloves, safety glasses, earplugs, and face shields, are to be used when exposed to a hazard from the tool
- Power tools are not to be carried or lowered by the cord or hose
- Disconnect tools from energy sources when not in use, before servicing and cleaning, and when changing accessories such as blades, bits, and cutters
- Safety guards on tools are to remain installed while the tool is in use and promptly replaced after repair or maintenance has been performed
- Tools are to be stored properly, where they will not be damaged or come in contact with hazardous materials
- If a cordless tool is connected to its recharge unit, both pieces of equipment must conform strictly with electrical standards and manufacturer's specifications
- Tools used in an explosive environment must be rated (i.e., intrinsically safe, spark proof, etc.) for work in that environment
- When using a knife or blade tool, stroke or cut away from the body with a smooth motion taking care not use excessive force that could damage tool, material being cut, or unprotected hands
- As alternatives to manual and pistol-grip hand tools that involve work with highly repetitive movement, extended elevation, constrained postures, or positioning of body members (e.g., hand, wrist, arm, shoulder, neck, etc.):
  - Consider alternative tool design
  - Improve posture
  - Select appropriate materials
  - Organize work—sequencing to prevent muscular skeletal, repetitive motion, and cumulative trauma stressors

- Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool—training and certification must be provided to the SC before using the tool

5.4.7 Rigging

(Reference CH2M HILL SOP 303, *Cranes, Hoists and Rigging*)

- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Hoists shall not be used to lift or lower personnel.
- Do not exceed hoist load limits.
- Ensure load is level and stable before hoisting
- Inspect all rigging equipment prior to use. Do not use defective rigging for any reason.
- Only use rigging equipment for the purpose it was designed and intended.

5.4.8 Stairways and Ladders

(Reference CH2M HILL SOP HSE-214, *Stairways and Ladders)*

- A stairway or ladder is generally required when a break in elevation of 19 inches (48 cm) or greater exists
- Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra precautions
- Personnel must not use pan and skeleton metal stairs until permanent or temporary treads and landings are provided the full width and depth of each step and landing
- Ladders must be inspected daily by a competent person for visible defects
- Defective ladders must be tagged and removed from service
- Ladders must be used only for the purpose for which they were designed and shall not be loaded beyond their rated capacity
- Only one person at a time shall climb on or work from an individual ladder
- User must face the ladder when climbing; keep belt buckle between side rails
- Ladders shall not be moved, shifted, or extended while in use
- User must use both hands to climb; use rope to raise and lower equipment and materials
- Straight and extension ladders must be tied off to prevent displacement
- Ladders that may be displaced by work activities or traffic must be secured or barricaded
- Portable ladders must extend at least 3 feet (1 m) above landing surface
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder
- Stepladders are to be used in the fully opened and locked position

- Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder
- Fixed ladders greater than or equal to 24 feet (7.3 m)in height must be provided with fall protection devices
- Fall protection should be considered when working from extension, straight, or fixed ladders greater than 6 feet (1.8 m) from lower levels and both hands are needed to perform the work, or when reaching or working outside of the plane of ladder side rails

5.4.9 Survey Lasers

Laser beams used in surveying may be hazardous to the eyes. The severity of the hazard depends on the type of laser and its power. Avoid direct eye contact with the beam. This is most important when wearing corrective eyeglasses which can intensify the beam's focus on the retina. Lasers used in surveying are usually low power. Lasers must be posted with safety warning signs.

5.5 Chemical Hazards

Project operations may pose chemical hazards during construction activities. The hazards posed by the chemicals used on this project will be communicated to project personnel using the hazard communication procedures. Copies of MSDSs for hazardous chemicals used on the project will be immediately available for project personnel.

5.5.1 Hydrogen Sulfide

Hydrogen sulfide (H2S), or sewer gas, is a colorless, flammable gas with a strong odor of rotten eggs. Upon exposure, one's sense of smell becomes rapidly fatigued and can NOT be relied upon to warn of its presence. Symptoms of exposure include irritation of the eyes and respiratory system, suspension of breathing, eye irritation and pain, conjunctivitis, dizziness, headache, fatigue, gastrointestinal disturbance, convulsions, and coma.

The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for H2S is 10 parts per million (ppm) as an 8-hour time-weighted average (TWA), and a 15-minute Short-Term Exposure Limit (STEL) of 15 ppm. The level at which H2S is considered immediately dangerous to life and health is 100 ppm. H2S will be monitored with a Multi Gas Monitor prior to, and continuously during, the confined space entry, and levels must be <10 ppm for entry to proceed.

5.5.2 Methane

Methane is a flammable gas that forms during sludge degradation processes. Methane is odorless and has practically no physiological effects below its flammability limits. However, it is a simple asphyxiant, which at high concentrations, displaces oxygen in the air. Methane has a lower explosive limit (LEL) in air of 5.3%, or 53,000 ppm, and an upper explosive limit (UEL) in air of 15%, or 150,000 ppm. Combustible gases and oxygen levels will be monitored with at least a four-gas monitor prior to, and continuously during, the confined space entry. The concentration of

combustible gases in air must be <10% LEL for entry to proceed, while oxygen levels must be within the range of 19.5% - 23.5%. As previously mentioned, it is critical to monitor for oxygen levels first to ensure that the combustible gas readings are accurate.

5.6 Outdoor Exposures

Operations conducted outdoors may expose workers to weather, ecological hazards and other location-related hazards. The following sections summarize these hazards.

5.6.1 Alligators

Alligator habitat includes large shallow lakes, marshes, ponds, swamps, rivers, creeks, and canals in fresh water. Smaller alligators eat insects, snails and small fish. Larger alligators eat fish, birds, turtles, snakes, and mammals. Adults range in size from six to fourteen feet, and up to 600 pounds. Alligators do attack people. There is an average of over 12,000 alligator complaints a year, with about four attacks on people a year.

Most attacks happen when they have been fed by humans or when they are defending their nests. To be safe, there are precautions to take. One, do not feed alligators. Second, never approach an alligator. Third report nuisance alligators to the Louisiana Department of Wildlife Fisheries, Alligator Program at (504) 568-5885.

Never kill, harass, molest, or attempt to move the animal. State law prohibits such actions, and the potential for being bitten or injured by a thrashing alligator is high. Feeding alligators is a violation of state law and that by feeding alligators; people create problems for others when the alligators loose their natural fear of people. American alligators are listed by the federal government as threatened due to the similarity in appearance to the endangered American Crocodile. It is illegal to feed, tease, harass, molest, capture, or kill alligators. Violations or suspicious activity should be reported.

5.6.2 Canada Geese

Canada Geese may be on site. Do not attempt to feed or go near geese or nesting areas. Canada Geese can be extremely aggressive during mating and nesting periods. If project work requires staff to work in areas where geese may be nesting, please contact the SC and/or client site supervisor to determine the correct course of action to be taken. Minimize direct contact with goose droppings, remove shoes prior to entering home or work following contact and wash hands thoroughly with antibacterial soap.

5.6.3 Dog Safety

According to the Centers for Disease Control and Prevention (CDC), dogs bite more than 4.7 million people a year (2% of the population). Almost 800,000 bites a year (one out of every 6) are serious enough to require medical attention. Dog bites send nearly 334,000 victims to hospital emergency rooms each year (914 each day). Between 15 and 20 people die each year from dog bite injuries. Not only are people injured by dog bits, there may be additional injuries incurred while

fighting the animal off or defending against the attack (twisting or breaking ankles or wrists while running away and falling).

For field workers, education and experience is the best line of defense. It is important to learn to know how to read the dog's movements and temperament. Educating field workers on the root causes of canine aggression is crucial in preventing dog bites. In the event of a dog attack, use what you have on or around you to get out of the area and to your vehicle.

Devices used to deter an attack are only effective when the dog is not yet on its target. Deterrents are no more than time-buyers. They may startle or stall the animal, giving the worker an opportunity to avoid contact and get out of the yard and to safety.

If a dog is already on its victim, something is needed to either redirect the dog's attention or defend against the injury. If a large enough stick is nearby, that can be used to give something else to bite on while the employee moves towards safety (while the employee pulls it and inches towards safety – similar to a less friendly game of tug of war with a dog toy). Remember dogs will bite the fist thing they come to. If an employee holds out their hand to fend off the dog, that is what the dog will bite.

Some common tools employees can carry to deter and defend themselves in the event of encountering an aggressive dog or a dog attack:

Method	**Pros**	**Cons**
Pepper Spray	Works on 70% of dogs	30% of dogs will advance undeterred through a stream of pepper spray (generally the more aggressive breeds that will act through pain, such as Pit Bulls, Rottweilers, Chows, Akita and German Shepherds) It can't be used when it is windy Does not work if the employee misses the dog Employee has a greater chance that the spray would disable them Other people (including children) may be exposed to the pepper spray if they touch the dog that has been sprayed Not considered a humane deterrent
Air Horn	Effective for dogs that have a sensitivity to sound and are submissive in nature Alert others you need help Considered a more humane deterrent than pepper spray	Ineffective for most dogs Will only work if the dog has a sensitivity to sound and is submissive in nature
Ultrasonic Devices	Effective for dogs that have a sensitivity to sound and are submissive in nature Only the dog can hear, will not disturb the community	Ineffective for most dogs Will only work if the dog has a sensitivity to sound and is submissive in nature

	Considered a more humane deterrent than pepper spray	
Umbrella	Excellent if the dog has any sight sensitivity (most dogs are fearful of the popping action of the umbrella) Difficult for dogs to get their teeth into, and block the dogs' view of the employee Considered a more humane deterrent than pepper spray	Does not work on dogs who would not fear the umbrella popping action
Dog Stick	Gives the dog a place to bite while employee can exit to be pulled to safety – dogs will bite the first thing they come to (if employees hold out their hand, that will be bitten) Includes a handle to hold and a tennis ball for the dog to bite onto	Can only be used if the employee sees the dog coming, and has it handy to use

Dog Safety Awareness Facts and Precautions:

- In recent years, the dogs responsible for the bulk of the fatalities are Pit Bulls and Rottweilers (in 2008, 65% of the dog bite fatalities were by Pit Bulls). Also Akita, Chows and German Shepherds are breeds known to be strong and smart, with instinctual aggression that humans have exploited for years. Dogs that are accepted as aggressive breeds tend to have a higher threshold for pain, and a lower fear threshold than other dogs. These breeds have been trained over generations to continue fighting despite injuries, so they have built up natural defenses over time. Even their teeth and jaws are bigger and stronger. Be especially wary of these breeds.
- Any dog may bite – even one familiar to you.
- Most dog bites occur on the owner's premises.
- Avoid all dogs – both leashed and stray.
- Be aware that chained dogs are also dangerous. Dogs do not like to be restrained. A chained dog is only as secure as the chain holding it. You will not know whether a chained dog is dominant or submissive. A chained animal must make you believe that he is a killer (you won't know if it is or isn't). This is a submissive dog's way of keeping you away from him. The dominant dog is showing what he really is. In 2008, 9% of the fatalities involved chained dogs.
- Don't disturb a dog while it is sleeping, eating, or caring for puppies.
- A dog is wary of anything it does not understand; if you have tools or equipment in your hands, a dog may consider these a threat to its safety.
- Dogs react strongly to body language; strangers should project confidence.
- If a dog approaches to sniff you, stay still and do not reach out to the dog; this may be interpreted as an act of aggression.

- Dogs are more aggressive when they travel in packs. Even docile dogs often become uncharacteristically violent and vicious when they are in a pack. In 2008, 39% of the fatalities involved multiple dogs.
- Dogs may attack if they are angry, afraid or rabid. Know how to spot an angry, afraid or rabid dog and leave the area immediately.

Trait	Happy	Afraid	Angry	Rabid
Tail	Low, may be wagging	Tucked between hind legs	High and stiff, may move back and forth	Aggressive or passive posture
Body	Relaxed, may wiggle when approaching	Tense and low to the ground	Tense and leans forward; Hair on neck and back is up	Aggressive or passive posture
Ears	Down, or slightly up	Ears are back	Up and forward, or may be flattened	Aggressive or passive posture
Eyes	Open, wide, relaxed	Avoids eye contact	Stare right at the person	Aggressive or passive posture
Face	Soft, relaxed	Tense	Tense	Aggressive or passive posture
Mouth	May be open; Upper teeth won't show	Pulled back; Teeth may show	Tight; Teeth may show	Foaming around the mouth (inability to swallow); May appear to be choking
Behavior	May walk around and sniff objects of interest	May back away or try to hide; Dog is trying to look smaller	Standing tall, trying to look bigger; May bark, growl or remain silent	Overly aggressive or overly passive; Anxiety, solitude, fever and nervousness; Erratic behavior; Constantly licking its wounds

- Three stages of rabies are recognized in dogs and other animals:
  - Stage 1 (Prodromal Stage) – One to three day period characterized changes.
  - Stage 2 (Excitative Stage) – Lasts three to four days; the infected dog tends to be hyper-reactive to external stimulus, and will bite at anything near.
  - Stage 3 (Paralytic Stage) – Damage to motor neurons; incoordination is seen due to rear limb paralysis and drooling and difficulty swallowing is caused by paralysis of facial and throat muscles. Death is usually caused by respiratory arrest.
- If you are threatened by a dog, remain calm, don't scream, and avoid direct eye contact – staring a strange dog directly in the eyes can be perceived as a challenge.
- If you say anything, speak calmly and firmly.
- Dogs want to attack from the rear, coming up from behind. Even one who sits up in his yard ahead of you may wait until you pass before giving chase. Do not turn your back on a dog.

- **While working position yourself so you face your partner, so you have a view of any animals, people or vehicles that may come up from behind.**
- Don't turn and run (running from a dog will trigger its natural chase instinct and increase its aggression, and you will not be able to outrun the dog). Try to stay still until the dog leaves, or back away slowly until the dog is out of sight or you have reached safety (e.g., vehicle, outside a gated/fenced area).
- If attacked, retreat to vehicle or attempt to place something between you and the dog.
- Get a solid object between you and the dog if possible. Or, if you are holding a jacket or other soft item, stuff it in the dog's mouth.
- If you can not reach your vehicle, try to climb on the roof of a nearby car, or get on the other side of a nearby gate or doorway until you get assistance or wait for the dog to leave.
- If you fall or are knocked to the ground, curl into a ball with your hands over your head and neck, and protect your face.
- If there is no chance to retreat and no chance of using any of the above techniques, do whatever you can to defend yourself and get out of the situation; kicking is safer than using your hands and arms (assuming you are wearing jeans).
- If a dog grabs a hand or a leg, go limp; the dog may let go.
- If bitten, immediately scrub the bite site vigorously with soap and water, seek medical attention as soon as possible, and report the incident to your supervisor and the local authorities.
- Report all dog-related incidents to your supervisor, even if they do not result in a bite.

5.6.4 Heat Stress

(Reference CH2M HILL SOP HSE&Q-211, *Heat and Cold Stress*)

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F (10° – 16 ° C) should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of or avoid consumption of coffee, carbohydrate-rich beverages, and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SC to avoid progression of heat-related illness.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs & Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	A skin irritation caused by excessive sweating during hot, humid weather. Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin cool, moist and/or clammy; complexion pale, muddy, flushed or red skin; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	**Life threatening.** Red, hot, dry skin; dizziness; confusion; rapid breathing and rapid weak pulse; high oral temperature (as high as 105 degrees F)
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Keep skin clean and dry and preventing infection. Avoid using ointments or creams as they keep the skin warm and moist and may make the condition worse.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Remove or loosen tight clothing and apply cool, wet cloths such as towels or wet sheets. Rest lying down, with head in low position. If person s awake and alert, give a half glass of cool water every 15 minutes. Do not let them drink too quickly. Seek medical attention.	**CALL 911 or local Emergency Medical Services** Move the person to a cooler place. Keep the person lying down. Quickly cool the body by wrapping wet sheets around the body and fan it. If you have ice packs or cold packs, wrap them in a cloth and place then on each victim's wrists and ankles, in the armpits and on the neck to cool the large blood vessels. Watch for signals of breathing problems and make sure the airway is clear.

Monitoring Heat Stress

These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress. The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

5.6.5 Lightning and Thunderstorms

- Monitor the weather to identify potentially hazardous weather approaching the area (TV/cable, radio, etc.).
- Decide when to suspend activities and move to a safe location.

- Know and use the 30-30 Rule (promoted by the National Oceanic and Atmospheric Administration). When the time between lightning and thunder is 30 seconds or less, immediately seek safe shelter.
- Wait at least 30 minutes after hearing the last thunder before leaving safe shelter.
- If the lightning can't be seen, hearing thunder means you should seek safe shelter.
- Note that the 30-30 Rule is best suited for existing thunderstorms moving into the area. It can not protect against the first lightning strike.
- Safe evacuation sites include substantial and enclosed buildings and fully enclosed metal vehicles with the windows up.
- Unsafe shelters include solitary trees, water, metal objects, electrical and electronic equipment, open fields, and high ground.
- If your skin tingles or your hair stands on end, squat low to the ground on the balls of your feet. Place your hands over your ears and your head between your knees. Make yourself the smallest target possible and minimize your contact with the ground. Do not lie down.
- If someone is struck by lightning, call 911 and administer first aid immediately.

5.6.6 Mosquitoes and West Nile Virus

The following information is taken from the Centers for Disease Control and Prevention (CDC) Website:

Human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low. On rare occasions, West Nile virus infection can result in a severe and sometimes fatal illness known as West Nile encephalitis (an inflammation of the brain). The risk of severe disease is higher for persons 50 years of age and older. There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

Most infections of West Nile encephalitis are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and rarely, death. The incubation period in humans (i.e., time from infection to onset of disease symptoms) for West Nile encephalitis is usually 3 to 15 days. If symptoms occur, see your doctor immediately.

You can reduce your chances of becoming ill by protecting yourself from mosquito bites. To avoid mosquito bites:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when you're outdoors. Apply sparingly to exposed skin. DEET in high concentrations (greater than 35%) provides no additional protection.
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing.
- Read and follow the product directions whenever you use insect repellent.
- Wear long-sleeved clothes and long pants treated with repellent and stay indoors during peak mosquito feeding hours (dusk until dawn) to further reduce your risk.
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources.

5.6.7 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac are typically found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin. Avoid contact with plants outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, call the Injury Management Administrator (866-893-2514).

5.6.8 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

5.6.9 Spiders

Most spiders are not poisonous. If a spider or web is found, promptly report them to the SC so others can avoid them.

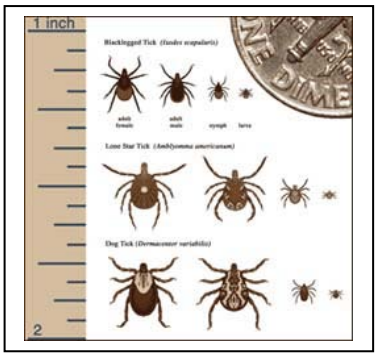
To Prevent Spider Bites:

- Inspect material before use
- Wear gloves when handling lumber, rocks
- Remove trash, boxes, piles of material
- Eliminate clutter in trailers
- Stack wood away from buildings
- Clean up dead insects
- Use rolled up paper to kill spiders, not bare hand
- Use insecticides

Report all bites immediately (ice, collect spider for identification). Bites look like a small white blister. Symptoms may include:

- Restlessness, Itching
- Fever, Chills
- Nausea, Vomiting, Shock

5.6.10 Ticks



Background

Ticks typically found are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown. They are very

small, with adults no larger than one-quarter inch in size. Ticks resemble a flea or a beetle, with a small head and eight legs.

Ticks may carry diseases and pathogenic organisms, and transfer them to people when they bite. Also the bite wounds themselves may become infected.

Tick Habitat

Ticks are associated with deciduous forest and habitat containing leaf litter. Leaf litter provides a moist cover from wind, snow and other elements. They may also be found in heavily wooded areas surrounded by tracts of land cleared for agriculture, scrub, high brush, and open grasslands.

Illnesses, Signs & Symptoms

The bite site may be red, swollen or develop ulceration or lesions. For Lyme disease, the bite area will sometimes resemble a target pattern.

There are six notable tick-borne pathogens that cause human illness in the United States. These pathogens may be transmitted during a tick bite, normally hours after attachment (a reason to find tick bites and remove ticks quickly). The illnesses, presented in order of most common to least, include:

- Lyme (bacteria) – To see the Lyme Disease risk for your area: www.aldf.com/usmap
- RMSF (Rocky Mountain Spotted Fever) (bacteria)
- Ehrlichiosis (bacteria)
- STARI (Southern Tick Associated Rash Illness) (bacteria)
- Tularemia (Rabbit Fever) (bacteria)
- Babesia (protozoan parasite)

Symptoms will vary based on the illness, and may develop in infected individuals typically between 3 and 30 days after transmission. Some infected individuals will not become ill or may develop only mild symptoms.

These illnesses include some or all of the following: fever, headache, muscle aches, chills, stiff neck, joint aches, nausea, vomiting, abdominal pain, bone pain, diarrhea, fatigue, malaise, weakness, small solid ring-like or spotted rashes. If these symptoms appear after a tick bite, seek medical attention immediately (call the injury reporting number, 866-893-2514, see Section 8.5.2).

A variety of long-term symptoms may result if the illness is left untreated, including debilitating effects and death.

Controls

The methods for controlling exposure to ticks include, in order of most- to least-preferred:

- Avoiding tick habitats, and ceasing operations in heavily infested areas
- Reducing tick abundance through habitat disruption or application of insecticide
- Personal protection through use of protective clothing, repellants (DEET), and contact insecticides (permethrin or permanone)
- Frequent tick inspections and proper hygiene

Note vaccinations are not available and preventative antibiotic treatment after a bite is generally not recommended.

When avoiding the habitat or reducing tick abundance is not feasible, to prevent tick bites:

- *Clothing:*
    - Wear light-colored clothing so they may be more easily seen before they bite.
    - Wear long sleeves and long pants.
    - Tuck in your clothes (shirt inside your pants, and pants legs inside your socks or boots)
    - Check your clothing frequently for ticks.
- *Repellants and Contact Insecticides:*
    - Use repellents (DEET) on your skin with contact insecticide (permethrin or permanone) on your clothing only, as directed on the product label; these products are nearly 100% effective in preventing tick bites when used together, and used correctly.
    - Apply repellants to all areas of exposed skin. Insects may only need unprotected skin the size of a quarter, repellant on nearby skin or on clothes will not protect this area of skin.
    - Reapply repellants before the duration of protection expires:

DEET Concentration	*Hours of Protection*
5-10%	2-4 hours
15%	6 hours
25-30%	up to 8 hours
100%	10+ hours

    - Avoid applying high-concentration DEET (greater than 35 percent) products to the skin and refrain from applying repellent to portions of the hands that are likely to come in contact with the eyes and mouth.

Tick Check

A tick check should be performed after field activities in potential tick habitats, before entering the field vehicle (you do not want to infest your field vehicle with ticks). Have your field partner check your back; the backs of your legs, arms and neck; and your hairline. Shake off clothing as thoroughly as possible before entering the vehicle. Once the field day is completed, repeat this procedure and perform a thorough self-check.

At the end of the day, search your entire body carefully for ticks, (particularly the groin, armpits, neck and head), and shower.

Tick Removal

If a tick has embedded itself into the skin, remove the tick as described below. Before performing activities in potential tick habitats, obtain a Tick Removal Kit from the regional warehouse (contact Kevin Mayer/GNV, 352-237-8199). The tick must be removed quickly, cleanly and intact:

- The tick must be removed quickly, the sooner it is removed the less likely the transmission of potentially infectious organisms, if it is carrying them.
- The tick must be removed cleanly, to prevent the bite wound form becoming infected.

- The tick must be removed intact, to prevent infecting the ticks fluids into the bite wound which may contain infectious organisms. Also if intact, the tick may be assessed to determine if it is carrying infectious organisms (see procedures below).

1. Use pointed, precision tweezers. Cosmetic tweezers with wide, flat ends may crush the tick, increase the potential of the transmission of potentially infectious organisms if the tick is carrying them, and make the wound worse. Choose unrasped fine-pointed tweezers whose tips align tightly when pressed firmly together.

2. After disinfecting the area first, grasp the tick as close to the skin surface as possible and pull upward with stead, even pressure.
    - Do not twist or jerk the tick, this may cause the mouth parts to break off and remain in the skin. If this happens, remove mouthparts with tweezers, and consult your healthcare provider if infection occurs.
    - Do not grasp, squeeze, crush, or puncture the body of the tick because its fluids (saliva, hemolymph, gut contents) may contain infectious organisms. Releasing these organisms to the outside of the tick's body or into the bite area may increase the chance of infectious organism transmission.
    - Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
3. Thoroughly disinfect the bite wound and wash your hands with soap and water.
4. Contact the Injury Management/Return To Work provider (IMRTW), WorkCare, using the toll-free number (866) 893-2514 to report the tick bite. WorkCare will follow up with each CH2M HILL employee who reports a tick bite and is at risk of develping Lyme disease by monitoring for symptoms up to 45 days, and will refer the employee to a medical provider for evaluation and treatment as necessary.

Tick Bite Treatment

Tick bites should always be treated with first aid. Clean and wash hands and disinfect the bite wound site before and after removing the embedded tick.

Monitor the site of the bite for the appearance of a rash or early tick-borne illness symptoms beginning 3 to 30 days after the bite. If infection or symptoms and effects of tick-borne illnesses develop, consult a healthcare professional (call the injury reporting number, 866-893-2514, see Section 8.5.2).

5.6.11 Ultraviolet Radiation

(Reference CH2M HILL SOP HSE-217, *Ultraviolet Radiation*)

- Sunlight is the most intense source of Ultraviolet Radiation (UV). Welding operations may produce levels of UV radiation that can result in significant health effects, primarily to the eyes (see SOP HSE-314, *Welding and Cutting*).
- Health effects caused by UV radiation are confined to the eyes and skin.
- Overexposure to the skin can result in redness, sunburn, skin rash, premature skin aging, and numerous types of skin cancer (melanoma is the most serious type of skin caner, and accounts for 75% of skin cancer deaths).

- Overexposure to the eyes may lead to inflammation of the cornea (sunburn to the cornea, also known as snow blindness, which leads to redness and a gritty feeling which progresses to pain and an inability to tolerate any kind of light). Working around or in water, or other natural UV reflectors, can cause a combination of direct and reflected sunlight resulting in double exposure. Long-term exposure to sunlight may also cause cataracts or clouding of the lens of the eye.
- UV exposure can lead to skin cancer, premature aging of the skin, wrinkles, cataracts, and other eye problems. See a health care physician if you find an unusual skin change (spot on the skin changing in size, shape or color over a period of 1 month to 2 years).
- The amount of UV exposure depends on:
  1. The strength of the light
  2. The length of exposure, and
  3. The protection provided for the skin.
- The skin and eyes are the most susceptible to UV damage. You need to be especially careful in the sun if you have:
    - Numerous moles, irregular moles, or large moles;
    - Freckles or burn before tanning;
    - Fair skin, or blond, red or light brown hair; or
    - Spend a lot of time outdoors
- When working outdoors, follow these five steps to protect against UV radiation and the adverse health affects it can cause:
  1. Wear Appropriate Clothing and Protection. Reduce UV radiation damage by wearing proper clothing.
     - Wear long sleeved shirts with collars, and long pants.
     - Wear clothing to protect as much of your skin as possible.
     - Wear clothing that does not allow visible light through it.
     - To determine if the clothing will protect you: Place your hand between the fabric and a light source. If you can see your hand through the fabric, the garment offers little protection against sun exposure.
     - Head protection should be worn to protect the face, ears, and neck. A wide brim hat is ideal because it protects the neck, ears, eyes, forehead, nose and scalp. Pith-style hard hats are available, as well as brim attachments for hard hats for additional protection. A baseball cap may not be appropriate depending on the hazards in the area. Baseball caps provide some protection for the front and top of the head, but not for the back of the neck or the ears where skin cancers commonly develop.
     - Wear UV-absorbent sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection. Ideal sunglasses do not have to be expensive, but they should block 99 to 100% of UVA and UVB radiation. Check the label to make sure they do. Darker glasses are not necessarily the best. UV protection comes from an invisible chemical applied to the lenses, not from the color or darkness of the lenses.
     - Use "broad spectrum" sunscreen with at least 15 SPF. Experts recommend products with a Sun Protection Factor (SPF) of at least 15. The number of the SPF represents the level of sunburn protection provided by the sunscreen. An SPF 15 blocks out 93% of the UV rays; an SPF 30 blocks out 97% of the UV rays. Products labeled "broad spectrum" block both UVB and UVA radiation. Both UVA and UVB contribute to skin cancer.
     - Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.

- Reapply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.
- Waterproof sunscreens should be selected for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.
- Check for expiration dates, because most sunscreens are only good for about 3 years. Store in a cool place out of the sun.
- Remember no sunscreen provides 100% protection against UV radiation; other precautions must be taken to avoid overexposure.

2. Provide Shade
   - Take lunch and breaks in shaded areas.
   - Use the shade form existing buildings, trees,
3. Limit Direct Sun Exposure.
   - Rotate staff so the same personnel are not exposed all of the time.
   - Limit exposure time when UV radiation is at peak levels. UV rays are most intense when the sun is high in the sky, between 10 AM and 4 PM. If you are unsure about the sun's intensity, take the shadow test: If your shadow is shorter than you, the sun's rays are the strongest. Seek shade whenever possible. Also, check the UV Index forecasted for your area while working outside (see below).
   - Avoid exposure to the sun, or take extra precautions when the UV index rating is high.
   - The UV Index is used to quantify the forecasted UV intensity. It is based on a scale from 1 (about 60 minutes before the skin will burn) to 10 (about 10 minutes before the skin will burn). The higher the number, the greater the exposure to UV radiation. The UV Index helps determine when to avoid sun exposure and when to take extra protective measures. It is forecasted daily for 58 cities. The UV Index can be found in the local newspaper on the local TV and radio weather broadcasts, or on internet weather forecasts (including the National Weather Service at www.nws.noaa.ov/om/uvi.htm).

6.0 Personal Protective Equipment

(Reference CH2M HILL SOP 117, *Personal Protective Equipment*, and 121, *Respiratory Protection*)

6.1 General Information

When actual or potential hazards exist and engineering controls or safe work practices cannot eliminate the hazard, employees shall use PPE. The employer shall provide field personnel with the required project-specific PPE and training.

Employees are responsible to:

- Acquire the necessary PPE from the employer
- Complete the appropriate training to learn the proper use and care
- Use PPE as required in the project-specific written safety plan
- Inspect PPE prior to use and maintain it in a clean and safe condition
- Not modify, tamper with, or repair PPE beyond routine maintenance
- Inform the employer of equipment that is damaged
- Inform the employer of equipment that they believe does not adequately protect them from actual or potential hazards

6.2 Hazard Assessment

The employer shall identify actual or potential hazards and the need for PPE. Two conditions typically dictate the necessity for PPE: general hazards present in the work area, and hazards created by the tasks being performed. Some work areas have actual or potential hazards that can be present at any time, thereby potentially exposing any personnel working or walking through the area. Such areas should be posted as PPE-required areas, or personnel should be informed of the requirements in an equivalent manner. In addition, the actual task being performed may create a hazard and require personnel who perform this task to wear appropriate PPE. The areas where these tasks are taking place may become PPE-required areas as long as that specific task is taking place.

Personnel must comply with the PPE requirements as specified in Table 11-1.

(Reference CH2M HILL SOP 117, *Personal Protective Equipment and* 121, *Respiratory Protection*)

Note that PPE is required when exposed to the general hazards listed below. Because certain tasks (e.g., welding, energized work, etc.) require specialized PPE, refer to SOP 121 to conduct an assessment for task-specific PPE requirements.

TABLE 11-1 PPE SPECIFICATIONS A

Hazard	PPE
General entry to active industrial facility or construction site, or when required by client/facility.	ANSI approved steel-toe leather work boots, safety glasses, and hardhat.
Working around heavy equipment or other noisy machinery, or if you must raise your voice to be heard while communicating with persons near you, hearing protection is required.	ANSI approved ear plugs or earmuffs.
Working in the proximity of heavy equipment, cranes, or vehicular traffic. Walking near or through private property.	High visibility vest or clothing.

TABLE 11-2
Reasons for Upgrading or Downgrading Level of Protection

Upgrade[a]	Downgrade
Request from individual performing tasks	Situation is less hazardous than originally thought
Change in work tasks that will increase potential for injury	Change in site conditions that decreases the hazard
Known or suspected presence of dermal hazards	Change in work task that will reduce potential for injury

[a] Performing tasks that require respiratory protection is permitted only when the PPE requirements have been approved by the Safety Officer, and a SC-C qualified at that level is present.

6.3 Training

CH2M HILL requires each PPE user to receive training on the proper care, maintenance, limitations, and instructions on how to wear and adjust PPE. The proper use of PPE should also be included in project safety briefings and toolbox meetings.

7.0 Safety Training

7.1 CH2M HILL Employee Training

The intent of CH2M HILLs employee training program is to ensure that CH2M HILL employees receive the appropriate level of training to conduct their work in a safe manner and to comply with applicable regulations. All employees are required to maintain the training qualification necessary to perform their assigned duties and job functions. Guidance on required courses can be obtained from HSMs and CH2M HILL SOP HSE-110, *Health, Safety, and Environment Training*.

7.2 Project Employee Orientation

Employees expecting to access the site are required to have CH2M HILLs project employee orientation. The training provided to the employees in the employee orientation shall include:

- Review the FSIs
- Present an overall site safety briefing (general site safety)
- Review employee responsibilities
- Review emergency procedures and evacuation plan
- Review injury and incident reporting procedures
- Review reporting procedures for hazardous conditions and/or hazardous activities

7.3 Safety Pre-Task Planning and Training

Each day, the onsite supervisors shall hold informational safety training with each member of their crew. Information discussed and training performed shall pertain to current project activities and scope of work. Contractors are encouraged to use this time for employee input and task-specific training (see Safety Pre-Task Planning).

7.4 Vendor Training

Vendors that supply equipment to the project will be required to perform a training session to review and explain the safe operation procedures to the parties that will be using or operating the equipment (e.g., fall protection equipment, confined space entry equipment, scaffolding, aerial lift platforms, powder actuated tools, and power tools).

7.5 Emergency Response Plan Training

Emergency Response Plan (ERP) training will occur during the employee orientation and retraining will occur periodically in safety meetings. The ERP training will include the procedures for reporting to external emergency response organizations (e.g., police, fire department, ambulance services, hospitals, rescue services, and hazardous material response services), building or site evacuation, designated evacuation assembly areas, and methods of accounting for staff upon evacuation. Emergency drills will be performed periodically, but at least twice per year. See Section 16 for the Emergency Preparedness procedures.

7.6 Training Documentation

All training shall be documented. Documentation and certificates verifying completion will be maintained onsite by the employer and copies of the training documentation will be submitted to the SC. Training documentation will be made available for review at all times

8.0 Incident Reporting, Investigation and Management

8.1 Scope and Application

This section describes requirements for internal notification, report and investigation of all incidents occurring in CH2M HILL facilities or projects, including serious incidents. Refer to CH2M HILL SOP 111, *Incident Notification, Reporting and Investigation* for more information.

8.2 Definitions

I**ncidents** are events that cause or could have caused undesired consequences. An incident may be caused by natural forces, employees, subcontractors, or third parties in any location associated with CH2M HILL operations, including offices, warehouses, project sites, private property, or public spaces. Incidents include:

- Injury or illness to a CH2M HILL employee or subcontractor employee
- Property damage
- Spill or release of hazardous or regulated material
- Environmental or permit violation
- A "near-miss"
- Other (e.g., fire, explosion, bomb threat, workplace violence)

Serious incidents must be immediately reported to senior management (see Section 8.5.3). Serious incidents include:

- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
- Kidnap/missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than $ 500,000 in damage.
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

8.3 Verbal Notification

- For all incidents, employees and subcontractors shall immediately notify the Safety Coordinator ***and*** their direct supervisor.
- The employee, Safety Coordinator or supervisor shall immediately notify the Project/Facility Manager ***and*** the Responsible Health and Safety Manager (RHSM) of all incidents.
- The Project/Facility Manager shall notify the Crisis Manager (720-286-4911) immediately of all serious incidents.
- The RHSM shall notify the REM of spills/releases and environmental/permit incidents.

8.4 Hours and Incidents Tracking System

The CH2M HILL **Hours and Incidents Tracking System** (HITS) is an online tool for reporting, tracking and trending all CH2M HILL and subcontractor incidents.

- The Safety Coordinator shall complete the Incident Report Form (IRF) in the HITS database **within 24 hours** for all non-injury/illness project incidents, including subcontractor incidents.
- The employee's supervisor shall complete the IRF **within 24 hours** for all injury/illness incidents.
- The WBG HSE Lead or designee shall update and evaluate the IRF for accuracy and completeness, consistent with company and regulatory requirements.

8.5 Incident Notification and Reporting

8.5.1 General Provisions

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and/or the DSC (the PM or DSC will notify the HSM).
- For CH2M HILL subcontractor incidents, complete and incident report form and submit to the HSM.
- For CH2M HILL work-related injuries or illnesses, follow the procedures detailed in Section 4.6.2 below.
- Notify and submit reports to CH2M HILL and to the client as required in the contract.

8.5.2 Incidents that Involve CH2M HILL Staff Only - Injury Management/Return-to-Work (IMRTW)

(Reference CH2M HILL, 124, *Injury Management/Return-to-Work*)

Background & Benefits:

The Injury Management Program has been established to provide orderly, effective and timely medical treatment and return-to-work transition for an employee who sustains a work-related injury or illness. It also provides guidance and assistance with obtaining appropriate treatment to aid recovery, keep supervisors informed of employee status, and to quickly report and investigate work-related injury/illnesses to prevent recurrence.

How it works:

All non-emergency work-related injuries and illnesses to a CH2M HILL employee within the United States and Puerto Rico must be reported immediately. This includes even minor injuries. In the case of an emergency, call 911 immediately.

- ***Employees***, if you are injured:
  1. Notify your supervisor immediately
  2. Call the Injury Management number – **(866) 893-2514**
  3. Obtain medical treatment as directed, and follow the medical providers directions

- ***Supervisors***, if your employee is injured:
  1. Ensure they have called the Injury Management number – **(866) 893-2514**, and are obtaining proper medical treatment. Make the call for them if they are not able to do so.

2. Complete the incident report form (Hours and Incident Tracking System, HITS) on the VO, with as much information as you know at that time (https://www.int.ch2m.com/hits).
3. Provide transitional duty when necessary, and ensure the restrictions given by the medical provider are followed.

8.5.3 Serious Incident Reporting

(Reference CH2M HILL, SOP 111, *Incident Notification, Reporting, and Investigation*)

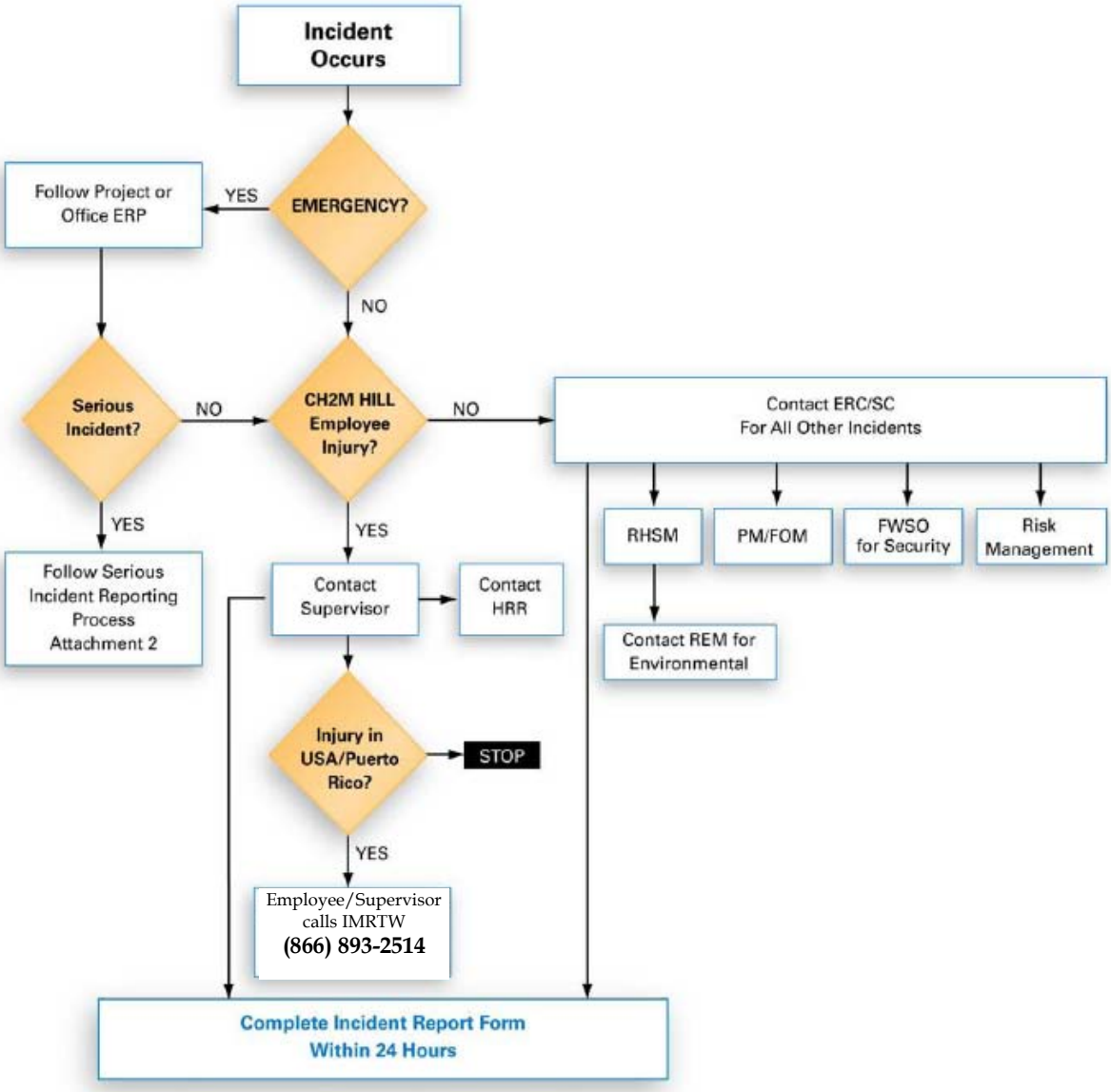
Serious Incidents must be reported in accordance with CH2M HILL Standard of Practice, *Serious Incident Reporting Process,* immediately. Serious incidents are those that involve any of the following:

- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
- Kidnap/missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than $500,000 in damage.
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

8.6 Flowcharts

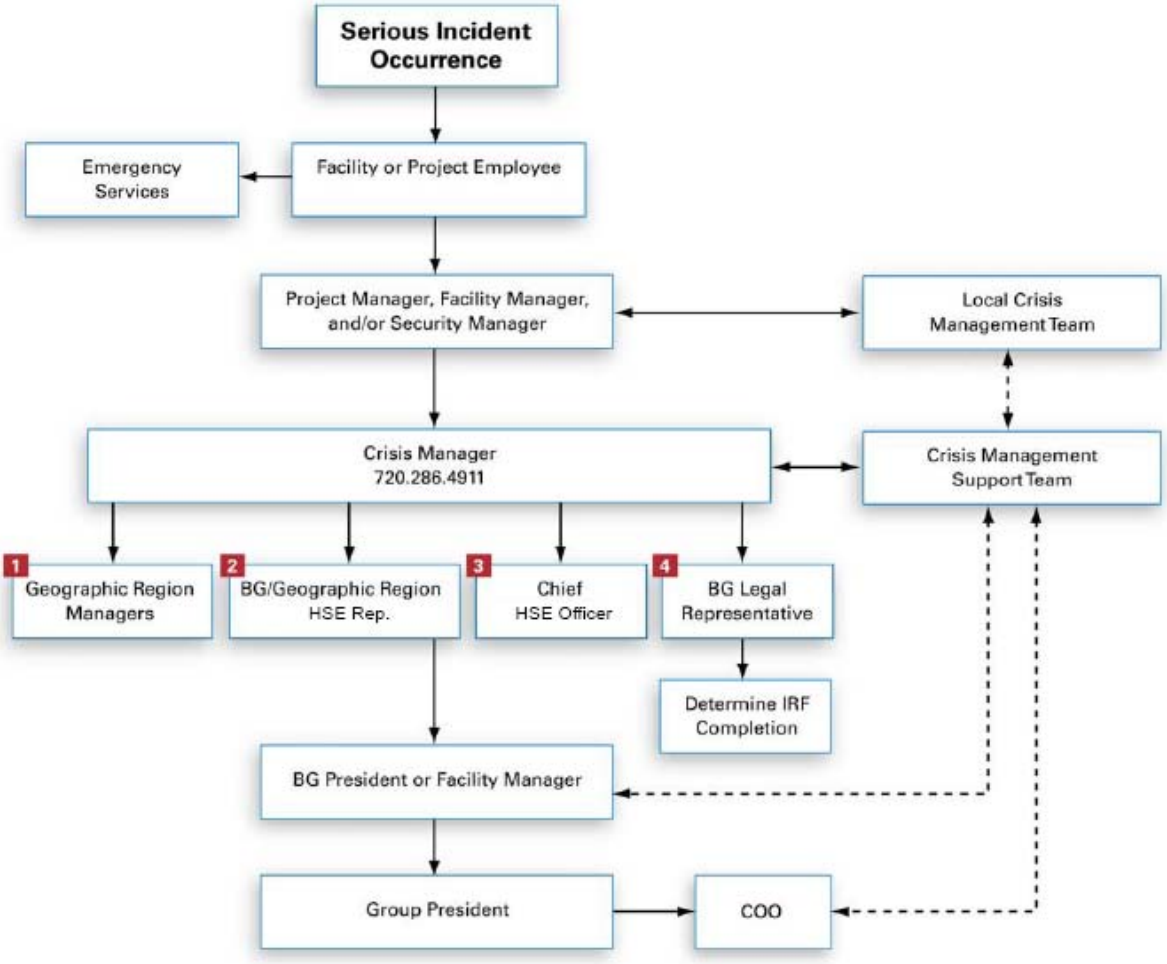
CH2MHILL

Attachment 1
CH2M HILL Immediate Incident Notification



ERC = Emergency Response Coordinator (designated in Emergency Response Plan)
ERP = Emergency Response Plan
FOM = Facility Office Manager
FWSO = Firm Wide Security Operations
HRR = Human Resources Representative
IMRTW = Injury Management/Return-to-Work
PM = Project Manager
REM = Responsible Environmental Manager
RHSM = Responsible Health & Safety Manager
SC = Safety Coordinator

Attachment 2
CH2M HILL Serious Incident Notification



LEGEND:

Direct line of communication

Indirect line of communication

DEFINITIONS:

Local Crisis Management Team: Team comprised of key facility, project and/or business group personnel. Team is assembled as necessary and as appropriate to effectively manage and respond to a crisis situation (serious incident) at/on scene.

Crisis Management Support Team: Team comprised of key corporate personnel. Team is assembled as necessary and as appropriate to effectively support, direct, and /or supplement a Local Crisis Management Team.

Crisis Manager: Corporate based Crisis Manager, contactable by pager 24/7.

8.7 Investigation

The purpose of an incident investigation is to understand how the incident happened, analyze the root causes, and prevent recurrence by implementing corrective actions and distributing lessons learned.

- Incident investigations shall be initiated by the supervisor or Project Manager and completed as soon as possible, but no later than 72 hours after the incident has occurred.

- Except for serious incidents, the RHSM or REM (depending on the type of incident) shall be responsible for determining the level of the investigation. The RHSM/ECC may conduct the investigation directly or may delegate this function to the Safety Coordinator.
- Non-serious investigations shall be documented by updating the HITS form.
- The Project Manager/Facility Manager shall implement all corrective actions.
- The RHSM/REM shall distribute lessons learned as needed and verify that corrective actions are implemented to prevent further incidents.

8.8 Incident Root Cause Analysis

The accident analysis is essential if all causes of the incident are to be identified for the correct remedial actions to be taken to prevent the same and similar type of incident from recurring. The investigation team will consist of the SC, the responsible supervisor, and the safety committee.

The Root Cause Analysis Form must be completed for all Loss Incidents and Near Loss Incidents. This form must be submitted to the investigation team for review.

For minor losses or near losses, the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, determine the root cause, and develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must use the Root Cause Analysis Flow Chart to assist in identifying the root cause(s) of a loss. Any loss may have one or more root causes and contributing factors. The root cause is the primary or immediate cause of the incident, while a contributing factor is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the person involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors." Causes that pertain to the system within which the loss or injury occurred should be referred to as "job factors."

8.8.1 Personal Factors

- Lack of skill or knowledge
- Correct way takes more time and/or requires more effort
- Short-cutting standard procedures is positively reinforced or tolerated
- Person thinks there is no personal benefit to always doing the job according to standards

8.8.2 Job Factors

- Lack of or inadequate operational procedures or work standards
- Inadequate communication of expectations regarding procedures or standards
- Inadequate tools or equipment

The root cause(s) could be any one or a combination of these seven possibilities or some other uncontrollable factor. In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates all seven other factors.

8.9 Corrective Actions

Include all corrective actions taken or those that should be taken to prevent recurrence of the incident. Include the specific actions to be taken, the employer and personnel responsible for implementing the actions, and a timeframe for completion. Be sure the corrective actions address the causes.

Once the investigation report has been completed, the PM shall hold a review meeting to discuss the incident and provide recommendations. The responsible supervisors shall be assigned to carry out the recommendations, and shall inform the SC upon successful implementation of all recommended actions.

9.0 Emergency Preparedness

An emergency may be an injury to a worker, an explosion, evacuation, fire, or chemical release. Employees must know what to do if an emergency occurs. This requires pre-planning and communication of these plans to employees.

9.1 Pre-Emergency Planning

- The SC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate (For additional Emergency Planning, reference CH2M HILL SOP 106 *Emergency Planning*)
- Review the facility emergency and contingency plans where applicable
- [Coordinate with third party contractors and the Client to review the plant and project site emergency and contingency procedures:
  - Emergency reporting procedures;
  - Notification procedures for all workers onsite that an emergency is taking place;
  - Emergency notification means;
  - Assembly area(s) for anticipated emergencies (chemical release, fire, severe weather, etc.); and
  - Site evacuation routes.]
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn)
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone)
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers
- Keep areas near exits and extinguishers clear
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities
- Inventory and check site emergency equipment, supplies, and potable water

Also, it is of the utmost importance that we carefully coordinate all of our emergency activities, particularly natural disasters, with our Information Technology groups. Be sure to include them, beginning in the planning stages.

9.2 Emergency Equipment and Supplies

The SC will verify that these supplies are available, as needed, and in proper working order and mark the locations of emergency equipment on the site map when a map is provided.

TABLE 16-1
Emergency Equipment and Supplies

Emergency Equipment and Supplies	Location
20 lb (9 kg)(or two 10-lb (4.5 kg)) fire extinguisher (A, B, and C classes)	Project Trailers
First aid kit	Field Vehicles
Personal eye wash	NA
Potable water	Field Vehicles
Bloodborne-pathogen kit	Field Vehicles
Additional equipment (specify):	

9.3 Emergency Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate area
- Notify appropriate response personnel
- Account for personnel at the designated assembly area(s)
- Assess the need for site evacuation, and evacuate the site as warranted
- Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled

9.4 Evacuation Procedures

- Evacuation routes and assembly areas will be designated by the SC before work begins
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation
- The SC will account for all CH2M HILL personnel and subcontractors at the assembly area
- The SC will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety

9.5 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to the Injury Management/Return To Work number ,(866) 893-2514. If there is doubt about whether medical

treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant.

Emergency contact information for the site office personnel and local vendors are included in the Emergency Contacts Table below and in the Project Contacts List.

Follow these procedures as appropriate:

- Notify appropriate emergency response authorities listed in Emergency Contacts
- Report the incident to the SC (the SC will notify the RHSM). Provide the following information:
    - Your name and telephone number (including extension).
    - The nature of the emergency.
    - The exact location of the emergency and any information you may have about the victim or other persons involved.
    - The name, sex and approximate age of the victim (as much as known).
    - The nature of the injury or illness.
    - Is the victim:
        1. Conscious
        2. Breathing without assistance
        3. Bleeding
- Do not move the victim.
- The SC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room. If possible, have someone meet responding personnel to lead them to the victim's location.
- Prevent further injury
- Initiate first aid and CPR where feasible
- Get medical attention immediately
- Make certain that the injured person is accompanied to the emergency room
- If the injured is a CH2M HILL employee, the SC or PM must accompany the injured CH2M HILL employee to the emergency room and to any follow-up appointments until the injured is released to full duty.
- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Incident Notification and Reporting, Section 8.5.2 (call (866) 893-2514).

Emergency Contacts

In the event of a Serious Incident:

- fatality, critical injuries,
- kidnap/missing person,
- event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than $ 500,000 in damage.
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

Immediately Contact the Crisis Manager at 720-286-4911

Medical Emergency – 911
Facility Medical Response #: NA
Local Ambulance #: 911

CH2M HILL Medical Consultant
Dr. Peter Greaney
Workcare
(866) 893-2514

Local Occupational Physician
Concentra Medical Clinic
3235 Perkins Road
Baton Rouge, LA 70808
(225) 387-3030
Hours: 8AM – 5PM (Mon-Fri)

Local Hospital
Our Lady of the Lake Regional Medical Center
5000 Hennessy Boulevard
Baton Rouge, LA 70808-4398
(225) 765-6565

Security & Police – 911
Facility Security #: NA
Local Police #: 911

CH2M HILL Director Security Operations
Thomas Horton/DEN
(720) 273-3100 (mobile) or (720) 286-0022

Fire/Spill Emergency -- 911
Facility Fire Response #: NA
Local Fire Dept #: 911

Utilities Emergency
Water: (225) 389-4858; 3PM-11PM and weekends, holiday call (225) 389-4603
Gas: 911
Electric: 911

WBG Director Health & Safety
Name: Denny Southam
Phone: (435) 654-4314; (801) 510-4268

Health and Safety Manager (HSM)
Name: Alan Cyrier, CSP
Phone: (770) 331-2829

Designated Safety Coordinator (DSC)
Name: Mike Uchniat
Phone: (225) 663-5276; (210) 861-7217

Regional Human Resources Department
CMS: Nancy Orr/DEN (720) 286-2397, x 62369
INC/WBG: Cindy Bauder/WDC (703) 376-5027

Project Manager/Construction Manager
Name: Michael Ellis
Phone: (225) 381-7281, x218; (225) 907-4528

Corporate Human Resources Department
Name: Darell Nepil/DEN
Phone: (720) 286-3082

Federal Express Dangerous Goods Shipping
Phone: (800) 238-5355

CH2M HILL Emergency Number for Shipping Dangerous Goods
Phone: (800) 255-3924

Workers' Compensation
Notify the supervisor immediately, then call the Injury Management number at (866) 893-2514. Supervisor to complete an incident report found at https://www.int.ch2m.com/hits, and notify the PM and HSM immediately.

Automobile Accidents
Rental: Carol Dietz/COR (303) 713-2757
CH2M HILL Vehicle: (800) VISA-911
Zurich Insurance (877) 246-3373
Report fatalities AND vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Facility Alarms: Project Specific - meet with the contractor and the Client's facility contact to determine site emergency procedures (how to be notified of an emergency, assembly area(s), and routes of evacuation for expected emergencies (chlorine/chemical release, fire, severe weather, general emergencies).	**Evacuation Assembly Area(s):** Project Specific - meet with the contractor and the Client's facility contact to determine site emergency procedures (how to be notified of an emergency, assembly area(s), and routes of evacuation for expected emergencies (chlorine/chemical release, fire, severe weather, general emergencies).

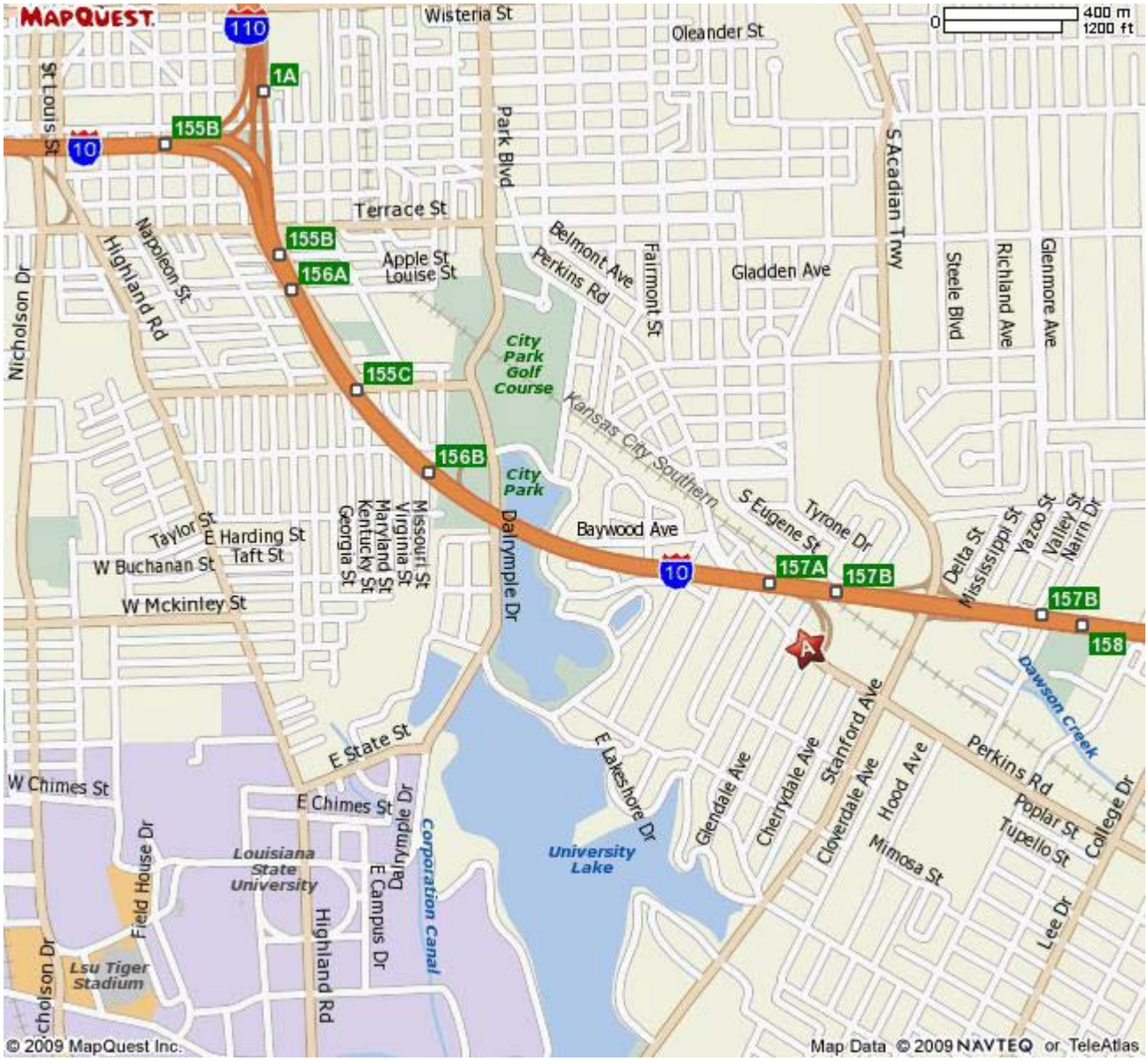
Facility/Site Evacuation Route(s): Project Specific - meet with the contractor and the Client's facility contact to determine site emergency procedures (how to be notified of an emergency, assembly area(s), and routes of evacuation for expected emergencies (chlorine/chemical release, fire, severe weather, general emergencies).

Directions to Medical Clinic

From I-10, take Exit 157B (Acadian THWY) toward Hospital/University of Phoenix.

Take the Acadian THWY ramp toward LSU, and turn slight right onto South Acadian TRWY/LA-427.

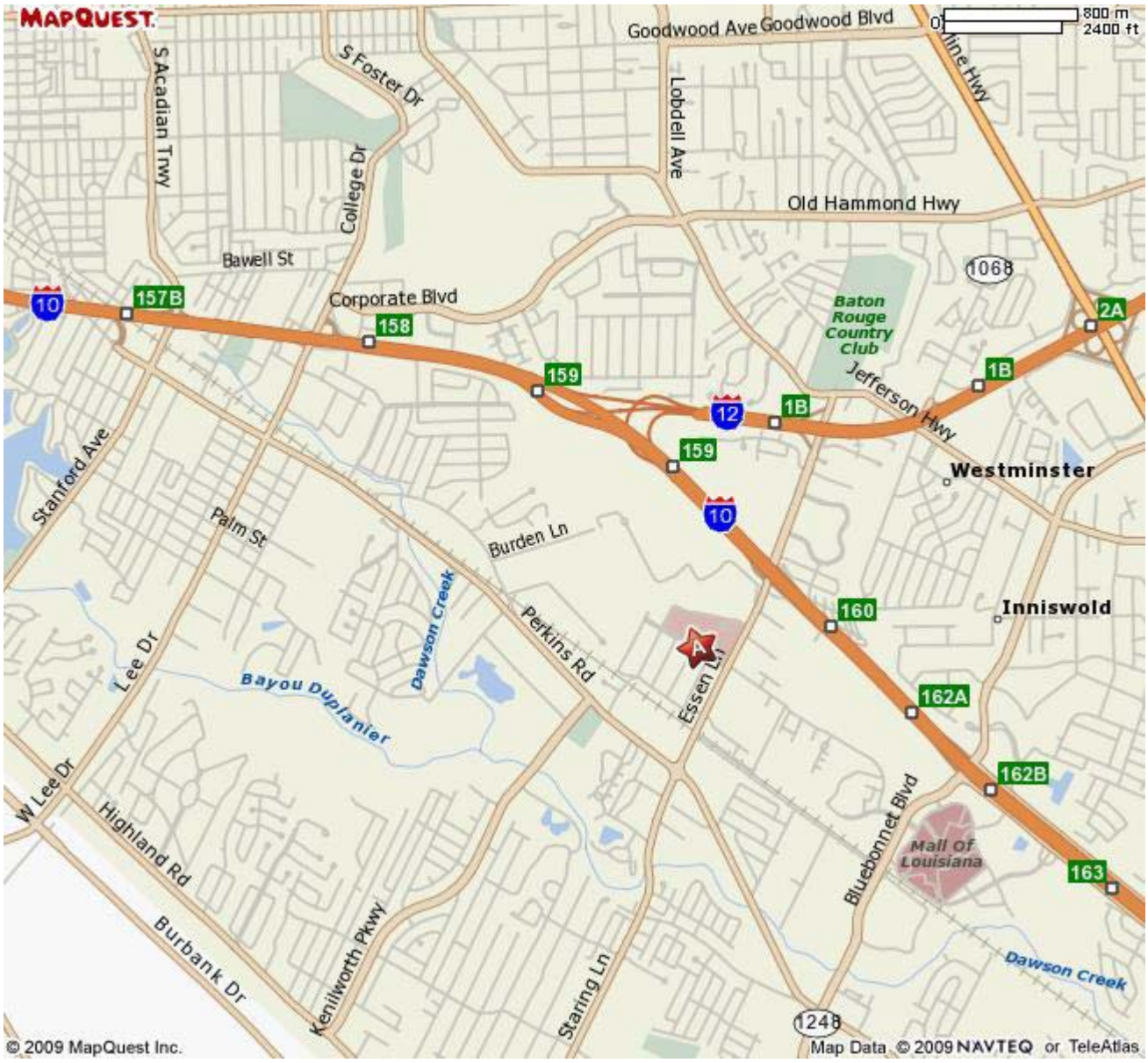
Turn right onto Perkins Road, go 0.2 miles to the Concentra Medical Clinic (3235 Perkins Road).



Directions to Hospital

From I-10, take Exit 160 (Essen Lane/LA-3064 West), go 0.7 miles.

Turn right onto Hennessy Boulevard, go 0.1 miles to hospital (5000 Hennessy Boulevard).



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PROJECT CONTACTS LIST

This form shall be completed and updated as necessary by the Safety Coordinator. A copy of the completed form shall be posted onsite and/or attached to the CH2M HILL HSE plan.

Client: Baton Rouge Department of Public Works

Project/Site Name: Sanitary Sewer Overflow Program **Project Number: 350589**

Project Contacts	Name	Phone Number	Mobile Number
Client	Bryan Harmon	(225) 389-3186	
CH2M Hill Project Manager	Michael Ellis	(225) 381-7281, x218	(225) 907-4528
CH2M HILL Safety Coordinator	Mike Uchniat	(225) 381-8455	(210) 377-3085
CH2M Hill HS&E Manager	Alan Cyrier		(770) 331-2829
CH2M HILL Environmental Compliance Coordinator (ECC)	Meg Morrison	(720) 286-0125	(850) 261-4296

CH2M HILL Subcontractors Contact List

Subcontractor	Primary Task	Site Manager	Phone
Sigma Consulting Group, Inc.	Civil Engineering, CMS	Gregg Gautreaux	(225) 298-0111

Client Contractors Contact List

Contractor Name	Primary Task	Contact	Phone
Several	General Construction	See project list	

Project Staff:

			Emergency Contact	
Staff Name	**Role**	**Mobile Number**	***Name*** ***Relationship***	***Number***
Michael Ellis	Project Manager	(225) 907-4528		
Mike Uchniat	CM, SCC	(210) 861-7217		
Lanre Dina	CM	(615) 414-1753		
Jarett Riegling	CM	(260) 416-4024		
Jason Moore	CM			

9.6 Emergency Preparedness Training

The emergency response plan will be reviewed during the employee orientation and occasionally during site safety briefings. The briefings should include:

- Emergency procedures for fires, explosions, chemical and vapor releases, personnel injuries, and suspected overexposure as they apply to the site
- Location of onsite emergency equipment and supplies of clean water
- Local emergency contacts, hospital routes, evacuation routes, and assembly points
- Site communication and location of phone nearest to the site
- Names of onsite personnel trained in first-aid and CPR
- Procedures for contacting CH2M HILL's medical consultant and occupational physician(s)

Emergency drills will be performed periodically. Upon completion of each drill, an evaluation shall be made of the ERP to determine its effectiveness. Any problems or concerns identified during the evaluation will be corrected.

10.0 Approval

This FSI has been written for use by CH2M HILL and their subcontractors only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The FSI is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

10.1 Original Plan

Written By: Alan Cyrier **Date: August 12, 2009**

Approved By: Alan Cyrier **Date: August 12, 2009**

10.2 Revisions

Revisions Made By: **Date:**

Revisions to Plan:

Revisions Approved By: **Date:**

11.0 Attachments

Attachment 1: **Employee Signoff Form – Field Safety Instructions**

Attachment 2: **Safety Planning Forms (THA and SPTP)**

Attachment 3: **Hazard Communication (Forms and MSDS)**

Attachment 4: **Project-Specific H&S Forms and Permits**

Attachment 5: **Project Activity Self-Assessment Checklists**

Attachment 6: **Injury Management Poster**

Attachment 1

Employee Signoff Form

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EMPLOYEE SIGNOFF FORM

Field Safety Instructions

- **The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this FSI, have read and understood it, and agree to abide by its provisions.**
- **The FSI should be reviewed on continuously to determine if the current FSI adequately addresses ongoing project work.** This includes whenever new tasks are considered or changed conditions are encountered. The Safety Coordinator should contact the RHSM for assistance in updating the FSI, or update the FSI and provide it to the RHSM. The follow conditions should be considered when determining if the FSI needs to be updated:
  - ☐ Access is needed to the restricted areas or activities listed in Section 2 of this FSI;
  - ☐ The scope changed, or additional tasks added to the project;
  - ☐ New CH2M HILL staff joined the project;
  - ☐ New subcontractor added to the project;
  - ☐ New chemical or product used that is not listed in Attachment 4;
  - ☐ New contaminants or higher than anticipated levels of original contaminants been encountered.
  - ☐ Any other safety, equipment, activity or environmental hazards encountered that are not addressed in the FSI;
  - ☐ New CH2M HILL or WBG policies, procedures or practices.

Project Name: Baton Rouge, Sanitary Sewer Overflow **Project Number:** 350589

EMPLOYEE NAME (Print)	EMPLOYEE SIGNATURE	COMPANY	DATE

Attachment 2

Safety Planning Forms

Task Hazard Analysis Form and Safety Pre-Task Planning Form

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DETAILED TASK HAZARD ANALYSIS

TASK/AREA: _____	PREPARED BY:_____	DATE/TIME:_____
COMPANY NAME:_____	SUPERVISOR: _____	

DESCRIPTION OF THE WORK:

TASK BREAKDOWN *(subtasks required to complete the task)*	IDENTIFY & ANALYZE THE HAZARDS *(chemical, physical, safety, and biological/environmental hazards)*	IDENTIFY HAZARD CONTROLS *(task training, equipment inspections, permits, air monitoring procedures, required PPE, emergency procedures, etc.)*

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TASK BREAKDOWN *(subtasks required to complete the task)*	IDENTIFY & ANALYZE THE HAZARDS *(chemical, physical, safety, and biological/environmental hazards)*	IDENTIFY HAZARD CONTROLS *(task training, equipment inspections, permits, air monitoring procedures, required PPE, emergency procedures, etc.)*

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Personnel to Perform Task

MY SUPERVISOR HAS REVIEWED THE THA FORM WITH ME AND I HAVE RECEIVED THE NECESSARY TRAINING TO PERFORM THIS TASK SAFELY.

NAME:	SIGNATURE:	DATE/TIME:

SAFETY PRE-TASK PLANNING

PROJECT: _____ **LOCATION:** _____ **DATE:** _____

SUPERVISOR: _____ **JOB ACTIVITY:** _____

EMERGENCY NUMBER(S): _____ **ALARMS/SIGNALS:** _____

TASK PERSONNEL NAME:	**TASK PERSONNEL SIGNATURE:**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

LIST TASKS

1.

2.

3.

4.

TOOLS/EQUIPMENT REQUIRED FOR TASKS

(LADDERS, SCAFFOLDS, FALL PROTECTION, CRANES/RIGGING, HEAVY EQUIPMENT, POWER TOOLS, ETC.):

1.	**2.**	**3.**	**4.**

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SAFETY PRE-TASK PLANNING

POTENTIAL H&S HAZARDS, INCLUDING CHEMICAL, PHYSICAL, SAFETY, BIOLOGICAL AND ENVIRONMENTAL (CHECK ALL THAT APPLY):

__ Chemical burns/contact	__ Trench, excavations, cave-ins	__Ergonomics
__ Pressurized lines/equipment	__ Overexertion	__ Chemical splash
__ Thermal burns	__ Pinch points	__ Poisonous plants/insects
__ Electrical	__ Cuts/abrasions	___Eye hazards/flying projectile
__ Weather conditions	__ Spills	__ Inhalation hazard
__Heights/fall> 6'	__ Overhead Electrical hazards	__ Heat/cold stress
__ Noise	__ Elevated loads	__ Water/drowning hazard
__ Explosion/fire	__ Slips, trip and falls	__ Heavy equipment
__Radiation	__ Manual lifting	__ Aerial lifts/platforms
__ Confined space entry	__Welding/cutting	__ Demolition

OTHER POTENTIAL HAZARDS (DESCRIBE):

_____

_____

_____

_____

HAZARD CONTROL MEASURES (CHECK ALL THAT APPLY):

PPE	PROTECTIVE SYSTEMS	FIRE PROTECTION	ELECTRICAL
__ Head	__ Sloping	__ Fire extinguishers	__ Lockout/tagout
__ Eye	__ Shoring	__ Fire watch	__ Grounded
__ Hand	__ Trench box	__ Non-spark tools	__ Panels covered
__ Foot	__ Barricades	__ Grounding/bonding	__ GFCI/extension cords
__ Respiratory	__ Competent person	__ Intrinsically safe equipment	__ Power tools/cord inspected
__ Reflective vests	__ Locate buried utilities	__Other	__Other
__ Hearing	__ Daily inspections		
__Other	__Other		

SAFETY PRE-TASK PLANNING

FALL PROTECTION	AIR MONITORING	PROPER EQUIPMENT	WELDING & CUTTING
__ Harness/lanyards	__ PID/FID	__ Aerial lift/ladders/scaffolds	__ Cylinders secured/capped
__ Adequate anchorage	__ Detector tubes	__ Forklift/ Heavy equipment	__ Cylinders separated/upright
__ Guardrail system	__ Radiation	__ Backup alarms	__ Flash-back arrestors
__ Covered opening	__ Personnel sampling	__ Hand/power tools	__ No cylinders in CSE
__ Fixed barricades	__ LEL/O2	__ Crane w/current inspection	__ Flame retardant clothing
__ Warning system	__ Other	__ Proper rigging	__ Appropriate goggles
__Other		__ Operator qualified	__Other
		__Other	
CONFINED SPACE ENTRY	**MEDICAL/ER**	**HEAT/COLD STRESS**	**VEHICLE/TRAFFIC**
__ Isolation	__ First-aid kit	__ Work/rest regime	__ Traffic control
__ Air monitoring	__ Eye wash	__ Rest area	__ Barricades
__ Trained personnel	__ FA-CPR trained personnel	__ Liquids available	__ Flags
__ Permit completed	__ Route to hospital	__ Monitoring	__ Signs
__ Rescue	__Other	__ Training	__Other
__Other		__Other	
PERMITS	**DEMOLITION**	**INSPECTIONS:**	**Training:**
__ Hot work	__ Pre-demolition survey	__ Ladders/aerial lifts	__ Hazwaste
__ Confined space	__ Structure condition	__ Lanyards/harness	__ Construction
__ Lockout/tagout	__ Isolate area/utilities	__ Scaffolds	__ Competent person
__ Excavation	__ Competent person	__ Heavy equipment	__ Task-specific (THA)
__ Demolition	__ Hazmat present	__Cranes and rigging	__ Hazcom
__ Energized work	__Other	__Other	__Other
__Other			

ADDITIONAL HAZARD CONTROL MEASURES:

_____

_____

FIELD NOTES:

_____

_____

_____

Supervisor Signature:_____ **Date:**_____

CH2M HILL FIELD SAFETY INSTRUCTIONS

Attachment 3

Hazard Communication

Project-Specific Chemical Product Hazard Communication Form

Chemical-Specific Training Form

Project-Specific Material Safety Data Sheets

1. Hydrogen Sulfide
2. Methane
3. Substance Name
4. Substance Name
5. Substance Name

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Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the DSC shall verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

Project Name: Baton Rouge, Sanitary Sewer Overflow **Project Number:** 350589

MSDSs will be maintained at the following location(s): Attachment 3 of FSI

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	Container labels	
				Identity	Hazard

Refer to SOP 107 *Hazard Communication* for more detailed information.

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CHEMICAL-SPECIFIC TRAINING FORM

Location: Project #: 350589

HCC: Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

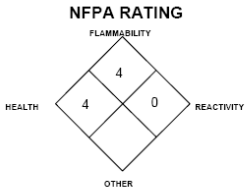
Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

Airgas

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards



PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:	**HYDROGEN SULFIDE - H_2S**
	Document Number: 001029
PRODUCT USE:	For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME:	AIRGAS INC.
ADDRESS:	259 N. Radnor-Chester Road Suite 100 Radnor, PA 19087-5283
BUSINESS PHONE:	1-610-687-5253
EMERGENCY PHONE:	1-800-949-7937 International: 423-479-0293
DATE OF PREPARATION:	May 20, 1996
REVISION DATE:	February 3, 2001

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Hydrogen Sulfide	7783-06-4	> 99.0%	10	15	20 C 10 (Vacated 1989 PEL)	50 ppm (10 minute maximum peak) 15 (Vacated 1989 PEL)	100	NIOSH REL: 10 ppm C (10 minutes) DFG-MAK: 10 ppm
Maximum Impurities		< 1.0%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Hydrogen Sulfide is a toxic, flammable gas and has a distinct "rotten-egg" smell. Hydrogen Sulfide is a colorless liquid which rapidly turns into a gas at standard atmospheric temperatures and pressures. Inhalation of high concentrations of this gas can result in unconsciousness, coma, and death. Contact with rapidly expanding gases, or contact with the liquid, may cause frostbite. Both the liquid and gas pose a serious fire hazard when accidentally released. The gas is heavier than air and may spread long distances. Distant ignition and flashback are possible. Flame or high temperature impinging on a localized area of the cylinder of Hydrogen Sulfide can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for Hydrogen Sulfide is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness. Exposure for more than 30 minutes at concentrations of greater than 600 ppm have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of Hydrogen Sulfide. A summary of exposure concentrations and observed effects are as follows:

CONCENTRATION	EXPOSURE SYMPTOM
0.3-30 ppm:	Odor is obvious and unpleasant.
50 ppm:	Eye irritation. Dryness and irritation of nose, throat.
Slightly higher than 50 ppm:	Irritation of the respiratory system.
100-150 ppm:	Temporary loss of smell.
200-250 ppm:	Headache, vomiting nausea. Prolonged exposure may lead to lung damage. Exposures of 4-8 hours can be fatal.
300-500:	Swifter onset of symptoms. Death occurs in 1-4 hours.
500 ppm:	Headache, excitement, staggering, stomach after brief exposure. Death occurs from 0.5 - 1 hour.
> 600 ppm:	Rapid onset of unconsciousness, coma, death.
> 1000 ppm:	Immediate respiratory arrest.

Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	4
FLAMMABILITY	(RED)	4
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		D

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

SKIN and EYE CONTACT: The gas may be irritating to the skin. Inflammation and irritation of the eyes can occur at very low airborne concentration (less than 10 ppm). Exposure over several hours may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm, there is an intense tearing, blurring of vision, and pain when looking at light. Exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eyes can be permanently damaged.

OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Hydrogen Sulfide may cause the following health effects:

ACUTE: Hydrogen Sulfide is irritating to the skin and eyes. Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness, and death. Contact with liquid or rapidly expanding gases may cause frostbite.

CHRONIC: Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage. Chronic overexposure may cause permanent eye damage.

TARGET ORGANS: Respiratory system, skin, eyes, central nervous system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO HYDROGEN SULFIDE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and gloves should be worn. Under some response circumstances, Fire-Retardant Personal Protective equipment may be necessary. Adequate fire protection must be provided during rescue situations.

Remove victim(s) to fresh air as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

SKIN EXPOSURE: If liquid is spilled on skin, or if irritation of the skin develops after exposure to liquid or gas, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes.

Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

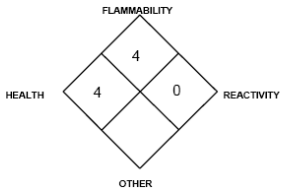
5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable. Hydrogen Sulfide is a flammable gas.
AUTOIGNITION TEMPERATURE: 260°C (500°F)
FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 4.0%
Upper (UEL): 44.0%

FIRE EXTINGUISHING MATERIALS: Extinguish Hydrogen Sulfide fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. Other appropriate extinguishing media are dry chemical, foam, and carbon dioxide.

NFPA RATING



See Section 16 for Definition of Ratings

UNUSUAL FIRE AND EXPLOSION HAZARDS: Hydrogen Sulfide is a flammable, toxic gas and presents an extreme hazard to firefighters. The products of thermal decomposition of this material include water and sulfur dioxide. This gas is heavier than air; it can travel a long distance to a source of ignition and flash back.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Hydrogen Sulfide can be very dangerous. Direct flame exposure on the cylinder wall can cause cylinder failure. For massive fires in large areas, use unmanned hose.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Static discharge may cause Hydrogen Sulfide to ignite explosively.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable mixture formation. If water is not available for cooling or protection of vessel exposures, evacuate the area. Refer to the North American Emergency Response Guidebook (Guide #117) for additional information.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided.

Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, mechanical resistant gloves and Self-Contained Breathing Apparatus.** Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas to dissipate. Monitor the surrounding area for levels of combustible gas, Hydrogen Sulfide, and oxygen. Combustible gas concentration must be below 10% of the LEL (LEL = 4.0%) prior to entry. A colorimetric tube is available for Hydrogen Sulfide. If a colorimetric tube is used to indicate the concentration of Hydrogen Sulfide, the reading obtained should be lower than the limits indicated in Section 2 (Composition and Information on Ingredients). The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus (SCBA).

Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY FLAMMABLE, TOXIC GAS. Protection of all personnel and the area must be maintained.

PART II *What should I do if a hazardous situation occurs?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Hydrogen Sulfide IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of effects of exposure indicated in Section 3 (Hazard Identification); exposures to fatal concentrations of Hydrogen Sulfide could occur rapidly. Working alone with Hydrogen Sulfide should be avoided when possible. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post "No Smoking or Open Flames" signs in storage or use areas. Store Hydrogen Sulfide cylinders away from incompatible materials, such as strong oxidizers, metals, and metal oxides.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in-place until cylinder is ready for use.
During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.
After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Hydrogen Sulfide. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "*Oxygen Deficient Atmospheres*" and CGA Pamphlet G-12, "*Hydrogen Sulfide*".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g. nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Hydrogen Sulfide dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of Hydrogen Sulfide, the presence of potentially explosive air-gas mixtures, and oxygen. Eye wash stations/safety showers should be near areas where Hydrogen Sulfide is used or stored.

RESPIRATORY PROTECTION: Maintain Hydrogen Sulfide levels below the exposure limits provided in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection during emergency response to a release of Hydrogen Sulfide. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The following NIOSH respiratory protection recommendations for Hydrogen Sulfide are provided for additional information.

CONCENTRATION of HYDROGEN SULFIDE	**RESPIRATORY EQUIPMENT**
Up to 100 ppm:	Powered air-purifying respirator with cartridge(s) to protect against Hydrogen Sulfide, gas mask with canister to protect against Hydrogen Sulfide, Supplied Air Respirator (SAR), or full-facepiece Self-Contained Breathing Apparatus (SCBA).
Emergency or Planned Entry into Unknown Concentration or IDLH Conditions:	Positive pressure, full-facepiece SCBA or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
Escape:	Gas mask with canister to protect against Hydrogen Sulfide or escape-type SCBA

The IDLH concentration for Hydrogen Sulfide is 100 ppm.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of Liquid Hydrogen Sulfide. Additionally, face-shields should be worn if there is a potential for contact with liquid Hydrogen Sulfide.

HAND PROTECTION: Wear mechanical resistant gloves when handling cylinders of Hydrogen Sulfide. Wear chemical resistant gloves when using this gas. Butyl rubber, chlorinated polyethylene, neoprene nitrile, and polyvinyl rubber are recommended.

BODY PROTECTION: Use body protection appropriate for task. Coveralls may be appropriate if splashes from the liquefied gas are anticipated. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 1.406 kg/m^3 (0.0878 lb/ft^3)
SPECIFIC GRAVITY (air = 1): 1.188
SOLUBILITY IN WATER: Soluble.
EVAPORATION RATE (nBuAc = 1): Not applicable.
ODOR THRESHOLD: 0.13-100 ppm.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
pH: Not applicable.
FREEZING POINT: -85.5°C (-122.0°F)
BOILING POINT @ 1 atm: -60.3°C (-76.6°F)
EXPANSION RATIO: Not applicable
VAPOR PRESSURE (psia): 266.7
SPECIFIC VOLUME (ft^3/lb): 11.2

APPEARANCE AND COLOR: Colorless gas. The liquid is also colorless. The odor for both the liquid and gas is similar to that of “rotten eggs”.

HOW TO DETECT THIS SUBSTANCE (warning properties): Continuous inhalation of low concentrations may cause olfactory fatigue, so that there are no distinct warning properties. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Wet lead acetate paper can be used for leak detection. The paper turns black in the presence of Hydrogen Sulfide. Cadmium Chloride solutions can also be used. The solution will turn yellow upon contact with Hydrogen Sulfide.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Water, sulfur dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Hydrogen Sulfide is not compatible with the following materials: oxidizing agents, organic peroxides, alkaline materials, metals (e.g., copper, lead), and metal oxides. Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks and other sources of ignition Avoid exposing cylinders to extremely high temperatures, which could cause the cylinders to rupture.

PART III *How can I prevent hazardous situations from occurring?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for Hydrogen Sulfide.

LCLo (inhalation, human) = 600 ppm/30 minutes
LDLo (inhalation, man) = 5.7 mg/kg; central nervous system, pulmonary effects
LCLo (inhalation, human) = 800 ppm/5 minutes
LC_{50} (inhalation, rat) = 444 ppm
TCLo (inhalation, rat) = 20 ppm (female, 6-22 days post), reproductive effects
LC_{50} (inhalation, mouse) = 634 ppm/1 hour
LCLo (inhalation, mammal) = 800 ppm/5 minutes

SUSPECTED CANCER AGENT: Hydrogen Sulfide is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Hydrogen Sulfide is severely irritating to the eyes, and may be mildly to severely irritating to the skin.

SENSITIZATION TO THE PRODUCT: Hydrogen Sulfide is not known to cause sensitization in humans with prolonged or repeated contact.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Hydrogen Sulfide and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects for humans have been described for Hydrogen Sulfide.
Embryotoxicity: No embryotoxic effects for humans have been described for Hydrogen Sulfide.
Teratogenicity: No teratogenic effects for humans have been described for Hydrogen Sulfide.
Reproductive Toxicity: No reproductive toxicity effects for humans have been described for Hydrogen Sulfide. Animal reproductive data are available for Hydrogen Sulfide; these data were obtained during clinical studies on specific animal tissues exposed to this compound.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Conditions relating to the target organs may be aggravated by overexposures to Hydrogen Sulfide. See Section 3 (Hazard Identification) for information on these conditions.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary. Treat symptoms and eliminate exposure. Be observant for initial signs of pulmonary edema.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Hydrogen Sulfide.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. Additional environmental data are available for Hydrogen Sulfide as follows:

HYDROGEN SULFIDE: Water Solubility = 1 g/242 mL at 20°C

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments, respiratory system damage, and central nervous system effects. See Section 11 (Toxicological Information) for additional information on the effects on animals. Additional information on the effects of Hydrogen Sulfide on plants are available as follows:

Continuous fumigation of plants with 300 or 3000 ppb Hydrogen Sulfide caused leaf lesions, defoliation, and reduced growth with severity of injury correlated to dose. At higher (3.25 and 5.03 ppm) Hydrogen Sulfide, significant reductions in leaf CO2 and water vapor exchanges occurred, and stomatal openings were depressed. When Hydrogen Sulfide gas was applied to 29 species of green plants for 5 hours, young, rapidly elongating tissues were more sensitive to injury than older tissues. Symptoms included scorching of young shoots and leaves, basal and marginal scorching of older leaves. Mature leaves were unaffected. Seeds exposed to Hydrogen Sulfide gas showed delay in germination.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Hydrogen Sulfide is soluble in water and is toxic to terrestrial life. Therefore, all work practices should be aimed at eliminating contamination of aquatic environments with Hydrogen Sulfide. Additional information on effects of Hydrogen Sulfide on aquatic life are as follows on the next page:

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF CHEMICAL ON AQUATIC LIFE:

TLm (Asellussp) = 0.111 mg/L/96 hour
TLm (Cranfgonyx sp) =1.07 mg/L/96 hour
TLm (Gammarrus) = 0.84 mg/L/96 hour
LC_{50} (fly inhalation) = 380 mg/m^3/960 minutes
LC_{50} (fly inhalation) = 1500 mg/m^3/7 minutes
TLm (Lepomis macrochirus, bluegill sunfish) = 0.0478 mg/L/96 hour
TLm (Lepomis macrochirus, bluegill sunfish) = 0.0448 mg/L/96 hour at 21-22 ~C
TLm (Pimephlaes promelas, fathead minnow) = 0.0071-0.55 mg/L/96 hour
TLm (Salvenilis foninalis, brook trout) = 0.0160-0.515 mg/L/96 hour at 6-12.5 ~C
LC_{50} (goldfish, *Carassius auratus*) = 51-95 mg/L, flow-through test, varied oxygen, 96 hours
LC_{50} (white suckers, *Catastonius commersonii*) = 0.018-0.034 mg/L, 24-120 hours, flow-through test
LC_{50} (northern pike, *Esox lucius)* = 0.026-0.159 mg/L, 96-24 hours, flow-through test
LC_{50} (walleye, *Stizostedion vitreum)* = 0.007-0.020 mg/L, 72-96 hours, flow-through test
LC_{50} (bluegill, *Lepomis macrochirus*) = 0.0090-0.032 mg/L, 96 hours, temperatures 8-22°C

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, and local regulations. Return cylinders with residual product to Airgas. Do not dispose locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Hydrogen sulfide, liquefied
HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Poison Gas)
UN IDENTIFICATION NUMBER: UN 1053
PACKING GROUP: Not Applicable
DOT LABEL(S) REQUIRED: Poison Gas, Flammable Gas
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 117
SPECIAL PROVISION: Hydrogen Sulfide is poisonous by inhalation. Shipments must be properly described as inhalation hazards. ZONE B.
MARINE POLLUTANT: Hydrogen Sulfide is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments. Note: There is an alternative shipping name spelling for Canadian shipments: Hydrogen Sulphide.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Hydrogen Sulfide is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Hydrogen Sulfide	YES	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: Hydrogen Sulfide = 500 lb.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Hydrogen Sulfide CERCLA RQ = 100 lb; Hydrogen Sulfide EHS (Extremely Hazardous Substance) RQ = 100 lb; Hydrogen Sulfide RCRA Code = U135.

CANADIAN DSL/NDSL INVENTORY STATUS: Hydrogen Sulfide is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Hydrogen Sulfide is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Hydrogen Sulfide is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Compliance with the OSHA Process Safety Standard (29 CFR 1910.119) may be applicable to operations involving the use of Hydrogen Sulfide. Under this regulation Hydrogen Sulfide is listed in Appendix A. The Threshold Quantity of Hydrogen Sulfide under this regulation is 1500 lb.

15. REGULATORY INFORMATION (Continued)

U.S. STATE REGULATORY INFORMATION: Hydrogen Sulfide is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Hydrogen Sulfide.
California - Permissible Exposure Limits for Chemical Contaminants: Hydrogen Sulfide.
Florida - Substance List: Hydrogen Sulfide.
Illinois - Toxic Substance List: Hydrogen Sulfide.
Kansas - Section 302/313 List: Hydrogen Sulfide.
Massachusetts - Substance List: Hydrogen Sulfide.
Michigan - Critical Materials Register: Hydrogen Sulfide.
Minnesota - List of Hazardous Substances: Hydrogen Sulfide.
Missouri - Employer Information/Toxic Substance List: Hydrogen Sulfide.
New Jersey - Right to Know Hazardous Substance List: Hydrogen Sulfide.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Hydrogen Sulfide.
Pennsylvania - Hazardous Substance List: Hydrogen Sulfide.
Rhode Island - Hazardous Substance List: Hydrogen Sulfide.
Texas - Hazardous Substance List: Hydrogen Sulfide.
West Virginia - Hazardous Substance List: Hydrogen Sulfide.
Wisconsin - Toxic and Hazardous Substances: Hydrogen Sulfide.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Hydrogen Sulfide is not on the California Proposition 65 lists.

LABELING:

DANGER: POISONOUS, FLAMMABLE LIQUID AND GAS UNDER PRESSURE.
MAY BE FATAL IF INHALED.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.
MAY CAUSE RESPIRATORY TRACT AND CENTRAL NERVOUS SYSTEM DAMAGE.
CAN CAUSE EYE IRRITATION.
GAS DEADENS SENSE OF SMELL.
SYMPTOMS MAY BE DELAYED.

ODOR: ROTTEN EGGS.

Do not breath gas.
Do not depend on odor to detect presence of gas.
Store and use with adequate ventilation, and use in closed systems.
Keep away from heat, flames, and sparks.
Avoid contact with eyes.
Cylinder temperature should not exceed 52°C (125°F).
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

POISON

CALL A PHYSICIAN

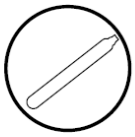
FIRST AID: **IF INHALED**, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician, even if no symptoms are present. Keep under medical observation. Symptoms may be delayed.

IN CASE OF CONTACT, immediately flush eyes or skin with water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician.

DO NOT REMOVE THIS PRODUCT LABEL.

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas
Class B1: Flammable Gas
Class D1A: Toxic Material/Immediate and Serious Effects
Class D2B: Other Toxic Effects




16. OTHER INFORMATION

PREPARED BY: **Airgas - SAFECOR**

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. AIRGAS, Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, AIRGAS, Inc. assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV -** Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration. **PEL -** Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

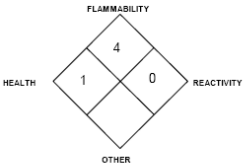
REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

MATERIAL SAFETY DATA SHEET

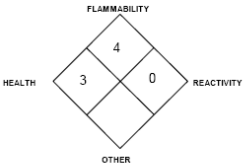
METHANE GAS

NFPA RATING



LIQUID METHANE

NFPA RATING



Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: **METHANE - CH_4, Gaseous Including CH4 with impurities**
Document Number: Methane

PRODUCT USE: For general analytic/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME: MESA Specialty Gases & Equipment
ADDRESS: 3619 Pendleton Avenue, Suite C
Santa Ana, CA 92704

BUSINESS PHONE: 1-714-434-7102
EMERGENCY PHONE: INFOTRAC: 1-800-535-5053

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV Ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Methane	74-82-8	> 98.0%	There are no specific exposure limits for Methane. Methane is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Maximum Impurities Including Carbon Monoxide, Carbon Dioxide, Hydrogen, Hydrogen Sulfide		< 2.0%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Methane is an odorless, colorless gas, or a colorless, odorless liquid in its cryogenic form. Both the liquid and the gas pose a serious fire hazard when accidentally released. The liquid will rapidly boil to the gas at standard temperatures and pressures. As a gas, it will act as a simple asphyxiant and present a significant health hazard by displacing the oxygen in the atmosphere. The gas is lighter than air and may spread long distances. Distant ignition and flashback are possible. The liquefied gas can cause frostbite to any contaminated tissue. Rapid evaporation of the liquid from the cylinder may cause frostbite. Flame or high temperature impinging on a localized area of the cylinder of Methane can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations. Allow the released gas to dissipate in the atmosphere.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for this gas is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: High concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur. Isobutylene also has some degree of anesthetic action and can be mildly irritating to the mucous membranes. The effects associated with various levels of oxygen are as follows:

CONCENTRATION	SYMPTOMS OF EXPOSURE
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

OTHER POTENTIAL HEALTH EFFECTS: Contact with cryogenic liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with the liquid can quickly subside.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	4
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Methane may cause the following health effects:

ACUTE: The most significant hazard associated with this gas is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, headache, dizziness, and nausea. At high concentrations, unconsciousness or death may occur. Contact with cryogenic liquid or rapidly expanding gases may cause frostbite.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to Methane.

TARGET ORGANS: Respiratory system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO METHANE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations.

4. FIRST-AID MEASURES (Continued)

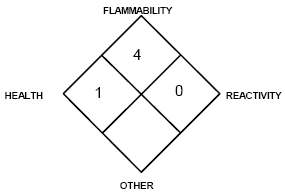
Remove victim(s) to fresh air as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit, Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention. Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

METHANE GAS

NFPA RATING



FLASH POINT (Closed Cup):
-187°C (-306°F)

AUTOIGNITION TEMPERATURE:
650°C (1202°F)

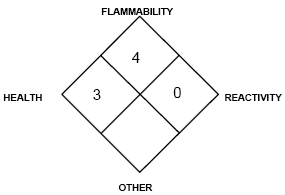
FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 5.0%
Upper (UEL): 15.0%

See Section 16 for Definition of Ratings

LIQUID METHANE

NFPA RATING



FIRE EXTINGUISHING MATERIALS: Extinguish fires of this gas by shutting off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this gas will ignite and produce toxic gases including carbon monoxide and carbon dioxide. An extreme explosion hazard exists in areas in which the gas has been released, but the material has not yet ignited.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Methane can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion either by BLEVE (Boiling Liquid Expanding Vapor Explosion) or by exothermic decomposition. This is a catastrophic failure of the vessel releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the vessel. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

RESPONSE TO FIRE INVOLVING CRYOGEN: Cryogenic liquids can be particularly dangerous during fires because of their potential to rapidly freeze water. Careless use of water may cause heavy icing. Furthermore, relatively warm water greatly increases the evaporation rate of Methane. If large concentrations of Methane gas are present, the water vapor in the surrounding air will condense, creating a dense fog that may make it difficult to find fire exits or equipment. Liquid Methane, when exposed to the atmosphere, will produce a cloud of ice/fog in the air upon its release. A flammable mixture will exist within the vapor cloud and it is advisable that personnel keep well outside the area of visible moisture.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Static discharge may cause Methane to ignite explosively.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the still-leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable or explosive mixture formation. For large releases, consider evacuation. Refer to the North American Emergency Response Guidebook for additional information.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided. Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves resistant to tears, and Self-Contained Breathing Apparatus.**

Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas, which is lighter than air, to dissipate. Liquid Methane, when exposed to the atmosphere, will produce a cloud of ice/fog in the air upon its release. A flammable mixture will exist within the vapor cloud, and it is advisable that personnel keep well outside the area of visible moisture. If cryogenic liquid is released, keep area clear and allow the liquid to evaporate. The gas that is then formed should be allowed to dissipate.

Monitor the surrounding area for combustible gas levels and oxygen. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Combustible gas concentration must be below 10% of the LEL (LEL = 5.0%) prior to entry. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

RESPONSE TO CRYOGENIC RELEASE: Clear the affected area and allow the liquid to evaporate and the gas to dissipate. After the gas is formed, follow the instructions provided in the previous paragraphs. If the area must be entered by emergency personnel, SCBA, Kevlar gloves, and appropriate foot and leg protection must be worn.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Methane IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Methane could occur without any significant warning symptoms.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post "No Smoking or Open Flames" signs in storage or use areas.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Isolate from oxidizers such as oxygen, chlorine, or fluorine. Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to work situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Methane. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "*Oxygen Deficient Atmospheres*".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Methane dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the presence of potentially explosive air-gas mixtures and the level of oxygen. Monitoring devices should be installed near the ceiling.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Methane. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of liquid Methane.

HAND PROTECTION: Wear gloves resistant to tears when handling cylinders of Methane. Use low-temperature protective gloves (e.g., Kevlar) when working with containers of liquid Methane.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 0.6784 kg/m^3 (0.042 35 lb/ft^3)
SPECIFIC GRAVITY (air = 1): 0.555
SOLUBILITY IN WATER: Very slight.
EXPANSION RATIO: 626 (cryogenic liquid)
ODOR THRESHOLD: Not applicable. Odorless.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
SPECIFIC VOLUME: 23.7
FREEZING POINT: -182.2°C (-296°F)
BOILING POINT @ 1 atm: -161°C (-258.7°F)
EVAPORATION RATE (n-BuAc): Not applicable.
VAPOR PRESSURE (psia): Not applicable.
pH: Not applicable.

APPEARANCE AND COLOR: Colorless, odorless gas, or colorless, odorless, cryogenic liquid.
HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.
NOTE: This gas is lighter than air and must not be allowed to accumulate in elevated locations.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: When ignited in the presence of oxygen, this gas will burn to produce carbon monoxide, carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers (e.g., chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks, and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: There are no specific toxicology data for Methane. Methane is a simple asphyxiant, which acts to displace oxygen in the environment.

SUSPECTED CANCER AGENT: Methane is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore, is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Methane is not irritating; however, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Methane does not cause sensitization with prolonged or repeated contact.

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Methane on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for Methane.
Embryotoxicity: No embryotoxic effects have been described for Methane.
Teratogenicity: No teratogenicity effects have been described for Methane.
Reproductive Toxicity: No reproductive toxicity effects have been described for Methane.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e., within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by overexposure to the components of Methane.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen if necessary. Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Methane.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Methane occurs naturally in the atmosphere. This gas will be dissipated rapidly in well-ventilated areas.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments. No adverse effect is anticipated to occur to plant-life, except for frost produced in the presence of rapidly expanding gases.
EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of Methane on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with residual product to MESA International Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

For Methane Gas:

PROPER SHIPPING NAME:	Methane, compressed
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1971
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

For Liquefied Methane:

PROPER SHIPPING NAME:	Methane, refrigerated liquid
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1972
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

MARINE POLLUTANT: Methane is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Methane is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

CANADIAN DSL/NDSL INVENTORY STATUS: Methane is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Methane is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Methane is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Depending on specific operations involving the use of Isobutylene, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Methane is not listed in Appendix A; however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lb (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

U.S. STATE REGULATORY INFORMATION: Methane is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Methane.
California - Permissible Exposure Limits for Chemical Contaminants: Methane.
Florida - Substance List: No.
Illinois - Toxic Substance List: Methane.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Methane.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Methane.
Missouri - Employer Information/Toxic Substance List: Methane.
New Jersey - Right to Know Hazardous Substance List: Methane.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Methane.
Rhode Island - Hazardous Substance List: Methane.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Methane is not on the California Proposition 65 lists.

LABELING:

DANGER:

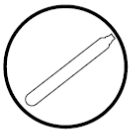
FLAMMABLE HIGH PRESSURE GAS.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.

Keep away from heat, flames, and sparks.
Store and use width adequate ventilation.
Use equipment rated for cylinder pressure.
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

DO NOT REMOVE THIS PRODUCT LABEL

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas
Class B1: Flammable Gas



16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. MESA Specialty Gases & Equipment assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, MESA Specialty Gases & Equipment assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV -** Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.
OSHA - U.S. Occupational Safety and Health Administration. **PEL -** Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.
IDLH - Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).
NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued):
Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:
Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:
Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:
This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

Attachment 4

Project-Specific H&S Forms and Permits

CH2MHILL

Confined-Space Entry Permit

1.0 GENERAL INFORMATION

Project:	Project #:	PM:
Date of Entry:	Duration of Entry:	Permit Expiration Date:
Space Location:		
Description of Space:		
Purpose of Entry:		

Hazards Expected: ☐ Oxygen Deficiency ☐ Oxygen Enrichment ☐ Flammable Vapors ☐ Temperature Extremes
☐ Entrapment ☐ Engulfment ☐ Fall ☐ Electrical ☐ Mechanical ☐ Chemical ☐ Pressure ☐ Combustible Dust
☐ Toxics (specify): ☐ Others (specify):

Entry Supervisor (ES):	Attendant(s):

2.0 CONTROL MEASURE REQUIREMENTS

Communication: ☐ Visual ☐ Voice ☐ Radio ☐ Cell Phone ☐ Other (specify):

Cleaning: ☐ None ☐ Purging ☐ Inerting ☐ Flushing Date/Time Completed:

Isolation: ☐ None ☐ Lockout/Tagout ☐ Line Breaking ☐ Blinding/Blanking ☐ Double Block & Bleed
☐ Other (specify): Date/Time Completed:

Ventilation: ☐ None ☐ Prior to Entry ☐ Continuous ☐ Periodic (specify frequency):
☐ Type (specify): Date/Time Completed:

Protective Equipment: ☐ GFCI ☐ Low-voltage Lighting: ☐ Fire Extinguisher ☐ Fall Protection ☐ First Aid Kit
☐ Respirators (specify): Other (specify):

Rescue Equipment: ☐ Harness ☐ Lifeline ☐ Tripod ☐ Retrieval Device ☐ Other (specify):

Other Requirements: ☐ Hot Work Permit ☐ Other (specify):

3.0 RESCUE AND EMERGENCY PROCEDURES

4.0 ATMOSPHERIC MONITORING

Frequency: ☐ Prior to Each Entry ☐ Prior to Shift ☐ Continuous ☐ Periodic (specify):

Instruments: ☐ Combustible Gas Indicator ☐ FID ☐ PID ☐ Colorimetric Tubes ☐ CO Monitor ☐ H_2S Monitor
☐ Other(specify):

Substances Monitored: ☐ Oxygen ☐ Flammables ☐ CO ☐ H2S ☐ Other (specify):

Monitoring Results			**Oxygen**	**Flammability**	**Toxicity**		
Monitors	Limits		19.5 – 23.5 %	< 10 % of LEL	< PEL/TLV		
Initials	Date	Time	%	% of LEL	Substance	Level	Limit

	Signature	Employee Number	Date	Time
HS&E Approval				
ES Permit Authorized				
ES Permit Canceled				

Problems Encountered During Entry

6.0 AUTHORIZATION/ACCOUNTABILITY LOG

CH2MHILL

uals have successfully completed confined space training, have attended a preentry briefing, and are authorized to enter the space.

	ES Initials		Attendant - check each time an individual enters or exits the space.											
Name of Entrant	Trained	Briefed	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out

Rev.3

CH2MHILL

Confined Space Alternative Procedure Certificate

Alternative procedures may be used for permit-required confined-space entry if the only hazard within the space is an atmospheric hazard and the hazard can be controlled to acceptable safe levels solely by forced-air ventilation. If the space must be entered to determine hazards, the initial entry must be done in full compliance with the requirements of a confined-space entry permit.

These alternative procedures are valid as long as the atmospheric hazards are controlled by forced-air ventilation. If additional hazards arise within the space, or the forced-air ventilation is inadequate in controlling the atmospheric hazard, personnel must exit the space immediately and the space must be reevaluated.

1.0 GENERAL INFORMATION

Project:	Project #:	PM:
Date of Entry:	Duration of Entry:	Certification Expiration Date:
Space Location:		
Description of Space:		
Purpose of Entry:		
Atmospheric Hazards Expected: ☐ Oxygen Deficiency ☐ Oxygen Enrichment ☐ Flammable Vapors ☐ Toxics (specify)::		
Entry Supervisor (ES):	Attendant(s):	

2.0 CERTIFICATE REQUIREMENTS

☐ Nonatmospheric hazards do not exist in this space
☐ Communication methods established between entrants and the attendant
☐ Covers can be removed safely
☐ Space openings guarded from fall hazards and falling objects
☐ Continuous forced-air ventilation from a clean air source is positioned in the immediate area where entrants are working and continue until they have left the space

3.0 ATMOSPHERIC MONITORING

Frequency: ☐ Prior to Entry ☐ Continuous ☐ Periodic (specify):

Instruments: ☐ Combustible Gas Indicator ☐ FID ☐ PID ☐ Colorimetric Tubes ☐ CO Monitor ☐ H_2S Monitor ☐ Other(specify):

Substances Monitored: ☐ Oxygen ☐ Flammables ☐ CO ☐ H2S ☐ Other (specify):

Monitoring Results			**Oxygen**	**Flammability**	**Toxicity**		
Monitors	Limits		19.5 – 23.5 %	< 10 % of LEL	< PEL/TLV		
Initials	Date	Time	%	% of LEL	Substance	Level	Limit

4.0 CERTIFICATE AUTHORIZATION AND CANCELLATION

	Entry Supervisor Signature	Employee Number	Date	Time
Entry Authorized				
Entry Canceled				
Problems Encountered During Entry				

5.0 AUTHORIZATION/ACCOUNTABILITY LOG

ls have successfully completed confined space training, have attended a preentry briefing, and are authorized to enter the space.

	ES Initials		Attendant - check each time an individual enters or exits the space.											
Name of Entrant	Trained	Briefed	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out

CH2MHILL

Confined-Space Non-permit Certificate

This non-permit certificate may be used for confined spaces that pose no actual or potential atmospheric hazard above acceptable safe levels and if all non-atmospheric hazards can be eliminated without entry into the space. If the space must be entered to eliminate non-atmospheric hazards, the initial entry must be done in full compliance with the requirements of a confined-space entry permit. If an atmospheric or non-atmospheric hazard is observed, personnel must exit the space immediately and the space must be reevaluated.

1.0 GENERAL INFORMATION

Project:	Project #:	PM:
Date of Entry:	Duration of Entry:	Certification Expiration Date:
Space Location:		
Description of Space:		
Purpose of Entry:		
Entry Supervisor:	Attendant(s):	

2.0 CERTIFICATE REQUIREMENTS

☐ Actual or potential atmospheric hazard above acceptable safe levels do not exist in this space
☐ Nonatmospheric hazards do not exist in this space or have been eliminated without entry
☐ Communication methods established between entrants and the buddy or attendant
☐ Entrants are informed to exit the space if any hazard is observed

3.0 ATMOSPHERIC MONITORING

Frequency: ☐ Prior to Entry ☐ Continuous ☐ Periodic (specify):

Instruments: ☐ Combustible Gas Indicator ☐ FID ☐ PID ☐ Colorimetric Tubes ☐ CO Monitor ☐ H_2S Monitor ☐ Other(specify):

Substances Monitored: ☐ Oxygen ☐ Flammables ☐ CO ☐ H2S ☐ Other (specify):

Monitoring Results			**Oxygen**	**Flammability**	**Toxicity**		
Monitors	Limits		19.5 – 23.5 %	< 10 % of LEL	< PEL/TLV		
Initials	Date	Time	%	% of LEL	Substance	Level	Limit

4.0 CERTIFICATE AUTHORIZATION AND CANCELLATION

	Entry Supervisor Signature	Employee Number	Date	Time
Entry Authorized				
Entry Canceled				

5.0 AUTHORIZATION/ACCOUNTABILITY LOG

The following individuals have successfully completed confined space training, have attended a preentry briefing, and are authorized to enter the space.

	ES Initials		Attendant - check each time an individual enters or exits the space.											
Name of Entrant	Trained	Briefed	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out

Problems Encountered During Entry

Attachment 6

Project Activity Self-Assessment Checklists

H&S Self-Assessment Checklist: CONFINED-SPACE ENTRY

This checklist is provided as a method of verifying compliance with the OSHA confined-space entry standard. It shall be used at locations where CH2M HILL employees enter confined spaces, or are required to perform oversight of subcontractor personnel entering confined spaces, or both.

CH2M HILL staff shall not direct the means and methods of subcontractor confined space operations nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies and CH2M HILL staff must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) must be corrected immediately or all exposed personnel must be removed from the hazard until corrected.

Completed checklists must be sent to the appropriate Regional Health and Safety Program Manager (RHSPM) for review.

Project Name: _____ Project No.: _____
Location: _____ PM: _____
Auditor: _____ Title: _____ Date:_____

This specific checklist has been completed to (check only one of the boxes below):

☐ Evaluate CH2M HILL compliance with its confined-space entry program (SOP HS-17)
☐ Evaluate a CH2M HILL subcontractor's compliance with its confined-space entry program
Subcontractor's Name: _____

- Check "Yes" if an assessment item is complete or correct.
- Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-17.

SECTION 1	Yes	No	N/A	N/O
CONFINED SPACE EVALUATION (6.1)				
1. Staff informed of location and hazards of existing confined spaces (danger signs, verbal)	☐	☐	☐	☐
2. Determination made that work can not be completed without entering the confined space	☐	☐	☐	☐
3. Information obtained regarding the space (blue prints, potential hazards, energy sources)	☐	☐	☐	☐
4. Spaces classified as permit-required, alternative procedure, or nonpermit confined spaces	☐	☐	☐	☐
TRAINING (6.2)				
5. Entrants, Attendants, and Entry Supervisor have completed confined-space entry training	☐	☐	☐	☐
6. Employees performing lockout/tagout procedures have completed LOTO training	☐	☐	☐	☐
7. Employees required to wear respirators have completed respiratory protection training	☐	☐	☐	☐
CONFINED-SPACE ENTRY (6.3)				
8. Completed permit or certificate posted at space entrance	☐	☐	☐	☐
9. Preentry briefing conducted	☐	☐	☐	☐
10. Entrants/Attendants verify that entry supervisor has authorized entry	☐	☐	☐	☐
11. Entrants/Attendants verify that all requirements of the permit or certificate have been satisfied	☐	☐	☐	☐
12. Atmospheric monitoring is conducted at frequency provided on the permit or certificate	☐	☐	☐	☐
13. Entry not permitted if an atmospheric hazard is detected above acceptable safe levels	☐	☐	☐	☐
14. Entrants evacuate space upon orders of the attendant or entry supervisor, when an alarm is sounded, or when a prohibited condition or dangerous situation is recognized	☐	☐	☐	☐
15. Entrants/Attendant informs entry supervisor of hazards confronted or created in the space or any problems encountered during entry.	☐	☐	☐	☐
16. Entry supervisor informs the owner of such issues in item 15 above	☐	☐	☐	☐
17. Ladder or other safe means of access provided if greater than 4 feet deep.	☐	☐	☐	☐

SECTION 1 (continued)	Yes	No	N/A	N/O
ENTRY UNDER A CONFINED-SPACE ENTRY PERMIT (CSEP) (6.4)				
17. CSEP completed by entry supervisor	☐	☐	☐	☐
18. All expected hazards listed	☐	☐	☐	☐
19. Entry supervisor and Attendant assigned	☐	☐	☐	☐
20. Communication methods established between entrants and the attendant (6.7.1)	☐	☐	☐	☐
21. Cleaning requirements identified (6.7.2)	☐	☐	☐	☐
22. Isolation requirements identified (6.7.3)	☐	☐	☐	☐
23. Ventilation requirements identified (6.7.4)	☐	☐	☐	☐
24. Protective equipment requirements identified (6.7.5)	☐	☐	☐	☐
25. Rescue equipment requirements identified (6.7.6)	☐	☐	☐	☐
26. Other requirements identified (6.7.7)	☐	☐	☐	☐
27. Rescue and emergency procedures identified (6.8)	☐	☐	☐	☐
28. Atmospheric monitoring requirements identified	☐	☐	☐	☐
29. HS&E manager approve use by signing (CH2M HILL CSEP only)	☐	☐	☐	☐
30. Entry supervisor authorized entry by signing	☐	☐	☐	☐
31. Authorized entrants have completed CSE training and attended preentry briefing	☐	☐	☐	☐
32. Only authorized entrants permitted to enter the space	☐	☐	☐	☐
33. Entry supervisor sign the CSEP indicating its cancellation	☐	☐	☐	☐
34. Problems encountered during the entry listed	☐	☐	☐	☐
ENTRY UNDER AN ALTERNATIVE PROCEDURE CERTIFICATE (APC) (6.5)				
35. APC completed by entry supervisor	☐	☐	☐	☐
36. All expected atmospheric hazards listed	☐	☐	☐	☐
37. Entry supervisor and Attendant assigned	☐	☐	☐	☐
38. Entry supervisor verifies that nonatmospheric hazards do not exist	☐	☐	☐	☐
39. Communication methods established between entrants and the attendant	☐	☐	☐	☐
40. Covers removed safely	☐	☐	☐	☐
41. Openings guarded from both fall hazards and from objects entering the space	☐	☐	☐	☐
42. Continuous forced-air ventilation positioned to ventilate the immediate areas where employees are working and continue until they have left the space	☐	☐	☐	☐
43. Ventilation from a clean source of air	☐	☐	☐	☐
44. Atmospheric monitoring requirements identified	☐	☐	☐	☐
45. Entry supervisor authorize entry by signing	☐	☐	☐	☐
46. Authorized entrants have completed CSE training and attended preentry briefing	☐	☐	☐	☐
47. Only authorized entrants permitted to enter the space	☐	☐	☐	☐
48. Entry supervisor sign the APC indicating its cancellation	☐	☐	☐	☐
49. Problems encountered during the entry listed	☐	☐	☐	☐
ENTRY UNDER A NONPERMIT CERTIFICATE (NPC) (6.6)				
50. NPC completed by entry supervisor	☐	☐	☐	☐
51. Entry supervisor assigned	☐	☐	☐	☐
52. Attendant or buddy assigned	☐	☐	☐	☐
53. Buddy remains in the space with the entrant	☐	☐	☐	☐
54. Entry supervisor verifies nonatmospheric hazards do not exist	☐	☐	☐	☐
55. Communication methods established between entrants and attendant or buddy	☐	☐	☐	☐
56. Entrants informed to exit the space immediately if hazards are observed	☐	☐	☐	☐
57. Atmospheric monitoring requirements identified	☐	☐	☐	☐
58. Entry supervisor authorizes entry by signing	☐	☐	☐	☐
59. Authorized entrants have completed CSE training and attended preentry briefing	☐	☐	☐	☐
60. Only authorized entrants permitted to enter the space	☐	☐	☐	☐
61. Entry supervisor shall sign the NPC indicating its cancellation	☐	☐	☐	☐
62. Problems encountered during the entry shall be listed	☐	☐	☐	☐

SECTION 1 (continued)	Yes	No	N/A	N/O
RESCUE (6.8)				
63. Entrants wearing body harness with attached retrieval line (lifeline)	☐	☐	☐	☐
64. Other end of lifeline attached to retrieval device (when required) or fixed point outside space	☐	☐	☐	☐
65. Mechanical retrieval device positioned at access point for vertical-type spaces > 5 feet deep	☐	☐	☐	☐
66. Rescue team established	☐	☐	☐	☐
67. Team members have completed confined-space entry training	☐	☐	☐	☐
68. Team members informed of the hazards that they may confront during rescue operations	☐	☐	☐	☐
69. PPE & rescue equipment necessary to conduct safe entry-rescue provided & readily available	☐	☐	☐	☐
70. Team members trained on rescue duties and proper use of PPE and rescue equipment	☐	☐	☐	☐
71. All team members trained in first aid & CPR, at least one member holding a current certification	☐	☐	☐	☐
72. Team has made simulated rescue from a space of similar configuration within last 12 months	☐	☐	☐	☐
73. Communication established & tested between the team & entrants, and emergency provider	☐	☐	☐	☐
74. Local emergency medical provider notified in advance of entries into PRCS	☐	☐	☐	☐
ATMOSPHERIC MONITORING (6.9)				
75. Qualified individual conducts atmospheric monitoring	☐	☐	☐	☐
76. Monitoring results documented on permit or certificate	☐	☐	☐	☐
77. Entrants do not enter until all monitoring requirements are completed	☐	☐	☐	☐
78. Monitoring equipment calibrated prior to use	☐	☐	☐	☐
79. Monitoring conducted for oxygen, flammability, and toxic air contaminants	☐	☐	☐	☐
80. Monitoring conducted bottom to top at five foot intervals	☐	☐	☐	☐
PREENTRY BRIEFING (6.10)				
81. Entry supervisor conducts the briefing and discusses the follow items:	☐	☐	☐	☐
82. Explanation of the work to be performed and limitations	☐	☐	☐	☐
83. Explanation of actual and potential hazards, including the possible behavioral effects and signs, symptoms, and consequences of exposure	☐	☐	☐	☐
84. Review of the control measure and atmospheric monitoring requirements, as specified on permit or certificate	☐	☐	☐	☐
85. Review of entrant and attendant responsibilities	☐	☐	☐	☐

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SECTION 2

Complete this section for all items checked "No" in Section 1. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned or Taken	Date Corrected

Rev.3

Auditor: _____ Project Manager: _____

H&S Self-Assessment Checklist—CRANES, HOISTS AND RIGGING

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's Field Safety Instructions. This checklist is to be used at locations where CH2M HILL employees are exposed to crane, hoist and rigging hazards.

Designated Safety Coordinator (DSC) may consult with subcontractors when completing this checklist, but shall not direct the means and methods of crane, hoist and rigging operations nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposure to crane, hoist and rigging hazards

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-44.

SECTION 1

	Yes	No	N/A	N/O
SAFE WORK PRACTICES (3.1)				
1. Individuals operating cranes and hoists of any type are certified operators	☐	☐	☐	☐
2. Cranes have current annual inspection and operations manual with load charts on site	☐	☐	☐	☐
3. Swing radius of cranes are guarded and barricaded	☐	☐	☐	☐
4. Competent person inspects crane daily	☐	☐	☐	☐
5. Pre-lift meetings conducted with all parties involved in crane operations	☐	☐	☐	☐
6. Cranes used to lift vertically only	☐	☐	☐	☐
7. Adequate distance maintained between cranes parts and overhead power lines	☐	☐	☐	☐
8. Dedicated signal person assigned to signal operator	☐	☐	☐	☐
9. Cranes do not swing over live roadways, railways, processes, or occupied buildings	☐	☐	☐	☐
10. Critical lifts have written lifting/rigging plan	☐	☐	☐	☐
11. No personnel permitted on or under loads lifted by crane. Tag lines used to control load	☐	☐	☐	☐
12. Manufacturers specifications and limitations for hoists followed	☐	☐	☐	☐
13. Personnel not permitted to ride on material hoists	☐	☐	☐	☐
14. Weather conditions considered when lifting operations performed	☐	☐	☐	☐
15. All rigging used as intended, inspected, stored, protected and supervised.	☐	☐	☐	☐
16. No fabrication, modifications, or additions to rigging made without testing and approval	☐	☐	☐	☐
17. Safety latch is in good condition and closes the throat of the hook	☐	☐	☐	☐

SECTION 2

Complete this section for all items checked "No" in Section 1. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: _____ Project Manager: _____

H&S Self-Assessment Checklist - EARTHMOVING EQUIPMENT

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's Field Safety Instructions (FSI). This checklist is to be used at locations where CH2M HILL employees are potentially exposed to hazards associated with earthmoving equipment.

Designated Safety Coordinator (DSC) may consult with earthmoving equipment contractors when completing this checklist, but shall not direct the means and methods of equipment operations nor direct the details of corrective actions. Earthmoving equipment contractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to earthmoving equipment hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with earthmoving equipment H&S requirements
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the earthmoving equipment subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-27.

SECTION 1	Yes	No	N/A	N/O
PERSONNEL SAFE WORK PRACTICES (3.1)				
1. Only authorized personnel operating earthmoving equipment	☐	☐	☐	☐
2. Personnel maintaining safe distance from operating equipment	☐	☐	☐	☐
3. Personnel and equipment operator in close communication when personnel must be in proximity of operating equipment	☐	☐	☐	☐
4. Personnel approach operating equipment safely	☐	☐	☐	☐
5. Personnel wear high-visibility vests when close to operating equipment	☐	☐	☐	☐
6. Personnel riding only in seats of equipment cab and using seat belts	☐	☐	☐	☐
7. Personnel not positioned under hoisted loads	☐	☐	☐	☐
8. Personnel not hoisted by equipment	☐	☐	☐	☐
9. Personnel instructed not to approach equipment that has become electrically energized	☐	☐	☐	☐
10. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 1	Yes	No	N/A	N/O
GENERAL (3.2.1)				
11. Daily safety briefing/meeting conducted with crew	☐	☐	☐	☐
12. Daily inspection of equipment and equipment accessories conducted before use	☐	☐	☐	☐
13. At least one fire extinguisher available at the equipment operating area	☐	☐	☐	☐
EARTHMOVING EQUIPMENT COMPONENTS (3.2.2)				
14. Backup alarm or spotter used when backing equipment	☐	☐	☐	☐
15. Operational horn provided on bi-directional equipment	☐	☐	☐	☐
16. Safe clearance distance maintained while working under overhead powerlines	☐	☐	☐	☐
17. Safe distance is maintained while traveling under powerlines	☐	☐	☐	☐

SECTION 2

Complete this section for all items checked "No" in Section 1. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: _____ Project Manager: _____

H&S Self-Assessment Checklist – TRAFFIC CONTROL

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are exposed to traffic hazards and/or 2) CH2M HILL provides oversight of subcontractor personnel who are exposed to traffic hazards.

SSC or DSC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of traffic control operations nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies, and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the HS&E Staff for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposure to traffic hazards.
☐ Evaluate a CH2M HILL subcontractor's compliance with traffic control requirements.
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-24.

SECTION 1

SAFE WORK PRACTICES (3.1)

	Yes	No	N/A	N/O
1. Personnel working on/adjacent to roadways or in control zones wearing safety vests.	☐	☐	☐	☐
2. Traffic control plan (TCP) is consistent with roadway, traffic, and working conditions.	☐	☐	☐	☐
3. TCP has been approved by regulatory or contractual authority prior to work.	☐	☐	☐	☐
4. TCP considers all factors that may influence traffic related hazards and controls.	☐	☐	☐	☐
5. Work areas are protected by rigid barriers.	☐	☐	☐	☐
6. Lookouts are used when applicable.	☐	☐	☐	☐
7. Vehicles are parked 40' away from work zone or equipped with hazard beacon/strobe.	☐	☐	☐	☐
8. TMCC or TMA vehicle is used where appropriate.	☐	☐	☐	☐
9. All CH2M HILL traffic control devices conform to MUTCD standards.	☐	☐	☐	☐
10. Traffic control devices are inspected continuously.	☐	☐	☐	☐
11. Flagging is only used when other means of traffic control are inadequate.	☐	☐	☐	☐
12. Additional traffic control zone controls have been implemented.	☐	☐	☐	☐
13. Cranes do not swing loads/booms over nor do workers enter/cross live roadways	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (3.2.1)				
14. Lane closings are performed when required by this SOP.	☐	☐	☐	☐
15. Traffic control configurations are based on an engineering study of the location.	☐	☐	☐	☐
16. If no study, traffic control performed with approval of the authority having jurisdiction.	☐	☐	☐	☐
17. TCP has been prepared and understood by all responsible parties prior to work.	☐	☐	☐	☐
18. Special coordination with external parties has been conducted where applicable.	☐	☐	☐	☐
19. All contractor traffic control devices conform to MUTCD standards.	☐	☐	☐	☐
20. Traffic movement and flow are inhibited or disrupted as little as possible.	☐	☐	☐	☐
21. Supplemental equipment and activities do not interfere with traffic.	☐	☐	☐	☐
22. Drivers and pedestrians are considered when entering, traversing traffic control zone.	☐	☐	☐	☐
TRAFFIC CONTROL ZONES (3.2.2)				
23. Traffic control zones are divided into the necessary five areas.	☐	☐	☐	☐
24. Advances warning area is designedon conditions of speed, roadways, and driver needs.	☐	☐	☐	☐
25. Advanced warning signage is spaced according to roadway type and conditions.	☐	☐	☐	☐
26. Transition areas are used to channelize traffic around the work area.	☐	☐	☐	☐
27. Buffer areas are used to provide a margin of safety for traffic and workers.	☐	☐	☐	☐
28. The buffer area is free of equipment, workers, materials, and worker vehicles.	☐	☐	☐	☐
29. The length of the buffer area is two times the posted speed limit in feet.	☐	☐	☐	☐
30. All work is contained in the work area and is closed to all traffic.	☐	☐	☐	☐
31. A termination area is used to provide traffic to return to normal lanes.	☐	☐	☐	☐
32. A downstream taper is installed in the termination area.	☐	☐	☐	☐
DEVICE INSTALLATION AND REMOVAL (3.2.3)				
33. All vehicles involved with device installation/removal have hazard beacons/strobes.	☐	☐	☐	☐
34. Devices are installed according to the order established by this SOP.	☐	☐	☐	☐
35. Devices are removed in the opposite order of installation.	☐	☐	☐	☐
36. Tapers are used to move traffic out of its normal path.	☐	☐	☐	☐
37. Tapers are created using channelizing devices.	☐	☐	☐	☐
38. The length of taper determined by posted speed and lane width to be closed (formula).	☐	☐	☐	☐
39. Local police or highway patrol assist during taper installation and removal.	☐	☐	☐	☐
40. TMCC/ TMA vehicles aused to protect personnel during device installation/removal.	☐	☐	☐	☐
41. Cone trucks are equipped with platforms and railings.	☐	☐	☐	☐
42. Cones are the appropriate height for the specific roadway and are reflectorized.	☐	☐	☐	☐
43. Temporary sign supports are secured using sandbags to prevent movement.	☐	☐	☐	☐
44. Arrow panels are used on lane closures where required.	☐	☐	☐	☐
45. Concrete barriers are used where required.	☐	☐	☐	☐
46. Barrels, crash cushions, or energy absorbing terminals used to protect traffic as required	☐	☐	☐	☐
47. Changeable message signs (CMS) are used as required.	☐	☐	☐	☐
48. CMS are not used to replace required signage.	☐	☐	☐	☐
49. No more than two message panels are used in any message cycle on CMS.	☐	☐	☐	☐
FLAGGING (3.2.4)				
50. Flagging is used only when other traffic control methods are inadequate.	☐	☐	☐	☐
51. Only approved personnel with current certification are allowed to be used as flaggers.	☐	☐	☐	☐
52. Flaggers are located off the traveled portion of the roadway.	☐	☐	☐	☐
53. A communication system is established when more than one flagger is used.	☐	☐	☐	☐
54. Hand signaling by flaggers is by means of red flags, sign paddles, or red lights.	☐	☐	☐	☐
55. Flaggers are alert, positioned to warn work crews, and easily identified from crew.	☐	☐	☐	☐
56. An escape plan is established by crew and flaggers prior to traffic control set up.	☐	☐	☐	☐
57. Signs indicating a flagger is present are used and removed as required.	☐	☐	☐	☐

SECTION 2	**Yes**	**No**	**N/A**	**N/O**
INSPECTION AND MAINTENANCE (3.2.5)				
58. Traffic control zones are monitored to determine their effectiveness under varying conditions.	☐	☐	☐	☐
59. Traffic control devices are inspected at the beginning and continuously during work shift.	☐	☐	☐	☐
60. Traffic control devices are restored to their proper position immediately and continuously.	☐	☐	☐	☐
61. Damaged, old, or ineffective devices are removed and replace immediately and continuously.	☐	☐	☐	☐
62. Devices using reflected light for illumination are cleaned and monitored continuously.	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: _____ Project Manager: _____

CH2M HILL FIELD SAFETY INSTRUCTIONS

Attachment 7

Injury Management Poster

CH2MHILL

Injured on the job—who do you call?

The Injury Management/Return to Work program has a different hotline number—and some improvements:

- Direct access is available with a nurse and physician—24/7
- The physician coordinates the employee's visit to the clinic for treatment and follow-up

Look for your Injury Management/Return to Work card at your office or project site—keep yours with you wherever you go.

Remember—if you get injured or sick on the job, report to your supervisor and call the number!

For more information please visit us on the VO at:

Company Resources | Corporate Groups | Health, Safety, Security, and Environment

HSSE