

Area 1 Phase 1 Health and Safety Plan

*Baltimore Works Site
Baltimore, Maryland*

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By:
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Harbor Point Development LLC

For:
U.S. Environmental Protection Agency - Region III
Maryland Department of the Environment

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1.0

INTRODUCTION

This Health and Safety Guidance (“HSG”) has been prepared for inclusion with the Detailed Development Plan (DDP) for Harbor Point Area 1 Development (“Site”). For Phase 1 construction in Area 1, the primary chemical of concern is hexavalent chromium in soil and groundwater, or on debris below the MMC synthetic layers. Lead and PNAs are identified as potential contaminants of concern in Areas 2 and 3.

Harbor Point is located on a peninsula in the Northwest Branch of the Patapsco River located in Baltimore, Maryland (Figure 1). The peninsula joins the mainland at the east side of the site, bounded by South Caroline Street and the Baltimore Inner Harbor. The main site area is referred to as Area 1, and the Southeast Quadrant is referred to as Area 2. Additionally, the property located midway between Wills Street and South Caroline Street North of Philpot Street is referred to as Area 3.

The approved Environmental Remediation System (ERS) is operated and maintained by Honeywell International Inc. (“Honeywell”) pursuant to the Consent Decree dated April 27, 1989, as amended, among Honeywell, EPA and MDE, to contain chromium contaminated groundwater and minimize the possibility of exposure to impacted soil. The ERS consists of the Multimedia Cap (MMC), Hydraulic Barrier, Head Maintenance System (HMS) and Outboard Embankment.

1.1

PURPOSE

Harbor Point Development (HPD) is developing this site which is currently owned and maintained by Honeywell International. Environmental Resources Management, Inc. (ERM) has prepared this HSG to be used, as appropriate, by Contractors engaged in preparing and implementing Contractor-Specific Health and Safety Plans (HASP) for Area 1 development. This HSG is intended to address worker safety related to potential exposure to environmental constituents of concern, e.g., chromium, and not health and safety, OSHA or other regulations pertaining to general construction activities.

This HSG does not supersede the *Final Master Health and Safety Plan for Honeywell Baltimore Inner Harbor*, dated August 2002 and revised June 2007.

This Health and Safety guidance document is not intended to be and shall not be used as a Contractor-Specific HASP. Also, this document is not intended to be inclusive of all health and safety conditions that may be encountered at the Site, such as those associated with general construction activities. Rather, this document is solely intended to provide guidance to Contractors to identify and address contaminated environmental media that may affect their work and, at a minimum, must be included in their HASP. It is the sole responsibility of Contractors to prepare and implement their own HASP in accordance with all applicable federal, state and local regulations and standards of care.

All Contractor-Specific HASPs will provide Site-specific health and safety requirements that are pertinent to their own anticipated activities. It is the responsibility of the Contractor to review the project documents to make its own determination as to the appropriate level of personnel protection based on the task being performed.

In the event that a conflict in procedures or requirements exists between this HSG and a Contractor-Specific HASP, the procedures or requirements that are most protective of human health will be applied. HPD, or its representative, will review all Contractor-Specific HASPs, but will not be responsible for approving the completeness or measures specified.

1.2

BACKGROUND

The Site has been divided into Areas 1, 2, and 3. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility (Figure 1). Chromium ore was processed in Area 1 from 1845 to 1985. The former manufacturing processes resulted in chromium impacts to soil and groundwater. An Environmental Remediation System (ERS) is maintained and operated by Honeywell International Inc. (Honeywell) to contain CrVI-impacted groundwater in Area 1 and control the potential for human exposure to affected soil. The ERS consists of a Multimedia cap (MMC), Hydraulic barrier, Head Maintenance System (HMS), a groundwater storage and transfer system, and Outboard Embankment. The HMS maintains an inward groundwater gradient to mitigate the migration of chromium-impacted groundwater from the Site.

Area 2 was mainly used for coal and raw chromium ore storage. In addition, a fertilizer warehousing and supply company operated in this area for many years.

Area 3 consists of five separate properties all with a history of industrial activity. This industrial activity included brass casing, oil blending and storage, lumber storage and coating/plastics production.

Honeywell purchased all of these properties by 1993 at which time all manufacturing was halted and subsequently all buildings and tanks were removed from these sites.

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PROJECT PERSONNEL AND RESPONSIBILITIES

Contractors shall designate and assign appropriately trained and qualified personnel to fulfill the following responsibilities for implementation of its HASP. These titles and the names of the individuals assigned should be included in the written HASP:

- Project Manager (PM) – The Project Manager will serve as the Contractor’s principal point of contact for project-related decisions and communication;
- Project Health and Safety Coordinator (HSC) – the HSC will be responsible for preparing and overseeing implementation of the Contractor-Specific HASP, as well as updating the HASP as conditions warrant. The HSC will be consulted by the Contractor’s PM or field personnel whenever site conditions may require modification to the Contractor’s HASP.
- Site Safety Officer (SSO) – The SSO or designee will be responsible for ensuring that the Contractor’s HASP is properly implemented by contractor’s employees and subcontractors. The SSO will serve as the primary point of contact for communications between field personnel and management. The SSO will be responsible for notifying the PM and the HSC of field conditions that may require modification to the HASP. It is the responsibility of the SSO or designee to ensure that site personnel are in conformance with the level of personal protection equipment (PPE) specified by the Contractor’s HASP. It is incumbent upon the SSO to establish and maintain direct lines of communication with the Owner and/or its representative.

3.0

SITE CONTROL MEASURES

The Contractor's written HASP must describe how site control will be maintained. The Contractor should ensure through the assigned SSO that site control is maintained by establishing egress and ingress points for work activities and modifying them, as appropriate, as the project and work areas progress. The Contractor's HASP should ensure that the site is properly secured at all times to restrict unauthorized access by visitors or other personnel.

The Contractor must ensure that visitors not engaged in site work will be provided with the appropriate level of PPE and escorted at all times while onsite by the SSO or designee. The Contractor should implement controls for all on-site personnel such that smoking, eating, drinking, or other activities which promote hand to mouth contact are only permitted in designated clean area(s), the locations of which will be determined by the SSO.

4.0

PERSONNEL TRAINING

The Contractor's HASP must describe what training is necessary to safely conduct the specific job and what types of employees receive training. The Contractor will distribute its HASP to appropriate employees and subcontractors involved in the project. Prior to commencing with the fieldwork, the Contractor's SSO should discuss the contents of the HASP with Contractor's workers and subcontractor employees. The SSO shall maintain documentation of specialty training provided for his role and the Contractor's employees based on their specific work task and responsibility. These documents shall be made available to the Owner or Owner's representative if requested.

It is the responsibility of the Contractor to ensure that its employees and subcontractors engaged in implementation of project activities comply with the applicable OSHA regulations in 29 CFR 1910 and 29 CFR 1926. It is required that employees who may come into contact with subsurface soils and groundwater during performance of the work comply with the training specified in 29 CFR 1910.120(e). Particular attention to dust suppression activities will be required should Chromium Ore Process Residue (COPR) be encountered. Additionally, field staff will be provided training in advance of site activities on the physical and characteristics of COPR and, should COPR be identified, the Contractor will use that opportunity to train field staff to visually recognize this material. It is the Contractor's responsibility to determine which employees may potentially be in contact with contaminated subsurface soils and groundwater. It is anticipated that the workers with the following job descriptions may potentially come into contact with contaminated media and must have the appropriate health and safety training:

- Backhoe Operators
- Vacuum Truck or Pump Operators
- Truck Drivers
- Laborers/Spotters

Workers on site only occasionally for a specific limited task (such as, but not limited to, groundwater monitoring, land surveying, or geophysical surveying) should also comply with the training specified in 29 CFR 1910.120(e).

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MEDICAL MONITORING

Personnel involved in site operations with the potential for encountering contaminated media must have undergone medical surveillance with their employer, to include initial and periodic examinations, prior to performing field work at the site. Each employer's occupational health physician will determine the frequency of examinations based on a variety of factors. The Contractor is responsible for the Contractor's employees involved in field activities associated with the project would be required, as appropriate, to adhere to the medical monitoring requirements of 29 CFR 1910.120(f). Project personnel will utilize the services of a licensed occupational health physician with knowledge and/or experience in the hazards associated with the project to provide the medical examinations and surveillance specified herein. Medical "fit-for-duty" certifications shall be maintained on Site for all HAZWOPER workers.

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6.0 HAZARD IDENTIFICATION CONTROL

6.1 HAZARD IDENTIFICATION PROCESS

Prior to initiating any new project activity or when there is a change in site conditions, the SSO will assist project team members in completing and documenting a Job Hazard Analysis (JHA). A copy of the JHA form that may be used by the Contractor is located in Appendix B.

6.2 CHEMICAL HAZARDS

Chromium, hexavalent chromium, lead and polynuclear aromatics (PNAs) may be present at the Site. For Phase 1 construction in Area 1, the primary chemical of concern is hexavalent chromium in soil, [COPR](#) and groundwater, or on debris below the MMC synthetic layers. Lead and PNAs may be present in Areas 2 and 3. Chemicals may be introduced into the body by ingestion, inhalation, or absorption through the skin. Since not all chemicals have the same level of toxicity, the length of time for the exposure and the concentration of the chemical are important in determining the potential risk to onsite workers. Inhalation and skin contact are the most common routes of entry for the type of work that is contemplated for this site. Chemicals can be introduced into the body by ingestion when chemicals present on the hands are transferred to food or cigarettes.

6.3 SOIL CONDITIONS

The uppermost material encountered in all of the soil borings collected on this site is fill material, ranging in thickness from about 7 to 30 feet. The fill consists of medium compact to loose, gray and brown fine to coarse sand, with some silt, trace to some gravel, trace clay, and with variable amounts of brick, concrete fragments, cinders and wood and likely contain materials impacted by hexavalent or trivalent chromium. [As a general practice](#) COPR was not land filled at the site; however, [the 1985 IT report and 1986 NUS report indicated the potential presence of COPR in dispersed in soils at the site.](#) Soil containing elevated concentrations of chromium can be expected to be encountered [below the layers of the multimedia cap.](#) Lead and PNAs may also be encountered in soil in Area 2.

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GROUNDWATER CONDITIONS

Elevated concentrations of hexavalent chromium have been reported in shallow groundwater. Shallow ground water levels have not been recorded above elevation +3 feet mean sea level (msl).

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FIELD ACTIVITIES

The following activities are anticipated to be performed during construction of the Area 1, Phase 1 development.

- Continuous operation of the Transfer Station and HMS including the storage and transfer contaminated groundwater;
- Installation of erosion and sediment controls;
- Demolition of concrete structures and asphalt paving;
- Selective demolition of the Transfer Station;
- Exposing portions of the MMC synthetic materials;
- Excavation, temporary storage and transportation of clean and contaminated soils and water;
- [Sheet Pile and Pipe Pile](#) driving;
- Concrete forming;
- Installation of clean fill, aggregates, and synthetic materials;
- Installation of utilities in clean fill;
- Backfill and surface grading;
- Vibration monitoring; and
- [HMS modifications.](#)

8.0

SITE PERSONNEL

Workers with the following job descriptions will be engaged in activities conducted in at the site:

- Heavy Equipment Operators
- Vacuum Truck or Pump Operators
- Truck Drivers
- Laborers/Spotters
- Technical Personnel

Other visitors to the site, not directly involved in proposed work activities, will be considered in the HASP as Technical Personnel listed above.

9.0

PERSONAL PROTECTIVE EQUIPMENT

Level D is the expected level of protection for this construction work. However, it is the responsibility of the Contractor to review the project documents in order to make its own determination as to the appropriate level of PPE for its personnel and subcontractors, as well as applicable action levels for use of more protective PPE. At a minimum, Level D PPE consists of the following:

- Coveralls or long sleeve shirts and long pants, unless otherwise directed by the SSO;
- Outer protective work gloves at a minimum for all hazardous or potentially hazardous material handling activities that may occur during site activities;
- As a conservative measure, workers that may routinely come into contact with groundwater (e.g., workers in the trench making the utility line connections) should be in poly-coated Tyvek, (Modified Level D) or similar chemical resistant suit, chemical resistant gloves and boots;
- Steel-toed work boots;
- Hard Hat, where appropriate;
- Safety Glasses; and
- High visibility outer ware or safety vest.
- Options, as required;
 - o Disposable outer boots;
 - o Hearing protection; and
 - o Chemical Resistant gloves.

Contractors performing intrusive operations into known or potential chromium impacted areas must address specific air/personal air monitoring requirements for hexavalent chromium in accordance with either 29 CFR 1910.1026 or 1926.1126. Prior to initiating any new project activity or when there is a change in site conditions, an additional JHA will be completed. A copy of the JHA form is located in Appendix B.

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Personal Protective Equipment requirements are provided in Table 9-1, below.

Table 9-1. Personal Protection Equipment Requirements

PPE Level	Ensemble Components	Anticipated Use
<p>Level D</p> <p>Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.</p>	<ul style="list-style-type: none"> • Long pants and shirt with sleeves. • Safety-toed footwear. • Safety glasses with molded side shields. • Hard hat. • Work gloves • Hearing protection if hazard is present 	<ul style="list-style-type: none"> • Demolition of concrete structures and asphalt paving. • Excavation, temporary stock pile and transportation of soils. • Installation of clean fill, aggregates, and synthetic materials. • Installation of utilities in clean fill area. • Air monitoring. • Backfill and surface grading. • Pile driving. • Concrete forming. • Dewatering.

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PPE Level	Ensemble Components	Anticipated Use
<i>Modified Level D</i>	Level D and the following: <ul style="list-style-type: none"> • Disposable poly-coated Tyvek coveralls. • Safety-toed rubber boots or disposal boot covers over shoes. • Thin nitrile gloves. • Green nitrile gloves over thin nitrile gloves when primary gloves may tear or puncture. 	Any of the above-referenced tasks in which there is moderate potential for skin contact with chromium impacted soil and/or water and for all activities involving direct contact with chromium impacted soils located beneath the multimedia cap.
<i>Level C</i> Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.	Level D or Modified Level D and the following: <ul style="list-style-type: none"> • Full-face air purifying respirator with combination dust organic vapor cartridges at least rated N-100 or better. If second action level surpassed • Half-face air purifying respirator with combination dust organic vapor cartridges at least rated N-100 or better. If first action level surpassed 	Any of the above-referenced tasks in which there is moderate potential for skin contact with chromium soil and air monitoring data indicate a need for respiratory protection.

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PPE Level	Ensemble Components	Anticipated Use
<p>Level B</p> <p>Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is needed.</p>	<p>Not anticipated to be required</p>	<p>Tasks requiring Level B PPE are not anticipated during this project. If Level B PPE is needed, as determined by the SSO and/or the Project Health and Safety Coordinator, the HASP will be revised.</p>
<p>Level A</p> <p>Should be worn when the highest level of respiratory, skin, and eye protection is needed.</p>	<p>Not anticipated to be required</p>	<p>Tasks requiring Level A PPE are not anticipated during this project. If Level A PPE is needed, as determined by the SSO and/or the Project Health and Safety Coordinator, the HASP will be revised.</p>

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RESPIRATORY PROTECTION

The type of respiratory protection required will be based on the results of ambient air monitoring, the results of any models used to predict ambient air concentrations, and the professional judgment of either the SSO or the Project Health and Safety Coordinator (HSC). Respiratory protection requirements are outlined on Table 9-1.

As required by 29 CFR 1910.134, *Respiratory Protection*, a cartridge change-out schedule will be developed based on either the results of ambient air monitoring, the results of any models used to predict ambient air concentration or the professional judgment of the Project HSC. The Site-specific dust action levels utilized for this HASP were developed from the data collected during the Pre-Construction Air Monitoring Study, conducted from 23 April through 22 June 2013.

The Site soil data indicates that the soil CrVI concentration presents conditions requiring exposure monitoring for the project. As such, the action level triggering upgrading to Level C is based on the Site-specific dust action level, as provided in Section 12 and the Site-specific Air Monitoring Plan. The Site-specific dust action levels are more conservative than the OSHA requirements and as such are protective of both perimeter receptors and those workers involved in intrusive work on the Site.

11.0 DECONTAMINATION PROCEDURES

Decontamination involves the orderly controlled removal of contaminants from both personnel and equipment. The purpose of decontamination procedures is to prevent the spreading of contaminated materials into uncontaminated areas. All site personnel should limit contact with contaminated soil, groundwater or equipment in order to reduce the need for extensive decontamination. Decontamination only applies to site personnel and equipment that contact contaminated media.

11.1 EQUIPMENT DECONTAMINATION

All contaminated tools and equipment will be decontaminated on site using appropriate methods. Dry decontamination procedures will consist of thoroughly brushing or wiping down tools and equipment. Wet decontamination will consist of thoroughly scrubbing and cleaning tools with a designated cleaning solution. All wipes, pads or towels will be containerized. All decontamination fluids will be drummed [and temporarily stored within the limits of the sealed container storage area shown on DDP Drawing EN1.01](#) for [proper off-site](#) disposal.

Equipment and materials used in the decontamination process may include the following:

- High pressure/hot water cleaning using only potable water/fire water;
- Phosphate-free detergent;
- Five-gallon bucket;
- Potable water;
- Distilled water;
- Paper towels; and
- Brushes.

11.2 **PERSONNEL DECONTAMINATION**

Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the Support Zone only after undergoing the decontamination procedures. Personnel shall remove all contaminated PPE and containerize it in drums. All work boots are to be decontaminated using a secured boot brush mounted over disposable plastic sheeting. All personnel shall remove any inner clothing that is contaminated and redress. All personnel must wash face and hands before taking breaks, eating and at the end of the work shift. All PPE and wash water drums will be disposed properly.

Emergency decontamination for a life threatening medical emergency will consist of removal of the victim's outer protective clothing or equipment to the extent where life saving procedures/medical treatment can be performed. Final decontamination can be postponed until emergency medical attention is received. The emergency medical personnel must be advised of the potential contamination.

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The potential exposure pathways of concern are incidental inhalation, ingestion or dermal contact with CrVI, lead and polynuclear aromatics from soil/debris/dust. Therefore, measures will be followed during soil/debris handling to eliminate the potential exposure pathway.

Particular attention to dust suppression activities will be required should COPR be encountered.

The SSO will routinely conduct real-time air monitoring for total airborne particulate concentrations to demonstrate that the Site-specific dust action level, as provided in the Air Monitoring Plan, is not exceeded during construction. It is expected that such monitoring will be performed throughout the duration of intrusive activities below the MMC synthetic layers and until contaminated media has been completely removed from the Site.

Site-specific background values and action levels have been established based upon the data evaluation presented in the Air Monitoring Plan, as derived from the Preconstruction Air Monitoring program. It is important to note that the site-specific dust action level will be established in the Air Monitoring Plan. Since the Site-specific dust action level is based on the background threshold value for pre-construction baseline air, compliance with the plan should result in no increase in particulate born inorganic or organic constituents due to project soil intrusive activities and serves as a real-time surrogate for CrVI as well as other particulate borne constituents including lead and PAHs. Therefore the Site-specific dust action level is significantly protective of potential particulate exposure to workers during intrusive activities.

A correlation between total airborne particulate concentrations and CrVI concentrations has been established for the site based upon the results of the Preconstruction Air Monitoring Study as presented in the Air Monitoring Plan. Based upon this correlation, it is extremely improbable that either the OSHA action levels for total particulates or CrVI will be exceeded given the restrictive Site-specific dust action level and response actions, including stopping work potentially contributing to elevated particulate concentrations (See Table 12-1). To meet the OSHA and Site-specific monitoring requirements, CrVI air sampling will be initiated should the Site-specific dust level be exceeded, as described in the Air Monitoring Plan. Air sampling will continue for 5 consecutive days to document CrVI airborne concentrations. Confirmation that the Site-specific dust levels are serving as a surrogate for the OSHA action level, will be accomplished by comparing laboratory analytical results utilizing

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OSHA Method ID 215 to the OSHA action level (0.25 µg/M³). While highly unlikely, if the OSHA CrVI action level is exceeded, reassessment of the response actions will be taken and changes made to reduce potential dust emitting activities.

Real-time aerosol monitors (RAM, DustTrak™ DRX 8534 will be utilized at four (4) perimeter air monitoring (PAM) stations to continuously monitor total particulate concentrations as the surrogate for CrVI (Figure 2). The PAM stations will continuously monitor and record total particulate concentrations at 1-minute averages operating at approximately 2 liters per minute (lpm), 24 hours per day, seven days per week.

Work Zone (WZ) monitoring will be performed utilizing two (2) RAMs; one positioned upwind and the other positioned downwind of the intrusive activity area. The WZ stations will continuously monitor and record total particulate concentrations at 1-minute averages operating at approximately 2 liters per minute (lpm) during work hours.

The DustTrak™ DRX 8534 total particulate concentration audible alarm shall be set at to the [site-specific dust action level as approved by EPA and MDE](#). Real-time and sampling pump instrumentation will be calibrated daily per manufacturer's instructions and have adequate and redundant power-supplies to ensure constant operation. All documentation regarding real-time results, monitoring times, dates, duration and monitoring locations shall be available to the Owner or Owner's representative upon request. [The Developer or Developer's representative must provide all air monitoring data to MDE immediately upon receipt and, in a similar time frame, will also place the data on a website that can be accessed by the public.](#)

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Table 12-1 outlines the steps to be taken by the SSO when the Site-specific action levels of the various contaminants are exceeded. Respiratory protection is selected based on occupational exposure limits of the constituents at the site and the potential for exposure to vapors and dust from site activities.

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Table 12-1. Action Levels and Response Actions Requirements

Chemical (Method)	Site-Specific Action Level	Response Actions
Dust Real-time Aerosol Monitor (RAM) and NIOSH Analytical Method 500	Greater than established action level sustained in the work zone for 15 minutes	<ul style="list-style-type: none"> • Contact PM and Project Health and Safety Coordinator. • Evaluate work practices and assess engineering controls to reduce airborne concentrations. • Continue to monitor RAM dust concentration level. • Implement dust suppression. • If readings are less than action level for 15 minutes, resume work.
	Greater than action level sustained in the work zone for 30 minutes	<ul style="list-style-type: none"> • If readings are at or greater than the action level for more than 15 minutes, initiate air sampling at WZ stations.
	Greater than action level sustained in the work zone for 1 hour	<ul style="list-style-type: none"> • If readings are at or greater than the action level for more than one hour, STOP work and contact the Owner or its representative. • Continue RAM monitoring and air sample collection for one, 24-hour duration after the RAM level has stabilized.
Chemical (Method)	Regulatory Action Level	Response Actions
Hexavalent Chromium (OSHA Analytical Method ID 215)	OSHA Action Level: 0.25 $\mu\text{g}/\text{M}^3$	Site-specific dust action levels are serving as a real-time surrogate for this requirement. If the Site-specific dust action level is exceeded for more than 1 hour follow the response actions above and don respiratory protection. CrVI analyses will be used to confirm the protectiveness of the surrogate.

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13.0 THERMAL STRESS

13.1 HEAT STRESS

Heat stress is caused by a combination of factors such as temperature, humidity, type of work being performed, and use of personal protective equipment including protective clothing. Heat stress tends to increase body temperature, heart rate, and sweating. The key to preventing heat stress is education of personnel relative to the hazards associated with working in the heat and implementation of proper controls and work practices. Table 13-1 summarizes heat stress disorders and prevention/first aid issues.

When the temperature is above 80° Fahrenheit (F), the SSO will monitor both the temperature and the humidity throughout the day in order to determine the Heat Index. The National Weather Service has developed a Heat Index that combines the ambient temperature and humidity into a value that reflects how hot it really feels. This Heat Index can be used to determine the risk associated with working outdoors during the hot months of the year. To use the heat index chart (Table 13-2), read the temperature at the left and humidity across the top, the Heat Index is where the two intersect. For example, with a temperature of 96 and a humidity of 50%, the Heat Index is 108.

The SSO will also inform site workers when the Heat Index Risk Level, as defined on Table 13-3, reaches Danger and/or Extreme Danger; the following additional precautions may be implemented at the discretion of the SSO based on factors such as use of Tyvek coveralls and the physical activity associated with each task. The following actions or work practices will be implemented, as practical, as part of the Heat Stress Management Program.

- Designated areas will be used for site workers to take breaks and for eating;
- If possible, physically demanding and strenuous tasks may be scheduled for the cooler parts of the day;
- Site workers will be required to drink 6-8 ounces of cool water or electrolyte replacement drinks every 60 minutes. Diabetics should use caution when using electrolyte replacement drinks to replenish fluids as these drinks may have high sugar content;

- Site workers taking prescription medications should check with their doctor or other medical professional regarding the interaction between working in hot environments and their medications;
- SSO will more closely observe site workers, especially those working in Tyvek coveralls or performing strenuous job tasks;
- Implement worker rotation during strenuous or physically demanding job tasks; and
- SSO will implement a work-rest cycle.

Table 13-1. Heat Stress Disorders

Disorder	Symptoms	Cause	Prevention/First Aid
Heat Rash or Prickly Heat	<ul style="list-style-type: none"> ◆ Rash ◆ Itching 	<ul style="list-style-type: none"> ◆ Hot, humid conditions ◆ Sweat doesn't evaporate easily ◆ Sweat ducts become clogged 	<ul style="list-style-type: none"> ◆ Ointments ◆ Keep skin clean and dry ◆ Good daily personal hygiene
Heat Cramps	<ul style="list-style-type: none"> ◆ Sudden onset of muscle cramps usually in legs or arms ◆ Hot, moist skin ◆ Normal pulse ◆ Normal or slightly elevated temperature 	<ul style="list-style-type: none"> ◆ Loss of water (sweating) ◆ Loss of electrolytes ◆ Replacing water but not electrolytes 	<ul style="list-style-type: none"> ◆ Move into shade ◆ Loosen clothing ◆ Drink tepid electrolyte drinks or water ◆ Seek medical assistance if conditions persist

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Disorder	Symptoms	Cause	Prevention/First Aid
Heat Exhaustion	<ul style="list-style-type: none"> ◆ Pale, clammy skin ◆ Profuse perspiration ◆ Thirst from dehydration ◆ Weakness ◆ Headache ◆ Nausea ◆ Loss of coordination 	<ul style="list-style-type: none"> ◆ Overexertion ◆ Excessive loss of water and electrolytes 	<ul style="list-style-type: none"> ◆ Move into shade ◆ Remove PPE ◆ Loosen street clothing ◆ Cool by applying damp cool compresses or ice packs ◆ Drink tepid electrolyte drinks or water ◆ Summon medical assistance
Heat Stroke	<ul style="list-style-type: none"> ◆ Elevated temperature (>103F) ◆ Flushed, hot, dry skin ◆ Absence of sweating ◆ Delirious ◆ Rapid pulse ◆ Nausea ◆ Headache ◆ Dizziness ◆ Unconsciousness 	<ul style="list-style-type: none"> ◆ Failure of body's cooling (sweating) mechanism 	<ul style="list-style-type: none"> ◆ Summon medical assistance immediately ◆ Move to shade ◆ Remove PPE ◆ Loosen street clothing ◆ Cool by fanning or applying damp compress or ice packs

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Table 13-2. Heat Index Chart

		Relative Humidity (%)													
		40	45	50	55	60	65	70	75	80	85	90	95	100	
Temperature (F)	110	136													
	108	130	137												
	106	124	130	137											
	104	119	124	131	137										
	102	114	119	124	130	137									
	100	109	114	118	124	129	136								
	98	105	109	113	117	123	128	134							
	96	101	104	108	112	116	121	126	132						
	94	97	100	102	106	110	114	119	124	129	136				
	92	94	96	99	101	105	108	112	116	121	126	131			
	90	91	93	95	97	100	103	106	109	113	117	122	127	132	
	88	88	89	91	93	95	98	100	103	106	110	113	117	121	
	86	85	87	88	89	91	93	95	97	100	102	106	108	112	
	84	83	84	85	86	88	89	90	92	94	96	98	100	103	
	82	81	82	83	84	84	85	86	88	89	90	91	93	95	
	80	80	80	81	81	82	82	83	84	84	85	86	86	87	

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Table 13-3. Heat Index Risk Level and Associated Health Effects

Heat Index	Associated Risk
>130	<i>Extreme Danger</i> Heat stroke highly likely with continued exposure
105-130	<i>Danger</i> Heat exhaustion and heat cramps likely and heat stroke possible with prolonged exposure and/or physical activity
90-105	<i>Extreme Caution</i> Heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity
80-90	<i>Caution</i> Fatigue possible with prolonged exposure and/or physical activity

Notes:

- Heat Index values were devised for shady, light wind conditions. Exposure to full sun may increase these values by up to 15°.
- Heat Index values were devised for the general public wearing typical lightweight summer clothing. Acclimatized workers may be able to work under conditions with a slightly higher Heat Index.
- The use of personal protective equipment, including clothing increases the heat stress load on the body.

The work-rest cycle outlined below may be implemented based on the professional judgment of the SSO and/or the Project Health and Safety Coordinator.

Heat Index	Risk Level	Work-Rest Cycle
> 130	Extreme Danger	15 minute break every 30 minutes
105-130	Danger	15 minute break every 60 minutes
90-105	Extreme Caution	15 minute break every 90 minutes
80-90	Caution	15 minute break every 120 minutes

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13.2 *COLD STRESS*

Cold stress situations may be encountered at the site. If lower than normal temperatures (i.e., less than 35°F) are forecasted the following information will be utilized. Most cold related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. The two most prominent adverse effects from exposure to cold temperatures are frostbite and hypothermia. A person qualified in first aid or a professional medical provider should administer treatment for cold related injuries. The single most important aspect of life-threatening hypothermia is a drop in the deep-core body temperature. Response to cold stress will be based on Cold Stress section of the ACGIH TLV booklet.

13.2.1 *Frostbite*

Frostbite occurs when the extremities do not get sufficient heat from the central body stores. The fluids around the cells of the body tissues freeze from exposure to low temperatures. This condition can result in damage to, and loss of, tissue. The most vulnerable areas are the nose, cheeks, ears, fingers, and toes. Damage from frostbite can occur in either the outer layers of skin or in the tissue beneath these layers and can be serious, resulting in scarring, tissue death, permanent loss of movement, or amputation.

13.2.2 *Hypothermia*

This is the most severe form of cold stress and results from a drop in the body's core temperature. Hypothermia can occur in relatively mild temperatures if there is a wind and the person's clothing becomes wet. The symptoms of hypothermia are:

- First, uncontrollable shivering and the sensation of the cold;
- Heartbeat slows and may become irregular;
- Pulse weakens and blood pressure changes;
- As the body's core temperature drops, other signs may include cool skin, slow irregular breathing, and apparent exhaustion;

- When core temperatures are in the mid-range, the victim may become listless, confused, exhibit severe shivering, or develop severe pain in the extremities; and
- Final signs are a significant drop in blood pressure, fatigue, and shallow respiration.

13.2.3 *Control Measures for Cold Stress*

Worker comfort will be monitored and increased layers of PPE or modesty clothing worn under the PPE may be required to minimize cold stress for those persons working inside a building. For those workers performing tasks outside a building when ambient temperature falls below 36°F, the following guidelines should be used:

- If wind chill is a factor, shielding the work area or providing employees an outer windbreak layer garment will reduce the cooling effect of the wind;
- Extremities, ears, toes, and nose will be protected from extreme cold by protective clothing;
- Employees performing light work and whose clothing may become wet will wear an outer layer of clothing that is impermeable to water;
- Employees performing moderate to heavy work and whose clothing may become wet will wear an outer layer of clothing that is water repellent; and
- Outer garments must provide for ventilation to prevent wetting of inner clothing by sweat.

Workers who become immersed in water or whose clothing becomes wet will immediately be provided a change of clothing and be treated for hypothermia if necessary. If the clothing becomes wet from sweating, the employees may finish the task that caused the sweating before changing into dry clothes. Metal handles of tools and control bars will be covered by thermal insulating materials when temperatures fall below 30°F. Whenever a site becomes covered with snow or ice, eye wear providing employees' protection against ultraviolet light, glare, and blowing ice crystals shall be worn.

When conducting work in air temperatures below 35° F, the following practices shall be followed:

- If the clothing of an employee is expected to become wet, the outer layers of clothing must be impermeable to water;
- If an employee's underclothing becomes wet it must be changed immediately. If the clothing becomes wet from sweating, the employee may finish the task that caused the sweating before changing into dry clothing;
- Employees will be provided a warm area (65° F or above) to change from work clothing into street clothing and for breaks;
- Hot liquids, such as soups, warm drinks, etc. shall be provided in the break area. The intake of caffeine containing products shall be discouraged due to their diuretic and circulatory effects;
- If appropriate, approved space heaters may be provided in the work area to warm the hands, feet, etc;
- The buddy system shall be practiced. Any employee observed with signs of cold stress shall immediately proceed to the break area;
- Employees will be reminded to layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing;
- Avoid overdressing when going into warm areas or when performing activities that are strenuous. This could potentially lead to heat stress situations;
- Auxiliary heated versions of hand wear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist;
- Employees handling liquids with high evaporation rates (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing with the liquids because of the added danger of cold injury caused by evaporative cooling;
- Work shall be arranged in such a way that sitting still or standing for long periods is minimized; and

- If the air temperature is 20° F or below the hands shall be protected by mittens or gloves prior to contact with cold surfaces such as metal, etc.

Air temperature is not the only factor to be considered while evaluating cold stress situations. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed the greater the risk of experiencing cold related injuries. For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of -25° F or less.

14.0 ***SAFE WORK PRACTICES AND STANDARD OPERATING PROCEDURES***

14.1 ***GENERAL SAFE PROVISIONS***

For Contractor's convenience, key regulations (including construction-related regulations) that may apply to the project activities are listed below. Contractors are responsible for ensuring that their HASPs address the issues and regulations applicable to their respective scopes of work for the project.

- Hazardous Waste Site Operations (29 CFR 1910.120);
- Construction Activities (29 CFR 1926);
- Hazard Communication (29 CFR 1910.1200 & 29 CFR 1926.59);
- Personal Protective Equipment (29 CFR 1920.132 & 29 CFR 1926.95)
- Fire Protection (29 CFR 1910.39 & 29 CFR 1926.150);
- Excavations (29 CFR 1926 Subpart P);
- Powered Hand Tools (29 CFR 1910.242 & 29 CFR 1926.301);
- Electrical Safety (29 CFR Subpart S & 29 CFR 1926.400-449);
- Fall Protection (29 CFR 1926 Subpart M);
- Walking Working Surfaces (29 CFR 1910.22)
- Welding (29 CFR 1910.251 & 29 CFR 1926.350-354);
- Earthmoving Equipment (29 CFR 1926.602);
- Hazardous Energy Control (29 CFR 1910.147);
- Sanitation (29 CFR 1926.51);
- Scaffolding (29 CFR 1910.28 & 29 CFR 1926.450-454);

- Confined Space Entry (29 CFR 1910.146):
- Respiratory Protection (29 CFR 1910.134).

14.1.1 *Smoking and Eating Areas*

Smoking will only be allowed in designated areas. Upon mobilization at the site, the SSO will establish smoking areas per site-specific or client-specific requirements. Individuals caught smoking outside the designated smoking areas will be subject to disciplinary action up to and including immediate termination.

Upon mobilization at the site, the SSO will establish eating and break areas per site-specific or client-specific requirements. Eating will only be allowed in the designated areas and the areas will be maintained in a clean and sanitary condition.

14.1.2 *Sanitation and Potable Water*

Containers used for drinking water will be equipped with a tap and capable of being tightly closed. In addition, the container will be labeled as "Drinking Water" or "Potable Water." Disposal cups will be stored in a sanitary condition and a receptacle for disposing of the cups will be near-by.

Potable and non-potable water containers and portable toilets (if used) will comply with OSHA 29 CFR 1910.141 requirements.

14.1.3 *Temporary Facilities*

All temporary facilities will be maintained in a clean and sanitary condition to discourage the entrance of rodents or vermin. If rodents or vermin become an issue, the SSO will be responsible for implementing an extermination program per site-specific or client-specific guidelines.

Trailers and other temporary structures used as field offices or for storage will be anchored with rods and cables or by steel straps to ground anchors. The anchor system will be designed to withstand winds and must meet applicable state or local regulations for the anchoring of mobile trailer homes. Use of standard anchoring systems to anchor structures is not permitted in Area 1 due to potential damage to the MMC. Methods designed to avoid impacting the MMC will be used to secure structures.

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14.1.4 ***First Aid Station***

A designated area must be readily accessible to employees. Signs shall be posted indicating the location for the first aid station and name of designated first aid provider(s). The sign should be in the form of a symbol that does not require workers to have language skills to understand it.

14.1.5 ***Eye Wash Stations***

The location of each eyewash station must be identified with a highly visible sign. The sign should be in the form of a symbol that does not require workers to have language skills to understand it. Eye wash stations must be inspected monthly.

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15.0

STANDARD OPERATING PROCEDURES

The following standard operating procedures will be adhered to at all times:

- All personnel entering the site must check in with the SSO.
- All individuals entering the site must demonstrate to the SSO that they have been adequately trained as defined in Section 4.
- All individuals must be familiar with emergency communication methods and how to summon emergency assistance.
- Use of alcoholic beverages before, during operations, or immediately after hours is absolutely forbidden. Alcohol can reduce the ability to detoxify compounds absorbed into the body as the result of minor exposures and may have negative effects with exposure to other chemicals. In addition, alcoholic beverages will dehydrate the body and intensify the effects of heat stress.
- Horseplay of any type is forbidden.
- All unsafe conditions will be immediately reported to the SSO, who will document such conditions in the field log. The SSO will be responsible for ensuring that the unsafe condition is corrected as quickly as possible.
- No smoking, eating, chewing gum or tobacco, taking medication, or applying cosmetics in the Contamination Reduction Zone or the Exclusion Zone. Wash hands and face thoroughly prior to conducting the activities in the Support Zone.
- Smoking, matches, and lighters are only allowed in the designated smoking area.
- Avoid contact with potentially contaminated substances. Avoid, whenever possible, kneeling on the ground, or leaning or sitting on trucks, equipment or the ground. Do not place equipment on potentially contaminated surfaces.
- If PPE becomes torn or saturated with contaminated material, immediately leave the Exclusion Zone, go through the decontamination steps, and replace the affected PPE. Additionally, wash any exposed skin thoroughly with soap and water.

16.0 SAFE WORK PRACTICES

16.1 PRE-EXCAVATION

Prior to mobilizing to the field, the Project Manger will be responsible for ensuring a Subsurface Clearance Checklist is followed, including verifying that the following issues have been adequately addressed.

- Contacting the State's One Call or equivalent utility locator service to identify underground pipelines, utility lines, and fiber optic cable;
- Contacting appropriate municipality to identify underground water and sewer lines;
- Contacting posted pipeline companies; and
- Contacting client to identify underground pipelines or other obstructions.
- Contacting client to notify Honeywell, the MDE and the EPA that excavation to the synthetic layers, or through the synthetic layers is about to occur. The anticipated date of the beginning of excavation will also be stated.

16.2 FALL PROTECTION

In the event that project team members and/or subcontractors are working more than six feet above grade and are not protected by handrails, complete floor decking or working on approved access ways, fall protection equipment will be required.

The distance above grade is measured from the employee's feet to the grade or approved work surface. Fall protection equipment will consist of an ANSI-approved full-body harness and shock-absorbing (or retractable) lanyard with double-locking d-rings.

Acceptable anchor points to which the lanyard may be attached includes, but are not limited to, the following:

- Structural beams at least six-inches in depth for one or more persons in a completed structure;

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- Pipes at least four-inches in diameter for one person;
- Pipes at least six-inches in diameter for two people;
- Nozzles at least three-inches for one person;
- Nozzles greater than three-inches for two people; and
- Permanent platform handrail post below mid-rail for one person.

16.3 WEATHER-RELATED EVENTS

Weather-related events that may impact field work include, but are not limited to, rain, thunder, lightning, flash flooding, high winds and tornados. The SSO will be responsible for determining what site work can be performed safely in the rain and at what point work will cease due to either quality or safety issues. In the event of thunder and/or lightning, all work will be suspended until 15 minutes have elapsed from the last clap of thunder or flash of lightning.

16.3.1 *Lightning Safety for Outdoor Workers*

Safety and productivity are not mutually compatible, so one must be chosen over the other. Easy choice: SAFETY FIRST! Lightning has visited most all outdoor work environments. Anticipate a high-risk situation and move to a low-risk location.

Lightning safety awareness is a priority at every outdoor facility and operation. Education is the single most important means to achieving lightning safety. The following steps are suggested:

- Monitor weather conditions in the early morning hours. Local weather forecasts -- from The Weather Channel or NOAA Weather Radio or other notably reliable source -- should be noted 24 hours prior to scheduled activities. An inexpensive portable weather radio is recommended for obtaining timely storm data.
- Suspension and resumption of work activities should be planned in advance. Understanding of SAFE shelters is essential. SAFE evacuation sites include:
 - Fully enclosed metal vehicles with windows up;
 - Substantial buildings;

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- Low ground -- seek cover in clumps of bushes; and
- Trees of uniform height, such as a forest.
- UNSAFE SHELTER AREAS include all outdoor metal objects, like power poles, fences and gates, high mast light poles, metal bleachers, electrical equipment, mowing and road machinery. AVOID solitary trees. AVOID water. AVOID open fields. AVOID high ground and caves.
- Lightning's distance from you is easy to calculate: If you hear thunder, the associated lightning is within audible range ... about 6-8 miles away. The distance from Strike A to Strike B also can be 6-8 miles. Suspend activities, allowing sufficient time to get to shelter. Of course, different distances to safety will determine different times to suspend activities. A good lightning safety motto is:
- *If you can see it (lightning), flee it; if you can hear it (thunder), clear it.*
- If you feel your hair standing on end, and/or hear "crackling noises," you are in lightning's electric field. If caught outside during close-in lightning, immediately remove metal objects (including baseball cap), place your feet together, duck your head, and crouch down low in baseball catcher's stance with hands on knees.
- Wait a minimum of 30 minutes from the last observed lightning or thunder before resuming activities. Be extra cautious during this phase as the storm may not be over.
- People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately if you are qualified to do so. Get emergency help promptly.

During rain, lightning and/or thunder events, site workers should seek shelter in either a building or vehicle. In the event of a tornado, site workers should seek shelter in a building, expect trailers, or in a low-lying area.

16.3.2

Noise

Employees performing any noisy task, such as but not limited to, operating heavy equipment, using power tools, or employees working nearby the person performing the task will wear hearing protection consisting of either earplugs or earmuffs. Personnel operating heavy equipment, such as pile driving equipment and excavators with hoe-ram attachments will also wear hearing protection.

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17.0

CONFINED SPACE ENTRY PROCEDURES

Entry into existing Site confined spaces is strictly forbidden [by untrained personnel and without a confined space permit issued by the Site Safety Officer](#). Entry into [HMS](#) confined spaces is anticipated [for](#) the Harbor Point construction activities. [HMS confined space signage is current at the Site](#). If a project task or activity involves entry into a permit-required confined space or if there is a question as to whether or not a job task or activity involves a permit-required confined space, the PM or SSO will contact the Project Health and Safety Coordinator for assistance.

18.0

SPILL CONTAINMENT PROGRAM

The spill containment program for this project will involve the use of preventative measures in order to reduce the potential for environmental releases. These preventative measures will include the following:

- Equipment inspection;
- Staging equipment on containment pads;
- Secondary containment for fuel storage tanks; and
- General housekeeping practices; and
- Appropriately sized and stocked spill/release kits/containers.

If project activities involve the use of drums or other containers, the drums or containers will meet the appropriate DOT regulations and will be inspected and their integrity assured prior to being moved. Operations will be organized so as to minimize drum or container movement. Drums or containers that cannot be moved without failure will be over-packed into an appropriate container.

Additionally, refer to the [site-specific](#) Spill Prevention and [Response Plan dated November 2013](#).

19.0

SITE COMMUNICATION

Telephones and two-way radios will be used for communication between the project team and the client. Cell phones may be used as part of the communication method. However, cell phones cannot be used while driving any type of vehicle.

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20.0

**COMMUNICATION AND REVIEW OF SITE-SPECIFIC HASP PLAN
(HAZARD COMMUNICATION)**

An initial review of the site-specific HASP will be held either prior to mobilization or after mobilization but prior to commencing work at the site to communicate HASP details and answer questions to individuals working at the site. Daily tailgate safety meetings will be held each morning to review work practices for the day and to discuss safety issues. Any new hazard or safety information will be disseminated at the daily tailgate safety meeting or as needed throughout the day.

21.0 ***EMERGENCY RESPONSE PLAN***

This section describes possible contingencies and emergency procedures to be implemented at the site.

21.1 ***PERSONNEL ROLES AND LINES OF AUTHORITY***

The SSO has primary responsibility for site evacuation and notification in the event of an emergency situation. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve the evacuation of personnel from the site area and ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. If the SSO is not available, the Project Health and Safety Coordinator will assume these responsibilities. Subcontractors are responsible for assisting the SSO in their mission within the parameters of their scope of work.

21.2 ***EVACUATION ROUTES AND PROCEDURES***

In the event of an emergency, it is important to be aware of the prevailing wind direction and evacuate upwind or crosswind.

21.3 ***ASSEMBLY POINTS***

The primary Assembly Point is in front of the construction trailer. The secondary Assembly Point is in front of the spill trailer. In the event of an emergency requiring evacuation to an Assembly Point, the SSO will be responsible to account for the presence of all project team members and subcontractors on-site at the time of the emergency.

22.0 *EMERGENCY RESPONSE*

22.1 *NOTIFICATION OF SITE EMERGENCIES*

The Contractor must have systems in place for responding to all emergencies. The written HASP should note the potential emergencies associated with this specific project and describe methods anticipated to perform the following:

- Notify appropriate individuals, authorities, and/or health care facilities of the site activities and anticipated duration prior to the mobilization of equipment;
- Ensure that, at a minimum, the following safety and monitoring equipment is available at the site: first aid supplies, fire extinguishers, a non-phosphate soap and water solution and potable water rinse, and potable water for eye washing;
- Ensure that a sufficient number of cellular telephones are present during site activities for emergency response and office communications. If deemed appropriate by the SSO or HSC, two-way radios may also be used on site for communication among workers;
- Have working knowledge of all safety equipment available at the site;
- Ensure that a map, which details the most direct route to the nearest hospital, is readily available with the emergency telephone numbers;
- The Contractor's HASP shall contain a list of emergency response telephone numbers. This list will be maintained at the work site by the SSO or his designee in a readily accessible location for use in case of an emergency.

22.2 *DIRECTIONS TO THE NEAREST HOSPITAL*

The Contractor's HASP will include a map and written directions to the Johns Hopkins Hospital Emergency Entrance located at 1800 Orleans Street (Appendix A). The SSO will identify site egress routes during the daily briefing prior to commencement of that day's work.

23.0

EVACUATION PROCEDURES

Where site evacuation could possibly be a health and safety consideration, the Contractor's HASP should define the primary evacuation route and also identify an alternate evacuation route based on the scheduled site operations. The two routes will be established independent of each other in the event of an obstruction on a particular route. A system should be in place to ensure that employees can easily evacuate the work area. It is recommended that daily evacuation routes will be reviewed with site workers at the start of each day.

24.0

INCIDENT REPORTING PROCEDURE

In the event that a health and safety incident occurs, it is imperative that specific reporting procedures be followed so that appropriate corrective action can be taken by the HSC and the PM for the duration of the project. The Contractor's HASP must define methods by which accidents are reported, investigated, and prevented in the future. It is recommended that the Contractor's PM and the HSC investigate the facility/site conditions to determine: (1) the severity of the incident; (2) the cause of the incident; (3) the means to prevent the incident from recurring; and, (4) personnel responsible for implementing the corrective action.

The following [additional](#) personnel shall be [identified in the Contractor's HASP and](#) notified within a reasonable timeframe, but this should be no later than 1 hour after any incident.

- [Jonathan Flesher, HPD, \(cell: 443-463-3937\)](#)
- Ken Biles, CH2M Hill, (cell: 443-271-6694);
- Bob Steele, CH2M Hill (cell: 609-625-1780)
- Bill Berlett, CH2M Hill (cell: 847-770-0209)
- Chris French, Honeywell (cell: 973-216-7506)

The Contractor's HASP will include an incident reporting form so that consistent and appropriate information is obtained regarding employee exposures or accidents. The form will be filed at the Contractor's office with the employee's medical and safety records to serve as documentation of the incident and the actions taken.

25.0

INCIDENT INVESTIGATIONS

All safety events, including incidents, will be recorded and documented within 24 hours of an incident. All incidents will be reported to Bill Berlett (see above) and investigated in a timely manner. Incidents will require entry into the Honeywell Event Tracking System by CH2M Hill. The Safety Team will schedule the investigation and include the SSO, the Project Manager, project supervision (subcontractors, and client), the injured/involved employee(s) and the Project Health and Safety Coordinator. Root cause analysis will be performed to assess the apparent cause and identify corrective measures to be implemented to prevent re-occurrence. The last page of the Incident Form is used to document the investigation.

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26.0

CERTIFICATION OF FAMILIARITY WITH PLAN BY SITE PERSONNEL

By signing below, signee certifies that they have read, understand and will abide by the contents of this HASP.

Name	Signature	Company	Date

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Figures

Figure 1
Site Location Map

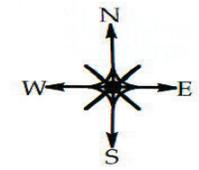
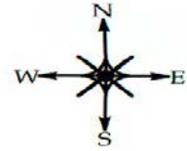


Figure 2
Construction Air Monitoring Locations
Harbor Point
Baltimore, Maryland



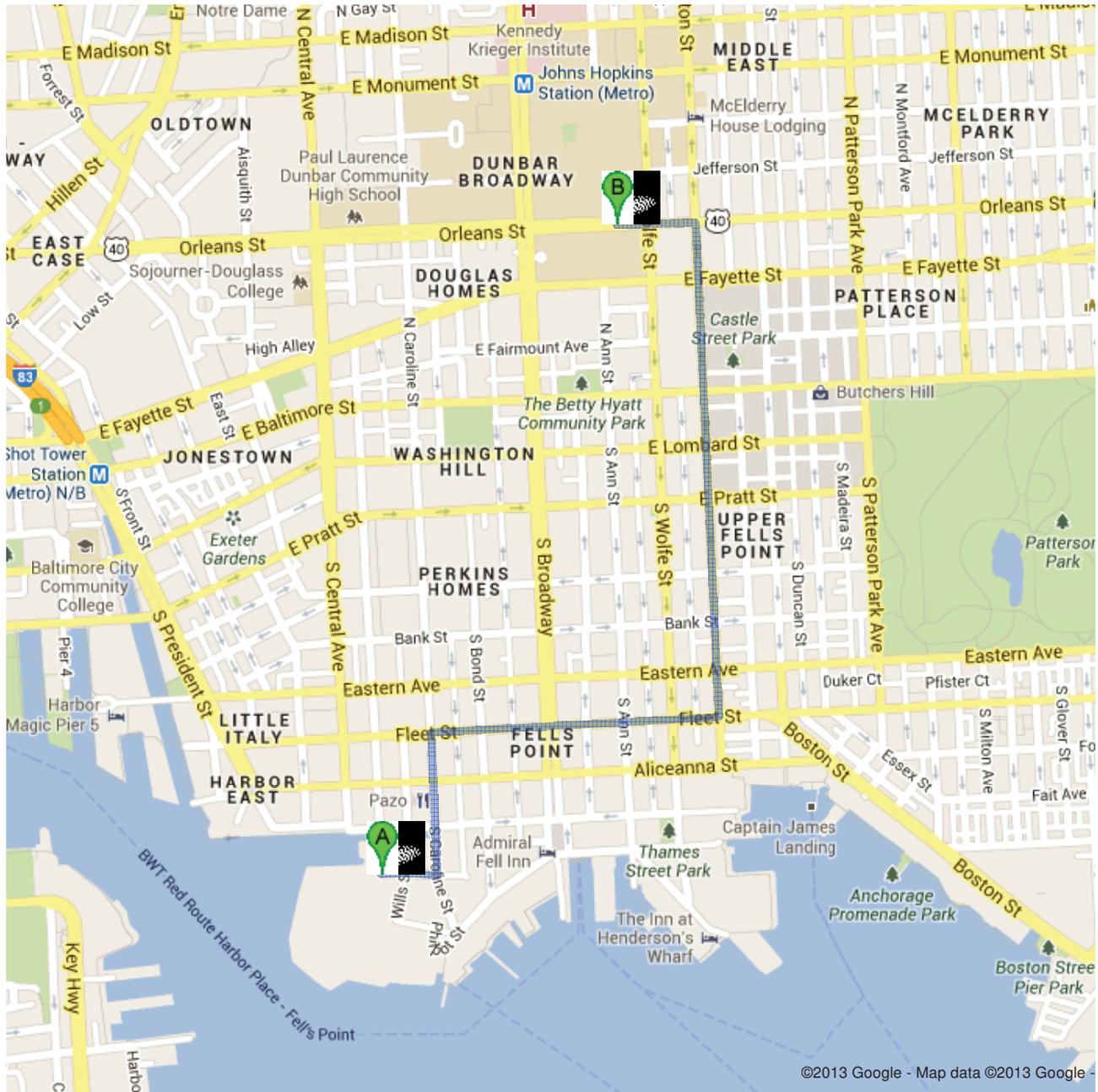
MET - Meteorological Station
PAM - Perimeter Air Monitor
OAM - Off-site Air Monitor
1 - City Recreation Pier
2 - Baltimore National Aquarium



Appendix A
Map to Hospital



Directions to 1800 Orleans St, Baltimore, MD 21287
1.6 mi – about 9 mins



 1000 Dock St, Baltimore, MD 21231

-
1. Head **east** on **Dock St** toward **Wills St**
Restricted usage road go 443 ft
total 443 ft
 -  2. Take the 1st left onto **S Caroline St**
About 1 min go 0.2 mi
total 0.3 mi
 -  3. Take the 3rd right onto **Fleet St**
About 2 mins go 0.4 mi
total 0.7 mi
 -  4. Turn left onto **S Washington St**
About 4 mins go 0.7 mi
total 1.5 mi
 -  5. Turn left onto **Orleans St**
Destination will be on the right go 0.1 mi
About 1 min total 1.6 mi

 1800 Orleans St, Baltimore, MD 21287

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

Map data ©2013 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

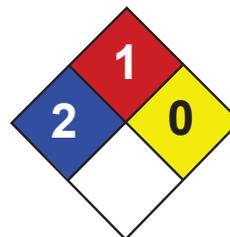
Appendix B
Job Hazard Analysis Form

Risk Matrix

What could go wrong? What is the worst thing that could happen if something goes wrong?

			Hazard Severity				
			1	2	3	4	5
			INSIGNIFICANT negligible or no injury could result	MINOR minor injury requiring only first aid	MODERATE Injury resulting in lost time could occur	HIGH Serious injury or death could occur	VERY HIGH multiple deaths could occur
Likelihood	1	VERY UNLIKELY	1	2	3	4	5
	2	UNLIKELY	2	4	6	8	10
	3	POSSIBLE	3	6	9	12	15
	4	LIKELY	4	8	12	16	20
	5	VERY LIKELY	5	10	15	20	25

Appendix C
Material Safety Data Sheets
(Example)



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

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

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.

MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

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

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:

Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:

Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:

Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:

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

Large Spill:

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

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

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

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

TWA: 0.5 (mg/m³) from ACGIH (TLV) [United States] TWA: 1 (mg/m³) from OSHA (PEL) [United States] TWA: 0.5 (mg/m³) from NIOSH [United States] TWA: 0.5 (mg/m³) [United Kingdom (UK)] TWA: 0.5 (mg/m³) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

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

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

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

Corrosivity: Not available.

Special Remarks on Reactivity:

Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation, sneezing, redness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconiosis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations**Waste Disposal:**

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information**Federal and State Regulations:**

Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

Other Regulations:

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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MATERIAL SAFETY DATA SHEET

ERA A Waters Company

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER: ERA BUSINESS PHONE: 303-431-8454
ADDRESS: 16341 Table Mountain Parkway FAX: 303-421-0159 EMAIL: info@eraqc.com
Golden, CO, 80403 U.S.A. CHEMICAL EMERGENCY PHONE: 352-535-5053 (INFOTRAC)

Product Name(s): Hexavalent Chromium 1000 mg/L
Catalog / Part Number(s): 019, 973, 186004178
MSDS Creation Date: November 22, 2005
Revision Date: July 18, 2012 MSDS Reference Number: 019

SECTION 2: HAZARDS IDENTIFICATION

Toxic. Harmful by inhalation. May cause cancer. Risk of cancer depends on duration and level of exposure. The matrix of each standard is a K2Cr2O7/water mixture listed below which is classified as dangerous by Directive 199/45/EC. Use only as directed and in accordance with good laboratory practices.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL INGREDIENT NAME	CAS NUMBER	EC NUMBER	% BY WT.	EXPOSURE LIMITS		EU LABEL
				OSHA	ACGIH	HAZARD LABEL
Potassium dichromate	7778-50-9	231-906-6	≤0.1	0.1 mg/m3 PEL	0.05 mg/m3	

Notes: This standard is 125 mL of a mixture containing potassium dichromate salt with the balance being ≥99.9% water. Hexavalent chromium is a known human carcinogen. Exposure Limits are 8-Hour TWA (Time Weighted Average) unless designated C (Ceiling) or STEL (Short Term Exposure Limit). Other components considered Non-Hazardous under OSHA 1910.1200 (HazCom) as they are not present in concentrations exceeding 1% (or 0.1% if considered a known or potential carcinogen). Material Use: Analytical reagent or certified reference material used in laboratories. Uses also include research and development.

SECTION 4: FIRST-AID MEASURES

Inhalation: Remove to fresh air.
Skin Contact: Flush with water.
Eye Contact: Immediately flush with water for a minimum of 15 minutes.
Ingestion: Get medical attention
After following first aid measures, seek medical attention.

SECTION 5: FIRE-FIGHTING MEASURES

Flammable Properties: Not flammable.
Extinguishing Media: Dry chemical, carbon dioxide or appropriate foam.
Unique Aspects Contributing To a Fire: None.
Special Fire Fighting Procedures: None.
Note: As in any fire, wear self-contained breathing apparatus, and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Absorb liquid with spill pillow or other absorbent. Ventilate and wash spill site after material pick up is complete. Place wastes into closed containers for proper disposal.

SECTION 7: HANDLING AND STORAGE

Handle in accordance with good laboratory practices. Store in a dry well-ventilated place. This product is intended for use only by people trained in the safety and handling of chemicals and laboratory preparations.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Handle in accordance with good laboratory practices. Wash thoroughly after handling.
Respiratory Protection: Not normally needed. If exposure limits are exceeded, use approved respirator.
Eye Protection: Safety glasses with side shields or safety goggles
Skin Protection: Neoprene or other chemical resistant gloves.
Engineering Controls: Not normally needed. If exposure limits are exceeded, work in a fume hood.

MATERIAL SAFETY DATA SHEET

ERA A Waters Company

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

DATA FOR MATRIX:

Appearance:	Clear to yellow	Specific Gravity:	NA	Melting Point:	NA
Physical State:	Liquid	Flash Point:	NA	Vapor Pressure:	NA
Odor:	NA	Explosion Limits:	NA	Vapor Density (air=1):	NA
pH:	NA	Boiling Point:	NA	Solubility in Water:	Soluble

SECTION 10: STABILITY AND REACTIVITY

Hazardous Polymerization Will Not Occur May Occur Stability: Stable Unstable
Hazardous Decomposition/Combustion Products: NA
Conditions and Materials to Avoid: Oxidizing agents.

SECTION 11: TOXICOLOGICAL INFORMATION

Primary Route(s) of Exposure Under Normal Use: Skin contact: may cause skin irritation or be harmful if absorbed through skin. Eye contact: may cause eye irritation. Inhalation: harmful if inhaled, may be irritation to mucous membranes and upper respiratory tract. Ingestion: harmful if swallowed.

Target Organ(s): Lungs, kidneys, blood.

Acute Effects: Harmful by inhalation. May cause sensitization by inhalation and skin contact. Ingestion can cause vomiting.

Potassium dichromate: Oral, child: LDLO=26 mg/kg; Oral, man: LDLO=143 mg/kg; Oral, rat:LD50=25 mg/kg; Skin, rabbit:LD50=14 mg/kg.

Chronic Effects: Carcinogen; Teratogen; May cause heritable genetic damage. Reproductive hazard; May impair fertility. May cause harm to the unborn child.

Other Information: Chemical Ingredient(s) potassium dichromate is classified as carcinogen(s) by OSHA, IARC (Group 1), NTP, ACGIH (A1), or California. California Prop-65: This product is or contains chemicals known to the state of California to cause cancer.

SECTION 12: ECOLOGICAL INFORMATION

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Avoid release into the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

To determine proper disposal, consult applicable federal, state and local environmental control regulations.

SECTION 14: TRANSPORT INFORMATION

Shipment Name/Type: Non-hazardous for transport.

UN Number: NA Shipping/Hazardous Class: NA Packing Group: NA

Shipping regulations are based on combinations of criteria such as quantity, class and packaging according to DOT, IATA and (49) CFR.

SECTION 15: REGULATORY INFORMATION

EU Symbol of Danger: Toxic (T) concentration ≤ 0.1 C $< 0.2\%$

EU Risk Phrases: May cause cancer [R45]; May cause heritable genetic damage [R46]; Harmful by inhalation [R20].

U.S. TSCA: Listed

Canada: This product has been classified according to the hazard criteria of the CPR and this MSDS contains all the information required by the CPR.

SECTION 16: OTHER INFORMATION

United States EPA Regulatory Information:	NFPA Rating:	Health: 3	Flammability: 0	Reactivity: 0
SARA 313: Yes (0.1% deminimis)	HMIS Rating:	Health: 3	Flammability: 0	Physical Hazard: 0
CERCLA RQ: 10 lbs				

NOTE: NA = Data not available, not established, determined or not pertinent.

DISCLAIMER: The information contained herein has been compiled from data presented in various technical sources believed to be accurate. This information is intended to be used only as a guide and does not purport to be complete. ERA makes no warranties and assumes no liability in connection with the use of this information. It is the user's responsibility to determine the suitability of this information and to assure the adoption of necessary precautions.

Appendix D
Daily Safety Meeting Form

Daily Safety Meeting Documentation Form

Project Name: Project Number: Meeting Date & Time: Meeting Leader:

Document Routing	
FSO	Retain copy in site health & safety file.

What work will be conducted on site today and by whom?

Work Task	Conducted By

What overlapping operations/simultaneous operations will occur today?

--

Any follow-up from previous Major Incidents, Near Misses, Unsafe Acts or Unsafe Conditions discussed today?

--

List any new / short-service personnel on site today?

--

Safety Meeting Core Topics - All Site Workers <i>and</i> Visitors

- What PPE is required in order to enter the work zone?
- What are the potential hazards associated with today's work. How will they be managed?
- What are the potential impacts of planned activities to: Visitors? Nearby workers? Public?
- Is everyone aware that they are empowered to stop work if something is questionable or unsafe?
- What happens and who do you contact if there is an injury or emergency? If working at an active facility, how will you be alerted of an emergency and what will you do?
- Who do you contact if you have questions, or before deviating from written procedures?
- Where is fire extinguisher, first aid kit, eyewash, safety shower located?
- Are any work permits required? Are permits completed and posted in plain view of workers?
- Have all excavation / borehole locations been cleared of underground utilities/structures, in accordance with ERM and client-specific subsurface clearance procedures?
- Have all tools / equipment / vehicles been inspected today to ensure safe operating condition?
- Will a follow-up safety meeting be conducted after lunch?
- Has anything unexpected or out-of-the-ordinary occurred on this job recently to share?
- What is the worst that could happen if something goes wrong today?

Daily Safety Meeting Documentation Form

Project Name: Project Number: Meeting Date & Time: Meeting Leader:

Safety Topics Related to ERM 2011/2012 Incident Trends - All Site Workers *and* Visitors

- What activities occurring today could result in hand injuries? Is everyone aware that the use of fixed open-blade knives is not permitted without cut-resistant gloves?
- Does the site pose natural hazards to be avoided? Thorny underbrush/ticks/poison ivy?
- What areas of the site have slip/trip/fall hazards? Are everyone's work boots in good shape?
- How will the on-site team avoid vehicle accidents? Is everyone aware that taking their eyes off the road for more than 2 seconds (for any reason) leads to vehicle accidents?

Who attended the safety meeting today (employees, subcontractors, visitors)?

Name	Company	Signature	Sign-In Initials*	Sign-Out Initials**

* Initials in this space verify that the employee is fit for performing work.

**Initials in this space verify that the employee was uninjured during the workday.

Who visited the site today but was not involved in work activities?

Name	Company	Arrival Time