Health and Safety Plan
for
Interim Offshore Monitoring Program

PORTSMOUTH NAVAL SHIPYARD
Kittery, Maine

Northern Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0815

July 2002

TETRA TECH NUS, INC.

HEALTH AND SAFETY PLAN

INTERIM OFFSHORE MONITORING PROGRAM

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Northern Division
Environmental Branch Code 18
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed to provide practices and procedures for Tetra Tech NUS, Inc. (TtNUS) and subcontractor personnel engaged in investigatory activities during the Interim Offshore Monitoring Program at the Portsmouth Naval Shipyard (PNS), Kittery, Maine. This HASP must be used in conjunction with the TtNUS Health and Safety Guidance Manual. Both of these documents must be present at the site during the performance of all site activities. The Guidance Manual provides detailed information pertaining to the HASP as well as applicable TtNUS Standard Operating Procedures (SOPs). In addition, the subcontractor will develop a site-specific HASP to address sampling and diving operations. This HASP and the contents of the Guidance Manual were developed to comply with the requirements stipulated in 29 CFR 1910.120 (OSHA's Hazardous Waste Operations and Emergency Response Standard), OSHA's Construction Industry Standards, 29 CFR 1926.

This HASP has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical hazards which may be associated with the proposed work at the site. The HASP will be modified, if new information becomes available. All changes to the HASP will be made with the approval of the TtNUS Project Health and Safety Officer (PHSO) and the TtNUS Health and Safety Manager (HSM). Requests for modifications to the HASP will be directed to the PHSO, who will determine, if the changes are necessary. The PHSO will notify the Project Manager (PM), who will notify all affected personnel of changes.

Normandeau Associates Inc. (Normandeau) has prepared a Health and Safety Plan for Field Collection of Chemistry and Biology Samples for the Interim Offshore Monitoring Program at PNS. This plan is included as Attachment IV at the end of this plan.

1.1 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibility for site safety and health for TtNUS and subcontractor employees engaged in onsite activities. Personnel assigned to these positions will exercise the primary responsibility for all onsite health and safety. These persons will be the primary points of contact for any questions regarding the safety and health procedures and the selected control measures that are to be implemented for onsite activities.

- The TtNUS PM is responsible for the overall direction of health and safety for this project.

- The Normandeau Program Manager has overall responsibility for the safe performance of tasks designated in Work Plan (performed by Normandeau personnel) and is responsible for providing the necessary resources to implement and enforce the requirement of this HASP.

- The PHSO is responsible for developing this HASP in accordance with applicable OSHA regulations. Specific responsibilities include:

  i. Providing information regarding site contaminants and physical hazards associated with the site and tasks to be conducted.
  ii. Establishing air monitoring and decontamination procedures.
  iii. Assigning personal protective equipment based on task and potential hazards.
  iv. Determining emergency response procedures and emergency contacts.
  v. Stipulating training requirements and reviewing appropriate training and medical surveillance certificates.
  vi. Providing standard work practices to minimize potential injuries and exposures associated with hazardous waste work.
  vii. Modify this HASP, as it becomes necessary.

- The TtNUS Field Operations Leader (FOL) is responsible for implementation of the HASP with the assistance of an appointed Site Safety Officer (SSO). The FOL manages field activities, executes the work plan, and enforces safety procedures as applicable to the work plan.

- The SSO supports site activities by advising the FOL on all aspects of health and safety on site. These duties may include:

  i. Coordinates all health and safety activities with the FOL.
  ii. Selects, applies, inspects, and maintains personal protective equipment.
  iii. Establishes work zones and control points in areas of operation.
  iv. Implements air monitoring program for onsite activities.
  v. Verifies training and medical clearance of onsite personnel status in relation to site activities.
  vi. Implements Hazard Communication, Respiratory Protection Programs, and other associated health and safety programs as they may apply to site activities..
  vii. Coordinates emergency services.
  viii. Provides site-specific training for all onsite personnel.
  ix. Investigates all accidents and injuries (see Attachment I - Illness/Injury Procedure and Report Form)

x. Provides input to the PHSO regarding the need to modify this HASP, or applicable health and safety associated documents as per site-specific requirements.

- Compliance with the requirements stipulated in this HASP is monitored by the SSO and coordinated through the TtNUS HSM.

Note: In some cases one person may be designated responsibilities for more than one position. For example, for the PNS Interim Offshore Monitoring activities, the FOL may also be responsible for SSO duties. This action will be performed only as credentials, experience, or the tasks involved permits.

- The Site Safety and Health Officer (SSHO) for Normandeau has the authority to suspend field operations if it is determined conditions in the field are unsafe. The SSHO is responsible for notifying the Normandeau Project Manager when:

  i. There are either unexpected hazardous conditions, or deviations from the HASP.
  ii. Maintaining project safety and health records
  iii. Ensuring that protective clothing and equipment are properly used and maintained
  iv. Ensuring that personnel performing field work have completed the required training
  v. Conducting a post field activity debriefing to identify problems encountered and lessons learned.

1.2 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: Portsmouth Naval Shipyard
Kittery, Maine

Client Contact: Marty Raymond
Phone Number: (207) 438-2536

Scheduled Activities: This activity will be divided into a multi-task operation, including the tasks of sediment and biota sampling. Further detail on these and other site tasks can be found in Section 4.0 of this HASP.

Dates of scheduled activities: Site activities are expected to begin in the Summer 2002 and will continue until project completion.

Project Team:

TtNUS Management Personnel:	Discipline/Tasks Assigned:
Aaron Bernhardt	Project Manager (PM)
Aaron Bernhardt	Field Operations Leader (FOL)
Aaron Bernhardt	Site Safety Officer (SSO)
Matthew M. Soltis, CIH, CSP	CLEAN Health and Safety Manager
Donald J. Westerhoff, CSP	Project Health and Safety Officer (PHSO)

Normandeau Personnel:	Discipline/Tasks Assigned:
Erik Foldotto	Normandeau Program Manager / SSO
Robert Hasevlat	Health and Safety Director
Mr. Fred Evans	Remedial Project Manager

Additional Normandeau Field Team Members:

Al Frizzell	Cory Francis
Gary Smith	Sandi Sprague
Kim Payne	Bob Helmers
Wayne Lovil	Wes Cornelison

Non-TtNUS/Normandeau Personnel	Affiliation/Discipline/Tasks Assigned
Texas A&M University	Analytical Laboratory

Hazard Assessment (for purpose of 29 CFR 1910.132) for HASP preparation has been conducted by:
Donald J. Westerhoff, CSP

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a planning effort to direct and guide field personnel in the event of an emergency. All site activities will be coordinated with the client contact, Marty Raymond. In the event of an emergency that cannot be mitigated using onsite resources, personnel will contact the appropriate emergency response agencies. It has been determined that the majority of potential emergency situations, including any that would occur while underwater, would be better supported by outside emergency responders. Based on this determination, TtNUS and subcontractor personnel will not provide emergency response support beyond the capabilities of onsite response. Workers who are ill or who have suffered a non-serious injury may be transported by site personnel to nearby medical facilities, provided that such transport does not aggravate or further endanger the welfare of the injured/ill person. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of site operations, which ensures adequate emergency response time. Navy contact Marty Raymond will be notified anytime outside response agencies are contacted. This Emergency Action Plan conforms to the requirements of 29 CFR 1910.38(a), as allowed in 29 CFR 1910.120(l)(1)(ii).

TtNUS will, through necessary services, provide the following emergency action measures:

- Initial stage fire fighting support and prevention
- Initial spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Initial medical support for injuries or illnesses requiring basic first-aid
- Site control and security measures as necessary

2.2 PRE-EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, it is anticipated that emergencies resulting from chemical, physical, or fire hazards are unlikely given the nature of site activities. Nonetheless, to minimize and eliminate the potential for any emergency situations, pre-emergency planning activities will include the following (which are the responsibility of the FOL):

- Coordinating with local Emergency Response personnel to ensure that TtNUS emergency action activities are compatible with existing emergency response procedures. PNS Emergency Services will be notified of scheduled events and activities. This is most imperative in situations where their services may be required.

- Establishing and maintaining information at the project staging area for easy access in the event of an emergency. This information will include the following:

  - Chemical Inventory (of chemicals used onsite), with Material Safety Data Sheets.
  - Onsite personnel medical records (Medical Data Sheets).
  - A log book identifying personnel onsite each day.
  - Hospital route maps with directions (these should also be placed in each site vehicle).
  - Emergency Notification - phone numbers.

The TtNUS FOL will be responsible for the following tasks:

- Identifying a chain of command for emergency action.

- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.

- Periodically performing practice drills to ensure site workers are familiar with incidental response measures.

- Providing the necessary equipment to safely accomplish identified tasks.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Emergency situations that may be encountered during site activities will generally be recognized by visual observation. To adequately recognize chemical exposures, site personnel must have a clear knowledge of signs and symptoms of exposure associated with site contaminants. This information is provided in Table 6-1. Tasks to be performed at the site, potential hazards associated with those tasks and the recommended control methods are discussed in detail in Sections 5.0 and 6.0. Additionally, early recognition of hazards will be supported by periodic site surveys to identify any situation predisposed to an

emergency. The FOL will be responsible for performing surveys of work areas prior to initiating site operations and periodically while operations are being conducted. Survey findings will be documented by the FOL in the site logbook, however, all site personnel will be responsible for reporting hazardous situations. Where potential hazards exist, TtNUS will initiate control measures to prevent adverse effects to human health and the environment.

The above actions will provide early recognition for potential emergency situations, and allow TtNUS to initiate necessary control measures. However, if the FOL determines that control measures are not sufficient to eliminate the hazard, TtNUS will withdraw from the site and notify the appropriate response agencies listed in Table 2-1.

2.3.2 Prevention

TtNUS and subcontractor personnel will minimize the potential for emergencies by following this HASP, the Health and Safety Guidance Manual, recognized boating safety practices, and applicable OSHA regulations. Periodic site surveys of work areas and correction of any identified deficiencies prior to the commencement of that day's activities by the FOL will also assist in prevention of illness/injuries when hazards are recognized early and control measures initiated.

2.4 EVACUATION ROUTES, PROCEDURES, AND PLACES OF REFUGE

An evacuation will be initiated whenever recommended hazard controls are insufficient to protect the health, safety or welfare of site workers. Specific examples of conditions that may initiate an evacuation include, but are not limited to the following: severe weather conditions; fire or explosion; evidence of personnel overexposure to potential site contaminants, and significant boat damage or capsizing.

In the event of an emergency requiring evacuation, all personnel will immediately stop activities and either report to the designated safe place of refuge (unless doing so would pose additional risks) or notify appropriate rescue agencies (such as the U.S. Coast Guard for significant incidents while underwater). When evacuation to the primary place of refuge is not possible, personnel will proceed to a designated alternate location and remain until further notification from the TtNUS FOL. Safe places of refuge will be identified prior to the commencement of site activities by the FOL and will be conveyed to personnel as part of the pre-activities briefing session. This information will be reiterated during daily safety meetings and indicated on the Safe Work Permits. Whenever possible, the safe place of refuge will also serve as the telephone communications point for that area. During an evacuation, personnel will remain at the refuge location until directed otherwise by the TtNUS FOL or the on-site Incident Commander of the

Emergency Response Team. The FOL will perform a head count at this location to account for and to confirm the location of all site personnel. Emergency response personnel will be immediately notified of any unaccounted personnel. The FOL will document the names of all personnel onsite (on a daily basis) in the site Health and Safety Logbook. This information will be utilized to perform the head count in the event of an emergency. Evacuation procedures will be discussed during the pre-activities training session, prior to the initiation of project tasks. Evacuation routes from the site and safe places of refuge are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required.. As a result, assembly points will be selected and communicated to the workers relative to the site location where work is being performed. Evacuation should always take place in an upwind direction from the site and away from water bodies.

In the event of significant incidents which occur while underwater, personnel will immediately notify the U.S. Coast Guard (603/433-7324) and alert them of the event. Personnel will follow the direction and guidance provided by the Coast Guard.

2.5 DECONTAMINATION PROCEDURES / EMERGENCY MEDICAL TREATMENT

During any site evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will not be performed if the incident warrants immediate evacuation. However, it is unlikely that an evacuation would occur which would require workers to evacuate the site without first performing the necessary decontamination procedures.

TtNUS personnel will perform rescue operations from emergency situations and may provide initial medical support for injury/illnesses requiring only "Basic First-Aid" level support, and only within the limits of training obtained by site personnel. Basic First-Aid is considered treatment that can be rendered by a trained first aid provider at the injury location and not requiring follow-up treatment or examination by a physician (for example; minor cuts, bruises, stings, scrapes, and burns). Not included as Basic First-Aid are second or third degree burns, cuts, lacerations requiring stitches or butterfly bandaging, heat exhaustion, severe poisonous plant or insect bite reactions. Personnel providing medical assistance are required to be trained in First-Aid and in the requirements of OSHA's Bloodborne Pathogen Standard (29 CFR 1910.1030). A combination of personnel from TtNUS and/or the University of Rhode Island (NORMANDEAU) will be available to provide First-Aid. Medical attention above First-Aid level support will require assistance from the designated emergency response agencies. **If the emergency involves personnel exposures to chemicals, follow the steps provided in Figure 2-1.**

FIGURE 2-2
EMERGENCY RESPONSE PROTOCOL

The purpose of this protocol is to provide guidance for the medical management of injury situations.

In the event of a personnel injury or accident:

- Rescue, when necessary, employing proper equipment and methods.
- Give attention to emergency health problems -- breathing, cardiac function, bleeding, and shock.
- Transfer the victim to the medical facility designated in this HASP by suitable and appropriate conveyance (i.e. ambulance for serious events)
- Obtain as much exposure history as possible (a Potential Exposure report is attached).
- If the injured person is a Tetra Tech NUS employee, call the medical facility and advise them that the patient(s) is/are being sent and that they can anticipate a call from the WorkCare physician. WorkCare will contact the medical facility and request specific testing which may be appropriate. WorkCare physicians will monitor the care of the victim. Site officers and personnel should not attempt to get this information, as this activity leads to confusion and misunderstanding.
- Call WorkCare at 1-800-455-6155 and enter Extension 109, or follow the voice prompt for after hours and weekend notification and be prepared to provide:
  - Any known information about the nature of the injury.
  - As much of the exposure history as was feasible to determine in the time allowed.
  - Name and phone number of the medical facility to which the victim(s) has/have been taken.
  - Name(s) of the involved Tetra Tech NUS, Inc. employee(s).
  - Name and phone number of an informed site officer who will be responsible for further investigations.
  - Fax appropriate information to WorkCare at (714) 456-2154.
- Contact Corporate Health and Safety Department (Matt Soltis) at 1-800-245-2730.
- As data is gathered and the scenario becomes more clearly defined, this information should be forwarded to WorkCare.

WorkCare will compile the results of all data and provide a summary report of the incident. A copy of this report will be placed in each victim's medical file in addition to being distributed to appropriately designated company officials.

Each involved worker will receive a letter describing the incident but deleting any personal or individual comments. A personalized letter describing the individual findings/results will accompany this generalized summary. A copy of the personal letter will be filed in the continuing medical file maintained by WorkCare.

FIGURE 2-2 (continued)
WORKCARE

POTENTIAL EXPOSURE REPORT

Name: _____ Date of Exposure: _____

Social Security No.: _____ Age: _____ Sex: _____

Client Contact: _____ Phone No.: _____

Company Name: _____

I. **Exposing Agent**
Name of Product or Chemicals (if known):_____
_____
Characteristics (if the name is not known)
Solid Liquid Gas Fume Mist Vapor

II. **Dose Determinants**
What was individual doing?_____
How long did individual work in area before signs/symptoms developed? _____
Was protective gear being used? If yes, what was the PPE? _____
Was their skin contact? _____
Was the exposing agent inhaled?_____
Were other persons exposed? If yes, did they experience symptoms? _____

III. **Signs and Symptoms** (check off appropriate symptoms)

Immediately With Exposure:

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Nausea / Vomiting
Dizziness
Weakness

Delayed Symptoms:

Weakness
Nausea / Vomiting
Shortness of Breath
Cough
Loss of Appetite
Abdominal Pain
Headache
Numbness / Tingling

IV. **Present Status of Symptoms** (check off appropriate symptoms)

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Cyanosis
Nausea / Vomiting
Dizziness
Weakness
Loss of Appetite
Abdominal Pain
Numbness / Tingling

Have symptoms: (please check off appropriate response and give duration of symptoms)
Improved: _____ Worsened: _____ Remained Unchanged: _____

V. **Treatment of Symptoms** (check off appropriate response)
None: _____ Self-Medicated: _____ Physician Treated: _____

TABLE 2-1
EMERGENCY REFERENCE
PORTSMOUTH NAVAL SHIPYARD

Police (Shipyard)	(207) 438-2444*
Fire Department (Shipyard)	(207) 438-2333*
Ambulance (Shipyard)	(207) 438-2555*
U.S. Coast Guard	(603) 433-7324
Hospital: Portsmouth Regional Hospital	(603) 433-4042
Poison Control Center: Maine New Hampshire	 1-800-442-6305 1-800-562-8236
Base Contact: Marty Raymond	(207) 438-2536
TtNUS Project Manager Aaron Bernhardt	(412) 921-8433
TtNUS Project Health and Safety Officer Donald J. Westerhoff, CSP	(412) 921-7281
CLEAN Health and Safety Manager Matthew M. Soltis, CIH, CSP	(412) 921-8912
Normandeau Program Manager, Dr. John King	(401) 874-6182
Normandeau SSHO, Kathryn Ford	(401) 874-6182
NORMANDEAU Field Team Leaders, Bradford Hubeny or Clifford Heil	(401) 874-6182
Agency for Toxic Substances and Disease Registry (ATSDR)	(404) 639-6300

*Phone calls from Base use last 4 digits.

2.6 EMERGENCY ROUTE TO HOSPITALS

Directions to the hospitals:

On Base: Ambulatory service will be available to provide transportation to the off base Hospital in response to emergencies.

Off Base: Portsmouth Regional Hospital

Exit the Shipyard through Gate No. 1. At signal light, continue straight down Walker Street. Proceed to second set of signal lights, and continue straight until road ends at Route 1 Bypass. Enter underpass rotary on left side. Go under Route 1 Bypass and loop onto Route 1 Bypass South. Cross bridge and continue straight to traffic circle. At traffic circle, go around to the right 270 degrees, 3/4 circle from entrance to traffic circle. Exit right. Go straight through first set of lights. At second set of traffic lights, turn right onto Borthwick Ave. Ext. Follow Borthwick Ave. Ext. 1/2 to 1 mile. Portsmouth Regional Hospital will be on the right side.

A map indicating the travel route from the site to the Hospital(s) is presented as Figure 2-2.

As soon as possible, Navy contact Marty Raymond must be informed of any incident or accident that requires medical attention. Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite. If an exposure to hazardous materials has occurred, provide hazard information from Table 6-1 to medical service personnel.

2.7 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

TtNUS personnel will likely be working in close proximity to each other during planned site activities. Site personnel will initiate emergency notification to all onsite personnel by voice commands, hand signals, vehicle horns, or line of site communication to alert site personnel of an emergency. When project tasks are performed simultaneously on different sites, radios will be used to communicate emergency situations and request assistance.

If an emergency warranting evacuation occurs, the following procedures are to be initiated:

- Initiate the evacuation via appropriate and/or available communication method (hand signals, voice commands, etc.).
- Report to the designated refuge point.
- Once all non-essential personnel are evacuated, appropriate response procedures will be enacted to control the situation.
- Describe to the FOL (serving as the Incident Coordinator) pertinent incident details.

In the event that site personnel cannot mitigate the hazardous situation, the FOL will enact emergency notification procedures to secure additional assistance in the following manner:

- Contact pertinent emergency contacts listed in Table 2-1 and report the incident. Give the emergency operator the location of the emergency, the type of emergency, the number of injured, and a brief description of the incident. Stay on the phone and follow the instructions given by the operator. The operator will then notify and dispatch the proper emergency response agencies.

2.8 PPE AND EMERGENCY EQUIPMENT

A first-aid kit, eye wash units (or bottles of disposable eyewash solution) and a fire extinguisher will be maintained onsite and shall be immediately available for use in the event of an emergency. This equipment will be located in the field office or site vehicle. Personnel identified within the field crew with bloodborne pathogen and first-aid training will be the only personnel permitted to offer first-aid assistance.

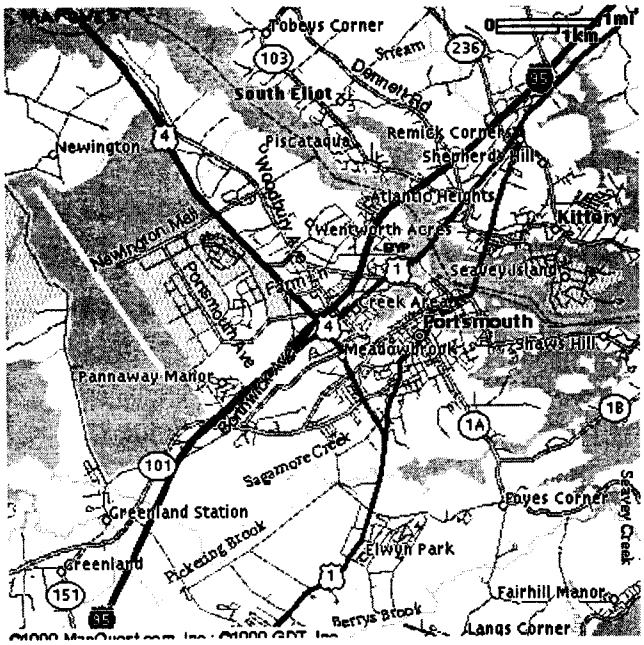
2.9 EMERGENCY CONTACTS

Prior to initiating field activities, all personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. Table 2-1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted where it is readily available to all site personnel. Facility maps should also be posted showing potential evacuation routes and designated meeting areas.

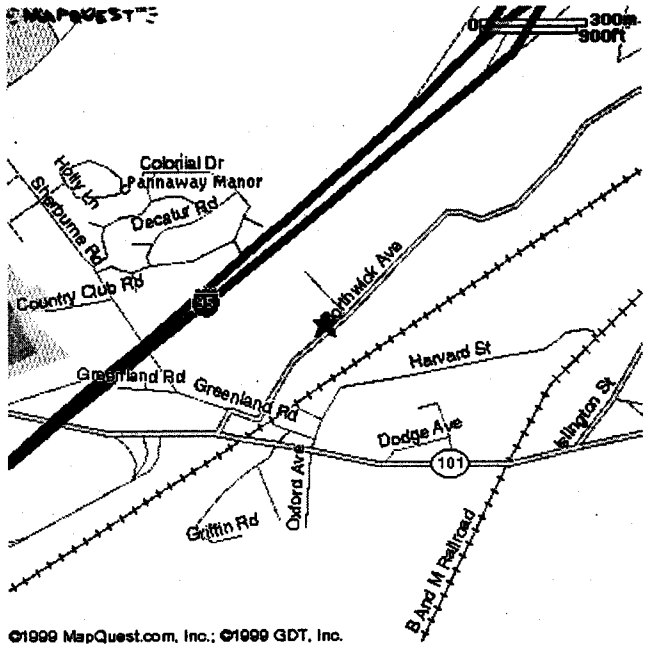
Figure 2-2

Route to Hospital

Full Route



destination



3.0 SITE BACKGROUND

A detailed discussion of the history and background of the Portsmouth Naval Shipyard, and of the individual site areas where work activities are planned to be performed under this project, is presented in the Interim Offshore Monitoring Program Work Plan. Figures 3-1 through 3-4 show the proposed monitoring station locations, sampling locations and AOCs for offshore, and reference locations associated with the planned work activities.

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4.0 SCOPE OF WORK

This section describes the project tasks that will be performed at PNS during the Interim Offshore Monitoring Program. Additionally, each task has been evaluated and the associated hazards and recommended control measures are listed in Table 5-1 of this HASP. TtNUS will be working in cooperation with Normandeau. Normandeau will be performing the offshore indigenous biota sampling and sediment collection. Normandeau has prepared standard operating procedures (SOPs) that they will be using during the scope of work.

Sampling Bottom Sediments

Surficial sediments (0 to 10 cm) will be sampled and analyzed to establish trends in the concentration of metals, organics, and other contaminants in the depositional environments around PNS. The purpose of the surface grab sampling is to develop information on chemical exposure levels within the surface sediments. Sediment samples will be collected at all monitoring stations and reference stations, where present, during all sampling rounds. Sediment sampling for porewater extraction/collection and toxicity testing will be conducted during one sampling round.

Sampling Biota

Sediment is not present in some areas of Operable Unit 4 (OU4), therefore, monitoring of mussels will be conducted as an alternative method for providing data for these locations. Mussel tissue concentrations will then be converted to sediment-based concentrations to evaluate the data against IRGs for these locations. Mussel samples will be collected at all monitoring stations and reference stations, where present, during all sampling rounds. In addition, underwater diving to collect biota samples may be necessary if initial efforts to collect samples are unsuccessful.

The planned activities involved in this effort are also presented in detail in the Interim Offshore Monitoring Program Work Plan developed for the project. If new tasks are to be performed at the site, Table 5-1 and this section will be modified accordingly. Other tasks associated with this project that will be conducted include:

- Mobilization and demobilization
- Decontamination of sampling equipment

5.0 SUMMARY OF TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES

Table 5-1 of this section serves as the primary portion of the site-specific HASP and identifies the tasks that are to be performed as part of the scope of work. This table will be modified and incorporated into this document as new or additional tasks are performed at the site. The anticipated hazards, recommended control measures, air monitoring recommendations, required Personal Protective Equipment (PPE), and decontamination measures for each site task are discussed in detail. This table and the associated control measures shall be changed, if the scope of work, contaminants of concern, or other conditions change.

Through using the table, site personnel can determine which hazards are associated with each task and at each site, and what associated control measures are necessary to minimize potential exposure or injuries related to those hazards. The table also assists field team members in determining which PPE and decontamination procedures to use as well as proper air monitoring techniques.

As discussed earlier, a Health and Safety Guidance Manual accompanies this table and HASP. The manual is designed to further explain supporting programs and elements for other site-specific aspects as required by 29 CFR 1910.120. The Guidance Manual should be referenced for additional information regarding decontamination activities, emergency response, hazard assessments, hazard communication program, medical surveillance, PPE, site control measures, standard work practices, and training requirements. Many of Tetra Tech NUS' SOPs are also provided in this Guidance Manual.

Safe Work Permits issued for sampling activities (See Section 10.10) will use elements defined in Table 5-1 as it's primary reference. The FOL in completing the Safe Work Permit will add additional site-specific information. In situations where the Safe Work Permit is more conservative than the direction provided in Table 5-1 due to the incorporation of site-specific elements, the Safe Work Permit will be followed.

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TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment *(Items in italics are deemed optional as conditions or the FOL dictates)*	Decontamination Procedures
Multi-media sampling, including sediment and biota sampling. This task includes diving operations for biota if necessary	***Chemical hazards:*** 1) Based on on-shore sampling at PNS, the primary types of contaminants are assumed to be metals (arsenic, cadmium, chromium, lead, and mercury), SVOCs (including benzo(a)pyrene), pesticides (including DDT),PCBs and Dioxins. Note that these contaminants are non-volatile and are unlikely to be a potential hazard to workers given the media to be sampled. Nonetheless, contact with sampling media should be avoided whenever possible. See Table 6-1 for more information on the chemicals of concern. 2) Transfer of contamination into clean areas ***Physical hazards:*** 3) Water hazards (drowning) 4) Lifting (strain/muscle pulls) 5) Pinches and compressions 6) Slip, trips, and falls 7) Ambient temperature extremes (cold stress) ***Natural hazards:*** 8) Insect/animal bites and stings 9) Inclement weather	1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (air, water, soils, etc.). Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods may be used. If area wetting methods are not feasible, termination of activities may be used to minimize exposure to observed airborne dusts. 2) Decontaminate all equipment and supplies between sampling locations and prior to leaving the site. 3) Employ U.S. Coast Guard approved personal flotation devices and lifeline (tie-off) procedures when working within four feet of the waters edge. Should diving operations be necessary to collect some biota samples, all operations shall be conducted consistent with 29 CFR 1910 Subpart T. All divers will be trained and certified to perform diving operations, and will be medical qualified by a licensed physician to perform anticipated activities. 4) Use multiple personnel for heavy lifts. Use proper lifting techniques. 5) Avoid moving parts or pinch points. Use tools or equipment where necessary to avoid contacting pinch points. 6) Preview work locations for unstable/uneven terrain. 7) Wear appropriate clothing for weather conditions. Provide acceptable shelter and hot liquids for field crews (if applicable). Avoid saturation of clothing with water. Additional information regarding cold stress concerns is provided in Section 4.0 of the TtNUS Health and Safety Guidance Manual. 8) Avoid nesting areas, use repellents. Report potential hazards to the SSO. Follow guidance presented in Section 4 of the TtNUS Health and Safety Guidance Manual. 9) The FOL will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.	**It is anticipated that potential contaminant concentrations at outdoor sample locations will not present an inhalation hazard.** Given the media to be sampled and the non-volatile nature of site contaminants, direct reading instruments will not be used to monitor site activities. Personnel are encouraged, however, to minimize contact with site sampling media whenever possible.	Level D protection will be utilized for the initiation of all sampling activities. Level D - (Minimum Requirements) - Standard field attire (Sleeved shirt; long pants) - Safety shoes (steel toe/shank) - Surgical style gloves (double-layered if necessary) - *U.S Coast Guard approved life vest when working over or near water* **Note:** The Safe Work Permit for this task (see Attachment II) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.	As it is anticipated that only workers' gloves will contact potentially contaminated media, personnel decontamination will consist of a removal and disposal of non-reusable gloves. Other recommended actions include: - Wash hands and face as soon as possible. Personnel decontamination will be performed onboard t the extent possible, and/or onshore at a location to be selected by the FOL and URI team leader. - Examine for ticks if sampling occurs in remote locations.
Mobilization/ Demobilization	***Physical hazards:*** 1) Lifting (strain/muscle pulls) 2) Pinches and compressions 3) Slip, trips, and falls 4) Ambient temperature extremes (cold stress) ***Natural hazards:*** 5) Insect/animal bites and stings 6) Inclement weather	1) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 2) Keep any machine guarding in place. Avoid moving parts and pinch points. Use tools or equipment where necessary to avoid contacting pinch points. 3) Preview work locations for unstable/uneven terrain. 4) Wear appropriate clothing for weather conditions. Provide acceptable shelter and hot liquids for field crews (if applicable). Avoid saturation of clothing with water. Additional information regarding cold stress concerns is provided in Section 4.0 of the TtNUS Health and Safety Guidance Manual. 5) Avoid nesting areas, use repellents. Report potential hazards to the SSO. Follow guidance presented in Section 4.0 of the TtNUS Health and Safety Guidance Manual. 6) The FOL will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.	Not required	Level D - (Minimum Requirements) - Standard field attire (Sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - *Safety glasses* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)*	Not required, however, examine for ticks if mobilizing/demobilizing to remote locations.
Decontamination of Sampling Equipment	***Chemical hazards:*** 1) Based on on-shore sampling at PNS, the primary types of contaminants are assumed to be metals (arsenic, cadmium, chromium, lead, and mercury), SVOCs (including benzo(a)pyrene), pesticides (including DDT), PCBs and Dioxins. Note that these contaminants are non-volatile and are unlikely to be a potential hazard to workers given the media to be sampled. Nonetheless, contact with sampling media should be avoided whenever possible. See Table 6-1 for more information on the chemicals of concern. 2) Decontamination fluids - Liquinox (detergent), and isopropanol ***Physical hazards:*** 3) Lifting (strain/muscle pulls) 4) Ambient temperature extremes (cold stress) 5) Slips, trips, and falls	1) and 2) Employ protective equipment to minimize contact with site contaminants and hazardous decontamination fluids. Obtain manufacturer's MSDS for any decontamination solvents used onsite. Use appropriate PPE as identified on MSDS. All chemicals used must be listed on the Chemical Inventory for the site, and site activities must be consistent with the Hazard Communication section of the Health and Safety Guidance Manual (Section 5). 3) Use multiple persons where necessary for lifting and handling sampling equipment for decontamination purposes. 4) Wear appropriate clothing for weather conditions. Provide acceptable shelter and hot liquids for field crews (if applicable). Avoid saturation of clothing with water. Additional information regarding cold stress concerns is provided in Section 4.0 of the TtNUS Health and Safety Guidance Manual. 5) Preview work locations for unstable/uneven terrain.	Use visual observation to ensure all equipment has been properly cleaned of contamination and dried.	For sampling equipment (Ponar dredge, trowels, etc.), the following PPE is required Level D Minimum requirements - - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Surgical style gloves (double-layered if necessary)	As it is anticipated that only workers' gloves will contact potentially contaminated media, personnel decontamination will consist of a removal and disposal of non-reusable gloves. Other recommended actions include: - Wash hands and face as soon as possible. Personnel decontamination will be performed onboard t the extent possible, and/or onshore at a location to be selected by the FOL and URI team leader. - Examine for ticks if sampling occurs in remote locations. Sampling equipment will be decontaminated as per the requirements in the Interim Offshore Monitoring Plan. MSDS for any decon solutions (Alconox, isopropanol, etc.) will be obtained and used to determine proper handling / disposal methods and protective measures (PPE, first-aid, etc.).

6.0 HAZARD ASSESSMENT

The following section provides information regarding the chemical, physical, and natural hazards anticipated to be present during the activities to be conducted. Table 6-1 provides information related to chemical constituents that have been identified as present at PNS and are conservatively assumed to be present in media to be sampled during this project. Specifically, toxicological information, exposure limits, symptoms of exposure, physical properties, and air monitoring and sampling data are discussed in the table.

6.1 CHEMICAL HAZARDS

The potential for worker exposure to hazardous concentrations of site contaminants is considered to be low. This assessment is based on the fact that activities are primarily centered around the collection of sediment and biota samples which are unlikely to be highly contaminated. The greatest potential for exposure to site contaminants exists when sediments are brought to the surface and handled. Routes of exposure include dermal contact, incidental ingestion, and to a lesser extent, inhalation of volatilized contaminants. As a precaution, contact with potential contaminated media will be minimized, and appropriate PPE and decontamination efforts will be deployed to further reduce the potential for exposure.

During the scope of work, workers have the potential to come into contact with sediments and biota that may be contaminated with various metals (arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc), PCBs, Polyaromatic Hydrocarbons (PAHS), pesticides (4,4'-DDT, 4,4'-DDD,and 4,4'-DDE) and Dioxins. It should be noted that the level of contamination in sediments and biota is anticipated to be greatly less than contamination indicated at the onshore PNS sites during previous site investigations. Earlier efforts concentrated on specific areas of PNS, such as the DRMO Storage Yard. Much of the activities associated with this scope of work will be performed away from the onshore areas of PNS where this contamination was identified.

6.2 PHYSICAL HAZARDS

The physical hazards that may be present during the performance of site activities are summarized below:

- Water hazards (drowning)
- Slips, trips, and falls
- Lifting (strain/muscle pulls)

- Ambient temperature extremes (cold stress)
- Pinches and compressions

These physical hazards are discussed in Table 5-1 as applicable to each site task. Further, many of these hazard are discussed in detail in Section 4.0 of the Health and Safety Guidance Manual. Specific discussions on some of these hazards are presented below.

6.2.1 Water Hazards (Drowning)

Planned activities involve locations that are near bodies or on bodies of water. To avoid potential hazards associated with working on or over water (drowning) the field team shall employ U.S. Coast Guard approved personal flotation devices and lifeline (tie-off) procedures will be used when working within four feet of the waters edge. Should diving operations be necessary to collect some biota samples, all operations shall be conducted consistent with applicable parts of 29 CFR 1910 Subpart T. Due to the obvious hazards associated with working on or near the water edge during inclement weather, all field activities may be temporarily suspended or terminated at the discretion and direction of the FOL.

6.2.2 Ambient Temperature Extremes

Overexposure to low ambient temperatures (cold stress) may exist during performance of this work depending on the project schedule, wind speed, humidity, amount of direct sunlight, and personnel contact with water. It will also be a function of physiological factors such as metabolic rate and skin moisture content. Additionally, work load and level of protective equipment will affect the degree of exposure. Site personnel will be cautioned to avoid saturation of clothing with water and to be aware of the potential for cold stress given project conditions. Additional information on cold stress may be found in Section 4.0 of the Health & Safety Guidance Manual. Work-rest regimens, if applicable, will be noted on the Safe Work Permits.

6.3 NATURAL HAZARDS

6.3.1 Insect/Animal Bites and Stings

During warm months (spring through early fall), tick-borne Lyme Disease may pose a potential health hazard. The longer a disease carrying tick remains attached to the body, the greater the potential for contracting the disease. Preventive measure for avoiding tick attachment include wearing long sleeved shirts and long pants (tucked into boots and taped), using commercially available bug sprays and repellents, and performing

frequent body checks. Whenever possible the system of using "buddy checks" should be followed to assist each individual in finding ticks. Site first aid kits should be equipped with medical forceps and rubbing alcohol to assist in tick removal. For information regarding tick removal procedures, and symptoms of exposure consult Section 4.0 of the Health and Safety Guidance Manual. Provide control measure or location where it may be found

Contact with poisonous plants and bites or stings from poisonous insects are other natural hazards, which must be considered. Long pants (tucked into boots), and avoiding potential nesting areas will minimize the hazards of exposure. All site personnel who are allergic to stinging insects such as bees, wasps, and hornets must be particularly careful since severe illness and death may result from allergic reactions. As with any medical condition or allergy, information regarding the condition must be listed on the Medical Data Sheet and the FOL notified.

6.3.2 Inclement Weather

All of the project tasks under this Scope of Work will be performed outdoors. As a result, inclement weather may be encountered. In the event that adverse weather (electrical storms, hurricanes, etc.) conditions arise, the FOL will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Arsenic	7440-38-2	Particulate form - This substance is unable to be detected by PID/FID.	Air sample using a particulate filter; acid desorption; AAS detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7900.	OSHA: Organic compounds 0.5 mg/m³ Inorganic compounds 0.01 mg/m³ NIOSH: (Ceiling) 0.002 mg/m³ ACGIH: 0.2 mg/m³ IDLH: 5 mg/m³ as arsenic	No identifiable warning properties to indicate presence and thereby detection. **Recommended APR Cartridge:** Suitable for dust and fume. Organic vapor acid gases with HEPA filter. This substance may be presented as a pesticide, therefore a cartridge suitable for pesticides (MSA-GMP). **Recommended Gloves:** This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	**Boiling Pt:** sublimation @ 1134°F; 612°C **Melting Pt:** 1497°F; 814°C @ 36 atm **Solubility:** Insoluble in water;soluble in nitric acid **Flash Pt:** Nonflammable, however, airborne in the form of a dust this substance will support combustion **LEL/LFL:** Nonflammable **UEL/UFL:** Nonflammable **Vapor Density:** Not available **Vapor Pressure:** 1 mm Hg @ 372°C (sublimes) **Specific Gravity:** 5.73 **Incompatibilities:** Oxidizers, halogens,zinc, lithium, azides, and acetylides **Appearance and odor:** Gray to black, brittle, crystalline, amorphous, odorless.	Overexposure to this substance through inhalation or ingestion may result in ulceration of the nasal septum, GI disturbances resulting in violent purging and vomiting, hoarse voice, sore throat, excessive salivation, peripheral neuropathy (numbness and burning sensations beginning at the extremities followed by motor weakness), respiratory irritation leading to possible pulmonary edema. Skin or eye contact may result in irritation, conjunctiva, dermatitis, and hyperpigmentation (darkening of the areas exposed) of the skin. This substance has been judged to be a Human carcinogen by NTP, and IARC.
Cadmium	7440-43-9	Particulate Form - Unable to be easily detected by PID or FID.	Air sample using a mixed cellulose-ester filter / acid desorption and analysis by atomic absorption-flame. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7300 or #7048.	OSHA: 2 µg/m³ (0.002 mg/m³) ACGIH: 0.01 mg/m³ (total particulate) 0.002 mg/m³ (respirable particulate) IDLH: 9 mg/m3 (as cd)	The use of an air purifying, full face-piece respirator with a high efficiency particulate air filter for concentrations up to 0.25 mg/m³. **Recommended Gloves:** This is in particulate form. Therefore any glove suitable to prevent skin contact.	**Boiling Pt:** 1412°F; 767°C **Melting Pt:** 610°F; 321°C **Solubility:** Insoluble **Flash Pt:** Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable **Vapor Density:** Not available **Vapor Pressure:** 1 mmHg @ 741°F; 394° C **Specific Gravity:** 8.65 @ 90°F; 32°C **Incompatibilities:** Strong oxidizers, elemental sulfur, selenium, tellurium, zinc, nitric acid, and hydrazoic acid **Appearance and Odor:** Metal: Silver-white, blue-tinged lustrous, odorless solid. Fume: yellow-brown, finely divided particulate dispersed in air.	Overexposure to this substance may result in irritation to the respiratory tract, dyspnea, tightness in the chest, coughing, possibly pulmonary edema. Overexposure to fumes causes symptoms characteristic of the flu (headaches, chills, muscle aches, nausea, vomiting, diarrhea). Chronic exposure may result in damage to the lungs, kidneys and liver. This substance has been identified as a confirmed animal; potential human carcinogen by IARC and NTP.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE
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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Chromium Compounds	7440-47-3 (Element)	Not detectable by PID. Not detectable by FID.	Air sample using mixed cellulose -ester filter; acid desorption and analysis by atomic absorption. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #7024.	OSHA & NIOSH: (Chromium II, III) 0.5 mg/m^3 (Chromium VI) 0.1 mg/m^3 (Ceiling) ACGIH: 0.5 mg/m^3 (*Chromium II, III compounds*), 0.05 mg/m^3 (Chromium VI compounds) IDLH: 30 mg/m^3 (Chromium VI compounds)	The use of a air purifying, full face-piece respirator with a high efficiency particulate filter for concentrations up to 0.1 mg/m^3. **Recommended Gloves:** This is *in* particulate form. Therefore any glove suitable to prevent skin contact.	**Boiling Pt:** 4788°F; 2642°C **Melting Pt:** 3452°F; 1900°C **Solubility:** Insoluble **Flash Pt:** Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable **Vapor Density:** Not available **Vapor Pressure:** 0 mmHg **Specific Gravity:** 7.14 **Incompatibilities:** Strong oxidizers, peroxides, and alkalis **Appearance and Odor:** Appearance and odor vary depending upon the specific compound.	Health hazards are characterized normally through chronic exposure manifesting as histologic fibrosis of the lungs and ulceration of the nasal septum and skin. IARC, NTP and ACGIH list various chromium compounds as possessing carcinogenic properties.
Lead	7439-92-1	Particulate form - Unable to be detected by either PID or FID.	Air sample using a mixed cellulose ester filter; or HNO_3 or H_2O_2 desorption; or Atomic absorption detection. NIOSH Method #7082 or #7300.	OSHA: 0.05 mg/m^3 ACGIH: 0.15 mg/m^3 NIOSH: 0.10 mg/m^3 IDLH: 100 mg/m^3 as lead	The use of a air purifying, full-face respirator with high efficiency particulate air filter for up to 2.5 mg/m^3. **Recommended gloves:** This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	**Boiling Pt:** 3164°F; 1740°C **Melting Pt:** 621°F; 327°C **Solubility:** Insoluble **Flash Pt:** Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable **Vapor Density:** Not available **Vapor Pressure:** 0 mmHg **Specific Gravity:** 11.34 **Incompatibilities:** Strong oxidizers, peroxides, sodium acetylide, zirconium, and acids **Appearance and Odor:** Metal: A heavy ductile, soft gray solid.	Overexposure to this substance via ingestion or inhalation may result in metallic taste in the mouth, dry throat, thirst, Gastrointestinal disorders (burning stomach pain, nausea, vomiting, possible diarrhea sometimes bloody or black, accompanied by severe bouts of colic), CNS effects (muscular weakness, pain, cramps, headaches, insomnia, depression, partial paralysis possibly coma and death. Extended exposure may result in damage to the kidneys, gingival lead line, brain, and anemia.
Mercury	7439-97-6	Jerome Mercury Vapor Analyzer This substance is unable to be detected by PID/FID.	Air sample using Hydrar® sorbent tube; acid desorption; AA cold detection. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #6009.	OSHA; NIOSH; ACGIH: as alkyl compounds 0.01 mg/m^3; STEL 0.03 mg/m^3 IDLH: 10 mg/m^3	No identifiable warning properties to indicate presence and thereby detection. **Recommended APR Cartridge:** Suitable for Metallic mercury with HEPA filter. Preferably, with an end-of-service life indicator. **Recommended gloves:** Rubber gloves	**Boiling Pt:** 674°F; 356.9°C **Melting Pt:** -38°F; -38.89°C **Solubility:** Insoluble ***Flash Pt:*** *Not available* **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 0.0012 mmHg @ 77°F; 25°C **Specific Gravity:** 13.6 **Incompatibilities:** Acetylene, ammonia, chlorine dioxide, azides, calcium, sodium carbide, lithium, rubidium, and copper **Appearance and odor:** Silvery-white heavy mobile liquid, odorless	This substance is corrosive to all points of contact. Systemic symptoms include irritability, wakefulness, muscle weakness and tremors, increased reflexes, gingivitis, anorexia, headache, tinnitus, hypermobility, GI disturbances (nausea, vomiting), diarrhea (sometimes bloody), liver changes, dermatitis, and fever. Symptoms experienced via inhalation include to those above coughing, chest pain, dyspnea, bronchial pneumonitis, and excessive salivation.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE
PAGE 3

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Dioxin (2,3,7,8-Tetrachloro-dibenzo-p-dioxin)	1746-01-6	PID: I.P. unknown. FID: Relative response ratio using FID is unknown.	An occupational health / industrial hygiene air sampling protocol was not identified.	OSHA & ACGIH: None established NIOSH: Carc. - lowest feasible concentration	Odor characteristics unknown. For situations where TCDD concentrations are low, an air-purifying respirator may be used. Use an SCBA or supplied-airline for higher or unknown concentrations. SCBA must be worn for all emergency or non-routine operations. **Recommended glove:** Butyl, Nitrile or Neoprene rubber	**Boiling Pt:** Decomposes **Melting Pt:** 581°F **Solubility:** Negligible **Flash Pt:** None reported **LEL/LFL:** None reported **UEL/UFL:** None reported **Vapor Density:** solid **Vapor Pressure:** <0.01 mmHg @ 68 °F; 20°C **Specific Gravity:** 1.118 @ 68°F; 20° C **Incompatibilities:** None reported. Avoid heat and ignition sources. **Appearance and Odor:** Solid, colorless needles. No odor reported	Overexposure to materials contaminated with TCDD may cause a severe and disabling acne-like rash (chloracne) that may persist for years, metabolic disorders, and nervous system and liver damage. Acute effects: Inhalation - shortness of breath, headaches, fatigue, severe muscle pains, weakness, and digestive disturbance. Ingestion - nausea, vomiting, and possibly pancreatitis Skin - chloracne & chemical burns
Benzo(a)pyrene	50-32-8	Particulate form - This substance is not detectable using a PID or FID.	Air sample using a glass fiber or silver membrane filter; analysis by gas chromatography/infrared or other spectrophotometric method or colorimeter. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #1(186).	OSHA: 0.2 mg/m^3 NIOSH: 0.1 mg/m^3	Adequate - use a full-face air-purifying respirator with dust/mist cartridge up to 10 mg/m^3. **Recommended glove:** Nitrile	**Boiling Pt:** 594°F; 312°C **Melting Pt:** 354°F; 179°C **Solubility:** Insoluble **Flash Pt:** Not available **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** 10 mmHg @ 594° F; 312°C **Specific Gravity:** Not available **Incompatibilities:** Not available **Appearance and Odor:** Yellow odorless crystals.	Regulated primarily as a result of potential carcinogenic properties. Listed by NTP, IARC, and ACGIH as carcinogenic.
DDT and the major metabolites; DDD and DDE.	50-29-3 72-54-8 72-55-9	Substance is not volatile, I.P. is unknown, detection by PID is unknown. Substance non-combustible, therefore a FID is anticipated to have reduced response to DDT.	Air sample using a binder free, glass fiber filter; isoctane desorption; gas chromatography-electron capture detector. Sampling and analytical protocol will proceed in accordance with NIOSH Method #3(S274).	OSHA; ACGIH: 1 mg/m^3 NIOSH: 0.5 mg/m^3	Adequate - Can use air purifying respirator with high efficiency particulate air filter (HEPA). **Recommended glove:** Nitrile acceptable for incidental contact.	**Boiling Pt:** 230°F; 110°C **Melting Pt:** 226°F; 108°C **Solubility:** Insoluble **Flash Pt:** 162-171°F; 72-77°C **LEL/LFL:** Not available **UEL/UFL:** Not available **Vapor Density:** Not available **Vapor Pressure:** Low **Specific Gravity:** 0.99 **Incompatibilities:** Strong oxidizers and alkalis **Appearance and Odor:** Colorless crystals or off-white powder with a slight aromatic odor	Large doses are followed by vomiting due to gastric irritation, diarrhea may follow. Numbness and parethesias of the lips tongue and face associated with malaise, headache, sorethroat, fatigue and weakness. Coarse tremors (usually first of the neck, head, and eyelids). This may be accompanied by confusion, apprehension, and depression. Convulsions may result and death may occur from respiratory failure. DDT is absorbed and retained in the fat of humans. Chronic exposure may result in damage to the liver, kidneys and Peripheral Nervous System. DDT is recognized as possessing carcinogenic properties by IARC and NTP.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE
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Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Aroclor-1260 (Polychlorinated Biphenyl, PCB) It should be noted that this substance is representative of the more common isomers Aroclor - 1242, 1254, which may be encountered.	11096-82-5 53469-21-9 (42%) 11097-69-1 (54%)	Substance is not volatile (VP=0.00006 mmHg), I.P. is unknown however is anticipated to be elevated, therefore, PID is not anticipated to detect substance. Substance is non combustible and as a result will not be detected by FID.	Air sample using a particulate filter, Florisil sorbent tube with glass fiber filter; hexane desorption; gas chromatography-electron capture detector. Sampling and analytical protocol shall proceed in accordance with NIOSH Method #5503 (PCBs).	OSHA; ACGIH: 0.5 mg/m³ (skin) NIOSH: 0.001 mg/m³ IDLH: 5 mg/m³	Inadequate - However due to the low volatility it is assumed unless agitated this substance does not present a volatile vapor or gas respiratory threat. For dusty conditions where this material may cling to particulates, use a HEPA filter. APRs are approved for escape only when concentrations exceed the exposure limits. Concentrations greater than the exposure limits require PAPR or supplied air respirators. **Recommended glove:** Butyl rubber >24 hrs; Neoprene rubber >24.00 hrs; Silver shield or Viton (for pure product).	**Boiling Pt:** distillation range 689- 734 °F; 365-390°C **Melting Pt:** -2 to 50°F; -19 to 10°C **Solubility:** Insoluble **Flash Pt:** Not applicable **LEL/LFL:** Not applicable **UEL/UFL:** Not applicable Nonflammable liquid, however, exposure to fire results in black soot containing PCBs, dibenzofurans, & chlorinated dibenzo-p-dioxins **Vapor Density:** Not available **Vapor Pressure:** 0.00006 - 0.001 mmHg **Specific Gravity:** 1.566 @ 60°F; 15.5°C **Incompatibilities:** Strong oxidizers **Appearance and Odor:** Colorless to pale yellow, viscous liquid or solid (Aroclor 54 below 50°F) with a mild, hydrocarbon odor	This substance is irritating to the eyes and skin. Chronic effects of overexposure may include potential to cause liver damage, chloracne, and reproductive effects. Recognized as possessing carcinogenic properties by NIOSH, and NTP.

References

1 ACGIH/Documentation
2 OSHA Subpart Z
3 International Agency for Research on Cancer (IARCX) – only I, IIA, IIB (not III)
4 National Toxicological Program (NTP)
5 Toxic Chemicals/SARA Title III (Green List)
6 Extremely Hazardous Substance List/Threshold Planning Quantities (EHS/TPQ) List (Blue List)
7 Registry of Toxic Effects of Chemical Substances (April 1988)
8 SAX Dangerous properties of Industrial Materials, 8th edition (1989)
9 Patty's Industrial Hygiene and Toxicology (1994)
10 Clinical Toxicology of Commercial Products (5th edition)
11 SAX Hazardous Chemicals Desk Reference (1989)
12 Casarett and Doull (1986)
13 Proctor and Hughes (1987)
14 Chemically Induced Birth Defects (1985)
15 Dreisbach's Poisoning (1987)
16 Hazardous Chemical Information Annual, Sax
17 Grant's Toxicology of the Eye (1986)
18 Sittigs, Handbook of Toxic and hazardous Chemicals (1981)
19 Suspect Chemicals Source Book
20 Merck Index 10th Edition
21 Chemical Safety Data Guide (1985)
22 NIOSH - National Institute Occupational Safety and Health Pocket Guide to Chemical Hazards (1994)
23 Other (e.g., European tox. Data)
24 Other
25 Condensed Chemical Dictionary

7.0 AIR MONITORING

Site activities will involve collecting samples that will be wet and saturated with water. Site contaminants identified on-shore at PNS are non-volatile and are not detectable using typical direct reading instruments. Further, any site contaminants present are anticipated to be in sampling media in low concentrations. As a result, direct reading instruments will not be used during site activities. The FOL will have the authority to implement the use of monitoring instruments if situations dictate or sampling analysis indicate the presence of volatile contaminants.

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for both TtNUS and subcontractor personnel participating in site activities.

8.1.1 Requirements for TtNUS Personnel

All TtNUS personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at PNS. Additionally, TtNUS personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120(e)(4) will be required for site supervisory personnel. Documentation of TtNUS introductory, supervisory, and refresher training as well as site-specific training will be maintained at the project. Copies of certificates or other official documentation will be used to fulfill this requirement.

TtNUS will conduct site-specific training session prior to initiating site work. Additionally, a brief meeting will be held daily to discuss operations planned for that day. At the end of the workday, a short meeting will be held to discuss the operations completed and any problems encountered. This activity will be supported through the use of a Safe Work Permit System (See Section 10.10).

8.1.2 Requirements for Subcontractors

Given the nature of site activities and the low concentrations of site contaminants anticipated in sampling media, TtNUS subcontractor personnel performing field work at PNS (under the direction of the TtNUS FOL) will not be required to have completed hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e). This position on subcontractor training will be modified if information becomes available to suggest that subcontractors could potentially be exposed to site contaminants. Although the current scope of work does not address dive operations for the purpose of collecting biota samples, if future investigations require the use of divers, sufficient documentation of training and qualifications to perform diving operations will be required. In that event, diving subcontractors must certify that each employee has had such training consistent with applicable parts of 29 CFR 1910 Subpart T.

8.2 SITE-SPECIFIC TRAINING

TtNUS will provide site-specific training to all site personnel who will perform work on this project. Site-specific training will also be provided to all personnel [U.S. Department of Defense (DOD), EPA, etc.] who may enter the site to perform functions that may or may not be directly related to site operations. Site-specific training will include:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of PPE
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Spill response procedures
- Review of the contents of any relevant Material Safety Data Sheets
- Use and application of the Safe Work Permit
- Means of communication

Site-specific documentation will be established through the use of Figure 8-1. All site personnel and visitors must sign this document upon receiving site-specific training.

8.3 MEDICAL SURVEILLANCE

8.3.1 Medical Surveillance Requirements for TtNUS Personnel

All TtNUS personnel participating in project field activities will have had a physical examination meeting the requirements of TtNUS's medical surveillance program. Documentation for medical clearances will be maintained on the job site.

8.3.2 Medical Surveillance Requirements for Subcontractors

Given the unlikely potential for significant exposure to site contaminants, subcontractors will not be required to participate in a medical surveillance program consistent with applicable parts of 29 CFR 1910.120. However, if future diving operations are required, evidence of medical clearance to perform these diving operations will be required.

FIGURE 8-1

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing remedial investigation activities at Portsmouth Naval Shipyard in Kittery, Maine, and that I have received site-specific training that included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Spill response procedures
- Review of contents of relevant Material Safety Data Sheets
- Use and application of the Safe Work Permit
- Means of communication

My signature below indicates that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction, and that the dates of my training and medical surveillance indicated below are accurate.

Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam

8.3.3 Requirements for All Field Personnel

Each field team member (including subcontractors) performing work on this project shall be required to complete and submit a copy of Medical Data Sheet presented in Section 7.0 of the Health and Safety Guidance Manual. This form shall be provided to the FOL prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

9.0 SPILL CONTAINMENT PROGRAM

Project activities will not require significant quantities of potentially hazardous materials to be handled. Sampling media to be collected will include sediment and marine biota, which do not constitute a spill hazard which could potentially harm human health or the environment. As a result, a Spill Containment Program will not be necessary for planned site activities. As the job progresses, however, disposable PPE and other non-reusable items may be generated. PPE and residue will be managed as specified in Section 5.5 Residue Management, of the Interim Offshore Monitoring Plan for Operable Unit 4.

10.0 SITE CONTROL

This section outlines the means by which TtNUS will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. Planned work will be conducted on or near water, and will involve minimal potential for exposure to site contaminants. The "concept" of a three-zone approach (routinely used in hazardous waste activities conducted on-shore) will be used during work at this site. However, strict demarcation of an Exclusion Zone, a Contamination Reduction Zone (CRZ), and a Support Zone will not be performed. Work practices and techniques will be used to minimize the potential for the spread of contaminants, and to protect individuals who are not working on the project (PNS personnel, public, etc.).

10.1 EXCLUSION ZONE

The Exclusion Zone is the area(s) of a site with known or suspected contamination. Given that during this project sampling will be conducted on water and involve various biota, the establishment of a formal Exclusion Zone is impractical. This position is further supported recognizing that significant amounts of contamination are not anticipated to be present in the proposed work areas. To prevent inadvertent or accident contamination, access to work areas will be controlled by TtNUS and Normandeau personnel.

10.2 CONTAMINATION REDUCTION ZONE

The CRZ is the buffer area between the Exclusion Zone and any area of a site where contamination is not suspected. Given the nature of planned site activities, all decontamination will occur immediately adjacent to sampling points (i.e., in the boat at the time of sample acquisition). The establishment of a formal CRZ, therefore, is not necessary. Personnel will take every reasonable precaution to contain any media or biota potentially contaminated to prevent further spread of contamination.

10.3 SUPPORT ZONE

The Support Zone is the staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. For this project the Support Zone will be considered the on-shore areas where exposure to site contaminants would not be expected during normal working conditions or foreseeable emergencies. A formal Support Zone will not be established given the nature of site activities.

10.4 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations by TtNUS
- Regulatory personnel (EPA, OSHA, etc.)
- PNS and other authorized personnel

All site visitors will be routed to the FOL, who will sign them into the field logbook. Information to be recorded in the logbook will include the individual's name (proper identification required), the entity which they represent, and the purpose of the visit. Once the above items have been documented for each visitor, he/she will be permitted to enter the operational zone. All visitors are required to observe the protective equipment and site restrictions in effect at the site at the time of their visit. Any and all visitors not meeting the requirements stipulated in this plan will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause the termination of all onsite activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be accomplished with support from the FOL or on-site security personnel.

10.5 SITE SECURITY

Site security will be accomplished using existing base security resources and procedures, supplemented by TtNUS or subcontractor personnel, if necessary. TtNUS will retain control over active operational areas. The first line of security will take place at the base boundaries restricting the general public. The second line of security will take place at the work site referring interested parties to the FOL. The FOL will serve as a focal point for site personnel, and will serve and the final line of security and the primary enforcement contact.

10.6 SITE MAPS

Site maps (showing the proposed monitoring station locations, sampling locations and AOCs for offshore, and reference locations associated with the planned work activities) are presented in Section 3 of this HASP.

10.7 BUDDY SYSTEM

Personnel engaged in onsite activities will practice the "buddy system" to ensure the safety during this operation.

10.8 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

TtNUS and subcontractor personnel will provide MSDSs for all chemicals brought on site. The contents of these documents will be reviewed by the FOL with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of all chemicals used on site will be developed using Section 5.0 of the Health and Safety Guidance Manual. The MSDSs will then be maintained in a central location and will be available for anyone to review upon request.

10.9 COMMUNICATION

Since the project site is not confined to a single discrete area, personnel may be working apart during field activities. Therefore, two-way radios may be necessary to maintain communication between field personnel. External communication will be accomplished by using cellular phones. External communication will primarily be used for the purpose of resource and emergency resource communications. Prior to the commencement of activities at the base, the FOL will determine and arrange for telephone communications if it is determined a cellular means will not be used.

10.10 SAFE WORK PERMITS

All sampling activities will be performed using Safe Work Permits to guide and direct field crews on a task by task basis. An example of the Safe Work Permit to be used is illustrated in Figure 10-1. Partially completed Permits for these tasks are included as Attachment II of this HASP. These work permits will be further supported by the daily meetings conducted during their generation. This effort will ensure all site-specific considerations and changing conditions are incorporated into the planning effort. Use of these permits will provide the communication line for reviewing protective measures and hazards associated with each operation. This HASP will be used as the primary reference for selecting levels of protection and control measures. The work permit will take precedence over the HASP when more conservative measures are required based on specific site conditions. The FOL will be responsible for completing the Safe Work Permit and issuing them to the appropriate parties. Site personnel at the end of each day's activity will turn in the permit(s) used for that day to the FOL. All permits will be maintained as part of the permanent project files attesting to safety and health measures employed for a given task at a given time and place. Any problems encountered with the protective measures required should be documented on the permit and brought to the attention of the FOL.

FIGURE 10-1
SAFE WORK PERMIT

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope (To be filled in by person performing work)

I. Work limited to the following (description, area, equipment used): _____

II. Names: _____

III. Onsite Inspection conducted Yes No Initials of Inspector _____ _____
TtNUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D Level B
Level C Level A
Detailed on Reverse

Respiratory equipment required

Full face APR Escape Pack
Half face APR SCBA
SKA-PAC SAR Bottle Trailer
Skid Rig None

Modifications/Exceptions: _____

V. Chemicals of Concern | Action Level(s) | Response Measures

_____ | _____ | _____
_____ | _____ | _____

VI. Additional Safety Equipment/Procedures

Hardhat	Yes	No	Hearing Protection	Yes	No
Safety Glasses	Yes	No	Safety belt/harness	Yes	No
Chemical/splash goggles	Yes	No	Radio	Yes	No
Splash Shield	Yes	No	Barricades	Yes	No
Splash suits/coveralls	Yes	No	Gloves (Type)	Yes	No
Steel toe/shank	Yes	No	Work/rest regimen	Yes	No
Workboots	Yes	No			

Modifications/Exceptions: _____

VII.

Procedure review with permit acceptors	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)			Emergency alarms		
Procedure for safe job completion			Evacuation routes		
Contractor tools/equipment inspected			Assembly points		

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressured		
Equipment purged/cleaned		
Isolation checklist completed		
Electrical lockout required/field switch tested		
Blinds/misalignments/blocks & bleeds in place		
Hazardous materials on walls/behind liners considered		

IX. Additional Permits required (Hot work, confined space entry, excavation etc.)..... Yes No

If yes, contact Health Science, Pittsburgh, PA Office

X. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____
Job Completed by: _____ Date: _____

11.0 CONFINED SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. **Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces.** To eliminate any confusion a confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

A Permit-Required Confined Space is one that:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space, consult the Health and Safety Guidance Manual or call the PHSO. If confined space operations are to be performed as part of the scope of work, detailed procedures and training requirements will have to be addressed.

12.0 MATERIALS AND DOCUMENTATION

The TtNUS FOL shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Health and Safety Guidance Manual
- Incident Reports
- Medical Data Sheets (multiple copies)
- Material Safety Data Sheets for all chemicals brought on site, including decon solutions, fuels, lime, sample preservatives, calibration gases, etc.
- A full-size OSHA Job Safety and Health Poster (See Attachment III)
- Training/Medical Surveillance Documentation Form (Blank) (multiple copies)
- Emergency Reference Information (Section 2.0, extra copy for posting)

12.1 MATERIALS TO BE POSTED OR MAINTAINED AT THE SITE

The following documentation is to be posted or maintained at the site for quick reference purposes. In situations where posting of these documents is not feasible (such as no office trailer), these documents should be filed in a transportable file container and immediately accessible. The file should remain in the FOL's possession.

Chemical Inventory Listing (posted) - This list represents all chemicals brought on site, including decontamination solutions, sample preservatives, fuel, calibration gases, etc.. This list should be posted in a central area.

Material Safety Data Sheets (MSDSs) (maintained) - The MSDSs should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory

list for all substances employed on site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.

The OSHA Job Safety & Health Protection Poster (posted) - This poster, as directed by 29 CFR 1903.2 (a)(1), should be conspicuously posted in places where notices to employees are normally posted. Each FOL shall ensure that this poster is not defaced, altered, or covered by other material.

Site Clearance (maintained) - This is found within the training section of the HASP (See Figure 8-1). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance and indicates not only clearance but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

Emergency Phone Numbers and Directions to the Hospital(s) (maintained) - This list of emergency numbers and hospital directions will be maintained at all phone communications points and in each site vehicle.

Medical Data Sheets/Cards (maintained) - Medical Data Sheets will be filled out by all onsite personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to be carried on their person.

13.0 GLOSSARY

ACGIH	American Conference of Governmental Industrial Hygienists
CFR	Code of Federal Regulations
CNS	Central Nervous System
CRZ	Contamination Reduction Zone
DOD	Department of Defense
DOT	Department of Transportation
EPA	Environmental Protection Agency
eV	electron Volts
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
N/A	Not Available
NIOSH	National Institute Occupational Safety and Health
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
PVC	Poly Vinyl Chloride
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
UV	Ultraviolet

ATTACHMENT I

INJURY/ILLNESS PROCEDURE AND REPORT FORM

CASE NO. _____

TETRA TECH NUS, INC.

INJURY/ILLNESS PROCEDURE
WORKER'S COMPENSATION PROGRAM

WHAT YOU SHOULD DO IF YOU ARE INJURED OR DEVELOP AN ILLNESS AS A RESULT OF YOUR EMPLOYMENT:

- If injury is minor, obtain appropriate first aid treatment.
- If injury or illness is severe or life threatening, obtain professional medical treatment at the nearest hospital emergency room.
- If incident involves a chemical exposure on a project work site, follow instructions in the Health & Safety Plan.
- Immediately report any injury or illness to your supervisor or office manager. In addition, you must contact your Human Resources representative, Marilyn Diethorn at (412) 921-8475, and the Corporate Health and Safety Manager, Matt Soltis at (412) 921-8912 within 24 hours. You will be required to complete an Injury/Illness Report (attached). You may also be required to participate in a more detailed investigation from the Health Sciences Department.
- If further medical treatment is needed, The Hartford Network Referral Unit will furnish a list of network providers customized to the location of the injured employee. These providers are to be used for treatment of Worker's Compensation injuries subject to the laws of the state in which you work. Please call Marilyn Diethorn at (412) 921-8475 for the number of the Referral Unit.

ADDITIONAL QUESTIONS REGARDING WORKER'S COMPENSATION:

Contact your local human resources representative, corporate health and safety coordinator, or Corporate Administration in Pasadena, California, at (626) 351-4664.

Worker's compensation is a state-mandated program that provides medical and disability benefits to employees who become disabled due to job related injury or illness. Tetra Tech, Inc. and its subsidiaries (Tetra Tech or Company) pay premiums on behalf of their employees. The type of injuries or illnesses covered and the amount of benefits paid are regulated by the state worker's compensation boards and vary from state to state. Corporate Administration in Pasadena is responsible for administering the Company's worker's compensation program. The following is a general explanation of worker's compensation provided in the event that you become injured or develop an illness as a result of your employment with Tetra Tech or any of its subsidiaries. Please be aware that the term used for worker's compensation varies from state to state.

WHO IS COVERED:

All employees of Tetra Tech, whether they are on a full-time, part-time or temporary status, working in an office or in the field, are entitled to worker's compensation benefits. All employees must follow the above injury/illness reporting procedures. Consultants, independent contractors, and employees of subcontractors are <u>not</u> covered by Tetra Tech's Worker's Compensation plan.

CASE NO. _____

WHAT IS COVERED:

If you are injured or develop an illness caused by your employment, worker's compensation benefits are available to you subject to the laws of the state you work in. Injuries do not have to be serious; even injuries treated by first aid practices are covered and must be reported. Please note that if you are working out-of-state and away from your home office, you are still eligible for worker's compensation benefits.

CASE NO. _____

TETRA TECH NUS, INC.
INJURY/ILLNESS PROCEDURE
WORKER'S COMPENSATION PROGRAM

To: Corporate Health and Safety Manager
Human Resource Administrator

Prepared by: _____

Position: _____

Project Name: _____

Office: _____

Project No. _____

Telephone: _____

Information Regarding Injured or Ill Employee:

Name: _____ Office: _____

Home address: _____ Gender: M ☐ F ☐ No. of dependents: _____

_____ Marital status: _____

Home telephone: _____ Date of birth: _____

Occupation (regular job title): _____ Social Security No.: _____

Department: _____

Date of Accident: _____ **Time of Accident:** _____

Location of Accident Was place of accident or exposure on employer's premises Yes ☐ No ☐

Street address: _____

City, state, and zip code: _____

County: _____

Narrative Description of How Accident Occurred: (Be specific. Explain what the employee was doing and how the accident occurred.)

TETRA TECH, INC.
INJURY/ILLNESS REPORT

Did employee die? Yes ☐ No ☐
Was employee performing regular job duties? Yes ☐ No ☐
Was safety equipment provided? Yes ☐ No ☐
Was safety equipment used? Yes ☐ No ☐
Note: Attach any police reports or related diagrams to this accident report.

Witness(es):

Name:

Address:

Telephone:

Describe the Illness or Injury and Part of Body Affected:

Name the Object or Substance which Directly Injured the Employee:

Medical Treatment Required:

☐ No ☐ Yes ☐ First Aid Only

Physician's Name: _____

Address: _____

Hospital or Office Name: _____

Address: _____

_____

Telephone No.: _____

Lost Work Days:

☐ No. of Lost Work Days _____

Last Date Worked _____

Time Employee Left Work _____

Date Employee Returned to Work _____

☐ No. of Restricted Work Days _____

☐ None

TETRA TECH, INC.
INJURY/ILLNESS REPORT

Corrective Action(s) Taken by Unit Reporting the Accident:

Corrective Action Still to be Taken (by whom and when):

Name of Tetra Tech employee the injury or illness was first reported to: _____

Date of Report: _____ Time of Report: _____

	Printed Name	Signature	Telephone No.	Date
Project or Office Manager				
Site Safety Coordinator				
Injured Employee				

To be completed by Human Resources:

Date of hire: Hire date in current job:

Wage information: $ _____ per _____ (hour, day, week, or month)

Position at time of hire:

Shift hours:

State in which employee was hired:

Status: ☐ Full-time ☐ Part-time Hours per week: _____ Days per week: _____

Temporary job end date:

To be completed during report to workers' compensation insurance carrier:

Date reported: Reported by:

TeleClaim phone number:

TeleClaim account number:

Location code:

Confirmation number:

Name of contact:

Field office of claims adjuster:

ATTACHMENT II

SAFE WORK PERMITS

SAFE WORK PERMIT FOR MULTI-MEDIA SAMPLING

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

I. Work limited to the following (description, area, equipment used): Multi-media sampling including sediment and biota. Diving operations may be used to collect some biota samples.

II. Required Monitoring Instrument(s): None

III. Field Crew: _____

IV. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____ _____
TtNUS

SECTION II: General Safety Requirements *(To be filled in by permit issuer)*

IV. Protective equipment required
Level D ☒ Level B ☐
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR	☐	Escape Pack	☐
Half face APR	☐	SCBA	☐
SKA-PAC SAR	☐	Bottle Trailer	☐
Skid Rig	☐	None	☒

Modifications/Exceptions: Minimum requirement include sleeved shirt and long pants, safety shoes, and surgical style gloves.

V. Chemicals of Concern	Action Level(s)	Response Measures
Site contaminants include metals, SVOCs, pesticides, PCBs and Dioxins	All site contaminants are non-volatile. DRI will not be used.	None

VI. Additional Safety Equipment/Procedures

Hard-hat	☐ Yes	☒ No	Hearing Protection (Plugs/Muffs)	☐ Yes	☐ No
Safety Glasses	☐ Yes	☒ No	Safety belt/harness	☐ Yes	☒ No
Chemical/splash goggles	☐ Yes	☒ No	Radio	☐ Yes	☒ No
Splash Shield	☐ Yes	☒ No	Barricades	☐ Yes	☒ No
Splash suits/coveralls	☐ Yes	☒ No	Gloves (Type - Nitrile)	☒ Yes	☐ No
Steel toe Work shoes or boots	☒ Yes	☐ No	Work/rest regimen	☐ Yes	☒ No

Modifications/Exceptions: _____

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☒	☐	Emergency alarms	☒	☐
Procedure for safe job completion	☐	☒	Evacuation routes	☒	☐
Contractor tools/equipment/PPE inspected	☐	☒	Assembly points	☒	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressurized	☐	☒
Equipment purged/cleaned	☐	☒
Isolation checklist completed	☐	☒
Electrical lockout required/field switch tested	☐	☒
Blinds/misalignments/blocks & bleeds in place	☐	☒
Hazardous materials on walls/behind liners considered	☐	☒

IX. Additional Permits required (Hot work, confined space entry, excavation etc.). ☐ Yes ☒ No
If yes, complete permit required or contact Health Sciences, Pittsburgh Office

X. Special instructions, precautions: If conducted, diving operations will be performed consistent with the requirement of 29 CFR 1910 Subpart T. All divers will be trained, certified, and medically qualified to dive.

Permit Issued by: _____ Permit Accepted by: _____

Job Completed by: _____ Date: _____

ATTACHMENT III

OSHA POSTER

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA

www.osha.gov

U.S. Department of Labor • **Occupational Safety and Health Administration** • **OSHA 3165**

ATTACHMENT IV

NORMANDEAU ASSOCIATES, INC.
HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

FOR

PORTSMOUTH NAVAL SHIPYARD

SAMPLING SERVICES

Rev. 0
6/28/02

Prepared for

Tetra Tech NUS, INC.
600 Clark Avenue, Suite 3
King of Prussia, PA 19406-1433

Prepared by

NORMANDEAU ASSOCIATES INC.
25 Nashua Road
Bedford, New Hampshire 03110-5500

P19455.000

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APPENDICES

1.0 INTRODUCTION

The purpose of this Health and Safety Plan is to establish personnel safety/protection standards and mandatory safety operating procedures relative to potential physical and chemical hazards encountered at the Portsmouth Naval Shipyard (PNS) site, to describe work activities and decontamination procedures, and to provide for contingencies which may arise during the course of sediment and mussel sample collection activities. This HASP is an appendix to the overall site HASP prepared by Tetra Tech NUS, Inc. (TtNUS; prime contractor). Refer to the main document for the safety and health risk analysis (Section 5), environmental (air) monitoring requirements (Section 5), employee training requirements (Section 8.1.2), medical surveillance requirements (Section 8.3.2), spill containment (Section 9), and confined space entry (Section11). Previous sampling has shown that contaminants at the site are typically non-volatile and are unlikely to be a potential hazard to workers. Personal protective equipment required is Level D, entailing standard field attire, safety shoes, surgical style gloves, and U.S. Coast Guard approved life vest when required.

These provisions are mandatory for all Normandeau Associates Inc. (NAI) personnel who are permitted access to the PNS site during sediment and mussel collection activities. All NAI personnel performing sampling collection activities on the PNS site are required to read and adhere to all aspects of this plan as well as the HASP prepared by TtNUS as it relates to activities performed by NAI personnel. An Acknowledgement (Section 13.0) must be signed and maintained in the project file.

2.0 SITE DESCRIPTION

Briefly, the Portsmouth Naval Shipyard is an active United Sates Naval facility that serves as a submarine maintenance shipyard. Tetra Tech NUS, Inc under a contract with the Northern Division, Naval Facilities Engineering Command, is conducting various site investigations on the shipyard. Normandeau Associates, Inc. has been contracted to provide field sampling collection services. Sediment samples will be collected at 58 locations while mussels will be collected at 40 locations. Based on on-shore sampling at PNS, the primary types of contaminants are assumed to be metals (arsenic, cadmium, chromium, lead, and mercury), SVOCs (including benzo(a)pyrene), pesticides (including DDT), PCBs, and Dioxins. These contaminants are non-volatile and are unlikely to be a potential hazard to workers given the media to be sampled.

3.0 RESPONSIBILITIES

Implementation of the procedures outlined in this Health and Safety Plan is the responsibility of the NAI Project Manager and Task Manager. This Health and Safety Plan includes a complete listing of key supervisory, management, and health and safety personnel and a description of their responsibilities for implementation of the procedures. Clear lines of authority have been established for enforcing safety compliance. NAI will employ the following health and safety organization.

3.1 ON-SITE PERSONNEL

3.1.1 Field Management

The Field Manager is responsible for field implementation of the Health and Safety Plan. This includes field supervision, enforcing safe work practices and decontamination procedures, ensuring proper use of personal protective equipment and communicating modified safety requirements to site personnel.

3.1.2 NAI Site Safety Officer

The NAI Site Safety Officer is responsible for the performance of the following tasks:

- Monitor compliance of workers relative to pre-established personnel protection levels (e.g., use of necessary clothing and equipment) to ensure the safety of personnel.
- Evaluate physical and chemical hazard information and recommend any necessary modifications to work plans and personnel protection levels to maintain personnel safety.
- Ensure all site personnel are aware of the nature of physical and chemical hazards suspected to be present.

The Site Safety Officer has the authority to deny or restrict the presence of any persons (under his control) access on-site and the authority to cease activities on-site if and when conditions present uncontrollable risks to site personnel. The Site Safety Officer is also responsible for coordinating, conducting and documenting required training and activities and for performing and maintaining record keeping duties.

3.1.3 Individual Site Personnel

All site personnel are responsible for familiarizing themselves with the procedures outlined in this Health and Safety Plan and with the appropriate safety procedures for the activities they are required to perform. All site personnel must wear appropriate personal protective equipment when required. All employees must bring to the attention of the most readily accessible project manager or site safety manager, any condition, practice, or circumstance that they believe could result in a health or safety hazard, injury, or death to any employee. When an imminent hazard exists, employees on the scene have the authority to take steps to eliminate or ameliorate the hazard; follow-up consultation with project or site safety management will be carried out at the first opportunity.

3.2 KEY PERSONNEL

Key project personnel are listed below. Any changes in key project personnel will be recorded on all copies of the Health and Safety Plan.

Project Site Manager: Tetra Tech NUS, Inc.	Aaron Bernhardt (412) 921-8433
Project Manager: Normandeau Associates Inc.	Erik Fel'Dotto (603) 926-7661
Technical Director: Normandeau Associates Inc.	Paul Geoghegan (603) 472-5191
Field Manager: Normandeau Associates Inc.	Erik Fel'Dotto (603) 926-7661
Alternative Field Manager: Normandeau Associates, Inc.	Allan Frizzell (603) 926-7661
Health and Safety Officer : Normandeau Associates Inc.	Eric Fel'Dotto (603) 770-0327
Site Safety Officer: Normandeau Associates Inc.	Eric Fel'Dotto (603) 770-0327
Alternate Site Safety Officer: Normandeau Associates, Inc.	Allan Frizzell (603) 926-7661

4.0 SITE SECURITY

4.1 Site Access

Prior to site activities, Normandeau Associates, Inc. will provide Tetra Tech NUS, Inc. a list of personnel that are scheduled to work at the site. For each person included in that list, the following information will be submitted:

- social security number
- a passport or birth certificate with raised seal
- the date and place of birth

These items will be necessary to gain access to the site.

4.2 Site Specific Training

In addition, site-specific training will be provided to all personnel scheduled to work on the site. The training approximately two hours in length will consist of a summary project description to inform all personnel of the planned activities, individual responsibilities and the safety measures or precautions in place to ensure safe operating conditions.

5.0 SITE ACTIVITES

5.1 Boating

Sample locations will be accessed by boat. Boat operations will follow safe boating procedures described in Normandeau Associates, Inc.'s Boating Safety Manual ; Revision 3, August 2001 (Appendix A). Boat operators must be familiar with this manual and a copy will be maintained on site. All personnel working on the boat will be required to wear a personal flotation device (PFD).

In addition, the boat will be equipped with a communications link for operational useage and for emergency situations. A marine radio or cell phone will be available for this purpose. The access number will be made available to shore based personnel for communication purposes.

Other boating equipment will include a first aid kit including an eye wash bottle , an appropriately sized anchor, oars, an air horn or other warning device and a fire extinguisher.

5.2 Sample Collection

Site activities consist of the collection of sediment and whole mussels (in shell) for chemical analysis. Most intertidal sampling locations will be determined by visually observing previously staked areas; GPS will be used to accurately record sampling locations. GPS will be used to locate the intertidal locations without markers, and all of the subtidal locations. Sediment will be collected using a kynar-coated standard Ponar grab or stainless steel van Veen grab at the subtidal sample locations. The intertidal sediment samples will be collected using stainless steel spoons or other appropriate sampling devices. Mussels will be collected at 40 locations either by hand in shallow water or by using oyster tongs in deeper water.

5.3 Equipment Decontamination

In between sampling locations, the Ponar grab will be decontaminated with 10% nitric acid and isopropanol after washing with water and Alconox. Fluids used to decontaminate the grab will be collected for proper disposal.

6.0 SITE HAZARDS AND WORK LIMITATIONS

At all times, all personnel will wear the appropriate level of personnel protective equipment as dictated by this Health and Safety Plan. For example, personnel on the boat must wear PFDs at all times. In addition, weather conditions will be monitored for storm events that may cause sampling activities to cease. Lightning and high winds are particularly dangerous. Strong tidal currents in the sampling areas particularly on the Piscataqua River side of the PNS must be monitored.

Sampling is scheduled for August, 2002. This time of the year is generally very warm and may be humid. Wrap around sunglasses and a hat to cover the facial areas are recommended. Sun screen lotion with a SPF greater than 15 are recommended. Long sleeved shirts and pants will also protect the skin. Cool drinking water is recommended to prevent dehydration that may lead to heat related illness.

During sampling for mussels, awareness of deepening water while sampling by hand must be noted. When in doubt about underwater conditions, sample from the boat using oyster tongs or other devices. Be aware of current conditions while wading as well.

The Ponar grab will be decontaminated first with Alconox and then with isopropanol and 10% nitric acid. Isopropanol is highly flammable and must be contained in a spark arresting container to control potential fire situations. Material safety data sheets (MSDS) are provided for isopropanol, nitric acid and Alconox in Appendix B and will be reviewed by all users of these chemicals.

No smoking is allowed aboard the boat. Smoking will be allowed on shore in smoking designated areas only, after personnel have removed and discarded gloves used while handling samples, removed waders or rainpants, and washed their hands (per section 5, TtNUS HASP).

Potentially, shipyard operations or emergencies may require the sampling crew to stand by until the situation is resolved. Site communications between the shipyard and project management will be maintained to adequately address this possibility.

7.0 PERSONAL PROTECTION EQUIPMENT

During the collection of sediment, to minimize skin contact with potentially contaminated sediments, nitrile gloves will be used to reduce this possibility. In addition, bib-type rain pants will be used to keep sediments off clothing and exposed skin during collection in subtidal areas. In areas where samples are collected by hand (intertidal or shallow subtidal areas), field personnel will wear chest waders, and gloves.

8.0 EQUIPMENT DECONTAMINATION

Equipment will be cleaned between sampling sites by washing down with Alconox, isopropanol and 10% nitric acid and then rinsing in clean water. Equipment may be stored until needed in a clean area of the boat. After all sampling has been completed, the equipment and the sampling boat will undergo a thorough cleaning with Alconox solution and clean water.

9.0 SITE EMERGENCY PROCEDURES

If, during the performance of field tasks, the presence of potentially hazardous conditions is evident in a particular area, work in that area will be terminated. Tetra Tech NUS, Inc. personnel will be informed of the condition. The source(s) of the potentially hazardous conditions will be determined, and if necessary remediated. The impact on site work will be evaluated and the health and safety program will be re-evaluated, if necessary, for workers in that area, before restarting sampling activities.

10.0 SITE COMMUNICATIONS

Site communications will be maintained via marine radio, cell phone and line-of-sight particularly while personnel are on board the workboat. Each work crew will be equipped with a marine radio or cell phone for communication.

11.0 EMERGENCY PROCEDURES

The purpose of this section is to recommend emergency response procedures. The types of potential emergencies include:

- Fire
- Exposure to contaminated sediments
- Boating accidents
- Physical injuries to site personnel
- Heat stress

Releases of chemicals that would impact the general public, property, or the environment are not anticipated during sampling activities.

11.1 Fires

Fires are possible whenever flammable materials are utilized at a work location. Motors and sample collection equipment may provide an ignition source. To prevent fires, flammable materials must be contained in safety cans or other approved containers. Internal combustion engines must be shut off before refueling. No smoking is allowed while refueling is taking place. Appropriate fire extinguishers must be available during refueling of boat engines or gas powered generators.

11.2 Exposure to Contaminated Sediments

Based on on-shore sampling at PNS, the primary types of contaminants are assumed to be metals (arsenic, cadmium, chromium, lead, and mercury), SVOCs (including benzo(a)pyrene), pesticides (including DDT), PCBs, and Dioxins. These contaminants are non-volatile and are unlikely to be a potential hazard to workers given the media to be sampled. However, work must be performed in such a manner that exposure to contaminants through skin or eye contact, inhalation or ingestion is further minimized. Work practices that must be followed to reduce chemical exposures include:

- Personal Protective Equipment, for the appropriate work activities and areas as defined by the Site Safety Officer, must be used by all personnel.
- Keep hands away from face during work activities.
- Minimize all skin and eye contact with contaminants.
- Skin, face and eyes must be flushed or washed immediately if there is any failure of the PPE or other event that results in eye/skin contact with the water or sediments.

11.3 Heat Stress

Heat stress may be a potential health issue during summer months. Dress appropriately for the weather conditions; wear a hat and sunglasses to protect facial skin. Long sleeved shirts and pants are recommended. Sun block lotions with a SPF factor greater than 15 are recommended. See Appendix C for a description of heat stress recognition and symptoms.

11.4 Boating Accidents

This project area is heavily traveled by pleasure boaters, commercial fishermen and naval water craft. To minimize the possibility of boating accidents, observe all boating rules while underway; observe local navigation markers and follow them. Yield to other boats as necessary. When at anchor while sampling, be aware of boat traffic particularly if moored in or near a navigation channel. Be alert for other boaters.

No personnel will operate a boat during this project without prior approval by the Site Safety Officer. Knowledge of the requirements outlined in the Normandeau Associates, Inc. Boating Safety will be required. All personnel working on a boat utilized for this project must wear a USCG approved personal floatation device. They must comply with the requirements of the Normandeau Assoicates, Inc, Boating safety Manual, provided in Appendix A.

11.5 Physical Injuries to Site Personnel

Site personnel should constantly look for potential safety hazards such as unstable boats due to wind and wave action, slippery surfaces and pinched fingers while working the davit hoist. Stormy weather can create unsafe work conditions so weather should be monitored for small craft advisories. Site personnel should inform the Site Safety Officer of any potential hazards identified so that corrective action can be taken.

12.0 EMERGENCY ALERTING PROCEDURES

The Site Safety Officer must alert the sampling crew when and if an emergency occurs on site through the use of radios, cell phone or by directly contacting the work group. The Site Safety Officer and any isolated work group must carry radios if reasonable line of sight contact cannot be maintained. If radios fail, a single blast from an alarm horn (or equivalent) must be used to signal workers to stop work and assemble at the rally point if possible. In addition, NAI will coordinate emergency evacuation procedures with the site investigation contractor, TetraTech NUS, Inc.

12.1 EVACUATION PROCEDURES

Evacuation due to emergencies is through the staging area on the project site. If it is determined that this is not prudent, evacuation by boat through regular boat channels is recommended. If evacuation is required, once project management has been notified of the sampling crew=s position and status, stay off the radio (if using) and monitor for instructions.

12.2 EMERGENCY TELEPHONE NUMBERS

The telephone numbers of emergency services are given below.

EMERGENCY SERVICE	TELEPHONE NUMBER
Local Police -	911
Fire Department	911
Local Hospital B Portsmouth Regional Hospital	(603) 436-5110
Ambulance	911
USEPA National Response Center	(800) 424-8802
U.S. Coast Guard	603-436-4414
TtNUS Project Manger (Aaron Bernhardt)	(412) 921-8433
TtNUS Health and Safety Manager (Matthew M. Soltis, CIH, CSP)	(412) 921-8912

This list, along with a street map showing the possible routes to Portsmouth Regional Hospital is included as Figure 1. This information will also be posted at key locations throughout the work sites and available in company vehicles.

12.3 EMERGENCY RESPONSE PERSONNEL

The Site Safety Officer must have the primary role in responding to all on-site emergencies. All site personnel must contact the Site Safety Officer in case of emergency. The Site Safety Officer must be present on-site during all sediment sampling activities. If reasonable contact cannot be

maintained, the Site Safety Officer must carry a radio or cell phone and each isolated activity group will also have a radio or cell phone. If any emergency such as a fire, chemical exposure, or physical injury occurs, the Site Safety Officer must be contacted immediately. All site personnel must take direction from the Site Safety Officer in cases of emergency response.

12.4 EMERGENCY DECONTAMINATION PROCEDURES

Decontamination of an injured or exposed worker must be performed only if decontamination does not interfere with essential treatment and does not make worse the injury or exposure.

- If decontamination can be done, then wash, rinse, and/or cut off protective clothing and equipment.
- If decontamination cannot be done, then the following action if recommended:
- Wrap the victim in blankets, plastic or rubber to reduce contamination of other personnel; and
- Alert emergency and off-site medical personnel to potential contamination.

The Site Safety Officer or other personnel familiar with the incident and site contaminants must accompany the victim to the hospital. NAI's Human Resources Manager must be notified as soon as possible via telephone or fax. A written accident report form must be completed and forwarded to NAI's Human Resources Manager as soon as possible. Notify TetraTech NUS, Inc.=s on Site Manager as well.

12.5 FIRST AID PROCEDURES

On-site medical treatment or first aid may be administered by personnel who have been certified in First Aid. General first aid procedures include:

- Removing the injured or exposed person(s) from immediate danger.
- Rendering first aid if necessary, and decontaminate affected personnel, if necessary.
- Calling an ambulance for transport to local hospital immediately.
- Evacuating other personnel on-site to a safe place if necessary, until the Site Safety Officer determines that it is safe for work to resume.
- Reporting the accident to the TetraTech NUS, Inc.on site manager immediately.

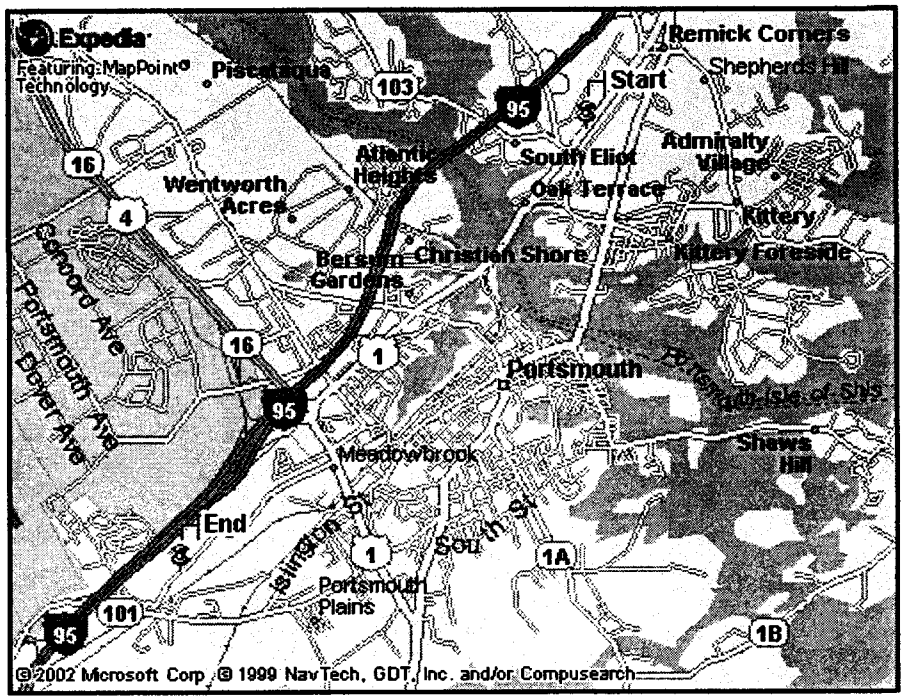
NAI personnel with current CPR/First Aid training include:
Erik Fel'dotto Al Frizzell Gary Smith

12.6 DIRECTIONS TO PORTSMOUTH REGIONAL HOSPITAL

The directions to the hospital must be verified by the Site Safety Officer prior to the initiation of fieldwork. A description of the route from the base of operations at the project site is given below (Figure 1). This site is accessible by boat and from the road for transport of personnel directly to the hospital in case of an emergency.

Directions	Distance	Time
Start : Depart Kittery Foreside, Maine, United States, on Bridge St (West)	**0.2**	**0:00**
1: Turn LEFT (South-West) onto US-1 Byp	**2.1**	**<0:01**
Entering New Hampshire		
2: Turn RIGHT (West) onto Borthwick Ave	**1.0**	**0:05**
End: Arrive 333 Borthwick Ave, Portsmouth, NH, 03801	**<0.1**	**<0:01**
Total Route	**3.3 mi**	**7 mins**

Directions to Portsmouth Regional Hospital:



13.0 STATEMENT OF ACKNOWLEDGEMENT

All NAI employees will be required to read this Health and Safety Plan. A Statement of Acknowledgement documenting this will be signed, dated and maintained in the project file.

STATEMENT OF ACKNOWLEDGEMENT

HEALTH AND SAFETY PLAN FOR PORTSMOUTH NAVAL SHIPYARD SAMPLING SERVICES

I have read the "Health and Safety plan for Portsmouth Naval Shipyard Sampling Services≅ outlined above and understand the material presented.

PRINTED NAME_____

SIGNATURE_____ DATE_____

Appendices

APPENDIX A.
BOATING SAFETY MANUAL

BOATING SAFETY MANUAL

Revision 3
8/1/01

Prepared by
NORMANDEAU ASSOCIATES, INC.
Bedford, New Hampshire

August 2001

TECHNICAL REVIEW: _____

PROGRAM APPROVAL: _____

QA APPROVAL: _____

COPY NUMBER: _____

ISSUED TO: _____

DOCUMENT: BOATING SAFETY MANUAL
Record of Changes

Change Number	Date Entered	Reviewed By	Change Number	Date Entered	Reviewed By
Change 0	6/12/87	G.Normandeau P.Clark			
Change 1	3/29/93	R.Hasevlat E.Fel'Dotto			
Change 2	4/15/94	R.Hasevlat E.Fel'Dotto			
Rev. 1	6/20/96	R.Hasevlat E.Fel'Dotto			
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DISTRIBUTION LIST

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9	Richard Kling
10	George Nardacci

VESSEL SAFETY POLICY AND TECHNICAL PROCEDURES MANUAL

I have read this technical procedures manual and thoroughly understand its contents.

Signed:_____ Date:_____

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 OBJECTIVE

This is written as a standard operating procedures manual describing the correct, safe methods to be employed on company owned or operated vessels. This manual supersedes the NAI Vessel Safety Policy and Technical Procedures Manual dated May, 2000.

1.2 SCOPE

The procedures in this manual ***shall be mandatory*** on all company owned or operated vessels. Applicability of some sections may vary depending on vessel size and individual project requirements.

1.3 RESPONSIBILITY

It is the responsibility of group and project management to implement the procedures in this manual. It is the responsibility of field operations supervisors and vessel captains to see that everyone on board company owned or operated vessels has read this manual and complies with its requirements. "Captain" is defined as the person who is assigned or assumes responsibility for operating of the vessel at the time it is operating. If NAI chooses to take on passengers for hire (only with management approval), a US Coast Guard licensed Captain with the appropriate rating in good standing must be the on-board vessel operator.

1.4 AUDITS

Audits of applicable projects may be carried out by boat captains and field operations supervisors during the course of operations to verify compliance with this manual. Audits may also be conducted during regularly scheduled project audits by the Quality Assurance Department. All field personnel must be alert for boating hazards during project operations and must report immediately to the boat captain any hazards.

1.5 REFERENCES

1) U.S.C.G. Navigation Rules: International-Inland

2) Chapman's Piloting, Seamanship, and Small Boat Handling.

Operators must be knowledgeable in boat handling techniques as well as rules and regulations to insure safe and efficient operation. The U.S.C.G. Navigation Rules are mandatory reading for boat operators in marine and freshwater systems that maintain buoyed navigation systems. Other references such as Chapman's Piloting, Seamanship, and Small Boat Handling or United States Power Squadron Sail and Power Boating Course Manuals are strongly recommended reading for all other boat operators.

2.0 STANDARD OPERATING PROCEDURES

2.1 VESSEL USE

1) No one shall operate any company vessel for non-company purposes without express management permission.

2) No one shall operate any company vessel without reading and fully understanding this manual.

3) No company vessel shall be operated without at least two people on board except when, due to specific project requirements, management permission is granted to do so.

2.2 THE CAPTAIN

The captain, normally also the crew leader, has two responsibilities:

1) To ensure the safety and well being of the crew and vessel.

2) To see that the day's work is carried out efficiently, completely, and in a professional manner.

These are constants, regardless of vessel and crew size. To achieve these goals the Captain must be totally familiar with this manual, the "rules of the road," the NAI Diving Safety Manual (where project requirements include diving), and the vessel. As the company's agent in the field, the Captain must see to it that the policies and procedures described in this manual are carried out.

It is the Captain's responsibility to decide whether or not to leave the dock. This decision shall be based on the following parameters:

1) Existing and forecast weather conditions

2) Sea state or condition of waterbody due to weather

3) Other hazards, including; ice, debris and currents

The following parameters must be considered relative to the above conditions:

1) Vessel size

2) Experience of Captain and crew

3) Type of sampling being undertaken

It is the Captain's responsibility to thoroughly check out a boat ***before*** leaving the dock (or office in the case of trailerable boats). The check out list below must be followed. Any deficiencies noted will be corrected before leaving. There is ***NO ACCEPTABLE EXCUSE*** for getting underway

without necessary safety equipment. The Captain should also inform project management, or field operations of the intended destination and expected return time.

The Captain must observe the crew and sampling gear, maintain the log, navigate, keep an eye on the engine and fathometer, monitor the radio, and keep a lookout, often all simultaneously. Depending on crew and vessel size, type of work, experience, etc., the effort and level of stress involved to perform these functions will vary. The important thing is to ***STAY ALERT***. Familiarity with a job, fatigue, or boredom often reduces effectiveness. The Captain must be attentive to crewmembers, especially around moving gear.

The Captain must be familiar with the vessel, whether it's a small outboard model or a larger diesel powered boat. Knowledge of a vessel's mechanical workings, its handling and the limits of its capabilities are essential for safe operation, and for the rapid diagnosis and solving of problems which may arise. A Captain should learn as much about the vessel's mechanics as possible.

Keeping the log is an important duty of the Captain. When practical, vessel operators will maintain logbooks. Each day's entry should start with the date. All occurrences of importance during the day should be noted in the log along with their respective times. This includes, but is not limited to:

1) Vessel checkout prior to leaving.
2) Number and names of people on board.
3) Amounts of fuel and fluids added.
4) Times and sample numbers of first and last tows where applicable.
5) Sampling problems.
6) Injuries including complete description and actions taken.
7) Arrival and departure times.
8) End of the day checkout including engine hours.
9) Diver activities where applicable.
10) Maintenance and drills.
11) Anything else of consequence.
12) Captain's signature

A logbook is considered a legal document in a court of law. Write clearly, be accurate with times, and *NEVER* erase anything. Draw a single line through a mistake and initial it.

2.3 VESSEL CHECKOUT PRIOR TO GETTING UNDERWAY

2.3.1 Diesel Vessel

1) Check coolant, lube oil, gear oil, and fuel levels
2) Make sure bilge pump(s) are operational
3) Make sure all required safety gear is onboard
4) Make sure all required sampling gear is onboard.
5) Start and warm engine at the dock.
6) Check spare parts supply (air filter, fuel filters, oil filter and lube oil).
7) Check electronics.
8) Perform radio check.
9) Make appropriate log entries.

2.3.2 Outboards

1) Check that the engine is operating properly before leaving the office.
2) Check supply of gas and 2 cycle oil (for 4 stroke outboards, check oil level).
3) Check trailer lights and safety chains.
4) Grease trailer bearings and check the tire pressure.
5) Unhook trailer lights before submerging them.
6) Make sure winch is in locked position and safety chain is in place before backing in or hauling out.
7) Make sure required sampling gear is onboard.
8) Make sure required safety equipment is onboard.
9) Make sure a boat plug is available and installed if applicable.
10) Start engine before letting boat drift off trailer.
11) Perform radio check when possible.
12) On applicable boats make log entries.

2.3.3 Safety Equipment Required On Board

1) 1 Personal Floatation Device for every person onboard. A Type I PFD must be available for each crew member for use on marine vessels greater than sixteen feet in length. Workvests or deck suits (Type V) may be substituted while performing work tasks. For all other vessels, marine or freshwater, appropriate PFD's will be made available and

appropriately worn. At least one throwable flotation device must be on board any marine vessel over sixteen feet in length. Survival/immersion suit for each crew member will be carried on vessels working more than one mile from shore.

2) 1 floatation work suit for every person onboard during cold weather should be available.

The Captain will require ***all*** persons to wear PFD's at ***all*** times except during cold weather when floatation work suits ***will*** be worn.

3) PFD's and work suits should be equipped with USCG approved lights and reflective strips for night work.

4) USCG required navigation lights & horn will be operational.

5) USCG approved flare kit with current (not expired) pyrotechnics.

6) All boats, regardless of size, will have onboard an operational VHF-FM marine radio when working in areas of Marine radio coverage. Boats working in inland waters should consider CB radios. On smaller boats these may take the form of portable hand held units. Where possible a cellular phone should also be carried.

7) A tool kit with basic tools and supplies (i.e. electrical tape, duct tape, twine, etc.).

8) Commonly required spare parts (belts, props, shear pins, fuel conditioner, filters, spark plugs etc.).

9) A first aid kit.

10) Where vessel size allows, a life raft rigged to self inflate if the boat sinks should be available.

11) Where vessel size allows, a life ring with water light and lanyard attached. This will be kept ready for immediate deployment.

12) All boats engaged in towing or any other operation involving gear over the side will have a pair of bolt cutters ready for immediate use to cut the wire in an emergency.

13) Off-shore vessels must be equipped with an Emergency Position Indicating Radio Beacon (EPIRB).

14) An anchor of appropriate size for the vessel with sufficient line for a 5 to 1 scope in the waters being worked.

15) Fire extinguishers of a size and type appropriate to the vessel.

16) Up to date charts for the area.

17) A list of emergency numbers for the work area.

2.4 CREW BEHAVIOR AND RESPONSIBILITIES

1) Wear PFD or work suit.
2) Keep clear of moving wires, ropes, blocks, and winches.
3) Keep clear of wires, ropes, booms, and gantries bearing heavy loads.
4) Stay off bow, gunwale, masts, and trawl frames except when necessary.
5) Be careful when nets are going out. It is very easy to get tangled in the mesh.
6) Carry a sharp knife and a watch.
7) Watch the Captain. Ask questions; learn as much about the boat as possible.
8) Learn where all emergency equipment is and how to use it.
9) If anything seems amiss, report it immediately to the Captain.
10) When working gear around the stern, keep it clear of the wheel.
11) Watch fellow crewman; be alert, don't assume the Captain sees everything.

2.5 VESSEL CHECKOUT AT THE END OF THE DAY

2.5.1 Diesel Boats

1) Check automatic bilge pumps and bilges.
2) Check stuffing boxes on shaft and rudder post-tighten if necessary.
3) Make sure stack is capped to keep out water.
4) Shut off master switch.
5) Shut sea cocks.
6) Make sure vessel is properly tied up and fended off.
7) Check for anything unusual such as loose bolts, cracked welds, frayed wire, etc.
8) Leave the boat clean and ready for the next day's use.

2.5.2 Outboards

1) Boats returning to the office are to be demobilized at the boat shed.
2) If an outboard is run in salt water, run the motor and flush with fresh water at the office.
3) Place gas cans in a proper storage area, labeled with date and oil/fuel mixture.
4) Sampling gear will be ***put away***, not left in the boat.

5) Boats with integral fuel tanks (the Monarks, Maritime, Privateers) will be left topped up with fuel and fuel conditioner.

6) Where provided, battery switches are turned off; otherwise remove the positive battery cable.

7) Pull the plug, wash down the boat and trailer, and park it tilted up to let water drain out.

8) If there are any problems with boats or equipment ***TELL SOMEONE***. Don't leave the next field crew to deal with known problems.

2.5.3 Zebra Mussel Decontamination

The recent documented dispersion of zebra mussels throughout several watersheds on which NAI operates boats requires decontamination procedures to help reduce the spread of these organisms. After completing projects in waterways that have or may have zebra mussels:

1) Inspect and remove any visible aquatic vegetation or weeds from the boat or sampling gear used. (Mussels are commonly found on aquatic plants.)

2) Flush the engine cooling system, bilge areas and live wells with tap water. Hot water is usually unavailable, and chlorine/salt solutions can damage clothing, equipment and the environment.

3) Discard any fish or bait that has contact with infested waters before leaving the site. Biological samples are an exception.

2.6 VESSEL MAINTENANCE

1) Follow all checkout procedures diligently.

2) Diesel Engines: Change lube oil, filters, fuel filters every 100 hours. Change gear oil yearly. Don't exceed recommended RPM; inspect wheel and stern bearings yearly, and repack stuffing box every year. Regular oil analysis is recommended.

3) Outboards: Flush with fresh water after use in salt water. Change lower unit oil yearly (more often in heavy use such as beach seining). Properly winterize for cold storage. Replace fuel filters (if fitted) every 100 hours.

4) Hydraulic Systems: Change filters yearly, fluid every two years. Check frequently for leaks.

5) Deck Machinery: Keep winch chains lubricated with grease and/or spray on chain lube (WD-40 is ***NO GOOD*** for this purpose). Grease winches and blocks regularly. Check frequently on bushing and sheave wear. Check frequently for breakdown of winch wires and standing rigging. Replace tow wire as required.

6) Keep bilge clean - take care to avoid fuel or oil entering the water. In case of a spill, shut off bilge pumps and clean up the spill immediately. Discharge of oil overboard can result in heavy fines.

7) Four stroke outboards: change lube oil and filter every 100 hours. Use oil specific for that motor. Change fuel filter every 100 hours or at the start of the sampling season.

2.7 FUELING

1 Engine(s) off - ***NO SMOKING*** - Master Switch off.

2 Have a fire extinguisher at hand.

3 Only required personnel on board.

4 Don't overfill.

5 Keep the nozzle in contact with the tank opening to maintain ground connection.

6 If possible, fill portable gas cans on shore.

7 Clean up any spillage.

8 Add outboard oil (non oil injection outboards) at intervals while fueling to assure thorough mixing.

9 Add fuel conditioner occasionally.

10 ***NEVER fuel boats while pumps or generators are operating.***

2.8 Drills & Instruction

All field personnel will be given instruction in the location of and use of all safety equipment onboard a vessel, prior to embarking on a particular boat for the first time. This equipment may vary in type and placement on different boats and it is critical that all crew members are familiar with the equipment prior to needing it.

Emergency training and safety drills will be held at regular intervals to insure that all field personnel working on boats are familiar with the procedures in this manual and to insure that they are able to respond appropriately in an emergency. These safety drills may take the form of field exercises, such as man overboard drills, fire drills or vessel sinking drills, as well as instruction in rules of the road, CPR, first aid, etc. A record of all drills and instruction will be kept.

3.0 EMERGENCY PROCEDURES - COMMON PROBLEMS

Should an emergency arise on board a vessel it is essential that the Captain/crew leader takes charge and gives specific instructions and assignments to crewmembers. The crewmembers must carry out their assignments unless it is unsafe to do so in which case they must inform the Captain that they are unable to carry out the assignment.

In most emergencies it can be critical that appropriate authorities be notified early in the onset of an emergency situation. This may be the Coast Guard in offshore areas or local EMS in inland areas. For example in the event of a fire onboard or a vessel sinking, an immediate call to the Coast Guard may be the only opportunity to use the radio.

3.1 FIRST AID EMERGENCY

Apply first aid, control bleeding, treat for shock, carry out CPR, whatever is required in the particular case. Get the victim to a hospital the fastest way possible. This will mean quickly heading for the nearest dock. If on marine waters, use the radio to notify the Coast Guard to have an ambulance waiting. Make your plan clear to the Coast Guard so there will be no mistakes. In an offshore situation the Coast Guard may send out a helicopter. The pilot will contact you on the radio. Follow his instructions ***exactly***. Don't touch the hook or basket until it grounds against the boat and ***NEVER*** tie the hook or basket to the boat.

In inland areas notify the local EMS (in most areas this would be 911 by cell phone).

It is recommended that all field personnel be trained in first aid and CPR. An NAI accident report should be completed within 24 hours of any injury and submitted to personnel management.

At each project locale, emergency telephone numbers must be available in the event emergencies occur. ***Personnel must have available telephone numbers for medical or injury emergencies.*** These numbers may also serve in the event of boat breakdowns to call for assistance.

If injured personnel are brought to shore, personnel must know where the nearest medical emergency or hospital facility is located. This is especially important if NAI personnel intend to drive the victim to the facility. Unless the area is extremely remote or EMS cannot be contacted, in the case of serious injuries it is preferable to wait for emergency personnel to come to you.

3.2 MAN OVERBOARD

If you fall overboard - yell to attract attention. At night, get your water light on. Don't panic.

If you observe someone fall overboard, yell, "man overboard". Don't take your eyes off the person. Get the life ring over the side. If available, Captain should quickly note GPS or Loran position. If the person in the water cannot be ***immediately*** located, contact the Coast Guard or local authorities via radio. Don't search for an hour before getting help; it may be too late by then.

3.3 DIVING ACCIDENT

All personnel involved with diving must be thoroughly familiar with the NAI Diving Safety Manual. Personnel must be familiar with diving emergency procedures described in the NAI Dive Safety Manual.

3.4 TAKING ON WATER - SINKING

Immediately attempt to locate and plug the leak. Check rudderpost, shaft log, seacocks, transducers, keel pipe through hulls, and bilges in general. Plug leaks with any available materials and head for the nearest port. Call the Coast Guard and keep them informed if in marine waters.

If the boat is sinking despite the best efforts of the crew, send out a Mayday call. Keep the crew on deck to avoid being trapped. If available, all crew must don survival suits. Where available prepare and deploy life raft. If the vessel carries an EPIRB, it should be taken into the water with the crew with its lanyard attached to a crewman or to the life raft. If the crew ends up in the water, stay together. Smaller vessels may contain floatation, and will remain awash, in this case try to remain with the vessel and wait for rescue.

3.5 HANG DOWNS

Where tow depths permit, use a float rope. Have quick-disconnects a couple of hundred feet beyond normal winch wire use. To avoid hang downs don't tow without a recording fathometer, make sure doors are let down evenly. Always keep a strain on gear when setting out.

3.5.1 Under normal conditions of light seas and wind and low current velocity make all reasonable attempts to retrieve the gear, being careful to avoid getting anything in the wheel. Occasionally, it will be impossible to get it back. Buoy everything off and leave. It may be possible to return and try again later.

3.5.2 Under adverse conditions of tide and/or weather don't risk the boat to retrieve gear. Let out the wire(s) to the disconnect(s), hook on Norway balls and leave. When tide and weather conditions improve the gear can be retrieved.

3.5.3 Examine new towing areas with the fathometer before setting gear and do trial tows under good conditions. If a potential hang down appears on the fathometer and it is uncertain that the gear will get over it, haul back.

3.5.4 Make sure to alert other vessels in the area when hung down and unable to maneuver. Display the proper lights and day shapes when towing.

3.6 GEAR IN THE WHEEL

Deploy the anchor as soon as possible if traffic, sea, or current conditions require its use. Let local traffic know the situation. DON'T shift the engine in and out of gear at high revolutions, this will

only damage the transmission. Conditions and availability permitting, an NAI Diver may go over and clear the wheel, otherwise call for a tow.

Under no circumstances should a mask and snorkel be used in an attempt to clear the wheel. It is too easy to become tangled in the gear. Use only SCUBA equipment, following NAI's Diving Safety Manual procedures.

3.7 COLLISION

3.7.1 Collisions can occur with other vessels, aids to navigation, rocks, submerged objects, etc. With the possible exception of submerged drifting objects (e.g. logs), they are almost always caused by human error. To avoid collisions:

1) ***BE ALERT.***

2) Know the rules of the road and ***OBEY THEM.***

3) Know the work area. Study charts of new areas before heading out in the boat.

4) Have up to date charts on hand.

5) When in doubt slow down or stop - be aware of what constitutes safe speed and risk of collision.

6) Monitor channels 16 & 13 or other appropriate channels based on location.

In a collision with another vessel the Captain or a crew member is required to stand by and give all assistance possible ***without*** endangering his/her own vessel. The Coast Guard must also be informed as soon as possible. Collision with an aid to navigation must also be reported to the Coast Guard.

Whenever a collision occurs, first check for injuries, then check for leaks. Check the boat over immediately following instructions for taking on water (Section 3.4). Be alert to new vibrations, which may indicate a loose skeg or rudder bolts, a bent shaft, or deformed wheel.

3.8 AGROUND

Avoiding grounding is similar to avoiding collisions: be alert, use prudent speed, know the area. Don't venture into unfamiliar areas without up to date charts and a fathometer. Understand the buoy system.

If a vessel runs aground, check for leaks following instruction for taking on water (Section 3.4), and try to back off. Wait for the tide if the situation allows. It may be possible to try kedging off by heaving out an anchor. If none of this works call for assistance.

3.9 ROUGH WEATHER

It is the Captain's responsibility to ascertain the current and *forecast* weather conditions and determine the advisability of leaving port. Prudence is called for. Do not take unnecessary risks with the weather.

NAI vessels may be caught out in rough weather conditions either at sea or on lakes or rivers. It is beyond the scope of this manual to rewrite Chapman's or the several books available on handling small boats in heavy weather. Read them. Here are a few basic rules:

1) Secure all openings.

2) Secure all loose objects.

3) Keep weight as low as possible.

4) Reduce speed as necessary to avoid pounding.

5) If conditions dictate, head for the nearest port and wait out the weather.

3.10 FIRE

Make sure ***before*** leaving the dock that adequate fire extinguishers are on board. In event of fire, the Captain must take charge immediately and direct the actions of the crew. Locate the source of the fire and try to eliminate it (i.e., cut off fuel flow, cut off electricity). Aim extinguishers at the base of the flames. CO2 works by cutting off oxygen to a fire. Use it in enclosed spaces which the nozzle can be inserted into. Don't use it in tight spaces which contain people; it cuts off the supply of oxygen to people too! In open spaces or occupied closed spaces use dry chemical extinguishers. These work by interrupting the chemical reaction of combustion. On wood, clothing, paper, etc. water is excellent. Don't use water on fuel or electrical fires.

3.11 ENGINE(S) WILL NOT START - LOST POWER

Whenever power is lost, drop anchor, notify area traffic of the problem, and place a person on lookout. The Captain can't properly keep watch while looking down in the bilge working on a mechanical problem. Remedies for most of the listed problems are self evident. The better one's knowledge of the mechanical systems of the boat the faster a problem can be diagnosed and cured. Keep the tool kit complete, and keep commonly used spares on board. Regular maintenance will prevent many problems.

3.11.1 Diesel Engines - Lost Power

Check the following:

1) Fuel tank empty.

2) Water in fuel.

3) Fuel line or filter clogged.

4) Emergency shut down tripped.

5) Broken fuel line.

6) Air leak into suction side of the fuel system.

7) Fuel shut off.

8) Air filter or strainer clogged.

3.11.2 Diesel Engines - Won't Start

Check the following:

1) Dead batteries.

2) Corroded battery and/or start connections.

3) Burnt out solenoid, starter, or starter switch.

4) Master switch off.

5) Any of the problems listed under Lost Power.

3.11.3 Outboards - Lost Power

Check the following:

1) Empty gas tank.

2) Closed gas line valve.

3) Closed vent on portable tanks.

4) Clogged or broken gas line.

5) Water in gas.

6) Clogged filter.

7) Fouled plugs.

8) Failed electronic ignition.

9) Wet ignition.

3.11.4 Outboards - Won't Start

Check the following:

1) Master switch off.

2) Engine in gear.

3) Dead batteries.

4) Bad Starter or battery connections.

5) Bad ignition switch or starter.

6) Failed neutral switch in gear shift box.

7) Bad Prime Bulb.

8) Helmsman safety switch cover off.

9) Any of the problems listed under Lost Power.

3.12 GEAR FAILURES

It is not possible to cover everything that ***might*** happen. Experience indicates the common problems are:

1) Blown hydraulic hoses.

2) Blown hydraulic pump or motor seals.

3) Worn out winch clutches.

4) Parting winch wires.

5) Parting standing rigging.

6) Slipping belts or clutches at the PTO.

7) Seizing of sheaves.

8) Excessive bearing wear in blocks.

Regular inspection and maintenance will avoid most problems. At least weekly, check belt tension, weeping oil seals, chaffing hoses, ropes, or wires. Look ***inside*** wire rope for corrosion. Grease blocks and winches. Log all inspections and maintenance.

3.13 ELECTROFISHING

Guard against electric shock. Rubber gloves and foot gear are to be worn. Bowmen and boat operators should have deadman switches. Check out switches, generators, and shocking units before taking them into the field. Read the manufacturer's instruction manual. If unfamiliar with the equipment ask for an explanation of its proper use.

3.14 BEACH SEINING

Anchor or tie off the boat at each beach. Don't swim after a boat that has drifted away (which won't happen if the anchor is out). Get assistance to retrieve the boat. Don't dive underwater to clear a

hung down net. Pull it off with the boat or, as last resort, cut it. A net is not worth drowning for. Be careful of entanglement and rope burns when running the net off the bow.

3.15 TRAILERING BOATS

1) Adjust mirrors.

2) Make sure lights work (carry a few spare bulbs).

3) ***Get out and look*** behind the boat before backing up.

4) Check the ramp for debris, pot holes, drop offs, and other obstacles before using it.

5) Grease wheel bearings occasionally, but don't overdo it.

6) Unplug trailer lights before submerging them.

7) Make sure the trailer winch is in the locked position and that either a safety chain is in place or the boat's bowline is secured to the trailer before backing down or pulling up a ramp.

8) If by accident the boat starts to slide off the trailer unintentionally, do not try to stop the winch by hand or use your hands or body to stop the boat, its too dangerous.

9) ***Put down antennas*** before driving off.

10) Don't jackknife the trailer.

11) Be aware of the height of the boat on the trailer.

12) Don't cut curbs too close.

13) When hauling a boat out, go slowly. If trailer tires are in a pothole or over a drop-off, it may be necessary to re-float the boat and reposition the trailer. Don't force it.

3.16 RAPIDS AND DAMS

Occasionally it is necessary to operate a boat in rapids. Use inflatable rafts when possible; aluminum flat-bottomed boats may be used but they have little buoyancy if they take on water. Bring an oversize anchor, 75' throw rope, spare props, and several shear pins. Only experienced boat handlers should operate the boat. The crew should include a shore-side observer with a life ring and safety line where possible. Always wear a PFD, whether in a boat or working along shore.

Working above or below dams presents significant hazards. People working in these areas must be aware of the dangers and how to best cope with them.

Low head dams are wall-like structures, which extend completely across a river. They are used to maintain a constant water level above the dam. These dams are extremely dangerous due to powerful undercurrents and backroller currents at the base of the dam, which can trap a person or boat. Unless a project specifically requires work in these areas, stay clear of them.

A project is more likely to require work around hydroelectric dams. Specific dangers to be aware of include:

1) Currents and water levels can change very rapidly and without warning.
2) Hazardous areas marked by buoy lines
3) Sudden water discharge from dam gates
4) Strong, unpredictable currents above and below dams
5) Submerged hazards above and below dams
6) Open spillways which may not be visible from above the dam.
7) Pay attention to warning signs and signals:
8) Flashing lights, horns or sirens
9) Increased or changed wildlife activity
10) Louder sound of rushing water
11) Previously exposed rocks become covered by water
12) Sudden change in water currents.

If you end up in the water, stay calm; lie flat on your back. Do not let your feet hang down in the water; they can get snagged on the bottom and the current can pull you underwater. Keep your feet up and pointed in the direction you are floating. Use your feet to cushion impacts with rocks or obstructions. Go with the flow; move diagonally across the current to the nearest shore.

Make sure gate keepers and power house personnel are aware of the work being undertaken and the area the work will be conducted in. They can alert the work crew to increasing or decreasing flows.

4.0 CONCLUSION

A boat is a hazardous work place. No amount of training or equipment will ***guarantee*** the safety of vessel and crew. However, regular maintenance and strict compliance with all safety rules will eliminate the circumstances, which initiate most accidents. A proper inventory of safety equipment, tools, and spare parts combined with the knowledge to use them correctly will give the Captain and crew the ability to deal with emergencies that do arise. Be alert and don't take chances.

APPENDIX B
MATERIAL SAFETY DATA SHEETS

NITRIC ACID 1.0 N AND 2.0 N VOLUMETRIC SOLUTIONS

MSDS Number: N3659 --- *Effective Date: 11/02/01*

1. Product Identification

Synonyms: Azotic acid solution; nitric acid 6.3%; nitric acid 1.0 N volumetric solution; nitric acid 2.0 N volumetric solution; nitric acid 12.6%
CAS No.: 7697-37-2
Molecular Weight: 63.00
Chemical Formula: HNO3 in H2O
Product Codes: J.T. Baker: 5639
Mallinckrodt: 3510

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	6 - 13%	Yes
Water	7732-18-5	> 87%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)
Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

Potential Health Effects
Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause

deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
May react explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.
Fire Extinguishing Media:
If involved in a fire, use water spray.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Nitric Acid:
OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat and incompatibles.

11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector.

Cancer Lists:

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)
Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 20L

International (Water, I.M.O.)
Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 20L

15. Regulatory Information

Chemical Inventory Status - Part 1

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

Chemical Inventory Status - Part 2

		------Canada-----		
Ingredient	Korea	DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

Federal, State & International Regulations - Part 1

	---SARA 302---		---------SARA 313---------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No

Water (7732-18-5)	No	No	No	No

Federal, State & International Regulations - Part 2

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Store in a tightly closed container.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

ALCONOX(R)

MSDS Number: A2052 --- *Effective Date: 02/21/00*

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.
CAS No.: Not applicable.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox(R)	N/A	90 - 100%	Yes

proprietary detergent mixture

3. Hazards Identification

Emergency Overview
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)
Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact:
No adverse effects expected.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.
Explosion:
No information found.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. When mixed with water, material foams profusely. Small amounts of residue may be flushed to sewer with plenty of water.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Moisture may cause material to cake. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
15 mg/m3 total dust, 5 mg/m3 respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m3 total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White powder interspersed with cream colored flakes.
Odor:
No information found.
Solubility:
Moderate (1-10%)
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
No information found.
Conditions to Avoid:
No information found.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.
Cancer Lists

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Alconox(R) proprietary detergent mixture	No	No	None

12. Ecological Information

Environmental Fate:
This product is biodegradable.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

Chemical Inventory Status - Part 1

Ingredient	TSCA	EC	Japan	Australia
Alconox(R) proprietary detergent mixture	Yes	No	No	No

Chemical Inventory Status - Part 2

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Alconox(R)	No	No	Yes	No

proprietary detergent mixture

Federal, State & International Regulations - Part 1

	---SARA 302---		--------SARA 313--------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Alconox(R)	No	No	No	No

proprietary detergent mixture

Federal, State & International Regulations - Part 2

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Alconox(R)	No	No	No

proprietary detergent mixture

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No . (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes.
Keep container closed.
Use with adequate ventilation.
Avoid breathing dust.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.
Product Use:
Laboratory Reagent.

Rev. 0
6/28/02

Revision Information:
MSDS Section(s) changed since last revision of document include: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16.

Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

ISOPROPYL ALCOHOL (90 - 100%)

MSDS Number: I8840 --- *Effective Date: 01/14/02*

1. Product Identification

Synonyms: 2-Propanol; sec-propyl alcohol; isopropanol; sec-propanol; dimethylcarbinol
CAS No.: 67-63-0
Molecular Weight: 60.10
Chemical Formula: (CH3)2 CHOH
Product Codes: J.T. Baker: 5082, 9037, 9080, U298
Mallinckrodt: 0562, 3027, 3031, 3032, 3035, 3037, 3043, 4359, 6569, H604, H982, V345, V555, V566

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Isopropyl Alcohol	67-63-0	90 - 100%	Yes
Water	7732-18-5	0 - 10%	No

3. Hazards Identification

Emergency Overview
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)
Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects
Inhalation:
Inhalation of vapors irritates the respiratory tract. Exposure to high concentrations has a narcotic effect, producing symptoms of dizziness, drowsiness, headache, staggering, unconsciousness and possibly death.
Ingestion:
Can cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about 250 mls (8 ounces).

Skin Contact:
May cause irritation with redness and pain. May be absorbed through the skin with possible systemic effects.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic exposure may cause skin effects.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this agent.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Call a physician if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 12C (54F) CC
Autoignition temperature: 399C (750F)
Flammable limits in air % by volume:
lel: 2.0; uel: 12.7
Listed fire data is for Pure Isopropyl Alcohol.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.
Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Small quantities of peroxides can form on prolonged storage. Exposure to light and/or air significantly increases the rate of peroxide formation. If evaporated to a residue, the mixture of peroxides and isopropanol may explode when exposed to heat or shock.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Isopropyl Alcohol (2-Propanol):
-OSHA Permissible Exposure Limit (PEL):
400 ppm (TWA)
-ACGIH Threshold Limit Value (TLV):
400 ppm (TWA), 500 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene and nitrile rubber are recommended materials.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Rubbing alcohol.
Solubility:
Miscible in water.
Specific Gravity:
0.79 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
82C (180F)
Melting Point:
-89C (-128F)
Vapor Density (Air=1):
2.1
Vapor Pressure (mm Hg):
44 @ 25C (77F)
Evaporation Rate (BuAc=1):
2.83

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, acetaldehyde, acids, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, aluminum, oleum and perchloric acid.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Oral rat LD50: 5045 mg/kg; skin rabbit LD50: 12.8 gm/kg; inhalation rat LC50: 16,000 ppm/8-hour; investigated as a tumorigen, mutagen, reproductive effector.

Cancer Lists:

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Isopropyl Alcohol (67-63-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material may biodegrade to a moderate extent. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
Environmental Toxicity:
The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)
Proper Shipping Name: ISOPROPANOL
Hazard Class: 3
UN/NA: UN1219
Packing Group: II
Information reported for product/size: 355LB

International (Water, I.M.O.)
Proper Shipping Name: ISOPROPANOL
Hazard Class: 3
UN/NA: UN1219
Packing Group: II
Information reported for product/size: 355LB

15. Regulatory Information

Chemical Inventory Status - Part 1

Ingredient	TSCA	EC	Japan	Australia
Isopropyl Alcohol (67-63-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

Chemical Inventory Status - Part 2

	--Canada--			
Ingredient	Korea	DSL	NDSL	Phil.
Isopropyl Alcohol (67-63-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

Federal, State & International Regulations - Part 1

	--SARA 302--		--------SARA 313--------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Isopropyl Alcohol (67-63-0)	No	No	Yes	No
Water (7732-18-5)	No	No	No	No

Federal, State & International Regulations - Part 2

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Isopropyl Alcohol (67-63-0)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2[S]2
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor or mist.
Avoid contact with eyes, skin and clothing.
Label First Aid:
If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

APPENDIX C.
HEAT STRESS

Heat stress is one of the most common and potentially serious illnesses at hazardous waste sites and, therefore, warrants regular monitoring and other preventive measures. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. depending on the ambient condition and the work being performed, heat stress can occur very rapidly - within as little as 15 minutes - and can pose as great a danger to worker health as chemical exposure. In its early stages, heat stress can cause rashes, cramps, and drowsiness. This can result in impaired functional ability that threatens the safety of both the individual and co-workers. Continued heat stress can lead to heat stroke and death.

Heat Stress and PPE

Heat stress is a major health hazard for workers wearing PPE because the same protective materials that shield the body from chemical exposure also limit the dissipation of body heat and moisture. Thus, personal protective clothing can create a hazardous condition.

Reduced work tolerance and the increased risk of excessive heat stress is directly influenced by the amount and type of PPE worn. The added weight and bulk of PPE severely reduces the body's access to normal heat exchange mechanisms and increases energy expenditure. When selecting PPE, therefore, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. After PPE has been selected, the safe duration of work/rest periods should be determined based on the anticipated work rate, the ambient temperature and other environmental factors, the type of protective ensemble, and the individual worker characteristics and fitness.

Monitoring for Heat Stress

All workers, even those not wearing protective equipment, should be monitored, because the incidence of heat stress depends on a variety of factors and can affect any worker. monitoring should be initiated before initial entry and should be continued during each break cycle. Some general guidelines include:

- For workers wearing permeable clothing, monitor for signs of heat stress and follow established work/rest schedules.
- For workers wearing semipermeable or impermeable encapsulating ensembles, workers should also be monitored when the temperature in the work area is above 70EF (21EC). Below 70EF, monitoring is considered on a case-by-case basis.

To conduct personnel monitoring, measure the heart rate and body temperature, as follows:

Heart Rate. Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

Oral Temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6EF (37.6EC), shorten the nest work cycle by one-third without changing the rest period. If oral temperature still exceeds 99.6EF (37.6EC) at the beginning of the <u>next</u> rest period, shorten the following work cycle by one-third. Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6EF (38.1EC).

Initially, the length of the work cycle should be governed by the frequency of the required physiological monitoring. The frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see following table).

Preventing Heat Stress

To protect against heat stress, it is important to choose the appropriate level of protection, to provide careful training for workers and site personnel, and to monitor frequently personnel who wear protective clothing. It is also important to ensure that work and rest periods are scheduled regularly, and that workers frequently replace lost fluids (it is not uncommon for workers to lose as many as 6 to 8 quarts of water in a hot shift).

Proper training and preventive measures will help avert serious illness and loss of work productivity caused by heat stress. Preventing heat stress is particularly important because one incident of heat stress will increase the likelihood of future incidents. The site health and safety officer should take the following steps to prevent heat stress:

- Adjust work and rest schedules as needed;
- Provide shelter or shaded areas to protect personnel during rest periods;
- Maintain workers' body fluids at normal levels to ensure that the cardiovascular system functions adequately. Daily fluid intake must equal the approximate amount of water lost in sweat;
- Encourage workers to maintain an optimal level of physical fitness. Fit individuals may acclimatize more readily to temperatures;
- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Effective devices include field showers or hose-down areas, as well as cooling jackets, vests, or suits;
- Train workers to recognize and treat heat stress by identifying its signs and symptoms (e.g., muscle spasms, dizziness, lack of perspiration). Refer to the following table for detail on the signs and symptoms of heat stress.