

**FINAL  
HEALTH AND SAFETY PLAN  
PHASE I REMEDIAL INVESTIGATION  
INSTALLATION RESTORATION PROGRAM  
ACTIVITIES  
NAVAL STATION ROOSEVELT ROADS  
PUERTO RICO  
CONTRACT TASK ORDER 0007**

*Prepared For:*

**DEPARTMENT OF THE NAVY  
ATLANTIC DIVISION  
NAVAL FACILITIES  
ENGINEERING COMMAND  
*Norfolk, Virginia***

*Under the:*

**LANTDIV CLEAN Program  
Contract N62470-89-D-4814**

*Prepared By:*

**BAKER ENVIRONMENTAL, INC.  
*Coraopolis, Pennsylvania***

**DECEMBER 15, 1992**

## TABLE OF CONTENTS

	<u>Page</u>
<b>EXECUTIVE SUMMARY</b> .....	<b>ES-1</b>
<b>1.0 INTRODUCTION</b> .....	<b>1</b>
1.1 Policy .....	1
1.2 References .....	1
1.3 Pre-Entry Requirements .....	2
<b>2.0 PROJECT PERSONNEL AND RESPONSIBILITIES</b> .....	<b>3</b>
<b>3.0 SITE CHARACTERIZATION</b> .....	<b>8</b>
3.1 Site Background .....	8
3.2 Site Work Plans .....	8
3.3 Site Description .....	9
3.4 Hazard Evaluation .....	17
3.4.1 Task-Specific Hazards .....	17
3.4.2 Chemical Hazards .....	19
3.4.3 Physical Hazards .....	22
3.4.4 Radiation Hazards .....	23
3.4.5 Environmental Hazards .....	23
3.4.6 Additional Hazards .....	24
<b>4.0 SITE CONTROL</b> .....	<b>25</b>
4.1 Site Access .....	25
4.2 Site Conditions .....	25
4.3 Work Zones .....	25
4.4 "Buddy System" .....	28
4.5 Safe Work Practices .....	28
4.6 Sanitation/Site Precautions .....	28
<b>5.0 AIR MONITORING</b> .....	<b>29</b>
5.1 Point-Source Monitoring .....	29
5.2 Personal Monitoring .....	29
5.3 Perimeter Monitoring .....	31
5.4 Site-Specific Air Monitoring Equipment and Frequency .....	31
5.5 Equipment Maintenance and Calibration .....	31
5.6 Monitoring Documentation .....	32
<b>6.0 PERSONAL PROTECTIVE EQUIPMENT</b> .....	<b>33</b>
6.1 Levels of Protection .....	33
6.2 Site-Specific Levels of Protection .....	34
6.3 Respiratory Protection .....	34
6.4 Care and Cleaning of Personal Protective Equipment .....	35

**TABLE OF CONTENTS**  
**(Continued)**

	<u>Page</u>
<b>7.0 DECONTAMINATION PROCEDURES .....</b>	<b>36</b>
7.1 Personnel Decontamination .....	36
7.2 Equipment Decontamination .....	37
7.3 Waste Handling Procedures .....	37
<b>8.0 EMERGENCY PROCEDURES .....</b>	<b>38</b>
8.1 Pre-Emergency Planning .....	38
8.2 Emergency Coordinator .....	38
8.3 Communications .....	39
8.4 Assembly Area .....	40
8.5 Emergency Hospital Route .....	41
8.6 Emergency Medical Treatment .....	44
8.7 Emergency Decontamination Procedures .....	46
8.8 Personal Protection and First-Aid Equipment .....	47
8.9 Notification .....	47
8.10 Hazard Assessment .....	48
8.11 Security .....	48
8.12 Emergency Alerting .....	49
8.13 Training .....	50
8.14 Spill Containment Procedures .....	50
<b>9.0 TRAINING REQUIREMENTS .....</b>	<b>52</b>
9.1 General .....	52
9.2 Site-Specific Requirements .....	55
<b>10.0 MEDICAL SURVEILLANCE REQUIREMENTS .....</b>	<b>56</b>
<b>11.0 HEALTH AND SAFETY PLAN APPROVAL .....</b>	<b>58</b>
<b>12.0 DECLARATION OF HEALTH AND SAFETY PLAN REVIEW .....</b>	<b>59</b>

## LIST OF TABLES

<u>Number</u>		<u>Page</u>
1	Chemical/Physical Properties of Chemicals Observed at NSRR .....	20
2	Chemical Exposure Information .....	21
3	Monitoring Equipment and Frequency for Sites at NSRR .....	30
4	OSHA Training History of Baker Project Personnel .....	53
5	Medical Surveillance Testing Parameters .....	57

## LIST OF FIGURES

<u>Number</u>		<u>Page</u>
1	Typical Contamination Reduction Zone Layout .....	27
2	Hospital Route (NSRR) .....	42
3	Hospital Route (NAF Roosevelt Roads -Vieques Island) .....	43

## LIST OF ATTACHMENTS

- A Baker Environmental, Inc. (Baker)  
(Applicable) Safety Standard Operating Procedures (SOPs)
- B Material Safety Data Sheets

## **EXECUTIVE SUMMARY**

**There are several potential chemical and physical hazards associated with the tasks of this project. The chemical hazards include the potential for exposure to various pesticides. The physical hazards include heavy equipment and heat stress. The environmental hazards include hazardous flora and fauna. Each of these hazards is described in Section 3.0.**

**Section 5.0 describes the air monitoring requirements which consist of using a PID and Dräger Tubes to monitor air contaminant levels.**

**The level of personal protective equipment (PPE) used for work tasks and other operations will be Level D or D+, with protection upgrades dependent on air monitoring results and the Site Health and Safety Officer's discretion.**

## 1.0 INTRODUCTION

### 1.1 Policy

It is the policy of Baker Environmental, Inc. (Baker) that all on-site hazardous waste management activities be performed in conformance with a Site-Specific Health and Safety Plan (HASP). The HASP is written based on the anticipated hazards and expected work conditions and applies to activities performed by both Baker and Subcontractor personnel. The HASP may be modified/updated with the approval of the Project Health and Safety Officer (PHSO) and Project Manager. Proper notification will be given to the Navy Engineer-in-Charge (EIC) when such changes to the plan are implemented.

This HASP is based on an outline developed by the U.S. Coast Guard for responding to hazardous chemical releases (U.S.C.G. Pollution Response COMDTINST-ML6456-30) and by NIOSH, OSHA, USCG, and EPA's recommended health and safety procedures (Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities). This plan, at a minimum, meets the requirements under OSHA Standard 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response). This plan has been designed as a Site-Specific HASP for the Phase I Remedial Investigation (Phase I RI) at U.S. Naval Station, Roosevelt Roads (NSRR), Ceiba, Puerto Rico.

### 1.2 References

The following publications have been referenced in the development and implementation of this HASP.

- American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices for 1991-1992.
- The Center for Labor Education and Research, Lori P. Andrews, P.E., Editor, 1990, Worker Protection During Hazardous Waste Remediation, Van Nostrand Reinhold, New York, New York.
- Lewis, Richard J., Sr., 1991, Hazardous Chemicals Risk Reference, 3rd Edition, Van Nostrand Reinhold, New York, New York.

- National Institute for Occupational Safety and Health/Occupational Safety and Health Administration/U.S. Coast Guard/U.S. Environmental Protection Agency (NIOSH/OSHA/USCG/EPA), October 1985, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.
- U.S. Coast Guard. Policy for Response to Hazardous Chemical Releases. USCG Pollution Response COMDTINST-M16465.30.
- U. S. Department of Health and Human Services, December 1979, Public Health Service, Centers for Disease Control, NIOSH, Criteria for a Recommended Standard ... Working in Confined Spaces.
- U.S. Department of Health and Human Services, June 1990, Public Health Service, Centers for Disease Control, NIOSH, NIOSH Pocket Guide to Chemical Hazards.

### 1.3 Pre-Entry Requirements

During the initiation of site activities (site mobilization), the SHSO will perform a reconnaissance of the anticipated work areas as identified in the Work Plan, establish or confirm emergency points of contact and procedures, and review any other issues deemed necessary to address site safety and health. The SHSO will then call a meeting with site personnel (as identified in Section 2.0) to discuss site-specific safety and health hazards, data obtained from a previous site reconnaissance, provisions outlined in this HASP, and appropriate safety and health related procedures/protocols.

## **2.0 PROJECT PERSONNEL AND RESPONSIBILITIES**

The following personnel are designated to carry out the stated job functions for both on- and off-site activities. (Note: One person may carry out more than one job function, and personnel identified are subject to change.). The responsibilities that correspond with each job function are outlined below.

**PROJECT MANAGER:** Mr. John Barone

The project manager is responsible for assuring that all activities are conducted in accordance with the HASP. The Project Manager has the authority to suspend field activities if employees are in danger of injury or exposure to harmful agents. In addition, the Project Manager is responsible for:

- Assisting the Project Health and Safety Officer in site-specific HASP development for all phases of the project.
- Designating a Site Health and Safety Officer and other site personnel who will assure compliance with the HASP.
- Reviewing and approving the information presented in this HASP.

**PROJECT HEALTH AND SAFETY OFFICER (PHSO):** Ms. Barbara Cummings

The Project Health and Safety Officer is responsible for general development and monitoring of compliance with the HASP. The PHSO will be the primary contact for inquiries as to the contents of the HASP. The PHSO will be consulted before changes to the HASP can be approved or implemented. The PHSO will also:

- Develop new protocols or modify the HASP as appropriate and issue amendments to the HASP.
- Resolve issues that arise in the field with respect to interpretation or implementation of the HASP.

- Monitor the field program through a regular review of field health and safety records, on-site activity audits, or a combination of both.
- Determine that all on-site personnel have received the required training and medical surveillance prior to entry onto the site.
- Coordinate review, evaluation, and approval of the HASP.
- Approve changes in PPE.

**SITE MANAGER:** \_\_\_\_\_ **Mr. John Barone**

The Site Manager is responsible for assuring that all day-to-day activities are conducted in accordance with the HASP. The Site Manager has the immediate authority to suspend field activities if employees are subjected to a situation that can be immediately dangerous to life or health. The Site Manager's responsibilities include:

- Assuring that the appropriate health and safety equipment and PPE has arrived on site and that it is properly maintained.
- Coordinating overall site access and security.
- Controlling visitor access to hazardous areas.
- Approving all on site activities.
- Coordinating site safety and health issues with the Site Health and Safety Officer.
- Assisting the SHSO in coordinating emergency procedures with the Naval Activity, emergency medical responders, etc., during site mobilization activities.
- Assuring compliance with site sanitation procedures and site precautions.
- Coordinating activities for Baker and Subcontractor Personnel.

**SITE HEALTH AND SAFETY OFFICER: Ms. Barbara Cummings**

**The SHSO is responsible for the implementation of the HASP. The SHSO will also:**

- **Coordinate the pre-entry briefing and daily/weekly briefings.**
- **Assure that monitoring equipment is properly calibrated and properly used.**
- **Assure compliance with site sanitation procedures and site precautions.**
- **Manage health and safety equipment, including instruments, respirators, PPE, etc., that is used in field activities.**
- **Arrange emergency response provisions in cooperation with Naval Activity Requirements, emergency medical care, etc., during site mobilization activities.**
- **Monitor conditions during field activities to assure compliance with the HASP and evaluate if more stringent procedures or a higher level of PPE should be implemented.**
- **Prepare a daily report (in the field log book) as necessary, which may include all relevant health and safety events; recordkeeping of all personnel and site monitoring information; accident investigation and reporting; safety inspections; maintain a record of site conditions, personnel involved in field activities, and any other relevant health and safety issues**
- **Oversee the arrangement and execution of equipment and personnel decontamination.**
- **Determine safe boundary procedures for activities requiring Level C or higher protection levels.**
- **Suspend field activities if the health and safety of personnel are endangered.**

- Audit the subcontractor training and medical surveillance records to verify compliance.
- Act as the Emergency Coordinator.

**FIELD TEAM LEADERS:** Mr. Richard Dabal and Mr. John Barone

The Field Team Leader is responsible for:

- Safety issues relevant to the tasks under his/her direction.
- Determining safe boundary procedures for activities requiring Level D or D+ protection levels.
- Assuring that PPE is properly maintained.

**FIELD TEAM MEMBERS:**

<u>Mr. Robert Sevcik</u>	<u>Ms. Terrie Baranek</u>
<u>Ms. Susan Johnston</u>	<u>Ms. Melissa Davidson</u>
<u>Mr. Tom Fuller (Navy Activity Coordinator, non-field activities only)</u>	

The Field Team Members are responsible for:

- Familiarity with the HASP.
- Attending training sessions to review the HASP, and remain informed of additional safety and health information.
- Being alert to identified and unidentified hazards.
- Reporting unidentified hazards to the SHSO and Site Manager.
- Offering suggestions, ideas, or recommendations that may improve or enhance site safety.

- Complying with the contents of the HASP.
- Conducting site activities in an orderly and appropriate manner.

Subcontractor personnel are responsible for:

- Complying with the conditions as outlined under Field Team Members.
- Obtaining the appropriate training and medical requirements under 29 CFR 1910.120 and providing documentation thereof.
- Complying with the training and medical surveillance requirements as outlined in Sections 9.0 and 10.0, respectively, and providing his/her own PPE that meets or exceeds the level of protection as outlined in this HASP.

**SUBCONTRACTOR COMPANIES:**

Driller:	<u>Not Applicable</u>
Surveyor:	<u>Environmental Service and Technology Corporation</u>
Geophysics:	<u>Weston Geophysical, Inc.</u>

**NAVFACENGCOM REPRESENTATIVES:**

Mr. James Szykman, EIC (804) 445-2993

**ACTIVITY/BASE REPRESENTATIVES:**

Commander L. V. Marchette, Public Works Officer (809) 865-4429

Mr. Sindulfo Castillo, Chemical/Environmental Engineer -

Public Works Department (809) 865-4429

Lt. J. G. Richardson, Officer-in-Charge (Vieques Island) (809) 741-2726

**FEDERAL/STATE/LOCAL REPRESENTATIVES:**

(not applicable)

\_\_\_\_\_

### **3.0 SITE CHARACTERIZATION**

#### **3.1 Site Background**

This Health and Safety Plan (HASP) has been prepared by Baker Environmental, Inc. (Baker) under contract N62470-89-D-4814, Contract Task Order (CTO) 0007, for the Naval Facilities Engineering Command, Atlantic Division (LANTDIV) in accordance with the specifications presented in the Final Revised Statement of Work, November, 1992.

This HASP addresses the Phase I RI of 10 sites at the U.S. Naval Station Roosevelt Roads (NSRR), Ceiba, Puerto Rico. Two of these sites, Sites 1 and 2, are physically located on Vieques Island, but for the purposes of this plan, shall be grouped with the remaining seven sites.

The objective of the Phase I RI at NSRR is to find current information directly relevant to a RCRA Facilities Investigation (RFI). The sites to be addressed in the field are as follows:

- Site 1 - Quebrada Disposal Site (Vieques Island)
- Site 2 - Mangrove Disposal Site (Vieques Island)
- Site 5 - Army Cremator Disposal Site
- Site 6 - Langley Drive Disposal Site
- Site 7 - Station Landfill
- Site 10 - Building 25 Storage Area
- Site 14 - Ensenada Honda Shoreline and Mangroves
- Site 16 - Old Power Plant, Building 38
- Site 18 - Pest Control Shop and Surrounding Area
- Site 21 - Building 121, Old Pesticide Storage

(Note: Site 13 is subject to CTO-0007, but will be addressed under a different program.)

#### **3.2 Site Work Plans**

The Work Plan (detailing the tasks to be performed at each site) and the Sampling and Analysis Plan (SAP) [comprising the Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP)] are bound as separate documents, and accompany the Health and Safety Plan.

### 3.3 Site Description

S.O.# 19007-SRN

Location: U.S. Naval Station, Roosevelt Roads

Start-Up Date: October 29, 1992

Investigation Duration: approximately 4 weeks

Anticipated weather conditions:

- Hot; temperatures ranging from 70 - 90°F

### VIEQUES ISLAND

#### Site 1 - Quebrada Disposal Site

Hazards:

- Potentially contaminated soil.
- Potentially contaminated groundwater.
- Potentially contaminated sediments.
- Site-specific hazards addressed below.

Area Affected:

- Former disposal site, now overgrown with native vegetation. Disposal occurred over the side of an embankment and into a ravine. Disposal area is suspected to contain: ordnance carriers, cans of oil, lubricants, solvents, paints, rubble, buried/exposed 55-gallon drums, cars, and general base trash.

Surrounding Population:

- No population in the immediate vicinity.

Topography:

- Densely overgrown with vegetation. Uneven terrain. Area will need clearing prior to sample collection.

Site-Specific Hazards:

- As noted previously, area is densely overgrown with vegetation, usually having a very steep slope, only trained personnel will be permitted to rappel down the slope for sampling. Island is known to contain wild horses; small game trails were noted during site visit. Also, numerous spiders and mosquitoes were noted as living within this area.

**Special Safety Equipment Concerns:**

- A seat harness and safety line combination connected to a winch or tied off to a stationary object to lower personnel down embankment.
- A mosquito net covering head (optional).
- Safety glasses with UV protection.

**Site 2 - Mangrove Disposal Site**

**Hazards:**

- Potentially contaminated soil.
- Potentially contaminated sediment.
- Potentially hazardous "tar" material.
- Site-specific hazards addressed below.

**Area Affected:**

- Former disposal site, now overgrown with native vegetation. A mangrove swamp with water inlet and subject to tides. Disposal area is suspected to contain: trash, cans of oil, lubricants, solvents, paint, and rubble.

**Surrounding Population:**

- No population in the immediate vicinity; however, area is frequented by fishermen.

**Topography**

- Densely overgrown with vegetation. Disposal occurred over flat terrain. Area is fairly open, vegetation is sporadic. Evidence of land crabs; soil is sandy. Evidence of a thin veneer of tar or asphaltic oil immediately below the soil.

**Site-Specific Hazards:**

- Island is known to contain wild horses, evidence of land crabs was noted during site visit. Also, gnats and mosquitoes were present in high concentration and very active during site visit. Broken glass noted throughout area.

**Special Safety Equipment Concerns:**

- A mosquito net covering head (optional).
- Disposable, latex/neoprene overboots to be worn over steel toe shoes.
- Disposable, breathable (Kleenguard) coveralls to be worn over normal work clothes (optional).
- Safety glasses with UV protection.

## **NSRR**

### **Site 5 - Army Cremator Disposal Site**

#### **Hazards:**

- Potentially contaminated soil.
- Potentially contaminated groundwater.
- Site-specific hazards addressed below.

#### **Area Affected:**

- Former disposal site, now overgrown with native vegetation. Located in and around mangrove area. Disposal area is suspected to contain: solid wastes, scrap metal, batteries, tires, appliances, cars, cables, dry cleaning solvent cans, paint cans, and gas cylinders. No evidence of disposal was detected during the preliminary site visit.

#### **Surrounding Population:**

- Area of concern is located away from populated areas.

#### **Topography:**

- Grossly overgrown vegetation covering uneven terrain. Area will need clearing prior to sample collection.

#### **Site-Specific Hazards:**

- Mosquitoes are expected to be prevalent in this area.
- Special care will need to be taken when clearing vegetation to avoid injury when using machetes or powered weed cutters.
- HNu nonresponsive during opening of groundwater monitoring wells.
- Earth-moving equipment in use for clearing area.

#### **Special Safety Equipment Concerns:**

- Mosquito nets covering face (optional).
- Hearing protection (optional).
- Safety glasses with UV protection.

### **Site 6 - Langley Drive Disposal Site**

#### **Hazards:**

- Potentially contaminated groundwater.
- Potentially contaminated soil.
- Site-specific hazards addressed below.

**Area Affected:**

- Former disposal site, now overgrown with native vegetation. Located in and around mangrove area. Disposal area is suspected to contain: partially buried metal and concrete objects, old fuel lines, flexible metal hoses, containers with pallets, steel cables, hardened tar, rubble, corroded 55-gallon drums (full).

**Surrounding Population:**

- Area of concern is located away from populated areas.

**Topography:**

- Grossly overgrown vegetation covering uneven terrain. Area will need clearing prior to sample collection.

**Site-Specific Hazards:**

- Mosquitoes are expected to be prevalent in this area.
- Special care will need to be taken when clearing vegetation to avoid injuring oneself or other personnel when using machetes or powered weed cutters.
- HNu nonresponsive during opening of groundwater monitoring wells.
- Earth-moving equipment in use for clearing area.

**Special Safety Equipment Concerns:**

- Mosquito nets covering face (optional).
- Hearing protection (optional).
- Safety glasses with UV protection.

**Site 7 - Station Landfill**

**Hazards:**

- Potentially contaminated groundwater.
- Site-specific hazards addressed below.

**Area Affected:**

- Operating and nonoperating portions of current landfill. Disposal area is expected to contain: paint waste, solvents, PCBs, Otto Fuel II, Argentine, pesticides, transformers, asbestos, and waste oil.

**Surrounding Population:**

- Area is essentially unpopulated, though workers are on the grounds to monitor current landfill operations.

#### Topography:

- Uneven terrain, some dumped material is exposed above surface. Some areas of interest have very dense vegetation. Some clearing will be required prior to sample collection.

#### Site-Specific Hazards:

- Very uneven terrain, care should be taken to avoid trips and falls.
- Wasp nests are present in the surrounding trees, care should be taken to avoid nests.
- Mosquitoes are expected to be prevalent in this area. Also, ant colonies were noted at one groundwater well location and should be expected at other locations.
- Special care will need to be taken when clearing vegetation to avoid injury when using machetes or powered weed cutters.
- HNu responsive during opening of groundwater monitoring wells R7GW02 (12-13 ppm) and R7GW03 (1-3 ppm). Slight deflection at well R7GW05.

#### Special Safety Equipment Concerns:

- Mosquito nets covering head (optional).
- Safety glasses with UV protection.

#### Site 10 - Building 25 Storage Area

##### Hazards:

- Potentially contaminated soil.
- Potentially contaminated groundwater (groundwater level measurements).
- Site-specific hazards addressed below.

##### Area Affected:

- Area is a mixture of fenced and unfenced storage surrounded by grassy open areas or more densely vegetative areas. Vehicular traffic in the vicinity is high. Storage area is expected to contain: 55-gallon drums, corroded 5-gallon pails, asbestos sheeting, transformers (one which has leaked dielectric fluid), mechanical devices, gas cylinders, and construction rubble.

##### Surrounding Population:

- Various occupied buildings surround this area.

##### Topography:

- Area is primarily level, with smaller areas of uneven terrain.

##### Site-Specific Hazards:

- Uneven terrain, some dense vegetation.
- Vehicular traffic is prevalent.
- Special care will need to be taken when clearing vegetation to avoid injury when using machetes or powered weed cutters.
- Sun exposure is high due to many open areas.

- Personnel are instructed to keep their distance from visibly dangerous materials (i.e., ordnance casings, 55- or 5-gallon drums).
- HNu responsive during opening of groundwater monitoring well 10GW08 (140-150 ppm initially, then 50-70 ppm after aeration).

**Special Safety Equipment Concerns:**

- Mosquito nets covering head (optional).
- Safety glasses with UV protection.

**Site 14 - Ensenada Honda Shoreline and Mangroves**

**Hazards:**

- Potentially contaminated sediments.
- Site-specific hazards addressed below.

**Area Affected:**

- Shoreline and mangroves surrounding the Ensenada Honda.

**Surrounding Population:**

- Coast Guard operations are located within the study area; however, area is essentially unpopulated aside from occasional boating activities.

**Topography:**

- Mangrove swamp and dense tropical vegetation subject to tidal influences.

**Site-Specific Hazards:**

- Operations are to be conducted from water vessels (i.e., kayaks, and a motor launch), therefore, personnel are instructed to review the information provided in Attachment D - Baker Safety Standard Operating Procedures, on Safe Boat Operations.
- Sun exposure while working on the water.
- Exposure to various insects and aquatic life.

**Special Safety/Personal Protective Equipment Concerns:**

- All pertinent safety equipment as outlined in SOP (see above).
- Extra safety line and life vests (should a rescue be required).
- Safety glasses with UV protection.

**Site 16 - Old Power Plant, Building 38**

**Hazards:**

- Potentially contaminated sediments and surface water.
- Site-specific hazards addressed below.

**Area Affected:**

- Shoreline and inland caissons.

**Surrounding Population:**

- Area is essentially unpopulated; some recreational activity near shoreline caissons, and vehicular traffic near inland caissons.

**Topography:**

- Shoreline with level topography inland.

**Site-Specific Hazards:**

- Operations are to be conducted from a water vessel (i.e., motor launch), therefore, personnel are instructed to review the information provided in Attachment D - Baker Safety Standard Operating Procedures, on Safe Boat Operations.
- Sun exposure while working on the water.
- Exposure to various insects and aquatic life.
- Falling hazard while sampling caissons.

**Special Safety/Personal Protective Equipment Concerns:**

- All pertinent safety equipment as outlined in SOP (see above).
- Extra life vests.
- Safety glasses with UV protection.
- Safety line and harnesses for fall protection during sampling.

**Site 18 - Pest Control Shop and Surrounding Area**

**Hazards:**

- Potentially contaminated soil.
- Potentially contaminated groundwater.
- Potentially contaminated sediments.
- Site-specific hazards as addressed below.

**Area Affected:**

- Formerly a pest control shop.

**Surrounding Population:**

- Area is unpopulated.

**Topography:**

- Essentially even terrain with drainage ditch along road side.

**Site-Specific Hazards:**

- Wasp nests are present in the surrounding trees, care should be taken to avoid nests.

- Special care will need to be taken when clearing vegetation to avoid injury when using machetes or powered weed cutters.
- Sun exposure is high due to many open areas.
- HNu nonresponsive during opening of groundwater monitoring wells.

**Special Safety/Personal Protective Equipment Concerns:**

- Mosquito net covering head (optional).
- Safety glasses with UV protection.

**Site 21 - Building 121, Old Pesticide Storage**

**Hazards:**

- Potentially contaminated soil.
- Potentially contaminated concrete.
- Site-specific hazards addressed below.

**Area Affected:**

- Building 121 and surrounding area.

**Surrounding Population:**

- Area is secluded and unpopulated.

**Topography:**

- A dirt road accesses Building 121, but surrounding area has dense vegetation. A telephone line runs within close proximity of site.

**Site-Specific Hazards:**

- Building 121 contains labeled and unlabeled 55-gallon and 25-gallon ring top drums and 5-gallon containers with waste pesticides (diazinon, zinc phosphide, chlordane, pyrethrins and others). Care should be taken not to disturb drums while obtaining concrete chip samples.
- Insects (cockroaches) and pests (rats) as well as broken pallets, splintered wood, and nails, have been observed within the building. Care should be taken to avoid encountering or aggravating such animals.
- HNu and combustible gas/toxic gas (H<sub>2</sub>S and CO) detectors unresponsive during monitoring in building 121.

**Special Safety Equipment Concerns:**

- Mosquito net covering head (optional).
- Safety glasses with UV protection.

### **3.4 Hazard Evaluation**

#### **3.4.1 Task-Specific Hazards**

Hazards at the site may be associated with several job tasks as detailed in the site work plan.

Only operators trained, qualified, and authorized by the SHSO will be permitted to operate project equipment. The equipment will be adequately sized to the job at hand. Hand signal communication will be prearranged between trained operators and personnel working in and around earth-moving equipment. Personnel nonessential to the operation of the equipment will maintain a safe working distance from the equipment. This distance will be determined by the SHSO during operations.

Employees must exercise caution to remain out of the paths of moving equipment and materials. Caution should also be exercised to avoid slips, trips, and falls.

Listed below are summaries for the hazards associated with each of the site tasks.

#### **Task 1 Sediment/Surface Water Sampling**

##### *Chemical*

- Potential for contaminated material to be splashed onto body or in eyes.
- Ingestion of contaminated material from hand to mouth contact.
- Inhalation of volatile constituents within the sediments or surface water.

##### *Physical/Environmental*

- Sampling operations that occur from boats. These operations must comply with Baker's Safety SOP for Safe Boat Operations.
- Slips/trips/falls - sloped, uneven terrain; crawling over and under obstacles.
- Skin irritation from contact with insects and vegetation.
- Interaction with native and potentially hostile animal life.

#### **Task 2 Surveying (performed by Subcontractor personnel)**

##### *Chemical*

- Ingestion of contaminated material from hand to mouth contact.

*Physical/Environmental*

- Slips/trips/falls - sloped, uneven terrain; crawling over and under obstacles.
- Skin irritation from contact with insects and vegetation.
- Interaction with native and potentially hostile animal life.

Task 3 Nonintrusive Geophysics (performed by Weston Geophysical)

*Chemical*

- Ingestion of contaminated material from hand to mouth contact.

*Physical/Environmental*

- Slips/trips/falls - sloped, uneven terrain; crawling over and under obstacles.
- Skin irritation from contact with insects and vegetation
- Interaction with native and potentially hostile animal life.

Task 4 Surface Soil Sampling

*Chemical*

- Skin contact with potentially contaminated soils.
- Ingestion of hazardous materials from hand to mouth contact.
- Inhalation of volatile or semivolatile contaminants.

*Physical/Environmental*

- Slips/trips/falls - sloped, uneven terrain; crawling over and under obstacles.
- Skin irritation from contact with insects and vegetation.
- Interaction with native and potentially hostile animal life.

Task 5 Groundwater Sampling

*Chemical*

- Skin contact with contaminated water.
- Eye contact from splashing water.
- Ingestion of hazardous materials from hand to mouth contact.
- Inhalation of volatiles emitting from the well opening.

*Physical/Environmental*

- Skin irritation from contact with insects and vegetation.
- Lifting hazards (muscle strain, etc.) while bailing well.
- Cuts from using knives to cut bailer rope.
- Slips/trips/falls - sloped, uneven terrain.
- Interaction with native and potentially hostile animal life.

## Task 6 Concrete Chip Sampling

### *Chemical*

- Inhalation of dust or particulate.
- Ingestion of dust or particulate.

### *Physical/Environmental*

- Eye damage due to flying pieces of concrete.
- Damage to fingers/hand from impact of hammer.

### **3.4.2 Chemical Hazards**

Exposure to hazardous chemicals can occur through various pathways into the body. These pathways include:

- Inhalation of vapors and/or particulates.
- Ingestion of contaminated particulates from hand-to-mouth contact.
- Dermal and eye contact from direct, unprotected contact.
- Absorption through the eye from exposure to concentrations in the air.

The chemical exposure potential for personnel working at NSRR is expected to result from the chemicals observed during the site visit. Therefore, Tables 1 and 2 identify the chemical/physical properties and exposure symptoms/routes of entry, respectively, for these chemicals.

By eliminating the potential routes of exposure throughout the use of engineering controls (safe sampling techniques) and personal protective equipment (chemical protective clothing) the risk of exposure can be effectively eliminated for those chemicals identified in Table 1.

Material Safety Data Sheets for those materials identified in Table 1 above have been compiled, and are included as Attachment B.

TABLE 1

CHEMICAL/PHYSICAL PROPERTIES OF CHEMICALS/SUBSTANCES OBSERVED ON SITE DURING THE SITE VISIT

Chemical/Substance	Site	Exposure Limit (EL)(a)	IDLH(b)	Vapor Pressure(c)	Specific Gravity(d)	Physical State(e)
Chlordane	21	0.5 mg/m <sup>3</sup> (skin)	500 mg/m <sup>3</sup> (CA)	0.00001	1.56 @ 77°F	Liquid
Diazinon	21	0.1 mg/m <sup>3</sup> (skin)	NA	NA	1.117	Liquid
Malathion	21	10 mg/m <sup>3</sup> (skin)	5,000 mg/m <sup>3</sup>	0.00004	1.21	Liquid
Parathion	21	0.1 mg/m <sup>3</sup> (skin)	20 mg/m <sup>3</sup>	0.00004	1.27	Liquid
Zinc Phosphide	21	10 mg/m <sup>3</sup>	NA	NA	4.55 @ 13°C	Solid (crystal or powder)

(a) EL - Exposure Limit = A time-weighted average concentration for a normal eight-hour work day and 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without expected adverse effect. The EL represents published Exposure Levels according to the following hierarchical order: (1) OSHA PELs; (2) NIOSH RELs; (3) ACGIH TLVs; and, (4) other recognized sources.

(b) IDLH - Immediately Dangerous to Life or Health.

(c) Vapor Pressure = Expressed as mm/Hg at 68°F (unless otherwise mentioned).

(d) Specific Gravity = At 68°F (unless otherwise mentioned).

(e) Physical State = at 15°C and 1 atmosphere (unless otherwise mentioned).

CA - Suspected or Proven Carcinogen

NA - Not Available

ppm - parts per million (in air)

mg/m<sup>3</sup> - milligrams per cubic meter (in air)

Skin - Potential for dermal absorption

**TABLE 2****CHEMICAL EXPOSURE INFORMATION**

A summary of exposure symptoms/routes of entry for chemicals observed at NSRR.

Substance	Acute Exposure Symptoms	Exposure Symptoms
Chlordane	Blurred vision, confusion, cough, nausea, vomiting, diarrhea, irritability, and tremors.	Inhalation, skin/eye contact, absorption, ingestion
Diazinon	Change in motor activity, muscle weakness, sweating; skin and eye irritation.	Ingestion, skin/eye contact
Malathion	Miosis, aching eyes, blurred vision; eye and skin irritations; nausea, vomiting, diarrhea, confusion and headache.	Inhalation, absorption, skin/eye contact, ingestion
Parathion	Miosis, headache, wheezing, cyanosis, nausea, vomiting, diarrhea; weakness, confusion; skin and eye irritation.	Inhalation, absorption, skin/eye contact, ingestion
Zinc Phosphide	Nausea and vomiting; potential eye and skin irritant.	Inhalation

### **3.4.3 Physical Hazards**

#### **3.4.3.1 Confined Space Entry**

It is not anticipated that there will be a need for a confined space entry procedure during the Phase I RI activities; therefore, a confined space entry SOP has not been included.

#### **3.4.3.2 Thermal Stress**

Provisions for monitoring of heat stress are outlined in Attachment A - Baker Safety SOPs.

#### **3.4.3.3 Explosion and Fire**

In general, the following items present potential physical hazards and will be monitored closely:

- **Explosion and fire resulting from:**
  - ▶ **Heavy equipment malfunction**
  - ▶ **Penetration into underground utility/service lines (gas, electric, fuel)**
  - ▶ **Ignition of trapped flammable vapors**
  - ▶ **Vehicular accidents**
  - ▶ **Disturbance of damaged, sensitive, or over-pressurized drums, and compressed gas cylinders**

As additional concerns are identified, provisions for making changes to the HASP will be presented by the SHSO, as needed.

#### **3.4.3.4 Noise**

Excessive noise levels may be produced during equipment operations. Depending on the length and duration of these procedures, personnel protective devices may be required. The determination for the need to wear protection will be made by the SHSO.

#### **3.4.4 Radiation Hazards**

The presence of radiological wastes or radioisotopes is not anticipated; therefore, radiation monitoring at NSRR will not be required.

#### **3.4.5 Environmental Hazards**

##### Hazardous Flora

Incidence of contact by individuals to poisonous/thorny plants is a real threat. Bare skin should be covered (i.e., long pants and shirt, steel toe boots, leather or cotton gloves, safety glasses, and head protection) as much as practical when working in forested areas. Personnel should avoid entering an area in the direct path of known poisonous flora (i.e., poison ivy/oak), a secondary route should be selected. Care should also be taken when walking in such areas as uneven terrain or vines may present a tripping hazard.

While attempting to cut into dense underbrush, hazards exist from the sharp machete, gas-powered weed cutter, etc. Care should be taken when using such devices. All rashes and other injuries will be reported to the SHSO as soon as they are known.

##### Hazardous Fauna

All animal life must be treated with respect. Without proper training, personnel may not be able to differentiate between dangerous and nondangerous varieties.

There are no poisonous snakes indigenous to Puerto Rico, only nonpoisonous snakes such as the Boa Constrictor. Feral (wild) dogs and cats have been observed.

Mongoose, rats, and mice have been documented to (potentially) carry rabies. There is some evidence that mongoose can be infected with the rabies virus in an attenuated form, allowing them to carry and spread the virus for considerable time before succumbing to the disease. Any observed unusual behavior by mongoose and other mammals must be reported. Signs of rabies can be characterized in two forms. Furious Rabies exhibits agitation and viciousness followed by paralysis and death. Dumb Rabies exhibits lethargy and paralytic symptoms followed by death. Behavioral indicators for both include fearlessness and change in nocturnal/diurnal rhythms.

Working in wet or swampy areas unprotected shall not be allowed. Contact with surface water will be kept to a minimum. There have been several incidents of infection by schistosomes (blood flukes) from contact with surface water. The aquatic snail vector, Australorbis Glabratus, transmits the schistosomes into surface waters, predominantly drainage ditches. Even momentary contact with contaminated surface water is sufficient to acquire an infection. Accidental contact requires thorough washing with isopropyl alcohol. Symptoms of infestation are fever, diarrhea, itchy skin, and CNS damage. Schistosomiasis is hard to treat and, once established in its host, may remain for several years.

Mosquitoes and sand flies pose a nuisance and physical hazard to field personnel. As a nuisance, they distract workers, leading to accidents. Mosquitoes also pose a physical threat by injecting live microorganisms into their victim. Sand fly bites that are repeatedly scratched have caused several secondary infections. Perfumes and deodorants should be avoided. Light colored clothing is preferable, as mosquitoes are not attracted to lighter colors. There is potential to come in contact with other dangerous insects. These include centipedes, ants, chiggers, bees, wasps, hornets, mites, fleas, black widow spiders, and tarantulas. All personnel should perform "checks" on each other periodically and at the end of the work shift. All insect bites must be reported to the Site Health and Safety Officer.

Prior to final selection of personnel, each individual shall be questioned about known sensitivities to any organism or agent.

### **3.4.6 Additional Hazards**

Provisions for the monitoring of hazards particular to the specific site activities (such as slippery ground, uneven terrain, overhead equipment, etc.), shall be addressed at the pre-entry briefing by the SHSO or qualified designee. All personnel are expected to adhere to all applicable safety regulations in OSHA standards 29 CFR 1910 and 1926 and follow good safety practice as described in the HASP.

#### **4.0 SITE CONTROL**

##### **4.1 Site Access**

- The Site Manager is designated to coordinate overall access and security on site. Perimeters for activities to be conducted at all Sites will be established according to the site boundary procedures identified in Section 4.3, Local Conditions, and Navy Activity requirements.
- Personnel will not be permitted within the Work Zone (Exclusion Zone) or Contamination Reduction Zone without proper authorization from the SHSO.
- All personnel arriving or departing the site will be documented in the field sign-in log.
- All activities on site must be cleared through the Site Manager.
- The location of the site(s) under investigation are identified in Section 8.5.

##### **4.2 Site Conditions**

- The prevailing wind conditions are generally easterly to northeasterly.
- The on-site Command Post will be established at each of the Baker Field Vehicles, on a daily basis. This location will always be in the Support Zone and oriented upwind from the Work Zone prior to beginning site activities.

##### **4.3 Work Zones**

###### **Level C Activities**

Work Zones for activities conducted under Level C shall be established utilizing control boundaries between the Work Zone, the Contamination Reduction Zone (CRZ), and the Support Zone (Clean Zone). These boundaries shall be defined as follows:

- Work Zone - A radius of at least 25 feet (barring obstruction) from Site Investigative Activities.

- Hotline - The boundary between the Work Zone and CRZ.
- CRZ - The area between the Work Zone and the Support Zone (located upwind of the Site Investigative Activities). Refer to Figure 1 for a "Typical Contamination Reduction Zone Layout."
- Contamination Control Line - The boundary between the CRZ and the Support Zone.
- Clean Zone - The outermost area next to the CRZ and upwind of the Site Investigative Activities.

These boundaries will be demarcated using:

- Colored boundary tape, cones, or equivalent for the Hotline.
- Colored boundary tape, cones, or equivalent for the Decontamination Corridor of the CRZ.
- Colored boundary tape and barriers for the Contamination Control Line including posted signs and/or barricades indicating "Work Area"/"Authorized Personnel Only", or equivalent.

#### **Level D and D+ Activities**

##### Populated Areas

Work Zones for activities conducted under Level D or D+ protection levels shall be established in such a manner as to preclude unauthorized personnel from entering the investigative area. A boundary will be established around the Work Zone to separate it from the Clean Zone using available materials. Such materials may include the Baker Field Vehicle, natural boundaries (buildings, structures, fences), or signs/placards, boundary tape, cones, barricades, etc..

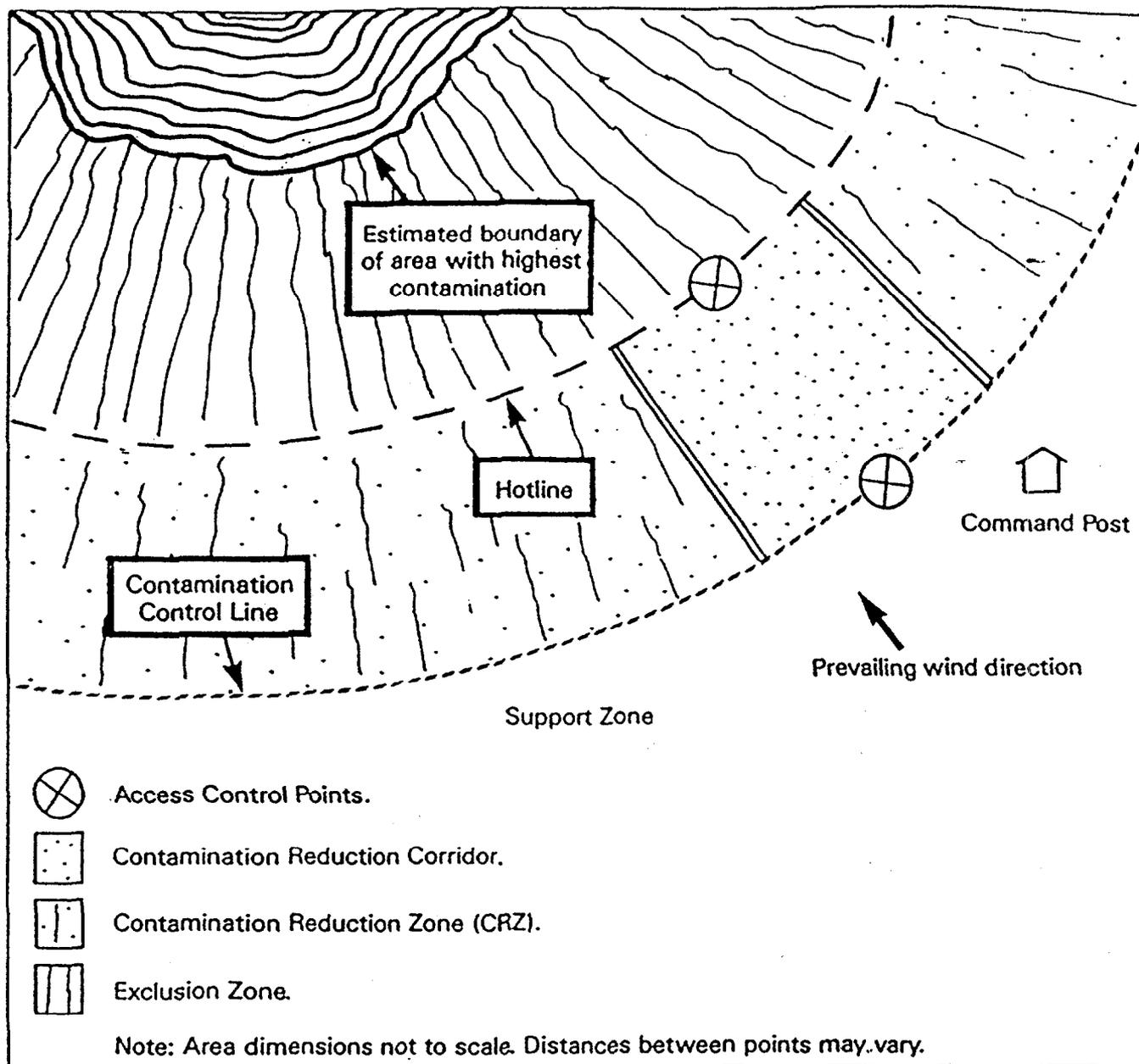


FIGURE 1  
TYPICAL CONTAMINATION  
REDUCTION ZONE LAYOUT

## Unpopulated/Secluded Areas

In unpopulated or secluded areas, the aforementioned materials may not be required due to the exclusive nature of the site, the short duration of the activity, and the low risk to outside populations. The SHSO and/or Field Team Leader is responsible for making this determination.

### 4.4 "Buddy System"

All site activities that involve hazards and/or the potential for contact with hazardous materials will be performed by a work team of no fewer than two people (Buddy System). For potential "high-hazard" activities, an additional person will serve as an observer or rescue person.

### 4.5 Safe Work Practices

Routine safe work practices may consist of:

- Setting up barriers to exclude personnel from contaminated areas.
- Minimizing the number of personnel and equipment at the site (s).
- Establishing work zones within the site.
- Establishing control points with regular access to and egress from work zones.
- Conducting operations in a manner to reduce exposure of personnel and equipment.
- Implementing appropriate decontamination procedures.
- Conducting sampling activities from an upwind location.

### 4.6 Sanitation/Site Precautions

Provisions for sanitation procedures and site precautions to be followed on site can be found in Attachment A - Baker Safety SOPs.

## 5.0 AIR MONITORING

### 5.1 Point Source Monitoring

Point source monitoring is defined by this HASP as monitoring performed at the source of the sampling/investigative activity. Instrumentation to be used will include a PID and Dräger Tubes as outlined in Section 5.4.

### 5.2 Personal Monitoring

The following personal monitoring will be in effect on site:

Personal monitoring will be accomplished using real time air monitoring instrumentation directed at the breathing zone of work party personnel, which should be sufficient according to the work activities and hazards presented. Refer to the guidelines below for protection levels required according to the concentration measured.

#### \*PID

- Background to 5 ppm = Level D
- > 5 ppm to 7 ppm for greater than 5 continuous minutes = Level C plus Benzene Dräger Tube Monitoring
- > 7 ppm for up to 15 continuous minutes = Stop Work and consult SHSO
- Instantaneous peak concentrations > 70 ppm = Stop Work and consult SHSO

\*PID with 10.2 eV ultraviolet lamp.

Dräger Tubes (used to determine if Level D or D+ protection levels are adequate) (1)

- Below limits of detection (BLD) to less than the EL (Exposure Level)\* = Level D
- EL to 5 times the EL = Level C (if adequate NIOSH certified air-purifying cartridge is available) or Stop Work and consult SHSO
- > 5 times the EL = Stop Work and consult SHSO

\*Refer to Table 1, Section 3.0, for explanation.

- (1) Phosphoric Acid Ester Dräger Tube (for presence of dichlorvos, EL = 1 mg/m<sup>3</sup>)  
Benzene Dräger Tube (for presence of Benzene, EL = 1 ppm)  
Refer to Table 3.

**TABLE 3**

**MONITORING EQUIPMENT AND FREQUENCY FOR SITES AT NSRR**

Job Task	PID	Dräger Colorimetric Tubes <sup>(1)</sup>	
		(67 28561) Benzene	(67 28461) Phosphoric Acid Ester
Sediment Sampling	I&P		
Surveying	I		
Nonintrusive Geophysics	I		
Surface Soil Sampling	I&P		
Groundwater Sampling	I&P		
Tar Sampling	I&P		
Chip Sampling	I		I

- I = Initially - At start of job task to confirm designated protection level.
- P = Periodically - When site condition or set-up changes, or when a new area is entered.
- C = Continuously - Monitor levels continuously.
- D = At the discretion of the SHSO.
- PID = Photoionization Detector

Note: As air concentrations are measured, they should be documented. In the case of continuous monitoring, every 15 to 30 minutes.

<sup>(1)</sup> The exact Dräger tubes to be used at this site are subject to change, based on site concerns.

As work progresses, the scope of monitoring may be extended based on monitoring results, odor detection, changing work conditions, and signs or symptoms of exposure. Any or all of these conditions will be immediately investigated and acted upon by the SHSO.

### **5.3 Perimeter Monitoring**

Perimeter monitoring is defined as monitoring performed at borders beyond the Clean Zone and often at the "fence line." Releases occurring during these types of investigative activities are expected to be minimal. Therefore, it is anticipated that the type and frequency of monitoring required for each site will be as follows:

- The PID will be used periodically to scan the perimeter as a means of documenting any volatile releases that may extend past the work zone, when volatile concentrations exceeding 70 ppm are detected at the breathing zone.
- Dräger Colorimetric Tubes will be used periodically to measure any potential releases when concentrations exceeding the EL are detected at the breathing zone. Refer to Table 3 in Section 5.4 to determine the specific tubes required for each task.

### **5.4 Site-Specific Air Monitoring Equipment and Frequency**

Air monitoring equipment and frequency for each site can be found in Table 3. Dräger Tubes are required when air concentrations reach a certain level according to an HNu response. In certain situations, however, Dräger tubes are specified for use in the same manner as other real time instrumentation. Action levels that govern changes in levels of protection, can be found in Section 5.2.

### **5.5 Equipment Maintenance and Calibration**

Baker's procedures for the return of equipment to inventory and for maintenance of the equipment shall be followed in order to assure that the optimum level of operation is maintained for the item. Equipment calibration under the direction of the SHSO will be completed daily and calibration information entered into the equipment calibration log sheet. The log sheets will be maintained on site for the duration of the project with copies to be given to the Equipment Manager once the equipment has been returned to the office. Procedures for equipment maintenance and calibration can be found in the operating manual provided by the

manufacturer (included with each piece of equipment), or, in Baker's Standard Operating Procedures for Administrative, Field, and Technical Activities Manual.

#### **5.6 Monitoring Documentation**

As environmental monitoring is performed, documentation of the results will be entered into the Field Log Book of the SHSO or other personnel performing the monitoring. At the end of each day (or at most each week), these values will be entered onto an air monitoring log sheet. The log sheets will be placed in a binder and remain on site till the end of the field activities, whereby the log sheets will become part of the permanent file.

## 6.0 PERSONAL PROTECTIVE EQUIPMENT

### 6.1 Levels of Protection

The required personal protective equipment, with options, for each level of protection is listed below. Specific information regarding respiratory protection is detailed in Section 6.3.

Personal Protective Equipment	Level of Protection				
	B	C	D+	D	Other
Chemical-Resistant Clothing (Polyethylene-coated Tyvek®)			X		
Uncoated Tyvek® Coveralls			X		
Normal Work Clothes or Coveralls				X	
Air-Line Respirator (ALR) with 5-minute escape pack					
Self-Contained Breathing Apparatus (SCBA) for rescue					
Full-Face Cartridge Respirator					
Half-Face Cartridge Respirator					
Full-face or Half-face Cartridge Respirator (on standby)			X		
Chemical-Resistant Gloves (Nitrile inner)			X	X	
Chemical-Resistant Gloves (Rubber/Neoprene outer)					
Chemical-Resistant Gloves (Latex inner)				X	
Chemical-Resistant Gloves (Nitrile outer)			X		
Work Gloves (outer)				X	
Chemical-Resistant Overboots (with steel toe and shank)					
Steel Toe Boots			X	X	
Chemical-Resistant Overboots (w/o steel toe)			X		
Safety Glasses/Goggles (w/UV protection)			X <sup>(1)</sup>	X	
Face Shield			X <sup>(1)</sup>		
Hard Hat			X <sup>(1)</sup>	X <sup>(1)</sup>	
Hearing Protection				X <sup>(1)</sup>	

(1) At the discretion of the SHSO.

Changes to the type of PPE required under each level of protection may be instituted by the SHSO.

**6.2 Site-Specific Levels of Protection**

Based on an evaluation of potential hazards the levels of personal protection have been designated for the following tasks. Upgrading or downgrading the level of protection will be based on real time monitoring and working conditions. Changes in level of protection will be the responsibility of the SHSO. (Note: No single combination of protective equipment and clothing is capable of protection against all hazards.) PPE should be used in conjunction with safe work practices, decontamination, and good personal hygiene.

Sites	Job Task	Level of Protection				
		B	C	D+	D	Other
1,5,6,7,10,18	Surveying				X	
5, 6 (optional)	Nonintrusive Geophysics				X	
1,2,5,6,10,18,21	Surface Soil Sampling			X(a)	X	
1,2,14,16,18	Sediment Sampling			X(a)	X(b)	
16,18	Surface Water Sampling				X	
1,5,6,7,18	Groundwater Sampling				X	
2	Tar Sampling			X(a)		
21	Chip Sampling			X		

- (a) For Site 2 only.
- (b) Protective equipment will consist of the following for Site 14:
  - Lightweight (comfortable) cotton clothing
  - Comfortable shoes with a nonslip tread
  - Head covering
  - Glasses with UV protection
  - Mosquito net head covering
  - Nitrile gloves (during sample handling)

**EXCEPT IN EMERGENCY SITUATIONS, CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL ONLY BE MADE WITH THE APPROVAL OF THE SITE HEALTH AND SAFETY OFFICER AND THE SITE MANAGER.**

**6.3 Respiratory Protection**

Site-specific respiratory protection requirements as outlined below will comply with the procedures in Attachment A - Baker Safety SOPs. The criteria for using these types of respiratory protection have been determined by qualified Baker personnel in compliance with OSHA Standard 29 CFR 1910.134.

### Level C

A "North or MSA" Brand full-face NIOSH certified air-purifying cartridge respirator with an organic vapor/HEPA cartridge is the appropriate cartridge for use with the detected hazardous materials and the measured contaminant concentrations. Upgrade/downgrade in the level of respiratory protection will be based on measured "realtime" air contaminant concentrations (see Section 5.2).

Cartridge changeover will occur when one or more of the following have been observed: exposure to PID/FID concentrations greater than or equal to 100 ppm; exposure duration greater than eight hours for vapor/gas cartridges; breathing resistance; smell, taste, or eye/throat irritation; and other indicators such as end-of-service life indicators for specialty filter cartridges.

### Level D+

A NIOSH certified air-purifying cartridge respirator meeting all the requirements identified under Level C will remain on standby at this level.

## **6.4 Care and Cleaning of Personnel Protective Equipment**

Provisions for the care and cleaning of personal protective equipment used on site can be found in Attachment A - Baker Safety SOPs. Responsibility for compliance with these provisions lies with the Site Manager and/or Field Team Leader.

## 7.0 DECONTAMINATION PROCEDURES

### 7.1 Personnel Decontamination

Personnel leaving the Work Zone will be thoroughly decontaminated. The following protocol will be used for the decontamination stations according to levels of protection:

Level D	Level D+	Level C
1. Equipment drop	1. Equipment drop	1. Equipment drop
2. Boot and glove gross contamination removal*	2. Outer boot and glove wash	2. Outer boot and glove wash
3. Boot and glove wash*	3. Outer boot and glove rinse	3. Outer boot and glove rinse
4. Boot and glove rinse*	4. Tape Removal	4. Tape Removal
5. Tape Removal*	5. Outer boot and glove removal	5. Outer boot and glove removal
6. Boot and glove removal*	6. Coverall removal/disposal	6. Coverall removal/disposal
7. Coverall removal*	7. Inner glove removal/disposal	7. Respirator removal
8. Hand/Face wash	8. Hand/face wash	8. Inner glove removal/disposal
9. Equipment wipe down	9. Equipment cleaning	9. Hand/face wash
		10. Respirator cleaning/sanitizing
		11. Equipment cleaning

\*Optional - depends on degree of contamination and type of PPE used.

The following decontamination equipment is required for Level C and higher protection levels and recommended for Levels D and D+ protection:

- Four small tubs (two sets of wash and rinse water)
- Scrub brush
- Towels
- Disposable wipes
- Pressurized sprayers for rinsing
- Contaminated clothing disposal bag or drum
- Contaminated liquids disposal drum
- Respirator cleaning solution
- Liquinox and water as the decontamination solution

The decontamination liquids and clothing will be contained and disposed according to policy defined in the Sampling and Analysis Plan (SAP).

## **7.2 Equipment Decontamination**

Provisions for the decontamination of equipment will be based on the size and type of equipment used. Specific decontamination procedures for all Sites can be found in the SAP.

## **7.3 Waste Handling Procedures**

The protocols outlined in the SAP for the handling, packaging, storing, and disposing of contaminated materials must be followed to: (1) minimize the risk of off-site exposures that could endanger public health; and (2) limit the potential for liabilities associated with handling, containment, storage, and transportation of contaminated materials. These protocols comply with Baker's SOP on "Handling of Site Investigation Generated Wastes," located in the Standard Operating Procedures for Administrative, Field, and Technical Activities Manual.

## **8.0 EMERGENCY PROCEDURES**

### **8.1 Pre-Emergency Planning**

All Navy/local emergency response contacts (On-Scene Coordinator, Fire Department, Security, etc.) at NSRR will be contacted during site mobilization activities. This notification will be performed by the SHSO and/or Site Manager. The information discussed may include:

- A description of site activities.
- Anticipated site hazards.
- Hazardous chemicals to be used on site.
- Expected length of time on site.
- Specific requirements the emergency response facilities may require.
- Confirmation of emergency phone numbers.

Specific points of contact, where applicable, will be established and added to the HASP. If requested, Material Safety Data Sheets will be provided at this time.

### **8.2 Emergency Coordinator**

The SHSO acting as the Emergency Coordinator is responsible for field implementation of the Emergency Plan. As the Emergency Coordinator, specific duties include:

- Familiarizing all on-site personnel with the emergency procedures and the emergency coordinator's authority.
- Identifying the nearest telephone in the event of an emergency.
- Communicating site emergency procedures and requirements to all Baker and subcontractor personnel, as necessary.
- Specifying a backup/alternate Emergency Coordinator.
- Controlling activities of subcontractors and contacting the Navy On-Scene Coordinator and other base response groups.

- Anticipating, identifying, assessing, and controlling fires, explosions, chemical releases, and other emergency situations to the best of his/her abilities.
- Familiarity with site personnel trained in emergency first aid and CPR.

All on-site personnel, whether involved in emergency response or not, will be notified of their responsibilities by the Emergency Coordinator in an emergency. They will be familiar with the emergency procedures and the Emergency Coordinator's authority.

### 8.3 Communications

Internal communications will rely on direct communication (via verbal or two-way radios) between site personnel. External communications will employ mobile telephones located in the Baker Field Vehicles.

Personnel in the Work Zone will remain in constant communication or within sight of the Site Manager, SHSO, or Field Team Leader. Any failure of communication requires an evaluation of whether personnel should leave the Work Zone.

**Air horns will be used for communication during emergency evacuation of site personnel. One long (3 second) air horn blast is the emergency signal to indicate that all personnel should evacuate the Work Zone.**

Hand signals will be used in case of failure of radio communications or when radio communications are not available:

- |   |                                    |
|---|------------------------------------|
| Hand gripping throat .....                          | - Can't breathe                    |
| Grip partner's wrist or both hands around waist ... | - Leave area immediately           |
| Hands on top of head .....                          | - Need assistance                  |
| Thumbs up .....                                     | - OK, I am all right, I understand |
| Thumbs down .....                                   | - No, negative                     |

Telephone communication at the Command Post (Baker Field Vehicle) will be established during site mobilization. The telephone number at the command post will also be determined during site mobilization.

Coordination between Baker and Subcontractor Personnel is the responsibility of the Site Manager. The best means for securing the lines of communication will be determined prior to start-up by on-site project personnel.

Emergency telephone numbers will be placed at strategic locations throughout the site. The list of emergency phone numbers is presented below.

NSRR	Phone Number On Base	Phone Number Off Base
Security (Police)	4123	(809) 865-4123
Fire	4333	(809) 865-4333
Ambulance	4144	(809) 865-4144
Hospital	4133	(809) 865-4133
General Information	2000	(809) 865-2000

Naval Ammunition Facility Vieques Island	Phone Number Base Facilities*	Phone Number Off-Base Facilities
Medical Clinic (Building 2037)	(809) 741-2726	N/A
Vieques Municipal Hospital	N/A	(809) 741-2341
Police	(809) 741-2726	(809) 741-2020
Fire	(809) 741-2726	(809) 741-2111
Ambulance	(809) 741-2726	(809) 741-2156
Officer-in-Charge	(809) 741-2726	N/A

\* In the event that the phone line is busy, call NSRR at (809) 865-4107 and they will reach Naval Ammunition Facility, Vieques Island by radio.

#### 8.4 Assembly Area

In the event of an emergency personnel will be instructed to meet at the Baker Field Vehicle, if inappropriate, an alternate assembly area will be designated by the Emergency Coordinator in an upwind location from the site before the start of operations. At this location, emergency needs will be provided, such as:

- Assembly for evacuated personnel
- First aid for injured personnel
- Decontamination material
- Communications.

### 8.5 Emergency Hospital Route

An emergency hospital route map showing the location of the local hospitals will be kept in the Baker Field Vehicles in an easily accessible location. Personnel will be informed of the location of the map and the directions to the hospital.

Figure 2 provides directions to the Naval Hospital, located in Building 1790, at NSRR.

Figure 3 provides directions to the Naval Clinic, located in Building 2037, at Roosevelt Roads Naval Ammunition Facility (Vieques Island).

Site Address: Public Works Office (Activity Contact - Mr. Sindulfo Castillo)  
Building 31  
Naval Station - Roosevelt Roads  
Ceiba, Puerto Rico

\*Site Telephone Number: \_\_\_\_\_

\*To be determined during site mobilization

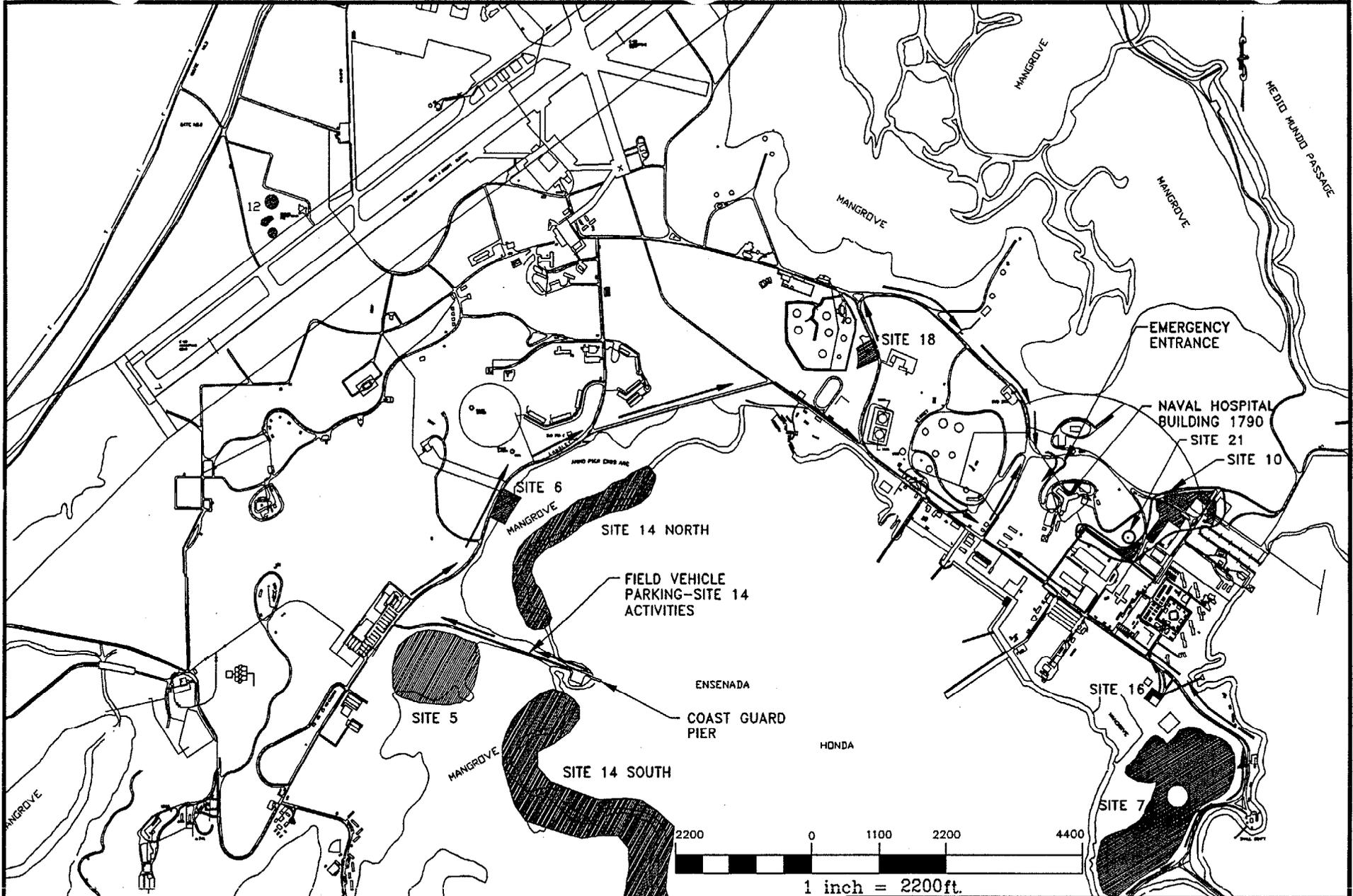
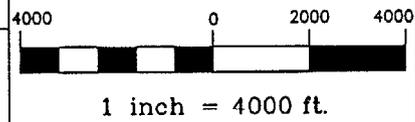
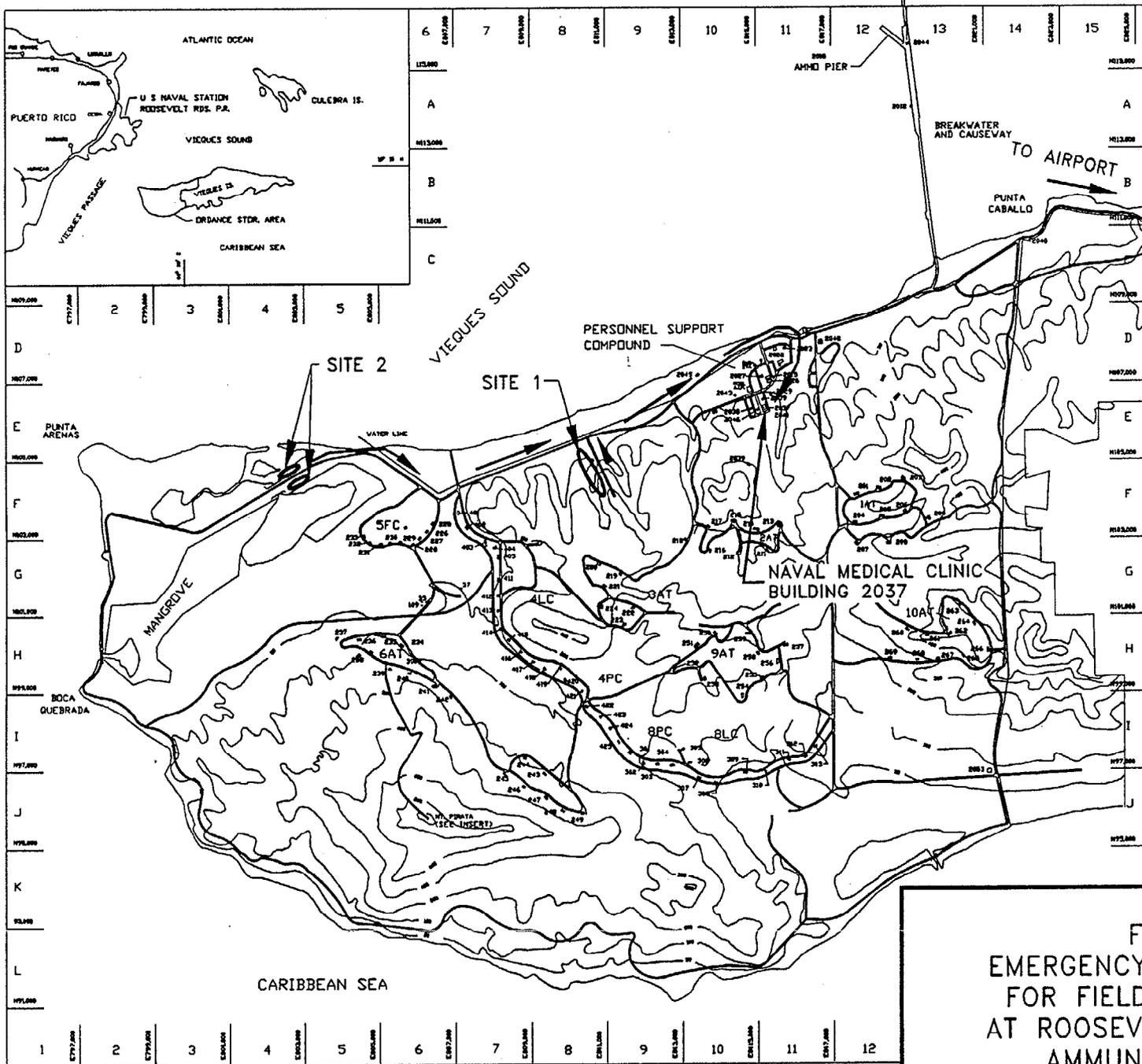


FIGURE 2  
EMERGENCY HOSPITAL ROUTE  
FOR FIELD INVESTIGATIONS  
AT NAVAL STATION ROOSEVELT ROADS  
PUERTO RICO



**Baker**  
Baker Environmental, Inc.

FIGURE 3  
EMERGENCY HOSPITAL ROUTE  
FOR FIELD INVESTIGATIONS  
AT ROOSEVELT ROADS NAVAL  
AMMUNITION FACILITY  
VIEQUES ISLAND, ROOSEVELT ROADS

## **8.6 Emergency Medical Treatment**

### **Emergency Services**

#### **NSRR (Naval Facilities)**

The nearest hospital is the (NSRR) Naval Hospital located at Building 1790, phone no.: 4133 (on base).

Local ambulance service is available from the (NSRR) Naval Hospital and can be reached at phone no.: 4144 (on base). Contact should be made with emergency personnel prior to the start of activities. (See Section 8.1).

#### **Roosevelt Roads Naval Ammunition Facility, Vieques Island (Naval Facilities)**

The nearest hospital is the Naval Medical Clinic located in Building 2037, phone no.: (to be determined).

Local ambulance service is available from the Vieques Municipal Hospital and can be reached at phone no.: (809) 741-2156. Contact should be made with emergency personnel prior to start of activities.

There will be a minimum of 1 person at each site that will be trained in emergency first aid and CPR.

#### **Extreme Emergency**

In instances of extreme emergency, or for "stable patient transfer" to nearby hospitals or those located in the continental United States, contact will be made with Aero Ambulance Service of San Juan, Puerto Rico (Main Offices are in Fort Lauderdale, Florida). The SHSO and Site Manager will serve as the primary contacts, however, site personnel will be permitted to make contact in extreme emergencies.

**Emergency Phone Numbers:** (809) 721-6999 (San Juan Office)  
(800) 443-8042 (Fort Lauderdale Office)

## **Physical Injury**

If an employee working in a contaminated area is physically injured, first-aid procedures are to be followed. Depending on the severity of the injury, emergency medical response from base personnel may be sought to stabilize victim for transport to public hospitals. If the employee can be moved, he/she will be taken to the edge of the work area and decontaminated, if necessary (refer to Section 8.7). Then, if circumstances permit, administered emergency first aid, and transport to an awaiting ambulance or to a local emergency medical facility.

## **Chemical Injury**

If the injury to a worker is chemical in nature (e.g., overexposure), the following first-aid procedures are to be instituted:

- Eye Exposure - If contaminated solid or liquid gets into the eyes, wash the eyes immediately at the emergency eyewash station using large amounts of water and lifting the lower and upper lids occasionally. Obtain medical attention immediately. Contact lenses will not be worn when working.
- Skin Exposure - If contaminated solid or liquid gets on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If solids or liquids penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medical attention immediately.
- Swallowing - If contaminated solid or liquid has been swallowed immediately contact the poison control center. Do not make an unconscious person vomit. If signs of overexposure develop contact the local Poison Control Center.
- Breathing - If a person has difficulty breathing, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.

If injuries are not serious or life threatening, affected personnel may be transported by other site personnel to the local medical facility, if necessary. Emergency medical response personnel will be contacted in the event of serious or multiple injuries. Medical personnel will

be provided with all available information regarding the nature of the incident and chemicals involved.

### **Decontamination**

If on-site decontamination of injured employee(s) is not possible, the Emergency Coordinator will provide polyethylene sheeting for a stretcher, and ambulance. If necessary, a site employee equipped with appropriate protective equipment and clothing will accompany the injured employee and will perform decontamination under the supervision of emergency medical personnel.

Instances requiring treatment beyond "first aid" will be handled at appropriate facilities and reported to the Site Manager and SHSO within 24 hours.

### **8.7 Emergency Decontamination Procedures**

In the event of a medical emergency, patients are to be adequately decontaminated before transfer, if possible. This is to prevent contamination of the medical transport vehicle and medical facility. Emergency personnel decontamination will include the following, depending on the level of protection.\*

Level D	Level D+	Level C
Equipment drop, tape, boot, and glove removal, and coverall removal.	Equipment drop, tape, outer boot, and glove removal, coverall removal/disposal, and inner glove removal/disposal.	Equipment drop, tape, outer boot, and glove removal, coverall removal/disposal, respirator removal, and inner glove removal/disposal.

\* If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination and wrap injured personnel with clean garments/blankets, to avoid contaminating other personnel or transporting equipment.

All emergency personnel are to be immediately informed of the injured person's condition and potential contaminants and provided with all pertinent chemical data.

If necessary, one of the site personnel equipped with appropriate PPE may accompany the injured worker and perform decontamination with supervision of medical personnel.

## 8.8 Personal Protection and First-Aid Equipment

PPE available for emergency response will include the following:

- Polyvinyl chloride boots
- Tyvek® suits, polyethylene coated and uncoated
- Nitrile gloves (inner and outer)
- Nitrile Gloves (outer)
- Face shields and goggles

PPE, first-aid equipment and the first-aid kits will be available in the support zone (i.e., Baker Field Vehicle).

Emergency and first aid equipment can be found at the following locations:

Fire Extinguisher:	<u>Baker Field Vehicle</u>
First aid kit:	<u>Baker Field Vehicle</u>
Emergency eye wash bottle:	<u>Baker Field Vehicle</u>
Air Horn:	<u>With Personnel</u>

## 8.9 Notification

If the Emergency Coordinator determines that the site has an uncontrolled situation, such as a spill, fire, or explosion, that could threaten human health or the environment, he/she will report their findings to the Navy On-Scene Coordinator and/or Fire Department. The notification report will be made from the Baker Field Vehicle, or other base locations and will include:

- Description of incident (e.g., release, fire)
- Name and telephone number of individual reporting the emergency
- Location of incident
- Name and quantity of material (s) involved
- The extent of injuries, and number of casualties
- The possible hazards to human health or the environment and cleanup procedures
- Assistance that is requested

## **8.10 Hazard Assessment**

The Emergency Coordinator will assess possible hazards to human health or the environment that may result from a chemical release, fire, explosion, or severe weather conditions to the best of his/her abilities, incorporating the following steps, as appropriate.

- Assess the immediate need to protect human health and safety.
- Identify the materials involved in the incident.
- Identify exposure and/or release pathways and the quantities of materials involved.
- Determine the potential effects of the exposure/release and appropriate safety precautions.
- Determine if release of materials meets EPA requirements for reportable quantities for spills under the RCRA or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
- Inform appropriate personnel as identified in Section 8.9.

This assessment will consider both the direct and indirect effects of the chemical release, fire, explosion, or severe weather conditions (e.g., the effects of any toxic, irritating, or asphyxiating gases that are generated or the effects of any hazardous surface water runoff from water or chemical agents used to control fire and heat-induced explosions).

## **8.11 Security**

During activation of the Emergency Plan, the Emergency Coordinator or his/her designated representative will control access to the site and maintain an incident log until the Navy On-Scene Coordinator or equivalent arrives. The incident log will include:

- Time of entry
- Expected exit time
- Use of team or "buddy" system
- Task being performed

- Location of task
- Rescue and response equipment used
- Protective equipment being used

#### 8.12 Emergency Alerting

**Personnel Injury in the Work Zone:** Upon notification of an injury in the Work Zone, verbal warning or one long airhorn blast shall be sounded, and all site personnel shall assemble at the decontamination control line (for Level D/D+) or the CRZ (for Level C or higher). The rescue team will enter the Work Zone (if required) to remove the injured person to the hotline. The SHSO and/or Site Manager will evaluate the nature of the injury, and assure that the affected person is decontaminated according to Section 8.7. If required, contact will be made with an ambulance, and/or with the designated medical facility. No persons shall reenter the Work Zone until an accident investigation is performed by the SHSO and/or the Site Manager.

**Personnel Injury in the Support Zone:** Upon notification of any injury in the Support Zone, the Site Manager and SHSO will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of other site personnel, operations may continue. If the injury increases the risk to others, verbal warning or one long airhorn blast shall be sounded and all remaining site personnel will move to the support zone for further instructions. Activities on site will stop until the added risk is mitigated.

**Fire/Explosion:** Upon notification of a fire or explosion on site, verbal warning or one long airhorn blast shall be sounded and all site personnel will assemble at the contamination control line (for Level D/D+) or the CRZ (for Level C or higher). The fire and security departments will be alerted and all personnel will move to a safe distance from the involved area for further instructions. Activities will stop until the added risk is mitigated.

**Personal Protective Equipment Failure:** If any site worker experiences difficulty, failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately cease work activities, leave the Exclusion Zone, and repair or replace the defective equipment. Reentry will not be permitted until the equipment has been repaired or replaced.

**Other Equipment Failure:** If any other equipment on site fails to operate properly, the Site Manager and/or the Field Team Leader and SHSO shall be notified to determine the effect of this failure on continuing operations on site. If the failure affects the safety of site personnel, work with the equipment will cease until the situation is evaluated and appropriate actions taken.

Accident/injury reports will be completed for any accidents no matter how minor the injury. All injuries resulting in treatment other than first aid will be reported to the Site Manager and SHSO within 24 hours. Records on equipment failure will also be completed.

In all situations, when an on-site emergency results in evacuation of the Work Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. The HASP has been reviewed and, if appropriate, modified.
4. Site personnel have been briefed on any changes in the HASP.

### **8.13 Training**

Site personnel will be informed of the details in the Emergency Plan during initial HASP training. The Emergency Plan will be reviewed/rehearsed by site personnel at least monthly or when elements of the plan change.

### **8.14 Spill Containment Procedures**

In the event that a spill of hazardous substances (gasoline, oil, etc.) occurs during the implementation of field activities, spill containment will be utilized to prevent the additional migration of contaminants through the site area. In the event of a spill, measures will be taken to contain the spill and clean it up. For the purpose of this HASP, a spill is defined as a release of a hazardous substance to soils or surface waters. Any release to soils or surface waters equaling or exceeding the reportable quantities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 CFR 304) or the EPA Clean Water Act (40 CFR 116 and 177) will be reported to the Navy Activity Contact who will in turn report the incident to an appropriate agency within 24 hours.

Specific spill containment procedures will be dependent on the type of materials spilled and the type of environment affected. Potential spill containment procedures may include diking with absorbent material/pads, then removal or containment of the contaminated materials. Spill containment materials will be located within close proximity to the storage area of the hazardous substances in a manner such that the pathway remains accessible and free of obstructions. Spill containment materials available on site will include:

- Plastic
- Dirt or Sand
- Vermiculite

## **9.0 TRAINING REQUIREMENTS**

### **9.1 General**

All Baker employees or other personnel entering the site will need to have received training in compliance with the Occupational Safety and Health Administration (OSHA) Standard 29CFR 1910.120. Baker employees engaged in field activities which potentially expose workers to hazardous substances receive a minimum of 40 hours of instruction off site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. These are generally 5-day (40-hour) courses. Key points of the 40-hour training include field demonstrations, respiratory fit testing and training, risk assessment, toxicology, chemical reactivity, use of monitoring equipment, downrange work procedures, site safety procedures, levels of protection, protective clothing, decontamination, and practical field exercises (which include donning, doffing, and working in personal protective ensembles for personal protection Levels A, B, and C).

In addition to the initial 40-hour training program, Baker requires site employees to receive an annual 8-hour refresher training course on the items specified by the 1910.120 standard. The general purpose of the 8-hour refresher is to ensure that personnel retain the knowledge necessary to be adequately protected, and stay current with proper site health and safety procedures.

Baker also requires that personnel involved with on-site employee supervision receive (in addition to 40 hours initial training and three days of supervised field experience) at least eight additional hours of specialized training at the time of job assignment. Training topics include, but are not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedures and techniques. The 8-hour supervisory training is required to ensure that supervisors have the knowledge necessary to understand and use the various Health and Safety Programs and to implement the elements of the HASP. Table 4 provides the appropriate OSHA Training History for Baker Project Personnel.

**TABLE 4**

**OSHA TRAINING HISTORY OF BAKER PROJECT PERSONNEL\***

<u>Personnel</u>	<u>Anticipated Site Activities</u>	<u>Training Status</u>
John Barone	<ul style="list-style-type: none"> <li>● Project Manager/Site Manager/ Field Team Leader</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 03/87</li> <li>● Supervisory training: Yes</li> <li>● 8-hr. refresher completed: 04/92</li> <li>● First Aid Training: 04/92</li> <li>● CPR Training: 04/92</li> <li>● Medical surveillance: Yes</li> </ul>
Barbara Cummings	<ul style="list-style-type: none"> <li>● Project Health and Safety Officer/ Site Health and Safety Officer</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 10/91</li> <li>● Supervisory training: Yes</li> <li>● 8-hr. refresher completed: 08/92</li> <li>● First Aid Training: 11/91</li> <li>● CPR Training: 11/91</li> <li>● Medical surveillance: Yes</li> </ul>
Richard Dabal	<ul style="list-style-type: none"> <li>● Field Team Leader</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 10/89</li> <li>● Supervisory training: Yes</li> <li>● 8-hr. refresher completed: 03/92</li> <li>● First Aid Training: 11/91</li> <li>● CPR Training: 11/91</li> <li>● Medical surveillance: Yes</li> </ul>
Robert Sevcik	<ul style="list-style-type: none"> <li>● Site Geologist</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 09/91</li> <li>● Supervisory training: 09/91</li> <li>● 8-hr. refresher completed: 08/92</li> <li>● First Aid Training: 06/92</li> <li>● CPR Training: 06/92</li> <li>● Medical surveillance: Yes</li> </ul>
Terrie Baranek	<ul style="list-style-type: none"> <li>● Senior Environmental Scientist</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 08/92</li> <li>● Supervisory training: NA</li> <li>● 8-hr. refresher completed: NA</li> <li>● First Aid Training: NA</li> <li>● CPR Training: NA</li> <li>● Medical surveillance: Yes</li> </ul>

TABLE 4 (Continued)

OSHA TRAINING HISTORY OF BAKER PROJECT PERSONNEL\*

<u>Personnel</u>	<u>Anticipated Site Activities</u>	<u>Training Status</u>
Melissa Davidson	<ul style="list-style-type: none"> <li>● Environmental Scientist</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 01/90</li> <li>● Supervisory training: Yes</li> <li>● 8-hr. refresher completed: 04/92</li> <li>● First Aid Training: NA</li> <li>● CPR Training: NA</li> <li>● Medical surveillance: Yes</li> </ul>
Susan Johnston	<ul style="list-style-type: none"> <li>● Environmental Scientist</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 10/91</li> <li>● Supervisory training: NA</li> <li>● 8-hr. refresher completed: 04/92</li> <li>● First Aid Training: NA</li> <li>● CPR Training: NA</li> <li>● Medical surveillance: Yes</li> </ul>
Thomas Fuller	<ul style="list-style-type: none"> <li>● Activity Coordinator (non-field activities)</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed:</li> <li>● Supervisory training:</li> <li>● 8-hr. refresher completed:</li> <li>● First Aid Training:</li> <li>● CPR Training:</li> <li>● Medical surveillance:</li> </ul>
Mike Nutting	<ul style="list-style-type: none"> <li>● Geophysical Surveyor</li> </ul>	<ul style="list-style-type: none"> <li>● 40-hr. training completed: 03/84</li> <li>● Supervisory training: NA</li> <li>● 8-hr. refresher completed: 02/92</li> <li>● First Aid Training: NA</li> <li>● CPR Training: NA</li> <li>● Medical surveillance: 08/92</li> </ul>

\* Training history for contractor personnel will be attached.  
NA - Not Applicable

## **9.2 Site-Specific Training**

Site-specific training, as discussed in Section 1.3, will consist of an initial health and safety briefing on the following information:

- Names of individuals responsible for site health and safety and methods of communicating safety and health concerns.
- Site-specific health and safety hazards.
- Use of PPE.
- Work practices by which employees can minimize risk.
- Safe use of equipment on site.
- Recognition of symptoms and signs of exposure to hazardous materials.
- Site control measures.
- Decontamination procedures.
- Emergency response procedures.

The SHSO will conduct the initial site-specific training prior to the initiation of field activities.

## **10.0 MEDICAL SURVEILLANCE REQUIREMENTS**

This Site-Specific HASP will require that project personnel, who may be exposed to materials having potentially adverse and deleterious health effects, have obtained medical clearance from Baker's Board Certified Occupational Health Physician in accordance with 29 CFR 1910.120(f) prior to entry onto the site. Baker's corporate medical surveillance program establishes a medical baseline and monitors for symptoms of overexposure for individuals who participate in Preliminary Assessments, Site Inspections, Remedial Investigations, Feasibility Studies, and construction-phase services at sites covered by the Department of Labor, Occupational Safety and Health Administration (OSHA), Hazardous Waste Operations and Emergency Response Standard, 29 CFR 1910.120. Additionally, the program is intended to determine the individual's capability for performing on-site work, including wearing respiratory protective equipment.

All Baker employees that will be engaged in site activities covered by the 1910.120 standard receive a Group III physical examination by a licensed physician who is provided information on the individuals site activities, and exposure or anticipated exposure levels. This exam is received initially, then once every 12 months thereafter. More frequent medical examinations, consultations, and/or laboratory testing will be provided if the examining physician determines that an increased frequency of examination is required. A complete Group III medical exam includes parameters such as height, weight, vision, temperature, blood pressure, and a complete review of occupational and medical histories. Other tests in a Group III exam include chest x-rays, electrocardiogram, pulmonary function test, urinalysis, and blood tests. Table 5 describes the medical surveillance testing parameters performed annually on Baker employees.

Prior to entry onto the site, all personnel, including subcontractors, will be required to provide medical clearance information from their company physician stating that they are physically capable of performing the activities required.

**TABLE 5**

**MEDICAL SURVEILLANCE BASELINE TESTING PARAMETERS\***

**Group I - Individuals Rarely in the Field (<10 days/year)**

- Medical History and Physical
- Eye Exam
- EKG (baseline and for individuals over 40 yrs.)
- CBC with differential

**Group II - Individuals Occasionally in the Field (10-30 days/year)**

- Medical History and Physical
- Eye Exam
- EKG (baseline and for individuals over 40 yrs.)
- Chest X-ray (baseline then every 5 years)
- Spirometry
- CBC with differential
- SMA 12 or 26 (liver enzyme scan)

**Group III - Individuals Frequently in the Field (> 30 days/year)**

- Medical History and Physical
- Eye Exam
- EKG (baseline and for individuals over 40 years)
- Audiometry
- Chest X-ray (baseline then every 3 years))
- Spirometry
- CBC with differential
- SMA 12 or 26 (liver enzyme scan)
- Urinalysis (glucose scan)
- Specific Blood and Urine Tests (dependent on field exposure)

**Group III with Asbestos - Individuals frequently in the Field and also associated with asbestos**

- Group III testing with the Asbestos Medical Questionnaire

**Group IV - Individuals associated with Asbestos**

- Medical history and physical
- Eye Exam
- Chest X-ray (baseline then every 5 years)
- Pulmonary Function Test (FVC<sub>1.0</sub> and FEV<sub>1.0</sub>)
- Urinalysis
- Audiometry
- Asbestos Medical Questionnaire

\* The attending physician has the right to reduce or expand the medical monitoring on an annual basis as he/she deems necessary.

\*\* Rare and expensive - to be performed only for individuals identified by the attending physician as being chronically exposed to organic compounds.

**11.0 HEALTH AND SAFETY PLAN APPROVAL**

This HASP has been reviewed by the following personnel prior to submission to LANTDIV and NSRR.

<u>Barbara Cummings</u>	<u>Project Health and Safety Officer</u>	<u>Barbara J. Cummings</u>
Name	Title	Signature

<u>John Barone</u>	<u>Project Manager</u>	<u>John Barone</u>
Name	Title	Signature

**12.0 DECLARATION OF HASP REVIEW**

All site personnel indicated below, have reviewed and are familiar with this Health and Safety Plan. Site personnel were briefed on the contents of this HASP on \_\_\_\_\_ at \_\_\_\_\_ a.m./p.m.

1.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
2.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
3.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
4.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
5.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
6.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)

**Declaration of Health and Safety Plan Review (Continued)**

7.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
8.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
9.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)
10.	_____	_____
	(Name-Print)	(Company)
	_____	_____
	(Name-Sign)	(Date)

**Attachment A**  
**Baker Environmental, Inc.**  
**Safety Standard Operating Procedures**

---

**ATTACHMENT A**  
**BAKER ENVIRONMENTAL, INC.**  
**(APPLICABLE) SAFETY STANDARD OPERATING PROCEDURES**

**TABLE OF CONTENTS**

- 1.0 Confined Space Entry Program\*
- 2.0 Respiratory Protection Program
- 3.0 Care and Cleaning of Personal Protective Equipment
- 4.0 Sanitation/Site Precautions
- 5.0 Heat Stress
- 6.0 Cold Stress\*
- 7.0 Safe Boat Operations

\* Not Applicable

## **2.0 - RESPIRATORY PROTECTION PROGRAM**

### **2.1 INTRODUCTION**

In accordance with OSHA requirements (29 CFR 1910.134), this document represents Baker Environmental, Inc.'s (Baker's) program governing the selection and use of respiratory protection for its employees. It is Baker's policy to provide its employees with the proper protective equipment, training, and medical surveillance necessary to protect individuals from any potential hazards which may be present during the tasks performed throughout the course of each individual's employment. This program specifically describes the procedures which have been established and implemented for the use of respiratory protection equipment. The effectiveness of this program shall be reevaluated on an annual basis and appropriate changes shall be made if deemed necessary.

### **2.2 EMPLOYER RESPONSIBILITY**

Baker shall provide its employees the respiratory protection equipment which is appropriate and suitable for the purpose intended, when such equipment is necessary to protect the health of the employee.

### **2.3 EMPLOYEE RESPONSIBILITY**

The employee shall use the respiratory protection provided in accordance with instructions and training received, and shall report any malfunction of the equipment to a responsible person. The employee shall not wear contact lenses in atmospheres where respiratory protection is required. Corrective lens inserts will be provided, at Baker's expense, for employees who require corrective lenses.

### **2.4 HAZARD ASSESSMENT**

The key elements of a respiratory protection program must start with an assessment of the inhalation and ingestion hazards present in the work area. Because Baker's services involve a variety of environmental and industrial hygiene studies, it is not practical to identify all

ZPP	<b>ZINC PHOSPHIDE</b>
-----	-----------------------

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

possible hazards to which all employees could be exposed within the scope of this document. Therefore, it is essential that a task specific assessment be conducted prior to the initiation of any activities on a given project. This task specific assessment may be part of the site-specific Health and Safety Plan.

After a task-specific assessment is completed and it is determined that airborne exposure concentrations exceed or may exceed the recommended limits, engineering and administrative controls should be implemented, whenever feasible.

If the exposure cannot be reduced, or it is not feasible to reduce the airborne exposure below the recommended limits, respirators will be selected by the Site Health and Safety Officer on the basis of:

- Toxicity
- Maximum Expected Concentration
- Oxygen Levels
- Warning properties of the substance(s) involved
- Sorbent Limitations
- Facepiece Fit
- Mobility Requirements
- Type of Use (routine, escape, or emergency entry)
- Possibility of Ingestion of Toxic Materials
- Respirator Attributes

## **2.5 TRAINING**

Each respirator wearer shall be given training, by a qualified individual, which will include explanations and discussions of:

- Opportunity to wear respiratory protection in an uncontaminated environment.
- Respirator Fit Testing (qualitative)
- The respiratory hazard(s) and what may occur if the respirator is not used properly.
- The reasons for selecting a particular type of respirator.
- The function, capabilities, and limitations of the selected respirator.
- The method of donning the respirator and checking its fit and operation.
- The proper wearing of the respirator.

- Respirator maintenance, repair, and cleaning.
- Recognizing and handling emergency situations.

Respirator training will be conducted on an annual basis, at a minimum. Records of the training and fit-testing will be maintained for a minimum of 30 years following termination of employment for each employee.

## **2.6 TYPES OF RESPIRATORS**

Baker provides employees with the North Brand half-face (Model 7700) and full-face (Model 7600) air purifying respirators, positive pressure 30-minute Self-Contained Breathing Apparatus (SCBAs) (Model 800), positive pressure supplied airline respirators, with 5-minute escape air cylinders (Model 85500). Only respiratory equipment certified by the appropriate approval agencies (e.g., NIOSH, MSHA) according to Title 30, Part II of the Code of Federal Regulations, will be distributed to Baker employees. As an alternate air purifying respirator, Baker will also keep, on-hand, the MSA ultra twin full-face respirator. All Baker employees who regularly perform tasks requiring respiratory protection will be issued their own half-face or full-face respirator, provided the employee can achieve a proper fit and is medically capable of wearing the equipment.

Because 30-minute SCBAs, positive pressure supplied airline respirators, and 5-minute escape air cylinders are used less frequently, this equipment will be distributed on an as-needed basis.

## **2.7 AIR QUALITY**

Compressed and liquid air used for respiration shall be of high purity. Breathing air shall meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1966. Breathing air may be supplied to respirators from cylinders or air compressors. Oxygen must never be used with air line respirators.

Air cylinders shall be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 178). Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.

Breathing gas containers shall be marked in accordance with American National Standard Method of marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954; Federal Specification BB-A-1034a, June 21, 1968, Air, Compressed for Breathing Purposes; or Interim Federal Specification GG-B-00675b, April 27, 1965, Breathing Apparatus, Self-Contained.

## **2.8 CLEANING AND MAINTENANCE**

Respirator maintenance will be performed by each trained individual on a regular basis. The maintenance shall be carried out on a schedule which ensures that each respirator wearer is provided with a respirator that is clean and in good operating condition.

Respiratory equipment that is used on an as-needed basis shall be maintained by qualified personnel. This equipment shall be cleaned/sanitized, then rinsed and air-dried, after each use. Inspections shall be conducted before and after each use.

Respiratory equipment that has been issued to an employee shall be cleaned/sanitized then rinsed and air-dried by the wearer on a schedule (specified by OSHA in 29 CFR 1910.134) which ensures that it will be maintained in clean and good operating condition. Inspections shall be conducted on a regular basis during usage and prior to each project requiring the potential usage of the equipment.

All respirators shall be stored in a plastic bag within a cool/dry location, in a manner that will protect them against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. They shall be stored to prevent distortion of rubber or other elastomer parts.

Parts replacement and repairs shall be performed only by appropriate personnel. Equipment requiring repairs shall be reported to appropriate Baker personnel. Examples of inspection forms are included at the end of this text.

## **2.9 FIT-TESTING**

Each respirator wearer shall be provided with a respirator that can properly form a secure face to mask seal. Each wearer shall be fit-tested prior to issuance of the respirator using either an irritant smoke or odorous vapor, or other suitable test agent (see example of form at end of

text). Retesting shall be performed, at a minimum, on an annual basis or if a different model respirator, other than the model he/she was previously fit-tested for, is to be used by the wearer. Air purifying respirators fit-tested qualitatively will be assigned a protection factor of 10 (APF = 10).

Facial hair, which interferes with the normally effective face to mask seal, is prohibited. Each respirator wearer shall be required to check the seal of the respirator by negative and positive pressure checks prior to entering a harmful atmosphere.

## **2.10 MEDICAL SURVEILLANCE**

Personnel who are or may be assigned to tasks requiring use of respirators shall participate in a medical surveillance program on an annual basis. The medical surveillance program shall include, but may not be limited to, a physical and a pulmonary function test conducted by the company's physician and at the expense of the company. Test parameters included in Baker's medical surveillance program is included as Attachment A in each site-specific Health and Safety Plan.

## **2.11 LIMITATIONS**

Wearing any respirator, alone or in conjunction with other types of protective equipment, will impose some physiological stress on the wearer. Therefore, selection of respiratory protective devices will be based on the breathing resistance, weight of the respirator, the type and amount of protection needed as well as the individual's tolerance of the given device. Additional concerns regarding the limitations of different types of PPE and the monitoring requirements for heat stress/strain will be addressed in the "Heat Stress" SOP.



**FULL-FACE AND HALF-FACE RESPIRATOR  
INSPECTION FORM**

Inspection Date	Type	FACE PIECE					HEADSTRAPS OR HEADBANDS		RESPIRATOR INTERIOR		
		Clean and Sanitized	No Cracks, Tears, or Holes	Proper Shape and Flexibility	Air Purifying Element Holders Operate Correctly	Proper Storage Free From Heat, Dirt, Sunlight, etc.	No Signs of Wear or Tears	Buckles Function Properly	No Foreign Material Under Valve Seat	No Cracks or Tears in Valves or Valve Bodies	Valve Covers and Bodies in Good Condition and Installed Correctly

✓ = OK   X = Not OK



# RESPIRATOR FIT TEST RECORD



TEST SUBJECT NAME \_\_\_\_\_  
(last) (first) (initial)

DATE \_\_\_\_\_ DEPARTMENT \_\_\_\_\_

SEX (M/F) \_\_\_\_\_ AGE \_\_\_\_\_ SOCIAL SECURITY NUMBER \_\_\_\_\_

RESPIRATOR MEDICAL DATE \_\_\_\_\_ RESPIRATOR TRAINING DATE \_\_\_\_\_

**SPECIAL/UNUSUAL CONDITIONS/CONSIDERATIONS:**

- |  |  |
|--|--|
| <input type="checkbox"/> Claustrophobia<br><input type="checkbox"/> Facial hair<br><input type="checkbox"/> Eyeglasses<br><input type="checkbox"/> Contacts<br><input type="checkbox"/> Other: _____ | <input type="checkbox"/> Scars<br><input type="checkbox"/> Broken or crooked nose<br><input type="checkbox"/> Extreme facial dimensions<br><input type="checkbox"/> Wrinkles |
|--|--|

### RESPIRATOR SELECTION

Manufacturer/Model	Size	Style	
_____	S ___ M ___ L ___	Half ___ Full ___	Pass ___ Fail ___
_____	S ___ M ___ L ___	Half ___ Full ___	Pass ___ Fail ___
_____	S ___ M ___ L ___	Half ___ Full ___	Pass ___ Fail ___

Testing Agent	Qualitative Test	Sensitivity Check
Isoamyl Acetate	Yes: ___ No: ___	Yes: ___ No: ___
Irritant Smoke	Yes: ___ No: ___	Yes: ___ No: ___

### TEST EXERCISES (Check all that apply)

- |                          |                       |
|--------------------------|-----------------------|
| Normal Breathing _____   | Talking _____         |
| Deep Breathing _____     | Running _____         |
| Head, Side to Side _____ | Bending _____         |
| Head, Up and Down _____  | Rainbow Passage _____ |

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_

Signed: \_\_\_\_\_  
 (Test Subject)

Signed: \_\_\_\_\_  
 (Technician/Instructor)

## 3.0 - CARE AND CLEANING OF PERSONAL PROTECTIVE EQUIPMENT

### 3.1 INTRODUCTION

The following procedures cover the care and cleaning of Levels D, C, and B personal protective equipment. Note: These are general procedures that apply to most situations and are not all inclusive. Procedures are subject to change at the direction of the Site Health and Safety Officer (SHSO).

### 3.2 EQUIPMENT CARE

#### 3.2.1 Chemical Resistant Suit (Levels C and B)

- Before donning, inspect suit for holes or tears; check to see that zippers are operable; and look for signs of suit degradation.
- When wearing, avoid contact with contaminated material where possible; be aware of sharp objects that can tear suit; periodically look over suit to check for major rips or tears.
- While decontaminating, remove gross excess of material from suit; remove suit so that material does not contact inner suit; place clothing in properly labeled disposal containers.

#### 3.2.2 Inner/Outer Gloves (Levels D through B)

- Look for rips, tears, or degradation of material. Replace as necessary or at the direction of the SHSO.

#### 3.2.3 Chemically Resistant Boots (Levels C and B)

- Nondisposable boots are to be examined on a daily basis before and after use. Disposable boots should be examined prior to donning and while in use. Dispose of according to site procedures.

### **3.2.4 Safety Shoes/Boots (Levels D through B)**

- Examine daily for gauges, open seams, etc., anything that would lessen the integrity of the boot. Replace as shoe/boot becomes worn.

### **3.2.5 Hard Hats (Levels D through B)**

- Should be visually inspected before donning for fit, cracks, and overall condition.

### **3.2.6 Safety Glasses/Goggles (Levels D and C)**

- Should be visually inspected before donning for cracks, deteriorated parts, and overall condition. Replace as necessary.

### **3.2.7 Respirators (Levels C and B)**

- Procedures for care of respiratory protective equipment are covered in Attachment D - Baker SOPs.

### **3.2.8 Hearing Protection (Levels D through B)**

- Disposable - Replace daily, or as material becomes worn or dirty.
- Reusable - Inspect before use, clean regularly, replace parts as necessary.

## **3.3 EQUIPMENT CLEANING**

General procedures for cleaning of equipment are listed below. Site-specific concerns will be addressed by the SHSO prior to and during site activities. Cleaning of respiratory equipment is covered under the "Respiratory Protection Program" SOP.

### **3.3.1 Gross Physical Removal**

Large amounts of contaminated soil is scraped off with a tongue depressor, or wiped off using a disposable wipe.

### **3.3.2 Physical/Chemical Removal**

The residual contamination will be scrubbed with a soft-bristled, long-handled brush using a nonphosphate detergent solution.

### **3.3.3 Rinsing/Dilution**

The detergent solution and residual contaminants will be rinsed with tap water using a pressurized sprayer.

## 4.0 - SANITATION/SITE PRECAUTIONS

### 4.1 SANITATION

- A supply of clearly marked potable water, tightly closed, and equipped with a tap.
- Single service disposal cups.
- Outlets for non-potable water, clearly marked, for fire fighting, or other purposes. Cross-contamination of the potable supply shall be prevented.
- One toilet facility which is either chemical, recirculating, combustion, or flush, depending on local code requirements.
- A place for food handling meeting all applicable laws, otherwise, suitable alternatives to such facilities will be provided (i.e., nearby restaurants, food wagons, etc.).
- Clean wash water will be available in the decontamination zone and the Baker Site Trailer.

### 4.2 SITE PRECAUTIONS

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material, is prohibited in any area designated as contaminated.
- Smoking will not be allowed in areas where flammable materials are present.
- Hands and face must be thoroughly washed upon leaving the work area.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

- **No contaminated work garments are to be worn off site.**
- **Contact lenses are not permitted to be worn on site.**
- **No facial hair which interferes with a satisfactory fit of the mask-to-face seal, is allowed on personnel required to wear respirators.**
- **Contact with contaminated or potentially contaminated surfaces should be avoided. Wherever possible, do not walk through puddles, leachate, discolored surfaces, kneel on ground, lean, sit or place equipment on drums/containers.**
- **Medicine and alcohol can potentiate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel where the potential for absorption, inhalation, or ingestion of toxic substances exist unless specifically approved by a qualified physician. Alcoholic beverage intake should be minimized or avoided during after-hour operations.**
- **Alcoholic beverages are prohibited on site.**
- **Personal radios, TVs, and tape players are prohibited on site.**
- **Firearms are prohibited on site.**
- **All personnel will observe any posted sign, warning, fence, or barrier posted around contaminated areas.**

## 5.0 - HEAT STRESS

### 5.0 HEAT STRESS

#### Monitoring

Provisions for monitoring for heat stress will be determined by the SHSO and performed as outlined below.

Heat stress monitoring is required for personnel wearing semipermeable or impermeable protective outerwear when there is an ambient air temperature greater than 70°F. One or more of the following procedures will be implemented when this condition exists:

1. Increased awareness of heat stress symptoms and buddy monitoring.
2. Fluid intake discipline.
3. Self monitoring of urine output quantities to prevent dehydration.
4. Work-rest intervals.
5. Calculate the Heat Exposure Threshold Limit Value (TLV) for work-rest intervals using the following steps:
  - a. Calculate the WBGT (Wet Bulb Globe Temperature) Index using the Quest® Heat Stress Monitor
  - b. Estimate the work load using the following guidelines:
    - (1) Light work = sitting or standing to control machines, performing light hand or arm work.
    - (2) Moderate work = walking about with moderated lifting and pushing.
    - (3) Heavy work = pick and shovel work.
  - c. Evaluate the calculations against the following Heat Exposure TLVs in °C or °F.

Work - Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous work	30.0 (86)	26.7 (80)	25.0 (77)
75% work - 25% rest, each hour	30.6 (87)	28.0 (82)	25.9 (78)
50% work - 50% rest, each hour	31.4 (89)	29.4 (85)	27.9 (82)
25% work - 75% rest, each hour	32.2 (90)	31.1 (88)	30.0 (86)

\* For unacclimatized workers, the permissible heat exposure TLV should be reduced by 2.5°C.

### Special Considerations

- Clothing - Subtract 2 from the TLV to compensate for the use of semipermeable clothing.
- Acclimatization - After approximately a week, workers should have acclimated themselves to their environment.
- Fitness - Physically fit workers will adjust more readily to a change in environment.
- Medication - Some medications can predispose individuals to heat-induced illnesses.

### Causes and Symptoms

The following heat stress causes and symptoms are provided for buddy monitoring purposes. Site personnel must realize that monitoring the physical condition of fellow personnel in Level B and C protective ensembles will be difficult.

1. *Heat rash* results from continuous exposure to heat or humid air.
2. *Heat cramps* are caused by heavy sweating and inadequate fluid intake. Symptoms include muscle spasms and pain in the hands, feet, and abdomen.
3. *Heat exhaustion* occurs when body organs attempt to keep the body cool, due to inadequate fluid intake and personnel not acclimated to the environment. Symptoms include pale, cool, moist skin; heavy sweating; and dizziness.

4. *Heat stroke* is the most serious form of heat stress. It is a **MEDICAL EMERGENCY**. Symptoms are red, hot, dry skin; lack of perspiration; nausea; dizziness and confusion; strong, rapid pulse rate; and coma.

The need to seek medical attention and the urgency in seeking medical attention depends on the symptoms and the severity of the symptoms displayed by the affected individual. If *heat stroke* is noted or suspected, medical attention must be sought **IMMEDIATELY**. Efforts should be taken to cool the body to prevent serious injury or death. Excessive cooling can cause hypothermia and should be avoided.

#### Prevention

Fluid intake should be increased during rest schedules to prevent dehydration. Drinking cool water is best; however, diluted electrolyte solutions (i.e., Gatorade or equivalent) can be substituted for water. Each individual should monitor their urine output and adjust their fluid intake to ensure that urine output and urine color are close to normal. Additional means for preventing heat-induced illnesses may include providing shelter or cooling devices, such as vests and showers.

## 7.0 - SAFE BOAT OPERATIONS

### 7.1 OBJECTIVE

To provide safe operating procedures while performing sampling activities from a boat.

### 7.2 EQUIPMENT

Refer to Attachment A, "Federal Requirements for Recreational Boats," for a list of required equipment.

### 7.3 PRELIMINARY ACTIVITIES

Ensure that requirements governing the safe operation of a boat, published by the Department of Transportation, United States Coast Guard (Attachment A) are reviewed prior to placing the boat in the water.

### 7.4 OPERATING PROCEDURE

Operate the boat according to the Department of Transportation, United States Coast Guard Regulations (Attachment A), where applicable.

### 7.5 REFERENCES

U.S. Department of Transportation, United States Coast Guard. Federal Requirements for Recreational Boats. United States Coast Guard, Washington, D. C. 20593.\*

\* It is recognized that these requirements are directed towards recreational boating, but Baker Environmental, Inc. believes that the topics of discussion included in this reference are applicable to the size of boat, and activities to be performed during environmental sampling.



## BE SAFE ON THE WATER

### KNOW . . .

- The stability and handling of the boat you are using.
- How to use the equipment on the boat.
- The waters you will be using, tides, currents, sand bars, and other hazards.
- The weather conditions.
- The safety devices and emergency equipment  
Make sure that life jackets fit properly.
- The navigation rules and observe the courtesies of safe boating.
- Your personal limitations and responsibilities.  
Exposure to sun, wind, cold water, all affect your ability to react.
- That it is illegal to operate a vessel while intoxicated. If you add alcohol or drugs to boating, the results can be fatal.

**. . . BEFORE YOU GO!**

## Federal Requirements for Recreational Boats



## FLOAT PLAN

Complete this page, before going boating and leave it with a reliable person who can be depended upon to notify the Coast Guard or other rescue organization, should you not return as scheduled. Do not file this plan with the Coast Guard.

1. NAME OF PERSON REPORTING AND TELEPHONE NUMBER \_\_\_\_\_
2. DESCRIPTION OF BOAT. TYPE \_\_\_\_\_  
 COLOR \_\_\_\_\_ TRIM \_\_\_\_\_ REGISTRATION NO. \_\_\_\_\_ LENGTH \_\_\_\_\_ NAME \_\_\_\_\_  
 MAKE \_\_\_\_\_  
 OTHER INFO. \_\_\_\_\_
3. PERSONS ABOARD \_\_\_\_\_  

NAME	AGE	ADDRESS & TELEPHONE NO.
_____	_____	_____
_____	_____	_____
4. DO ANY OF THE PERSONS ABOARD HAVE A MEDICAL PROBLEM? \_\_\_\_\_ IF SO, WHAT? \_\_\_\_\_
5. ENGINE TYPE \_\_\_\_\_ H.P. \_\_\_\_\_  
 NO. OF ENGINES \_\_\_\_\_ FUEL CAPACITY \_\_\_\_\_
6. SURVIVAL EQUIPMENT: (CHECK AS APPROPRIATE)  
 PFDs \_\_\_\_\_ FLARES \_\_\_\_\_ MIRROR \_\_\_\_\_  
 SMOKE SIGNALS \_\_\_\_\_ FLASHLIGHT \_\_\_\_\_  
 FOOD \_\_\_\_\_ PADDLES \_\_\_\_\_ WATER \_\_\_\_\_  
 OTHERS \_\_\_\_\_ ANCHOR \_\_\_\_\_  
 RAFT OR DINGHY \_\_\_\_\_ EPIRB \_\_\_\_\_
7. RADIO YES/NO TYPE \_\_\_\_\_  
 FREQS. \_\_\_\_\_
8. TRIP EXPECTATIONS: LEAVE AT \_\_\_\_\_  
 FROM \_\_\_\_\_ GOING TO \_\_\_\_\_  
 EXPECT TO RETURN BY \_\_\_\_\_ (TIME) AND IN  
 NO EVENT LATER THAN \_\_\_\_\_
9. ANY OTHER PERTINENT INFO. \_\_\_\_\_
10. AUTOMOBILE LICENSE \_\_\_\_\_  
 TYPE \_\_\_\_\_ TRAILER LICENSE \_\_\_\_\_  
 COLOR AND MAKE OF AUTO \_\_\_\_\_  
 WHERE PARKED \_\_\_\_\_
11. IF NOT RETURNED BY \_\_\_\_\_ (TIME)  
 CALL THE COAST GUARD, OR \_\_\_\_\_ (LOCAL  
 AUTHORITY)
12. TELEPHONE NUMBERS \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

This pamphlet contains the Federal equipment carriage requirements for recreational vessels. The owner/operator may be required to comply with additional regulations specific to the State in which the vessel is registered or operated. State laws vary. A vessel in compliance with the laws of the State of registration, may not meet the requirements of another State where it may be operating.

To insure compliance with State boating laws, contact your State boating safety agency.

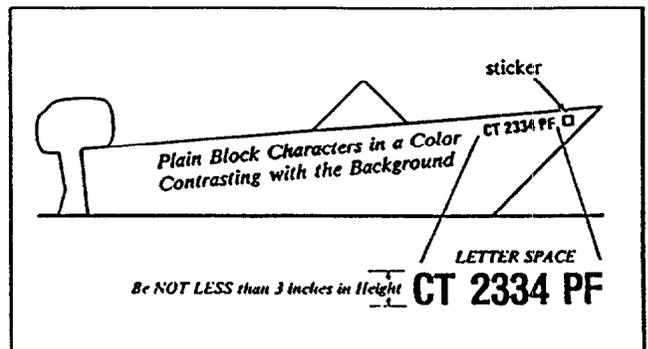
## REGISTRATION AND NUMBERING REQUIREMENTS

All undocumented vessels equipped with propulsion machinery must be registered in the State of principal use. A certificate of number will be issued upon registering the vessel. These numbers must be displayed on your vessel. Some States require all vessels to be numbered, check with your State boating authority for numbering requirements.

A documented vessel is not exempt from applicable State or Federal taxes, nor is its operator exempt from compliance with Federal or State equipment carriage requirements.

## DISPLAY OF NUMBER

Numbers must be painted or permanently attached to each side of the forward half of the vessel. The Coast Guard and many States issue two validation stickers. They must be affixed within six inches of the registration number. No other letters or numbers may be displayed nearby.



## CERTIFICATE OF NUMBER

The owner/operator of a vessel must carry a valid certificate of number whenever the vessel is in use. When a vessel is moved to a new State of principal use, the certificate of number is valid for 60 days.

The Coast Guard issues the certificate of numbers in Alaska.

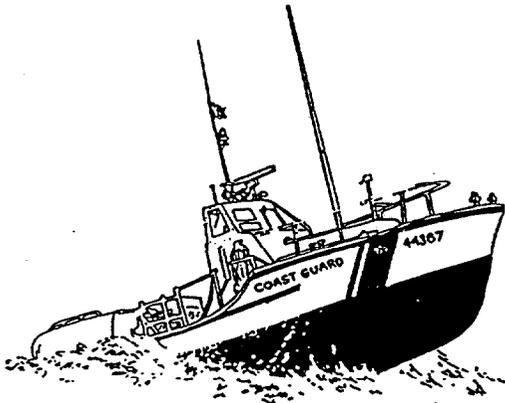
## NOTIFICATION OF CHANGES

The owner of a vessel must notify the agency which issued the certificate of numbers within 15 days if:

- The vessel is transferred, destroyed, abandoned, lost, stolen or recovered.
- The certificate of number is lost, destroyed or the owner's address changes.

If the certificate of number becomes invalid for any reason, it must be surrendered in the manner prescribed by the issuing authority within 15 days.

## LAW ENFORCEMENT



A vessel underway, when hailed by a Coast Guard vessel is required to heave to, or maneuver in such a manner that permits a boarding officer to come aboard.

Other Federal, State and local law enforcement officials may board and examine your vessel, whether it is numbered, unnumbered or documented. Coast Guard law enforcement personnel may also be found aboard other vessels.

## Law Enforcement (continued)

The Coast Guard may impose a civil penalty up to \$1,000 for failure to: comply with numbering requirements; comply with equipment requirements; report a boating accident; or comply with other Federal regulations. Failure to comply with the unified Inland Rules of the Road (Inland Navigation Rules Act of 1980) can result in a civil penalty up to \$5,000.

Improper use of a radiotelephone is a criminal offense. The use of obscene, indecent or profane language during radio communications is punishable by a \$10,000 fine, imprisonment for two years or both. Other penalties exist for misuse of a radio, such as improper use of Channel 16 VHF-FM.

Channel 16 is a calling and distress channel. It is not to be used for conversation or radio checks. Such traffic should be conducted on an authorized working channel.

**OPERATING A VESSEL WHILE INTOXICATED** became a specific federal offense effective January 13, 1988. The final rule set standards for determining when an individual is intoxicated. The BAC is .10% (.08% in Utah) for operators of recreational vessels being used only for pleasure. Violators are subject to civil penalty not to exceed \$1,000 or criminal penalty not to exceed \$5,000, 1 year imprisonment or both.

**NEGLIGENT or GROSSLY NEGLIGENT OPERATION** of a vessel which endangers lives and property is prohibited by law. The Coast Guard may impose a civil penalty for negligent operation. **GROSSLY NEGLIGENT OPERATION** is a criminal offense and an operator may be fined up to \$5,000, imprisoned for one year, or both. Some examples of actions that may constitute negligent or grossly negligent operation are:

- Operating a boat in a swimming area.
- Operating a boat while under the influence of alcohol or drugs.
- Excessive speed in the vicinity of other boats or in dangerous waters.
- Hazardous water skiing practices.
- Bowriding, also riding on seatback, gunwale or transom.

## TERMINATION OF USE

A Coast Guard boarding officer who observes a vessel being operated in an UNSAFE CONDITION, specifically defined by law or regulation, and who determines that an ESPECIALLY HAZARDOUS CONDITION exists, may direct the operator to take immediate steps to correct the condition, including returning to port. Termination of unsafe use may be imposed for:

- Insufficient number of CG Approved Personal Flotation Devices (PFDs).
- Insufficient fire extinguishers.
- Overloading beyond manufacturers recommended safe loading capacity.
- Improper navigation light display.
- Fuel leakage.
- Fuel in bilges.
- Improper ventilation.
- Improper backfire flame control.
- Operating in regulated boating areas during predetermined adverse conditions. (Applies in 13th CG District Only).
- Manifestly unsafe voyage.

An operator who refuses to terminate the unsafe use of a vessel can be cited for failure to comply with the directions of a Coast Guard boarding officer, as well as for the specific violations which were the basis for the termination order. Violators may be fined not more than \$1000 or imprisoned not more than one year or both.

## COAST GUARD APPROVED EQUIPMENT

The Coast Guard sets minimum safety standards for vessels and associated equipment. To meet these standards various equipment must be Coast Guard approved. "Coast Guard Approved Equipment" has been determined to be in compliance with USCG specifications and regulations relating to performance, construction or materials.

## PERSONAL FLOTATION DEVICES (PFDs)

PFDs must be Coast Guard Approved, in good and serviceable condition, and of appropriate size for the intended user. Wearable PFDs must be readily accessible, meaning you must be able to put them on in a reasonable amount of time in an emergency (vessel sinking, on fire, etc.). They should not be stowed in plastic bags, in locked or closed compartments or have other gear stowed on top of them. Throwable devices must be immediately available for use. Though not required, a PFD should be worn at all times when the vessel is underway. A wearable PFD can save your life, but only if you wear it.

Boats less than 16 feet in length (including canoes and kayaks of any length) must be equipped with one Type I, II, III, IV or V PFD for each person aboard.

Boats 16 feet and longer must be equipped with one Type I, II, III or V for each person aboard PLUS one Type IV.

Federal law does not require PFDs on racing shells, rowing skulls and racing kayaks; State laws vary.

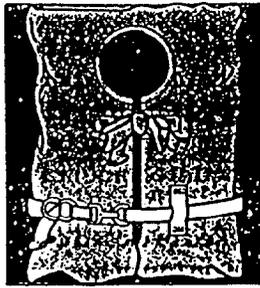
## TYPES OF PFDs

A TYPE I PFD, or OFF-SHORE LIFE JACKET provides the most buoyancy. It is effective for all waters, especially open, rough or remote waters where rescue may be delayed. It is designed to turn most unconscious wearers in the water to a face-up position. The Type I comes in two sizes. The adult size provides at least 22 pounds buoyancy, the child size, 11 pounds, minimum.



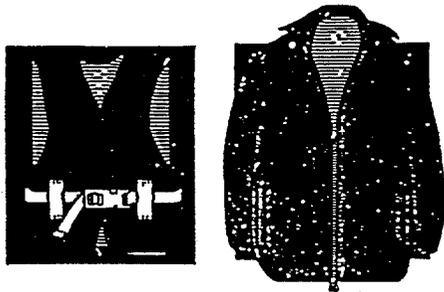
Off-shore Lifejacket

Types of PFDs (continued)



Near-Shore Buoyant Vest

A TYPE II PFD, or NEAR-SHORE BUOYANT VEST is intended for calm, inland water or where there is a good chance of quick rescue. This type will turn SOME unconscious wearers to a face-up position in the water. The turning action is not as pronounced and it will not turn as many persons under the same conditions as a Type I. An adult size device provides at least 15 1/2 pounds buoyancy, a medium child size provides 11 pounds. Infant and small child sizes each provide at least 7 pounds buoyancy.

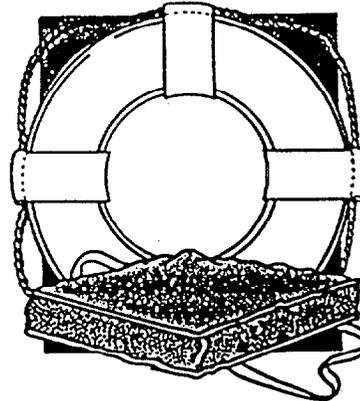


Flotation Aid

A TYPE III PFD, or FLOTATION AID is good for calm, inland water, or where there is a good chance of quick rescue. It is designed so wearers can place themselves in a face-up position in the water. The wearer may have to tilt head back to avoid turning face-down in the water. The Type III has the same minimum buoyancy as a Type II PFD. It comes in many styles, colors and sizes and is generally the most comfortable type for continuous wear. Float coats, fishing vests and vests designed with features suitable for various sports activities are examples of this type PFD.

Types of PFDs (continued)

A TYPE IV PFD, or THROWABLE DEVICE is intended for calm, inland water with heavy boat traffic, where help is always present. It is designed to be thrown to a person in the water and grasped and held by the user until rescued. It is not designed to be worn. Type IV devices include buoyant cushions, ring buoys and horseshoe buoys.

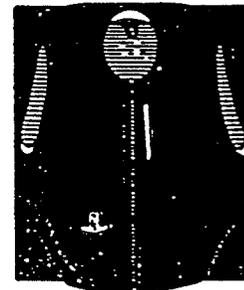


Throwable Device

A TYPE V PFD, or SPECIAL USE DEVICE is intended for specific activities and may be carried instead of another PFD only if used according to the approval conditions on the label. Some Type V devices provide significant hypothermia protection. Varieties include deck suits, work vests, board sailing vests and Hybrid PFDs.

A TYPE V HYBRID INFLATABLE PFD is the least bulky of all PFD types. It contains a small amount of inherent buoyancy, and an inflatable chamber. Its performance is equal to a Type I, II, or III PFD (as noted on the PFD label) when inflated. Hybrid PFDs must be worn when underway to be acceptable.

Inflated Hybrid



## WATER SKIING

A waterskier, while being towed, is considered on board the vessel and a PFD is required for the purposes of compliance with the PFD carriage requirements. Although not required by Federal law it is advisable and recommended for a skier to wear a PFD designed and intended to withstand the impact of hitting the water at high speed as when a skier falls. "Impact Class" marking refers to PFD strength, not personal protection. Some State laws require skiers to wear a PFD.

## VISUAL DISTRESS SIGNALS

All vessels, used on coastal waters, the Great Lakes, territorial seas and those waters connected directly to them, up to a point where a body of water is less than two miles wide, must be equipped with visual distress signals. Vessels owned in the United States operating on the high seas must be equipped with visual distress signals. The following vessels are not required to carry day signals but must carry night signals when operating from sunset to sunrise:

- Recreational boats less than 16 feet in length.
- Boats participating in organized events such as races, regattas or marine parades.
- Open sailboats less than 26 feet in length not equipped with propulsion machinery.
- Manually propelled boats.

**PYROTECHNIC VISUAL DISTRESS SIGNALS** must be Coast Guard Approved, in serviceable condition and readily accessible. They are marked with a date showing the service life, which must not be expired. Launchers manufactured before January 1, 1981, intended for use with approved signals, are not required to be Coast Guard Approved. If pyrotechnic devices are selected, a minimum of three are required. That is three signals for day use and three signals for night. Some pyrotechnic signals meet both day and night use requirements. Pyrotechnic devices should be stored in a cool, dry location. A watertight container painted red or orange and prominently marked "DISTRESS SIGNALS" is recommended.

USCG Approved Pyrotechnic Visual Distress Signals and Associated Devices include:

- Pyrotechnic red flares, hand-held or aerial.
- Pyrotechnic orange smoke, hand-held or floating.
- Launchers for aerial red meteors or parachute flares.

**NON-PYROTECHNIC VISUAL DISTRESS SIGNALS** must be in serviceable condition, readily accessible and certified by the manufacturer as complying with USCG requirements, they include:

- Orange distress flag
- Electric distress light

The distress flag is a day signal only. It must be at least 3x3 feet with a black square and ball on an orange background. It is most distinctive when attached and waved on a paddle or boathook or flown from a mast.

The electric distress light is accepted for night use only and must automatically flash the international SOS distress signal (··—··). This is an unmistakable distress signal. A standard flashlight is not acceptable as a visual distress signal.

Under Inland Navigation Rules, a high intensity white light flashing at regular intervals from 50-70 times per minute is considered a distress signal. Strobe lights used in inland waters shall only be used as a distress signal.

Regulations prohibit display of visual distress signals on the water under any circumstances except when assistance is required to prevent immediate or potential danger to persons on board a vessel.

All distress signals have distinct advantages and disadvantages, no single device is ideal under all conditions or suitable for all purposes. Pyrotechnics are excellent distress signals, universally recognized. However, there is potential for injury and property damage if not properly handled. These devices produce a very hot flame, the residue can cause burns and ignite flammable material. Pistol launched and hand-held parachute flares and meteors have many characteristics of a firearm and must be handled with caution.

## FIRE EXTINGUISHERS

Approved extinguishers are classified by a letter and number symbol. The letter indicates the type fire the unit is designed to extinguish (Type B designed to extinguish flammable liquids such as gasoline, oil and grease fires). The number indicates the relative size of the extinguisher (minimum extinguishing agent weight).

Approved extinguishers are hand-portable, either B-I or B-II classification and have the following characteristics:

<u>Classes</u>	<u>Foam</u> <u>(Gals.)</u>	<u>CO<sub>2</sub></u> <u>(LBS)</u>	<u>Dry</u>	
			<u>Chemical</u> <u>(LBS)</u>	<u>Halon</u> <u>(LBS)</u>
B-I	1.25	4	2	2.5
B-II	2.5	15	10	10

Fire extinguishers are required if any one or more of the following conditions exist:

- Inboard engines.
- Closed compartments under thwarts and seats where portable fuel tanks may be stored.
- Double bottoms not sealed to the hull or which are not completely filled with flotation materials.
- Closed living spaces.
- Closed stowage compartments in which combustible or flammable materials are stored.
- Permanently installed fuel tanks. Fuel tanks secured so they cannot be moved in case of fire or other emergency are considered permanently installed. There are no gallon capacity limits to determine if a fuel tank is portable. If the weight of a fuel tank is such that persons on board cannot move it, the Coast Guard considers it permanently installed.

Dry chemical fire extinguishers without gauges or indicating devices must be inspected every 6 months. If the gross weight of a carbon dioxide (CO<sub>2</sub>) extinguisher is reduced by more than 10% of the net weight, the extinguisher is not acceptable and must be recharged.

Check extinguishers regularly to ensure gauges are free and nozzles are clear.

Minimum number of hand portable fire extinguishers required:

<u>VESSEL</u> <u>LENGTH</u>	<u>NO FIXED</u> <u>SYSTEM</u>	<u>WITH</u> <u>APPROVED</u>
		<u>FIXED</u> <u>SYSTEM</u>
Less than 26'	1 B-I	0
26' to less than 40'	2 B-I or 1 B-II	1 B-I
40' to 65'	3 B-I or 1 B-II and 1 B-I	2 B-I or 1 B-II

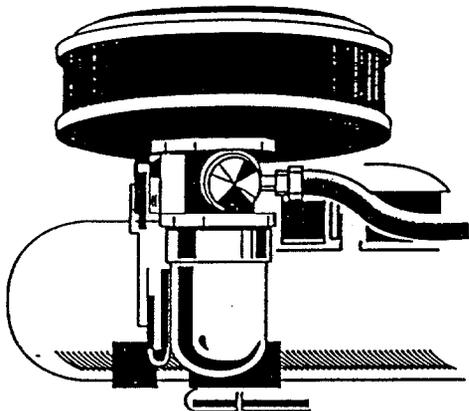
Coast Guard Approved extinguishers are identified by the following marking on the label: "Marine Type USCG Approved, Size . . . , Type . . . , 162.208/ . . . /", etc.



Types of  
Fire  
Extinguishers

## BACKFIRE FLAME CONTROL

Gasoline engines installed in a vessel after April 40, except outboard motors, must be equipped an acceptable means of backfire flame control. The device must be suitably attached to the air intake with a flamelight connection and is required to be Coast Guard approved.



Back Fire Flame Arrester

## REQUIRED NONAPPROVED EQUIPMENT

### NATURAL VENTILATION

All vessels with propulsion machinery that use gasoline for fuel, with enclosed engine and/or fuel tank compartments built after April 25, 1940 and before August 1, 1980 are required to have natural ventilation.

Natural ventilation consists of at least two ventilation ducts fitted with cowls or their equivalent for the purpose of efficiently ventilating the bilges of every engine and fuel tank compartment. At least one exhaust duct extending to the lower portion of the bilge and at least one intake duct extending to a point midway to the bilge or at least below the level of the carburetor air intake is required.

Vessels built after July 31, 1978, but prior to August 1, 1980, have no requirement for ventilation of the fuel tank compartment if there is no electrical source in the compartment and the tank vents to the outside of the vessel.

## POWERED VENTILATION

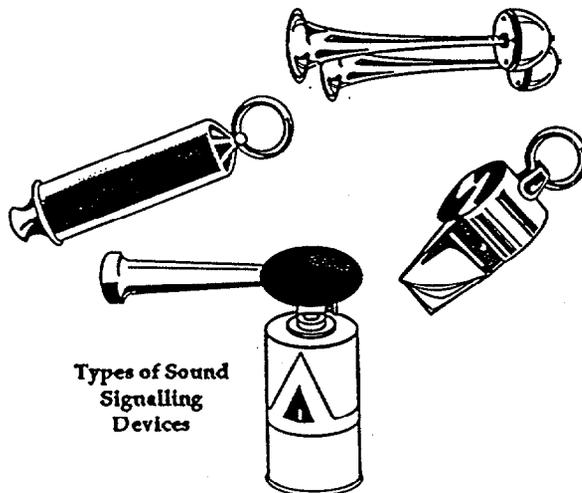
Vessels built after July 31, 1980 that have gasoline engines, with a cranking motor (starter), for electrical generation, mechanical power or propulsion in a closed compartment are required to have a powered ventilation system. This includes each compartment with such an engine.

No person may operate a vessel built after July 31, 1980 with a gasoline engine in a closed compartment unless it is equipped with an operable ventilation system that meets Coast Guard standards. The operator is required to keep the system in operating condition and ensure cowls and ducting are not blocked or torn.

## SOUND SIGNALLING DEVICES

Regulations do not specifically require vessels less than 12 meters to carry a whistle, horn or bell. However, the navigation rules require sound signals to be made under certain circumstances. Meeting, crossing and overtaking situations described in Navigation Rules section are examples of when sound signals are required. Recreational vessels are also required to sound fog signals during periods of reduced visibility. Therefore, you must have some means of making an efficient sound signal.

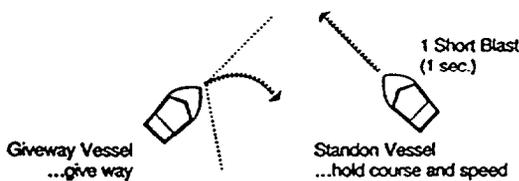
Vessels 12 meters or more in length are required to carry on board a power whistle or power horn and a bell.



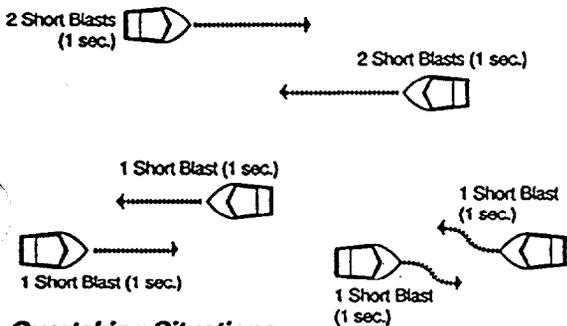
Types of Sound Signalling Devices

## NAVIGATION RULES

The Navigation Rules establish actions to be taken by vessels to avoid collision. The vessel operator is responsible for knowing and following applicable navigation rules. The following diagrams describe the whistle signals and actions to be taken by recreational vessels in a crossing, meeting and overtaking situation. These are basic examples, for further information consult the NAVIGATION RULES International - Inland (COMDTINST M16672.2A).



### Meeting Head-On or Nearly So



### Overtaking Situations

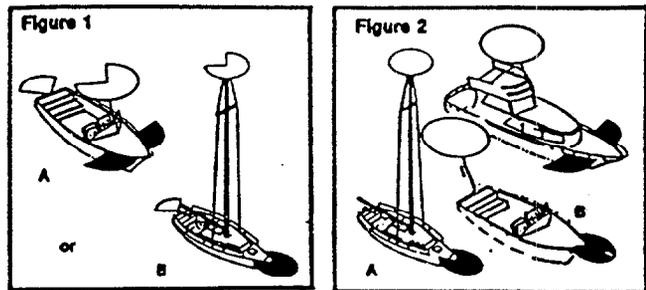


International Rules apply outside established lines of demarcation and Inland Rules apply inside the lines. Demarcation lines are printed on most navigational charts and are published in the Navigation Rules.

## NAVIGATION LIGHTS

Recreational vessels are required to display navigation lights between sunset and sunrise and other periods of reduced visibility (fog, rain, haze etc.). The U. S. Coast Guard Navigation Rules, International - Inland encompasses lighting requirements for every description of watercraft. The information provided here is intended for power-driven and sailing vessels less than 20 meters.

### POWER DRIVEN VESSELS



Power-driven vessels of less than 20 meters, shall exhibit navigation lights as shown in Figure 1. Vessels of less than 12 meters in length, may show the lights in either Figure 1 or Figure 2.

Power-driven vessels of less than 7 meters whose maximum speed cannot exceed 7 knots may exhibit an all-round white light, and if practicable sidelights instead of the lights prescribed above, in International Waters only.

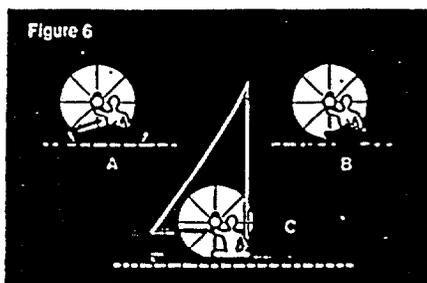
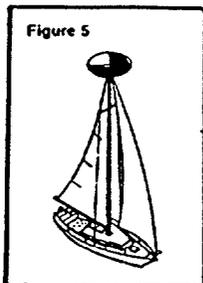
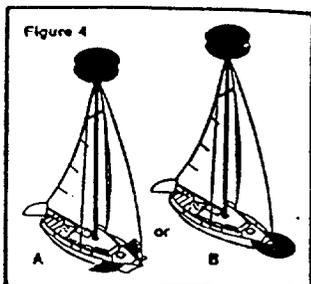
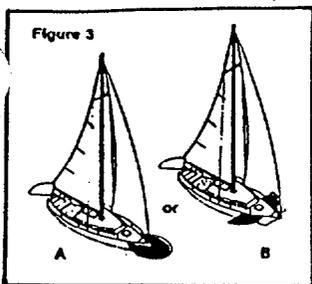
Sailing vessels operating under machinery, or under sail and machinery are considered power-driven and must display the lights prescribed for a power-driven vessel.

### SAILING VESSELS AND VESSELS UNDER OARS

Sailing vessels less than 20 meters exhibit navigation lights shown in Figures 3 or 4 or may be combined in a single lantern carried at the top of the mast as shown in Figure 5.

Sailing vessels less than 7 meters may carry an electric torch or lighted lantern showing a white light

Sailing Vessels and Vessels Under Oars (continued)



to be displayed in sufficient time to prevent collision (see Figure 6), if practicable, the lights prescribed for sailing vessels less than 20 meters should be displayed.

Vessels under oars may display the lights prescribed for sailing vessels, but if not, must have ready at hand an electric torch or lighted lantern showing a white light to be shown in sufficient time to prevent collision (see Figure 6).

LIGHTS FOR ANCHORED VESSELS

Power-driven vessels and sailing vessels at anchor must display anchor lights. An anchor light for a vessel less than 20 meters in length is an all-round white light visible for 2 miles exhibited where it can best be seen.

Vessels less than 7 meters are not required to display anchor lights unless anchored in or near a narrow channel, fairway or anchorage or where other vessels normally navigate.

Anchor lights are not required on vessels less than 20 meters, anchored in special anchorages designated by the Secretary of Transportation in Inland Waters.

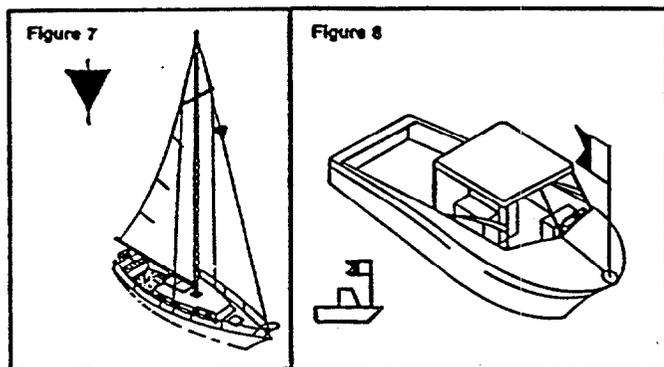
Vessels under sail also being propelled by machinery, must exhibit forward, where it can best be seen, a conical shape, apex down (See Figure 7). Vessels less than 12 meters are not required to exhibit the dayshape in Inland Waters.

DIVING OPERATIONS

The Navigational Rules require vessels restricted in ability to maneuver to display appropriate day shapes. To meet this requirement, recreational vessels engaged in diving activities may exhibit a rigid replica of the international code flag "A" not less than one meter in height (See Figure 8).

This requirement does not affect the use of the red and white diver's flag which may be required by State or local law to mark the diver's location under water. The "A" flag is a navigation signal advertising the vessel's restricted maneuverability. It does not pertain to the diver.

DAY SHAPES REQUIRED BETWEEN SUNRISE AND SUNSET



The operator of each self-propelled vessel 12 meters or more in length is required to carry on board, and maintain for ready reference, a copy of the Inland Navigation Rules while operating on Inland waters, subject to a penalty for failure to comply of not more than \$5,000. Copies of the rules may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 (tel: (202) 783-3238). Stock number 050-012-00205-3, \$6.00 each.

## POLLUTION REGULATIONS

The Refuse Act of 1899 prohibits throwing, discharging or depositing any refuse matter of any kind (including trash, garbage, oil and other liquid pollutants) into the waters of the United States. The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances which may be harmful into U. S. navigable waters. You must immediately notify the U. S. Coast Guard if your vessel discharges oil or hazardous substances into the water. Call toll-free 800-424-8802 (In Washington, D. C. (202) 267-2675). Report the following information:

- a. location      c. size      e. substance
- b. source        d. color     f. time observed

Avoid flame, physical contact or inhalation of fumes near any source of pollution.

Regulations issued under the Federal Water Pollution Control Act require all vessels with machinery propulsion to have a capacity to retain oily mixtures on board. A fixed or portable means to discharge oily waste to a reception facility is required. A bucket or bailer is suitable as a portable means of discharging oily waste on recreational vessels.

No person may intentionally drain oil or oily waste from any source into the bilge of any vessel.

Vessels 26 feet in length and over must display a placard at least 5 by 8 inches, made of durable material, fixed in a conspicuous place in the machinery spaces, or at the bilge pump control station, stating the following:

### DISCHARGE OF OIL PROHIBITED

The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters of the United States or the waters of the contiguous zone if such discharge causes a film or sheen upon, or discoloration of, the surface of the water, or causes a sludge or emulsion beneath the surface of the water. Violators are subject to a penalty of \$5,000.

## Marine Sanitation Devices

All recreational boats with installed toilet facilities must have an operable marine sanitation device (MSD) on board. Vessels 65 feet and under may use a Type I, II or III MSD. Vessels over 65 feet must install a Type II or III MSD. All installed MSDs must be Coast Guard certified. Coast Guard certified devices are so labeled except for some holding tanks, which are certified by definition under the regulations.

## REPORTING BOATING ACCIDENTS

All boating accidents or accidents resulting from the use of related equipment (which meet the criteria below), must be reported by the operator or owner of the vessel to the proper marine law enforcement authority for the State in which the accident occurred.

**IMMEDIATE NOTIFICATION REQUIRED FOR FATAL ACCIDENTS.** If a person dies or disappears as a result of a recreational boating accident the nearest State boating authority must be notified without delay, providing the following information:

- Date, time and exact location of the accident;
- Name of each person who died or disappeared;
- Number and name of the vessel; and
- Names and addresses of the owner and operator.

**A FORMAL REPORT OF A FATALITY MUST BE FILED WITHIN 48 HOURS.** If, as a result of a boating or related equipment accident, a person sustains injuries that require more than first aid, a formal report must be filed.

**ACCIDENTS INVOLVING MORE THAN \$200 DAMAGE MUST BE REPORTED WITHIN 10 DAYS.** A formal report must be made if property damage exceeds \$200; or there is a complete loss of a vessel.

If you need further information regarding accident reporting, please call the Boating Safety Hotline, 800-268-5647.

## RENDERING ASSISTANCE

The master or person in charge of a vessel is obligated by law to provide assistance that can be safely provided to any individual at sea in danger of being lost, and is subject to a fine and/or imprisonment for failure to do so.

## ADDITIONAL EQUIPMENT AND ADVICE

As the operator and/or owner you are responsible for the prudent and safe operation of your vessel, and for the lives and safety of your passengers and others around you. You should become familiar with Federal, State and local rules and regulations regarding safe boat operation and attempt to learn and practice good seamanship, boathandling, navigation and piloting, etc.

Besides meeting the legal requirements, prudent boaters carry additional safety equipment.

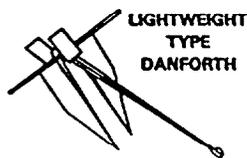
## ADDITIONAL MEANS OF PROPULSION

Vessels less than 16 feet should carry alternate propulsion, such as a paddle or oars. If an alternate means of mechanical propulsion is carried it should use a separate fuel tank and starting source than the main propulsion motor.

## ANCHORING

All vessels should be equipped with an anchor and line of suitable size and length for the vessel and waters in which it is being operated. Choose the right anchor for your vessel and the type of bottom you expect to be anchoring in.

To anchor, bring the bow into the wind or current and put the engine in neutral. When the vessel comes to a stop, lower, do not throw, the anchor over the bow. The anchor line should be 5 to 7 times the depth of water.



Types of anchors



## STERN ANCHORING

Anchoring a small boat by the stern has caused many to capsize and sink. The transom is usually squared off and has less freeboard than the bow. In a current, the stern can be pulled under by the force of the water. The boat is also vulnerable to swamping by wave action. The weight of a motor, fuel tank, or other gear in the stern increases the risk. Do not anchor by the stern!

## BAILER

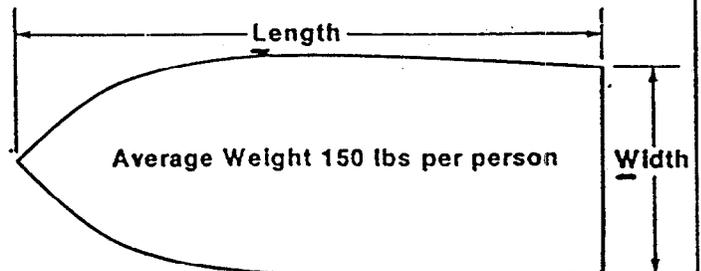
All vessels should carry at least one effective manual device (portable bilge pump, bucket, scoop, etc.) for bailing water, in addition to any installed electric bilge pump.

## FIRST AID

As the operator of a small boat you should consider taking a First Aid course and becoming proficient in its application. A first aid kit and manual, bandages, gauze, adhesive tape, antiseptic, aspirin, etc. is suggested.

## LOADING YOUR VESSEL

Keep the load low and evenly distributed. Do not exceed the "U.S. Coast Guard Maximum Capacities" label. If there is no capacity label use the following formula to determine the maximum number of persons you can safely carry in calm weather:



$$\text{People} = \frac{L \times W}{15}$$

Length is determined by measuring in a straight line from the foremost part to the aftermost of the vessel, parallel to the centerline, exclusive of sheer. Bowsprits, rudders, outboard motors and similar fittings are not included in the measurement.

## CARE AND MAINTENANCE

### FUELING PRECAUTIONS

Fill portable tanks off the vessel. Close all hatches and other openings before fueling. Extinguish smoking materials. Secure all electrical equipment, radios, stoves and other appliances. Secure all engines and motors.

Wipe up any spilled fuel immediately. Open all hatches to air out the vessel. Run the blower five minutes, and then check the bilges for fuel vapors before starting the engine. NEVER start the engine until all traces of fuel vapors are eliminated.

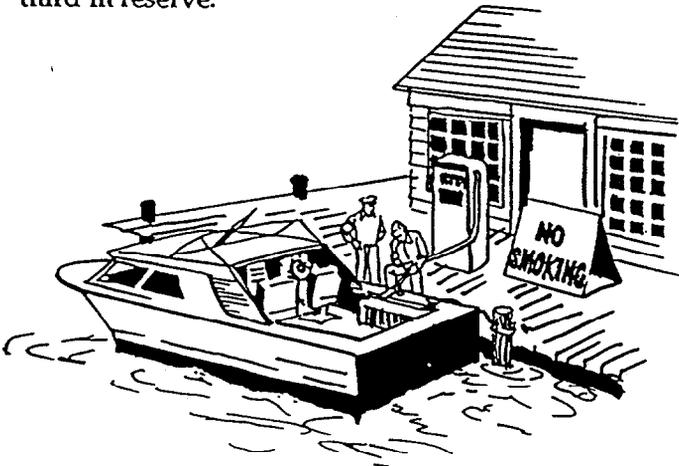
### FUEL TANKS

Ensure portable fuel tanks are constructed of sturdy material and in good condition, free of excessive corrosion and do not leak. The vents on portable tanks must be operable and the tanks should have a vapor-tight, leak-proof cap. Do not allow excessive movement of portable tanks.

Permanent fuel tanks and lines should be free of corrosion and must not leak. Tanks must be vented to the outside of the hull. The fill pipe and plate must fit tightly and be located outside of closed compartments.

### FUEL MANAGEMENT

Practice the "One-Third Rule" by using one-third of the fuel going out, one-third to get back and one-third in reserve.



All equipment and supplies should be properly secured. Keep decks and other spaces clean, free of clutter and trash. The vessel should be free of fire hazards with clean bilges and in good condition. Inspection and required maintenance on a regular schedule will ensure the hull and superstructure remain sound. Ensure all repairs are made properly and with marine rated parts. You should carry a few tools, spare parts and learn how to make minor repairs.

### FLOAT PLAN

Tell a friend or relative where you are going and when you plan to return. Make sure they have a description of your vessel and other information that will make identification easier should the need arise. An example is provided on the inside front cover.

### WEATHER

Check weather reports before leaving shore and remain watchful for signs of bad weather. Become familiar with National Weather Service Storm Advisory Signals and know where they are displayed.

### SMALL BOATS AND WATER ACTIVITIES

Most hunters and anglers do not think of themselves as boaters. But many use small semi-v hull vessels, flatbottom jon boats or canoes to pursue their sport. These boats tend to be unstable and easily capsized. Capsizings, sinkings, and falls overboard account 70% of boating fatalities and are directly related to poor stability. These facts mean care must be used in operating small boats. You must have a greater awareness of the boat's limitations and the skill and knowledge to overcome them.

Standing in a small boat raises the center of gravity, often to the point of capsizing. Standing for any reason or even changing position in a small boat can be dangerous, as is sitting on the gunnels or seat backs or in a pedestal seat while underway. A wave or sudden turn may cause a fall overboard or capsizing because of the raised center of gravity.

## SURVIVAL TIPS

It is a common belief that someone dressed in dry clothing or waders will sink immediately if they fall overboard. This is not true. Air trapped in clothing provides considerable flotation, bending the knees will trap air in waders, providing additional flotation. To stay afloat, remain calm, do not thrash about or try to remove clothing or footwear, this leads to exhaustion and increases the loss of air that keeps you afloat. Keep your knees bent, float on your back and paddle slowly to safety.

## HYPOTHERMIA

Hypothermia is the loss of body heat, immersion in water speeds the loss of heat. If your boat capsizes it will likely float on or just below the surface. Vessels built after 1978 will support you even if full of water or capsized. To reduce the effects of hypothermia get in or on the boat. Try to get as much of your body out of the water as possible. If you can't get in the boat a PFD will enable you to keep your head out of the water. This is very important because about 50% of body heat loss is from the head.

## SUDDEN DISAPPEARANCE SYNDROME

Sudden immersion in cold water can induce rapid, uncontrolled breathing, cardiac arrest, and other life-threatening situations which can result in drowning. Wearing a PFD will prevent this. If you must enter the water, button up your clothing, wear a PFD, cover your head if possible and enter the water slowly.

## COLD WATER DROWNING

It may be possible to revive a drowning victim who has been under water for considerable time and shows no signs of life. Increasingly numerous documented cases exist where victims have been resuscitated with no apparent harmful effects after long immersions. Start CPR immediately and get the victim to a hospital as quickly as possible.

## CONVERSION OF METRIC TO U. S. UNITS

Metric Measure	Feet in Decimals	Feet and Inches
50 Meters (M)	164.0 ft.	164'1/2"
20 Meters (M)	65.6 ft.	65'7 1/2"
12 M	39.4 ft.	39'4 1/2"
10 M	32.8 ft.	32'9 3/4"
8 M	26.2 ft.	26'3"
7 M	23.0 ft.	23'11 1/2"
6 M	19.7 ft.	19'8 1/4"
5 M	16.4 ft.	16'4 3/4"
4 M	13.1 ft.	13'1 1/2"
2.5 M	8.2 ft.	8'2 1/2"
1 M	3.3 ft.	3'3 1/4"

Boating Safety is no accident. To build sound knowledge, proficiency and confidence, the keys to safe boating, take a boating safety course.



**Coast Guard**

**Boating Safety Hotline:**

**800-368-5647**

- ✓ For Boating Safety Recall Information.
- ✓ To Report Possible Safety Defects In Boats.
- ✓ For Answers To Boating Safety Questions.

✓ **Call, Toll Free!**

For more information on boating safety and boating courses, contact your State Boating Agency, local Coast Guard District or call the Boating Safety Hotline.

**Attachment B**  
**Material Safety Data Sheets**

---

# CHLORDANE

CDN

<p><b>Common Synonyms</b> Chlordane 1,2,4,5,6,7,8,8-octachloro-2,3,3,4,4,7,7a-hexahydro-4,7-methanonindene Toxichlor, Octachlor Velsicol 1066</p>		Brown	Sharp odor
<p>AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		<p>Sinks in water.</p>	
Fire	<p>Not flammable but solution may be combustible. <b>POISONOUS GASES MAY BE PRODUCED IN FIRE.</b> Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID. LIQUID OR SOLUTION <b>POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. <b>DO NOT RUB AFFECTED AREAS.</b> IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-poison Restrict access Should be removed Chemical and physical treatment</p>		<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Not listed 3.2 Formula: C<sub>12</sub>H<sub>6</sub>Cl<sub>8</sub> 3.3 IMO/IUN Designation: 6.1/2762 3.4 DOT ID No.: 2762 3.5 CAS Registry No.: 57-74-9</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Brown 4.3 Odor: Penetrating, aromatic; slightly pungent, like chlorine</p>	
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Respirator for sprays, fogs, or dust; goggles; rubber gloves. 5.2 Symptoms Following Exposure: Moderately irritating to eyes and skin. Ingestion, absorption through skin, or inhalation of mist or dust may cause excitability, convulsions, nausea, vomiting, diarrhea, and some local irritation of the gastrointestinal tract. 5.3 Treatment of Exposure: INHALATION: administer oxygen and give fluid therapy; do not give epinephrine, since it may induce ventricular fibrillation; enforce complete rest. EYES: flush with water for at least 15 min. SKIN: wash off skin with adequate quantities of soap and water; do NOT scrub. INGESTION: induce vomiting and follow with gastric lavage and administration of saline cathartics; ether and barbiturates may be used to control convulsions; oxygen and fluid therapy are also recommended; do NOT give epinephrine. Since no specific antidotes are known, symptomatic therapy must be accompanied by complete rest. 5.4 Threshold Limit Value: 0.5 mg/m<sup>3</sup> 5.5 Short Term Inhalation Limit: 2 mg/m<sup>3</sup> for 30 min 5.6 Toxicity by Ingestion: Grade 3; oral LD<sub>50</sub> = 283 mg/kg (rat) 5.7 Late Toxicity: Possible liver damage; loss of appetite and weight. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 500 mg/m<sup>3</sup></p>			

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: Solution: 225°F O.C.; 132°F C.C. Solid is not flammable. 6.2 Flammable Limits in Air: 0.7%-5% (kerosene solution) 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective on solution fire. 6.5 Special Hazards of Combustion: Products: Irritating and toxic hydrogen chloride and phosgene gases may be formed when kerosene solution of compound burns. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 410°F (kerosene solvent) 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent (Continued)</p>		<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X-Y</p>	
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable to 160°F 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>		<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Combustible liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>	
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 0.5 ppm/96 hr/goldfish/TL<sub>50</sub>/fresh water 8.2 Waterfowl Toxicity: LD<sub>50</sub> = 1,200 mg/kg 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: High</p>		<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 409.8 12.3 Boiling Point at 1 atm: Decomposes 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.6 at 25°C (liquid) 12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: (est.) -4,000 Btu/lb = -2,200 cal/g = -93 x 10<sup>3</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p> <p>*Properties refer to undiluted, technical-grade chlordane.</p>	
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Technical. A variety of dusts, powders, and solutions in kerosene containing 2-50% chlordane are shipped. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>			
<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>			

CDN

# CHLORDANE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F (estimate)	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F (estimate)	Temperature (degrees F)	Centipoise (estimate)
52	100.400	60	.300	60	1.209	130	58.980
54	100.400	61	.300	61	1.209	140	51.140
56	100.299	62	.300	62	1.209	150	44.560
58	100.200	63	.300	63	1.209	160	38.990
60	100.200	64	.300	64	1.209	170	34.270
62	100.099	65	.300	65	1.209	180	30.240
64	100.000	66	.300	66	1.209	190	26.780
66	99.940	67	.300	67	1.209	200	23.810
68	99.879	68	.300	68	1.209	210	21.240
70	99.809	69	.300	69	1.209	220	19.020
72	99.740	70	.300	70	1.209	230	17.080
74	99.669	71	.300	71	1.209	240	15.390
76	99.599	72	.300	72	1.209	250	13.900
78	99.530	73	.300	73	1.209	260	12.590
80	99.459	74	.300	74	1.209	270	11.440
82	99.389	75	.300	75	1.209	280	10.420
84	99.320	76	.300	76	1.209	290	9.516
86	99.250	77	.300	77	1.209	300	8.710

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	215	.000	215	.00001		N
	N	220	.000	220	.00001		O
	S	225	.000	225	.00002		T
	O	230	.000	230	.00002		
	L	235	.001	235	.00003		P
	U	240	.001	240	.00005		E
	B	245	.001	245	.00007		R
	L	250	.002	250	.00009		T
	E	255	.002	255	.00012		I
		260	.003	260	.00017		N
		265	.004	265	.00023		E
		270	.006	270	.00031		N
		275	.008	275	.00042		T
		280	.011	280	.00056		
		285	.015	285	.00074		
		290	.019	290	.00099		
		295	.026	295	.00131		
		300	.035	300	.00174		
		305	.046	305	.00228		
		310	.060	310	.00300		
		315	.079	315	.00391		
		320	.104	320	.00510		
		325	.136	325	.00662		
		330	.177	330	.00856		
		335	.230	335	.01104		
		340	.297	340	.01418		

# DIAZINON

DZN

<p><b>Common Synonyms:</b> O, O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate</p> <p><b>Alkyl for Spacicide Series:</b></p>	<p style="text-align: center;">Light to dark brown</p> <p style="text-align: center;">Soluble in water.</p>
<p>Stop discharge if possible. Keep people away, isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<b>Fire</b>	<p>Not flammable. <b>POISONOUS GASES ARE PRODUCED WHEN HEATED.</b></p>
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p><b>LIQUID POISONOUS IF SWALLOWED.</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. <b>IF IN EYES,</b> hold eyelids open and flush with plenty of water. <b>IF SWALLOWED</b> and victim is CONSCIOUS, have victim drink water or milk.</p>
<b>Water Pollution</b>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-poison, water contaminant, high flammability (if solution) Restrict access Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CQ Competibility Class: Not listed 3.2 Formula: C<sub>12</sub>H<sub>16</sub>N<sub>2</sub>O<sub>3</sub>PS 3.3 IMO/UN Designation: 6.1/1615 3.4 DOT ID No.: 1615 3.5 CAS Registry No.: 333-41-5</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Solid or liquid solution 4.2 Color: Amber to dark brown 4.3 Odor: Data not available</p>
<p style="text-align: center;"><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves; protective clothing. 5.2 Symptoms Following Exposure: Ingestion or prolonged inhalation of mist causes headache, giddiness, blurred vision, nervousness, weakness, cramps, diarrhea, discomfort in the chest, sweating, nausea, tearing, salivation and other excessive respiratory tract secretion, vomiting, cyanosis, pericarditis, uncontrollable muscle twitches, convulsions, coma, loss of reflexes, and loss of sphincter control. Liquid irritates eyes and skin. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air; keep warm; get medical attention at once. <b>EYES:</b> flush with plenty of water for at least 15 min. and get medical attention. <b>SKIN:</b> wash contaminated area with soap and water. <b>INGESTION:</b> get medical attention at once; give water slurry of charcoal; do NOT give milk or alcohol. 5.4 Threshold Limit Value: 0.1 mg/m<sup>3</sup> 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3; oral LD<sub>50</sub> = 76 mg/kg (rat) 5.7 Late Toxicity: May be mutagenic 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>	

<p style="text-align: center;"><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 82-105°F C.C. (solution only; pure liquid difficult to burn) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: (for solution) Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Oxides of sulfur and of phosphorus are generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: (for solution) 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>
<p style="text-align: center;"><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity With Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>
<p style="text-align: center;"><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 0.025 ppm/96 hr/stoney nymph/TL<sub>50</sub>/fresh water 30 µg/l/48 hr/bluegill/TL<sub>50</sub>/fresh water (becomes bound to soil when used according to directions) 8.2 Waterfowl Toxicity: LD<sub>50</sub> = 3.54 mg/kg LC<sub>50</sub> = 5 days, 90 ppm mallard duck LC<sub>50</sub> = 7 days, 66 ppm quail 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available</p>
<p style="text-align: center;"><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Technical; wettable powders; a variety of emulsifiable solutions in combustible solvents. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>

<p style="text-align: center;"><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X-Y</p>
<p style="text-align: center;"><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: ORM-A 11.2 KAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p style="text-align: center;"><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 16°C and 1 atm: Liquid 12.2 Molecular Weight: 304.4 12.3 Boiling Point at 1 atm: Very high decomposes 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.117 at 20°C (liquid) 12.8 Liquid Surface Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.040 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: (est.) -12,000 Btu/lb = -6,500 cal/g = -270 X 10<sup>3</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>

NOTES

DZN

## DIAZINON

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F (estimate)	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F (estimate)	Temperature (degrees F)	Centipoise (estimate)
52	70.280	51	.400	51	1.048	51	4.064
54	70.209	52	.400	52	1.048	52	4.005
58	70.139	53	.400	53	1.048	53	3.948
58	70.070	54	.400	54	1.048	54	3.892
60	70.000	55	.400	55	1.048	55	3.836
62	69.929	56	.400	56	1.048	58	3.782
64	69.860	57	.400	57	1.048	57	3.729
66	69.790	58	.400	58	1.048	58	3.677
68	69.730	59	.400	59	1.048	59	3.625
70	69.660	60	.400	60	1.048	60	3.575
72	69.589	61	.400	61	1.048	61	3.525
74	69.520	62	.400	62	1.048	62	3.478
76	69.450	63	.400	63	1.048	63	3.428
78	69.379	64	.400	64	1.048	64	3.381
80	69.309	65	.400	65	1.048	65	3.335
82	69.240	66	.400	66	1.048	66	3.290
84	69.169	67	.400	67	1.048	67	3.245
86	69.099	68	.400	68	1.048	68	3.201
		69	.400	69	1.048	69	3.158
		70	.400	70	1.048	70	3.116
		71	.400	71	1.048	71	3.074
		72	.400	72	1.048	72	3.033
		73	.400	73	1.048	73	2.993
		74	.400	74	1.048	74	2.954
		75	.400	75	1.048	75	2.915
		76	.400	76	1.048	76	2.877

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	.004		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



Genium Publishing Corporation  
 1145 Catalyn Street  
 Schenectady, NY 12303-1836 USA  
 (518) 377-8854

**Section 1. Material Identification**

**Jet Fuel Description:** A petroleum distillate similar to kerosine composed of C<sub>3</sub> to C<sub>16</sub> aliphatics, monocycloparaffins, aromatics, and olefins (for turbine engines only). Aromatics are a lower percentage for jet fuels, but there are a number of jet fuel types with somewhat different compositions and properties.  
**Other Designations:** Jet A, Jet A-1, Jet B, Jet fuel HEF-3, JP-1, JP-4, JP-5, JP-6.  
**Manufacturer:** Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*<sup>(1)</sup> for a suppliers list.  
**Cautions:** Jet fuel is volatile, combustible, and thus, a dangerous fire hazard. It is a skin, eye, and respiratory tract irritant. Ingestion can be harmful, even fatal.

R 1	(a)	NFPA	(b)
I -	2	0	3
S 2	0	0	1
K 2-4*	-	0	0
* Varying flash points			
	HMIS		HMIS
	H 1		H 1
	F 2		F 3
	R 0		R 0
	PPG†		PPG†
			† Sec. 8

- (a) Jet A and Jet A-1 (combustible) and JP-5 (flammable to combustible).
- (b) Jet B (dangerous fire hazard) and JP-4 (dangerous fire hazard and moderate explosion hazard in the form of vapor).

**Section 2. Ingredients and Occupational Exposure Limits**

Jet fuel, ca 100%			
1989 OSHA PEL	1989-90 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data*
None established	None established	None established	Rat, oral, LD <sub>50</sub> : 40 mg/kg
			Rat, inhalation, LC <sub>50</sub> : 23 ppm/4 hr
			Rat, skin, LD <sub>50</sub> : 317 mg/kg

\* These toxicity data pertain to jet fuel HEF-3. See NIOSH, RTECS (MH5425100), for additional toxicity data.

**Section 3. Physical Data\***

**Boiling Point:** 300 to 550 °F (149 to 288 °C)      **Relative Density (15 °C/4 °C):** 0.79 to 0.84  
**Vapor Pressure:** 0.1 mm Hg at 20 °C      **Water Solubility:** Negligible  
**Viscosity:** 1.0 to 2.0 cSt at 72 °F (40 °C)  
**Appearance and Odor:** A clear liquid with a hydrocarbon odor.

\* Physical data vary with fuel type. These data pertain to kerosine jet fuels in general.

**Section 4. Fire and Explosion Data**

<b>Flash Point:</b> 100 °F (37.8 °C), OC*	<b>Autolgnition Temperature:</b> 446 °F (230.2 °C)*	<b>LEL:</b> 0.6% v/v	<b>UEL:</b> 3.7% v/v
Jet A and Jet A-1: 110 to 150 °F (43.4 to 65.6 °C)			
Jet B: -16 to -30 °F (-26.7 to -34.5 °C)			
JP-1: 95 to 145 °F (35.0 to 62.8 °C)	JP-1: 442 °F (228 °C)		
JP-4†: -10 to 30 °F (-23.4 to -1.1 °C)	JP-4: 468 °F (242 °C)	JP-4: 1.3% v/v	JP-4: 8.0% v/v
JP-5: 95 to 145 °F (35.0 to 62.8 °C)	JP-5: 475 °F (246 °C)		

**Extinguishing Media:** For large fire, use water spray, fog, or foam. For small fires, use dry chemical or CO<sub>2</sub>. Water may be ineffective in fighting fires involving materials with low flash points. Apply in the form of a spray.

**Unusual Fire or Explosion Hazards:** Jet fuel is volatile and combustible.  
**Special Fire-fighting Procedures:** Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

\* A higher kerosene cut than JP-4 with fewer impurities.  
 † 65% gasoline and 35% light petroleum distillate.

**Section 5. Reactivity Data**

**Stability/Polymerization:** Jet fuels are stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.  
**Chemical Incompatibilities:** A violent reaction occurs with fluorine (F<sub>2</sub>). Jet fuels are also incompatible with halogens, strong acids, alkalines, and oxidizers.  
**Conditions to Avoid:** Avoid heat, sparks, flame, and build up of static electricity.  
**Hazardous Products of Decomposition:** Thermal oxidative decomposition of jet fuel can produce carbon monoxide from incomplete combustion.

**Section 6. Health Hazard Data**

**Carcinogenicity:** The NTP, IARC, and OSHA do not list jet fuels as a carcinogen.

**Category of Risks:** Jet fuel is a moderate skin, eye, and respiratory irritant. Ingestion may be harmful or fatal. The most serious toxic effect is aspiration pneumonia.

**Medical Conditions Aggravated by Long-Term Exposure:** Individuals with chronic pulmonary disease should not be exposed to jet fuel vapor.

**Target Organs:** Central nervous system, respiratory tract.

**Primary Entry Routes:** Inhalation, ingestion.

**Acute Effects:** Systemic exposure through the respiratory or gastrointestinal (GI) tract may result in increasing levels of central nervous system depression, manifest by a staggering gait, slurred speech, or mental confusion. These symptoms could progress to unconsciousness, coma, and death from respiratory failure. Exposure of lung tissue through aspiration of liquid jet fuel causes an immediate irritant and destructive reaction.

The inflammatory lung changes cause a chemical pneumonitis, pulmonary edema (fluid in the lungs), and/or bleeding in the lung tissue. Secondary infection as a result of the injury, and scarring may occur with resultant permanent lung damage. The immediate clinical effects are increasing shortness of breath, coughing, bloody sputum, and chest pain. These symptoms may worsen over the following hours to days. Ingestion causes irritation to the GI tract characterized by vomiting, abdominal pain, and diarrhea. Other organs possibly injured through systemic exposure include parenchyma of the liver, kidney, pancreas, and spleen. Exposure to high mist concentrations may irritate the mucous membrane.

**Chronic Effects:** Chronic lung dysfunction may result from aspiration into the lungs. Prolonged or repeated skin contact can cause dermatitis.

**FIRST AID**

**Eyes:** Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting*. If the victim is nauseated, position head lower than knees to prevent aspiration. Administer vegetable oil and call a physician immediately.

After first aid, get appropriate in-plant, paramedic, or community medical support.

**Section 7. Spill, Leak, and Disposal Procedures**

**Spill/Leak:** *Design and practice a jet fuel spill control and countermeasure program (SCCP)*. Notify safety personnel, isolate hazard area and deny entry, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and direct contact with skin or eyes. Immediately absorb spilled jet fuel with noncombustible, inert material such as fire-retardant treated sawdust or diatomaceous earth. Using nonsparking tools, immediately shovel spilled material in appropriate containers for disposal. After completing material pickup, ventilate area and wash spill site. Follow applicable OSHA regulations (29 CFR 1910.120).

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**ERD Designations****OSHA Designations**

Hazardous Waste (40 CFR 261.33): Not listed

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

A Hazardous Substance (40 CFR 302.4): Not listed

Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

**Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

**Other:** Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear nonsparking shoes (rubber, cord, or sewn leather soles).

**Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(103)</sup>

**Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

**Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Store in tightly closed containers in a cool, dry, well-ventilated area away from all heat and ignition sources and incompatible materials (Sec. 5). Outside or detached storage is preferred.

**Engineering Controls:** Avoid vapor inhalation and skin or eye contact. Use with appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Jet fuel's greatest hazard is its fire potential. Train all employees to use fire-extinguishing equipment. Perform fire drill exercises periodically. Take all measures to prevent static electricity: electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. Maintain and test grounding and bonding connections. Do not use drag chains or cables on fueling vehicles. After filling jet fuel storage tanks, wait 30 min before opening hatches to permit the relaxation of any static charges generated during filling or hauling. Empty containers or drums retaining residue (liquid and/or vapor) can be dangerous. Do not expose to heat or ignition sources. All drums should be completely drained, properly bunged, and promptly disposed of per local regulations. Practice good personal hygiene and housekeeping procedures. Take care in handling cans, and funnels wet with jet fuel. Before touching with bare hands, carefully wipe jet fuel containers. Properly dispose of wet rags per hazardous waste requirements. Avoid contamination of jet fuel with water, rust, scale, dirt, and other petroleum products. Use commercial hydrokit, Aqua-Glo, or "Clear and Bright") to detect water and dirt, respectively.

Transportation Data (49 CFR 172.101, .102): Not listed

**MSDS Collection References:** 1, 73, 84, 103, 126, 132, 133, 136

Prepared by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: W Silverman, MD; Edited by: JR Stuart, MS

# MALATHION

MLT

<p><b>Common Synonyms</b> Cytion Insecticide</p>		<p><b>Liquid</b> Yellow to dark brown Skunk-like odor</p> <p>Mixes in water. Freezing point is 37°F.</p>
<p><b>AVOID CONTACT WITH LIQUID.</b> Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p><b>Fire</b></p>	<p>Combustible. <b>POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED.</b> Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, water, or foam. Cool exposed containers with water.</p>	
<p><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID.</p> <p><b>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.</b> Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>	
<p><b>Water Pollution</b></p>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook)</p> <p>Issue warning-poison, water containment Restrict access Should be removed Chemical and physical treatment</p>		<p><b>2. LABEL</b></p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 GHS Competibility Class: Not listed 3.2 Formula: C<sub>10</sub>H<sub>11</sub>O<sub>3</sub>PS<sub>2</sub> 3.3 IMO/IUN Designation: 6.1/2783 3.4 DOT ID No.: 2783 3.5 CAS Registry No.: 121-75-5</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow to dark brown 4.3 Odor: Characteristic skunk-like mercaptan</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>6.1 Personal Protective Equipment: Wear self-contained breathing apparatus for respirator for organophosphate pesticides and rubber clothing while fighting fires of malathion with chlorine bleach solution. All clothing contaminated by fumes and vapors must be decontaminated.</p> <p>6.2 Symptoms Following Exposure: Exposure to fumes from a fire or to liquid causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramp, diarrhea, and lightness in the chest. Muscles twitch and convulsions may follow. The symptoms may develop over a period of 8 hours.</p> <p>6.3 Treatment of Exposure: Speed is essential. <b>INHALATION:</b> in the nonbreathing victims immediately institute artificial respiration, using the mouth-to-mouth, the mouth-to-nose, or the mouth-to-oropharyngeal method. Call physician <b>INGESTION:</b> administer milk, water or salt-water and induce vomiting repeatedly. <b>SKIN OR EYE CONTACT:</b> flood and wash exposed skin areas thoroughly with water. Remove contaminated clothing under a shower. Administer atropine, 2 mg(1/30 gr) intramuscularly or intravenously as soon as any local or systemic signs or symptoms of an intoxication are noted; repeat the administration of atropine every 3-8 min. until signs of atropinization (mydriasis, dry mouth, rapid pulse, hot and dry skin) occur; initiate treatment in children with 1 mg of atropine. Watch respiration, and remove bronchial secretions if they appear to be obstructing the airway; intubate if necessary. Give 2-PAM (Prothidomac: Protopam), 2.5 gm in 100 ml of sterile water or in 5% dextrose and water, intravenously, slowly, in 15-30 min.; if sufficient fluid is not available, give 1 gm of 2-PAM in 3 ml of distilled water by deep intramuscular injection; repeat this every half hour if respiration weakens or if muscle fasciculation or convulsions recur.</p> <p>6.4 Threshold Limit Value: 10 mg/m<sup>3</sup> 6.5 Short Term Inhalation Limits: Data not available 6.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5g/kg(rat) 6.7 Late Toxicity: Data not available 6.8 Vapor (Gas) Irritant Characteristics: None likely 6.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin.</p>		

(Continued)

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: &gt;325°F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, water spray, foam 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Vapors and fumes from fires are hazardous. They include sulfur dioxide and phosphoric acid. 6.6 Behavior in Fire: Gives off hazardous fumes. Area surrounding fire should be diked to prevent water runoff. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X-Y</p>
<p>(Continued)</p> <p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: None 7.2 Reactivity with Common Materials: No hazardous reaction 7.3 Stability During Transport: Not pertinent 7.4 Neutralizing Agents for Acids and Caustics: Liquid bleach solution for decontamination. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: ORM-A 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 0.09 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water 0.033-0.063 ppm/96 hr/marine crustaceans/LC<sub>50</sub> 8.2 Waterfowl Toxicity: LD<sub>50</sub> = 1465 mg/kg 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 330.36 12.3 Boiling Point at 1 atm: Very High 12.4 Freezing Point: 37°F = 2.9°C = 276°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.234 at 25°C (liquid) 12.8 Liquid Surface Tension: 37.1 dynes/cm = 0.0371 N/m at 24°C 12.9 Liquid Water Interfacial Tension: 19 dynes/cm = 0.019 N/m at 24°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: Data not available 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: Data not available</p>
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purty: CYTHION insecticide, Malathion ULV Concentrate insecticide. Many powders, dusts, and spray solutions are sold under a variety of trade names. 9.2 Storage Temperature: Below 120°F. Decomposition (non-hazardous) occurs at higher temperatures. 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available</p>	<p><b>5. HEALTH HAZARDS (Continued)</b></p> <p>5.10 Odor Threshold: Data not available 5.11 IOH Value: 5000 mg/m<sup>3</sup></p>
<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	

MLT

## MALATHION

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
77	77.089	85	.380		N O T  P E R T I N E N T	70	45.270
78	77.089	90	.384			72	42.680
79	77.089	95	.389			74	40.260
80	77.089	100	.393			76	37.990
81	77.089	105	.398			78	35.870
82	77.089	110	.402			80	33.880
83	77.089	115	.406			82	32.020
84	77.089	120	.411			84	30.270
85	77.089	125	.415			86	28.620
86	77.089	130	.420			88	27.080
87	77.089	135	.424			90	25.630
88	77.089	140	.429			92	24.270
89	77.089	145	.433		94	22.990	
90	77.089	150	.438		96	21.780	
91	77.089				98	20.650	
92	77.089				100	19.580	
93	77.089				102	18.580	
94	77.089				104	17.630	
95	77.089				106	16.740	
96	77.089				108	15.900	
97	77.089				110	15.100	
98	77.089				112	14.350	
99	77.089				114	13.650	
100	77.089				116	12.980	
101	77.089				118	12.350	
102	77.089				120	11.750	

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.014		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PARATHION

PTO

<p><b>Common Synonyms</b> Ethyl parathion Phosphorothioic acid, O, O-diethyl O-p-nitrophenyl ester O, O Diethyl O-(p-nitrophenyl) phosphorothioate</p>		<p>Light to dark brown  Soluble in water. Freezing point is 43°F.</p>
<p><b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p><b>Fire</b></p>	<p>Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED.</p>	
<p><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>	
<p><b>Water Pollution</b></p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.  Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-poison, water contaminant Restrict access Should be removed Chemical and physical treatment</p>		<p><b>2. LABEL</b> 2.1 Category: Poison 2.2 Class: 6</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CQ Competibility Class: Not applicable 3.2 Formula: <math>(C_2H_5O)_2P(S)OC_6H_4NO_2</math> 3.3 IMO/IUN Designation: 6.1/2784 3.4 DOT ID No.: 2784 3.5 CAS Registry No.: 56-38-2</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Deep brown to yellow 4.3 Odor: Characteristic</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>6.1 Personal Protective Equipment: Neoprene-coated gloves; rubber work shoes or overshoes; latex rubber apron; goggles; respirator or mask approved for toxic dusts and organic vapors</p> <p>6.2 Symptoms Following Exposure: Inhalation of mist, dust, or vapor (or ingestion, or absorption through the skin) cause dizziness, usually accompanied by constriction of the pupils, headache, and tightness of the chest. Nausea, vomiting, abdominal cramps, diarrhea, muscular twitchings, convulsions and possibly death may follow. An increase in salivary and bronchial secretions may result which simulate severe pulmonary edema. Contact with eyes causes irritation.</p> <p>6.3 Treatment of Exposure: Call a doctor for all exposures to this compound. <b>INHALATION:</b> remove victim from exposure immediately; have physician treat with atropine injections until full atropinization; 2-PAM may also be administered by physician. <b>EYES:</b> flush with water immediately after contact for at least 15 min. <b>SKIN:</b> remove all clothing and shoes immediately; quickly wipe off the affected area with a clean cloth; follow immediately with a shower, using plenty of soap. If a complete shower is impossible, wash the affected skin repeatedly with soap and water. <b>INGESTION:</b> if victim is conscious, induce vomiting and repeat until vomit fluid is clear; make victim drink plenty of milk or water; have him lie down and keep warm.</p> <p>6.4 Threshold Limit Value: 0.1 mg/m<sup>3</sup></p> <p>6.5 Short Term Inhalation Limit: 0.5 mg/m<sup>3</sup> for 30 min.</p> <p>6.6 Toxicity by Ingestion: Grade 4; oral LD<sub>50</sub> = 2 mg/kg (rat)</p> <p>6.7 Late Toxicity: Birth defects in chick embryos</p> <p>6.8 Vapor (Gas) Irritant Characteristics: Data not available</p> <p>6.9 Liquid or Solid Irritant Characteristics: Data not available</p> <p>6.10 Odor Threshold: 0.04 ppm</p> <p>6.11 IDLH Value: 20 mg/m<sup>3</sup></p>		

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: Not flammable</p> <p>6.2 Flammable Limits in Air: Not flammable</p> <p>6.3 Fire Extinguishing Agents: Water on adjacent fire</p> <p>6.4 Fire Extinguishing Agents Not to be Used: High-pressure water hoses may scatter parathion from broken containers, increasing contamination hazard.</p> <p>6.5 Special Hazards of Combustion Products: Fumes from decomposing material may contain oxides of sulfur and nitrogen.</p> <p>6.6 Behavior in Fire: Containers may explode when heated.</p> <p>6.7 Ignition Temperature: Not pertinent</p> <p>6.8 Electrical Hazard: Not pertinent</p> <p>6.9 Burning Rate: Not pertinent</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;">(Continued)</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-O-X-Y</p>								
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: Slow reaction, not considered hazardous</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: Data not available</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Poison, B</p> <p>11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed</p> <p>11.3 NFPA Hazard Classification:</p> <table border="0"> <tr> <td>Category</td> <td>Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td>4</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </table>	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	1	Reactivity (Yellow)	2
Category	Classification								
Health Hazard (Blue)	4								
Flammability (Red)	1								
Reactivity (Yellow)	2								
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 1.6 ppm/96 hr/minnow/TL<sub>50</sub>/fresh water 0.43 ppm &lt; 24 hr/brine shrimp/lethal/salt water</p> <p>8.2 Waterfowl Toxicity: LD<sub>50</sub> = 2.13 mg/kg</p> <p>8.3 Biological Oxygen Demand (BOD): Data not available</p> <p>8.4 Food Chain Concentration Potential: No buildup in food chain</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 291.3</p> <p>12.3 Boiling Point at 1 atm: Very high; decomposes</p> <p>12.4 Freezing Point: 43°F = 6°C = 279°K</p> <p>12.5 Critical Temperature: Not pertinent</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity: 1.266 at 25°C (liquid)</p> <p>12.8 Liquid Surface Tension: Data not available</p> <p>12.9 Liquid Water Interfacial Tension: Data not available</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent</p> <p>12.12 Latent Heat of Vaporization: Not pertinent</p> <p>12.13 Heat of Combustion: -9,240 Btu/lb = -5,140 cal/g = -215 X 10<sup>4</sup> J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: Data not available</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: Data not available</p>								
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: 98.5+ % Sometimes distributed as solutions emulsifiable in water.</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Pressure-vacuum</p>	<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>								

PTO

## PARATHION

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F (estimate)	Temperature (degrees F)	Centipoise
65	79.379	65	.338	60	.967	65	20.340
70	79.209	70	.339	61	.967	70	18.290
75	79.049	75	.341	62	.967	75	16.480
80	78.879	80	.343	63	.967	80	14.880
85	78.719	85	.345	64	.967	85	13.480
90	78.559	90	.347	65	.967	90	12.200
95	78.400	95	.349	66	.967	95	11.070
100	78.240	100	.350	67	.967	100	10.070
105	78.080	105	.352	68	.967	105	9.173
110	77.929	110	.354	69	.967	110	8.370
115	77.770	115	.356	70	.967	115	7.649
120	77.620	120	.358	71	.967	120	7.001
125	77.459	125	.359	72	.967	125	6.417
		130	.361	73	.967		
				74	.967		
				75	.967		
				76	.967		
				77	.967		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T		N O T		N O T
	R E A C T S  S L O W L Y		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T



Genium Publishing Corporation  
1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 467  
Automotive Gasoline, Lead-free

Issued: 10/81 Revision: A, 9/91

**Section 1. Material Identification** 35

**Automotive Gasoline, Lead-free, Description:** A mixture of volatile hydrocarbons composed mainly of branched-chain paraffins, cycloparaffins, olefins, naphthenes, and aromatics. In general, gasoline is produced from petroleum, shale oil, Athabasca tar sands, and coal. Motor gasolines are made chiefly by cracking processes, which convert heavier petroleum fractions into more volatile fractions by thermal or catalytic decomposition. Widely used as fuel in internal combustion engines of the spark-ignited, reciprocating type. Automotive gasoline has an octane number of approximately 90. A high content of aromatic hydrocarbons and a consequent high toxicity are also associated with a high octane rating. Some gasolines sold in the US contain a minor proportion of tetraethyllead, which is added in concentrations not exceeding 3 ml per gallon to prevent engine "knock." However, methyl-tert-butyl ether (MTBE) has almost completely replaced tetraethyllead.

R 1	NFPA
I 2	
S 2*	
K 4	
* Skin absorption	HMIS
	H 2
	F 3
	R 1
	PPG†
	† Sec. 8

**Other Designations:** CAS No. 8006-61-9, benzin, gasoline, gasolene, motor spirits, natural gasoline, petrol.

**Manufacturer:** Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*<sup>(TM)</sup> for a suppliers list.

**Cautions:** Inhalation of automotive gasoline vapors can cause intense burning in throat and lungs, central nervous system (CNS) depression, and possible fatal pulmonary edema. Gasoline is a dangerous fire and explosion hazard when exposed to heat and flames.

**Section 2. Ingredients and Occupational Exposure Limits**

Automotive gasoline, lead-free\*

1990 OSHA PELs

8-hr TWA: 300 ppm, 900 mg/m<sup>3</sup>

15-min STEL: 500 ppm, 1500 mg/m<sup>3</sup>

1990-91 ACGIH TLVs

TWA: 300 ppm, 890 mg/m<sup>3</sup>

STEL: 500 ppm, 1480 mg/m<sup>3</sup>

1990 NIOSH REL

None established

1985-86 Toxicity Data\*

Man, inhalation, TC<sub>50</sub>: 900 ppm/1 hr; toxic effects include sense organs and special senses (conjunctiva irritation), behavioral (hallucinations, distorted perceptions), lungs, thorax, or respiration (cough)

Human, eye: 140 ppm/8 hr; toxic effects include mild irritation

Rat, inhalation, LC<sub>50</sub>: 300 g/m<sup>3</sup>/5 min

\* A typical modern gasoline composition is 80% paraffins, 14% aromatics, and 6% olefins. The mean benzene content is approximately 1%. Other additives include sulfur, phosphorus, and MTBE.

† See NIOSH, *RTECS* (LX3300000), for additional toxicity data.

**Section 3. Physical Data**

**Boiling Point:** Initially, 102 °F (39 °C); after 10% distilled, 140 °F (60 °C); after 50% distilled, 230 °F (110 °C); after 90% distilled, 338 °F (170 °C); final boiling point, 399 °F (204 °C)

**Density/Specific Gravity:** 0.72 to 0.76 at 60 °F (15.6 °C)

**Water Solubility:** Insoluble

**Vapor Density (air = 1):** 3.0 to 4.0

**Appearance and Odor:** A clear (gasoline may be colored with dye), mobile liquid with a characteristic odor recognizable at about 10 ppm in air.

**Section 4. Fire and Explosion Data**

**Flash Point:** -45 °F (-43 °C)

**Autoignition Temperature:** 536 to 853 °F (280 to 456 °C)

**LEL:** 1.3% v/v

**UEL:** 6.0% v/v

**Extinguishing Media:** Use dry chemical, carbon dioxide, or alcohol foam as extinguishing media. Use of water may be ineffective to extinguish fire, but use water spray to knock down vapors and to cool fire-exposed drums and tanks to prevent pressure rupture. Do not use a solid stream of water since it may spread the fuel.

**Unusual Fire or Explosion Hazards:** Automobile gasoline is an OSHA Class IB flammable liquid and a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow to an ignition source and flash back. Automobile gasoline can also react violently with oxidizing agents.

**Special Fire-fighting Procedures:** Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. When the fire is extinguished, use nonsparking tools for cleanup. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

**Section 5. Reactivity Data**

**Stability/Polymerization:** Automotive gasoline is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

**Chemical Incompatibilities:** Automotive gasoline can react with oxidizing materials such as peroxides, nitric acid, and perchlorates.

**Conditions to Avoid:** Avoid heat and ignition sources.

**Hazardous Products of Decomposition:** Thermal oxidative decomposition of automotive gasoline can produce oxides of carbon and partially oxidized hydrocarbons.

**Section 6. Health Hazard Data**

**Carcinogenicity:** In 1990 reports, the IARC list gasoline as a possible human carcinogen (Group 2B). Although the IARC has assigned an overall evaluation to gasoline, it has not assigned an overall evaluation to specific substances within this group (inadequate human evidence).

**Summary of Risks:** Gasoline vapors are considered moderately poisonous. Vapor inhalation can cause central nervous system (CNS) depression, mucous membrane and respiratory tract irritation. Brief inhalations of high concentrations can cause a fatal pulmonary edema. Reported effects to gasoline vapor concentrations are: 160 to 270 ppm causes eye and throat irritation in several hours; 500 to 900 ppm causes eye, nose, and throat irritation, and dizziness in 1 hr; and 2000 ppm produces mild anesthesia in 30 min. Higher concentrations are intoxicating in 4 to 10 minutes. If large areas of skin are exposed to gasoline, toxic amounts may be absorbed. Repeated or prolonged skin exposure causes dermatitis. Certain individuals may develop hypersensitivity. Ingestion can cause CNS depression. Pulmonary aspiration after ingestion can cause severe pneumonitis. In adults, ingestion of 20 to 50 g gasoline may produce severe symptoms of poisoning.

**Medical Conditions Aggravated by Long-Term Exposure:** None reported.

**Target Organs:** Skin, eye, respiratory and central nervous systems.

**Primary Entry Routes:** Inhalation, ingestion, skin contact.

**Acute Effects:** Acute inhalation produces intense nose, throat, and lung irritation; headaches; blurred vision; conjunctivitis; flushing of the face; mental confusion; staggering gait; slurred speech; and unconsciousness, sometimes with convulsions. Ingestion causes inebriation (drunkenness), vomiting, dizziness, fever, drowsiness, confusion, and cyanosis (a blue to dark purplish coloration of skin and mucous membrane caused by lack of oxygen). Aspiration causes choking, cough, shortness of breath, increased rate of respiration, excessively rapid heartbeat, fever, bronchitis, and pneumonitis. Other symptoms following acute exposure include acute hemorrhage of the pancreas, fatty degeneration of the liver and kidneys, and passive congestion of spleen.

**Chronic Effects:** Chronic inhalation results in appetite loss, nausea, weight loss, insomnia, and unusual sensitivity (hyperesthesia) of the distal extremities followed by motor weakness, muscular degeneration, and diminished tendon reflexes and coordination. Repeated skin exposure can cause blistering, drying, and lesions.

**FIRST AID**

**Eyes:** Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Give conscious victim a mixture of 2 tablespoons of activated charcoal mixed in 8 oz of water to drink. Consult a physician immediately.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Section 7. Spill, Leak, and Disposal Procedures**

**Spill/Leak:** Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Use nonsparking tools. Take up small spills with sand or other noncombustible adsorbent. Dike storage areas to control leaks and spills. Follow applicable OSHA regulations (29 CFR 1910.120).

**Aquatic Toxicity:** Bluegill, freshwater, LC<sub>50</sub> 8 ppm/96 hr.

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**EPA Designations**

**RCRA Hazardous Waste (40 CFR 261.21):** Characteristic of ignitability

**FLA Hazardous Substance (40 CFR 302.4):** Not listed

**Extremely Hazardous Substance (40 CFR 355):** Not listed

**Toxic Chemical (40 CFR 372.65):** Not listed

**OSHA Designations**

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.

**Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. There are no specific NIOSH recommendations. However, for vapor concentrations not immediately dangerous to life or health, use chemical cartridge respirator equipped with organic vapor cartridge(s), or a supplied-air respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

**Other:** Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Materials such as neoprene or polyvinyl alcohol provide excellent/good resistance for protective clothing. Note: Resistance of specific materials can vary from product to product.

**Ventilation:** Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(103)</sup>

**Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

**Contaminated Equipment:** Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Store in closed containers in a cool, dry, well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IB liquid. Outside or detached storage preferred.

**Engineering Controls:** Avoid vapor inhalation and skin or eye contact. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Indoor use of this material requires explosion-proof exhaust ventilation to remove vapors. Only use gasoline as a fuel source due to its volatility and flammable/explosive nature. Practice good personal hygiene and housekeeping procedures. Wear clean work clothing daily.

**Transportation Data (49 CFR 172.101, .102)**

**DOT Shipping Name:** Gasoline (including casing-head and natural)

**DOT Hazard Class:** Flammable liquid

**ID No.:** UN1203

**Label:** Flammable liquid

**Packaging Exceptions:** 173.118

**DOT Packaging Requirements:** 173.119

**IMO Shipping Name:** Gasoline

**IMO Hazard Class:** 3.1

**ID No.:** UN1203

**IMO Label:** Flammable liquid

**IMDG Packaging Group:** II

**MSDS Collection References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 140, 143, 146, 153, 159

**Prepared by:** M Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

95

# ZINC PHOSPHIDE

ZPP

Common Synonyms		Solid: Grey to black Faint odor	
		Strike in water.	
Avoid contact with solid and dust. Keep people away. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	Not flammable. Irritating gases may be produced when heated.		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p><b>DUST</b> Irritating to eyes, nose and throat. If inhaled will cause dizziness, difficult breathing, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>SOLID POISONOUS IF SWALLOWED.</b> Irritating to skin and eyes. If swallowed will cause dizziness, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS, OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-poison, water contaminant, air contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 2.1 Category: Poison 2.2 Class: 6	
3. CHEMICAL DESIGNATIONS 3.1 OQ Compatibility Class: Not listed 3.2 Formula: Zn <sub>3</sub> P <sub>2</sub> 3.3 MCO/UN Designation: 6.1/1714 3.4 DOT ID No.: 1714 3.5 CAS Registry No.: 1314-84-7		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Grey or grey-black 4.3 Odor: Faint phosphorus	
5. HEALTH HAZARDS			
<p>6.1 Personal Protective Equipment: Dust mask or self-contained breathing apparatus; goggles or face shield; protective gloves</p> <p>6.2 Symptoms Following Exposure: When inhaled or ingested, compound releases phosphine, which causes faintness, weakness, nausea, vomiting, dyspnea, fall in blood pressure, change in pulse rate, diarrhea, intense thirst, convulsions, paralysis, and coma. Contact with eyes or skin causes irritation.</p> <p>6.3 Treatment of Exposure: <b>INHALATION:</b> move to fresh air; give artificial respiration if required; get medical attention for phosphine poisoning. <b>INGESTION:</b> give one tablespoonful of mustard in a glass of warm water; repeat until vomit fluid is clear; avoid use of all oils; call physician immediately; have patient lie down and keep warm. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> flush with water, wash with soap and water</p> <p>6.4 Threshold Limit Values: Data not available</p> <p>6.5 Short Term Inhalation Limits: Data not available</p> <p>6.6 Toxicity by Ingestion: Grade 4; oral LD<sub>50</sub> = 40 mg/kg (rat)</p> <p>6.7 Late Toxicity: Data not available</p> <p>6.8 Vapor (Gas) Irritant Characteristics: Data not available</p> <p>6.9 Liquid or Solid Irritant Characteristics: Data not available</p> <p>6.10 Odor Threshold: Data not available</p> <p>6.11 IDLH Values: Data not available</p>			

6. FIRE HAZARDS		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) H	
<p>6.1 Flash Point: Not flammable</p> <p>6.2 Flammable Limits in Air: Not flammable</p> <p>6.3 Fire Extinguishing Agents: Use water, foam, or dry chemical on adjacent fires.</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Any agent with an acid reaction (e.g., carbon dioxide or halogenated agents) will liberate phosphine, a toxic and spontaneously flammable gas.</p> <p>6.5 Special Hazards of Combustion Products: Irritating oxides of phosphorus may be formed in fires.</p> <p>6.6 Behavior in Fire: Data not available</p> <p>6.7 Ignition Temperature: Not pertinent</p> <p>6.8 Electrical Hazard: Not pertinent</p> <p>6.9 Burning Rate: Not pertinent</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;">(Continued)</p>		11. HAZARD CLASSIFICATIONS	
		<p>11.1 Code of Federal Regulations: Poison, 6</p> <p>11.2 HAZ Hazard Rating for Bulk Water Transportation: Not listed</p> <p>11.3 NFPA Hazard Classification: Not listed</p>	
7. CHEMICAL REACTIVITY		12. PHYSICAL AND CHEMICAL PROPERTIES	
<p>7.1 Reactivity With Water: Reacts slowly with water, more rapidly with dilute acid, to form phosphine gas, which is toxic and spontaneously flammable.</p> <p>7.2 Reactivity with Common Materials: Data not available</p> <p>7.3 Stability During Transport: Stable unless exposed to moisture; toxic phosphine gas may then be released and collect in closed spaces.</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: Data not available</p>		<p>12.1 Physical State at 16°C and 1 atm: Solid</p> <p>12.2 Molecular Weight: 258.10</p> <p>12.3 Boiling Point at 1 atm: 2,012°F = 1,110°C = 1,373°K</p> <p>12.4 Freezing Point (sublimes): 786°F = 420°C = 693°K</p> <p>12.5 Critical Temperature: Not pertinent</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity: 4.55 at 13°C (solid)</p> <p>12.8 Liquid Surface Tension: Not pertinent</p> <p>12.9 Liquid Water Interfacial Tension: Not pertinent</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent</p> <p>12.12 Latent Heat of Vaporization: Not pertinent</p> <p>12.13 Heat of Combustion: -4,100 Btu/lb = -2,270 cal/g = -95 X 10<sup>4</sup> J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: Data not available</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: Data not available</p>	
8. WATER POLLUTION			
<p>8.1 Aquatic Toxicity: Data not available</p> <p>8.2 Waterfowl Toxicity: 1,265 ppm LC<sub>50</sub></p> <p>8.3 Biological Oxygen Demand (BOD): Data not available</p> <p>8.4 Food Chain Concentration Potential: Zinc is accumulated by some organisms but is not considered to be bioconcentrate-ive.</p>			
9. SHIPPING INFORMATION			
<p>9.1 Grades of Purity: Technical, 94 + %</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Pressure-vacuum</p>			
E. FIRE HAZARDS (Continued)			
<p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>			