



City of Seattle

# LOWER DUWAMISH WATERWAY SLIP 4 EARLY ACTION AREA

---

## LONG-TERM MONITORING AND REPORTING PLAN APPENDIX B: HEALTH AND SAFETY PLAN

*Submitted to*

**U.S. Environmental Protection Agency**

1200 Sixth Avenue  
Seattle, WA 98101

*Submitted by*

**City of Seattle**

*Prepared by*



411 1st Avenue S.  
Suite 550  
Seattle, WA 98104

March 21, 2013

## CONTENTS

<b>LIST OF ATTACHMENTS .....</b>	<b>iv</b>
<b>ACRONYMS AND ABBREVIATIONS.....</b>	<b>v</b>
<b>SITE HEALTH AND SAFETY PLAN APPROVAL.....</b>	<b>vi</b>
<b>SITE HEALTH AND SAFETY PLAN ACKNOWLEDGMENT .....</b>	<b>vii</b>
<b>1 INTRODUCTION .....</b>	<b>1-1</b>
1.1 OBJECTIVES AND METHODS.....	1-2
1.2 ORGANIZATION .....	1-2
1.3 ROLES AND RESPONSIBILITIES .....	1-3
1.3.1 Site Safety Officer .....	1-3
1.3.2 Project Manager .....	1-3
1.3.3 Corporate Health and Safety Manager.....	1-4
1.3.4 Field Personnel .....	1-4
1.4 SITE DESCRIPTION .....	1-4
1.5 PROJECT MANAGER AND OTHER KEY CONTACTS.....	1-5
<b>2 CHEMICAL HAZARD EVALUATION .....</b>	<b>2-1</b>
<b>3 PHYSICAL HAZARD EVALUATION AND GUIDELINES .....</b>	<b>3-1</b>
3.1 GENERAL PHYSICAL HAZARDS .....	3-1
3.2 OVERWATER WORK GUIDELINES.....	3-2
3.2.1 General Overwater Safety Guidelines .....	3-2
3.2.2 Sampling Vessel Operations .....	3-3
3.2.3 Small Craft Operation.....	3-4
3.2.4 U.S. Coast Guard Notification .....	3-4
<b>4 PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT.....</b>	<b>4-1</b>
4.1 PERSONAL PROTECTIVE EQUIPMENT .....	4-1
4.1.1 Respirator and Respirator Cartridge Information.....	4-1
4.2 SAFETY EQUIPMENT.....	4-2
<b>5 AIR MONITORING .....</b>	<b>5-1</b>
<b>6 HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING .....</b>	<b>6-1</b>
6.1 HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING.....	6-1
6.2 TRAINING REQUIREMENTS.....	6-1
6.2.1 Site Safety Meetings .....	6-1

6.3	MEDICAL MONITORING .....	6-2
<b>7</b>	<b>EMERGENCY RESPONSE PLAN.....</b>	<b>7-1</b>
7.1	EMERGENCY RECOGNITION AND PREVENTION .....	7-1
7.2	EMERGENCY RESPONSE AND NOTIFICATION .....	7-1
7.3	EMERGENCY DECONTAMINATION PROCEDURES .....	7-3
7.4	SITE COMMUNICATIONS.....	7-3
7.5	BUDDY SYSTEM.....	7-3
<b>8</b>	<b>WORK ZONES.....</b>	<b>8-1</b>
8.1	SEDIMENT SAMPLING – VESSEL-BASED.....	8-1
8.2	SEDIMENT SAMPLING – OVER LAND .....	8-1
<b>9</b>	<b>EQUIPMENT DECONTAMINATION AND PERSONAL HYGIENE.....</b>	<b>9-1</b>
9.1	EQUIPMENT DECONTAMINATION PROCEDURES.....	9-1
9.2	PERSONAL HYGIENE.....	9-2
<b>10</b>	<b>VEHICLE SAFETY, SPILL CONTAINMENT, AND SHIPPING INSTRUCTIONS .....</b>	<b>10-1</b>
10.1	VEHICLE SAFETY .....	10-1
10.2	SPILL CONTAINMENT.....	10-1
10.3	SHIPPING INFORMATION.....	10-2
<b>11</b>	<b>TASK-SPECIFIC SAFETY PROCEDURE SUMMARY.....</b>	<b>11-1</b>
11.1	SEDIMENT SAMPLING – VESSEL-BASED.....	11-1
11.2	SEDIMENT SAMPLING – ON FOOT .....	11-1
11.3	VISUAL BANK SURVEY .....	11-1
11.4	HYDROGRAPHIC SURVEY.....	11-2
11.5	TOPOGRAPHIC SURVEY .....	11-2
<b>12</b>	<b>REFERENCES.....</b>	<b>12-1</b>

## **LIST OF ATTACHMENTS**

- Attachment 1. Site Map and Hospital Route**  
Site Map  
Hospital Route Map  
Marina Route Map
- Attachment 2. Regulatory Notices**  
Federal OSHA Right to Know Posters
- Attachment 3. Safety Procedures**
- Attachment 4. Material Safety Data Sheets**
- Attachment 5. Near-Miss Incident Report**

## ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
CPR	cardiopulmonary resuscitation
HAZWOPER	hazardous waste operations and emergency response
HEPA	high-efficiency particulate air
IDLH	immediately dangerous to life and health
Integral	Integral Consulting Inc.
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PFD	personal flotation device
PPE	personal protective equipment
SHSP	site health and safety plan
SSO	site safety officer
STEL	short-term exposure limit
USCG	U.S. Coast Guard
WISHA	Washington Industrial Safety and Health Act

## **SITE HEALTH AND SAFETY PLAN APPROVAL**

This site health and safety plan has been reviewed and approved for the Slip 4 Long-Term Monitoring and Reporting Plan at Slip 4 Early Action Area, Seattle, Washington.

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Corporate Health and Safety Manager

\_\_\_\_\_  
Date

## SITE HEALTH AND SAFETY PLAN ACKNOWLEDGMENT

In the absence of an appropriate subcontractor or consultant health and safety plan, and with the written approval of Integral Consulting Inc. (Integral) corporate health and safety manager (CHSM), the subcontractor or consultant may utilize the Integral site health and safety plan (SHSP), provided there is written concurrence from the subcontractor or consultant that it will directly administer the plan for its employees and assumes all risks associated with any possible errors or omissions in the plan. This SHSP does not cover any construction activities. The Integral SHSP is a minimum standard for the site and will be strictly enforced for all Integral personnel, or its subcontractors or consultants where applicable.

I have reviewed the SHSP prepared by Integral, dated March 21, 2013, for the long-term monitoring of sediments in Lower Duwamish Waterway, Slip 4 Early Action Area fieldwork. I understand the purpose of the plan, and I consent to adhere to its policies, procedures, and guidelines while an employee of Integral, or its subcontractors or consultants. I have had an opportunity to ask questions regarding this plan, which have been answered satisfactorily by Integral.

_____ Employee signature	_____ Company	_____ Date

# 1 INTRODUCTION

It is the policy of Integral Consulting Inc. (Integral) to provide a safe and healthful work environment that is compliant with applicable regulations. No aspect of the work is more important than protecting the health and safety of all workers.

This site health and safety plan (SHSP) provides general health and safety provisions to protect workers from potential hazards during field activities at the Slip 4 Early Action Area (EAA), located in Seattle, Washington. This SHSP has been prepared in accordance with the Washington Industrial Safety and Health Act (WISHA) and federal Occupational Safety and Health Administration (OSHA) safety regulations (29 CFR [Code of Federal Regulations] 1910 and 29 CFR 1926).

Workplace health and safety regulations within the state of Washington, with a few exceptions, are covered by WISHA, which is a statute composed of Revised Code of Washington 49.17 and other codes that relate to occupational safety and health. The Division of Safety and Health of the Washington State Department of Labor and Industries administers WISHA. WISHA is the state equivalent of the federal government's Occupational Safety and Health Act, which is administered by OSHA. This SHSP follows both WISHA and OSHA hazardous waste operations and emergency response (HAZWOPER) and applicable regulations in 29 CFR 1910 and 29 CFR 1926.

Attachments to the SHSP provide a site-specific map and specific routes to the hospital from the site (Attachment 1), regulatory notices (Attachment 2), safety procedures (Attachment 3), material safety data sheets (Attachment 4), and a near-miss incident report form (Attachment 5).

This SHSP has been prepared to identify potential site hazards to the extent possible based on information available to Integral. Integral cannot guarantee the health or safety of any person entering this site. Because of the potentially hazardous nature of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this site. The health and safety guidelines in this plan were prepared specifically for this site and should not be used on any other site without prior evaluation by trained health and safety personnel.

Integral will employ subcontractors to perform certain aspects of the long-term monitoring program, such as hydrographic and topographic surveys, and sampling/survey vessel operation; however specific subcontractors have not yet been selected. Integral will provide its subcontractors with a copy of this SHSP once contracts have been executed. All subcontractors are responsible for providing their field crews with a SHSP while onsite. The subcontractor may elect to adopt Integral's SHSP or follow their own SHSP. If the subcontractor follows their own SHSP, it must be consistent with the provisions in this SHSP. The subcontractor is

responsible for administering the SHSP for their field crews. Integral and its subcontractors' field crews must keep a copy of Integral's SHSP in their custody during field activities. All individuals performing fieldwork must read, understand, and comply with this plan before undertaking field activities. Once the information has been read and understood, the individual must sign the Site Health and Safety Plan Acknowledgment form provided as part of this plan. The signed form will become part of the project file.

This plan may be modified at any time based on the judgment of the Integral site safety officer (SSO) in consultation with the project manager and Integral corporate health and safety manager (CHSM) or designee. Any modification will be presented to the onsite team during a safety briefing and will be recorded in the field logbook.

## **1.1 OBJECTIVES AND METHODS**

The primary purpose of the long-term monitoring of the remedy in the Slip 4 EAA is to ensure that the site remains protective of human health and the environment. The monitoring program involves the collection of data to assess the remedy's effectiveness over a span of 10 years. Subsequent monitoring will be determined after consultation with the U.S. Environmental Protection Agency (EPA).

To meet these objectives, field activities will include sediment sampling, visual inspection of capped shoreline and intertidal sediments, and hydrographic surveys. In addition, topographic surveys may be conducted if evidence of bank slope deformation is observed during the visual inspections. A power grab sampler aboard a sampling vessel will be used to collect the in-water surface sediment samples (0–10 cm). Surface sediment samples (0–10 cm) that are sampled at low tide along the bank will be collected using a stainless steel spoon or spade. The visual survey will be conducted along the periphery of the cap at low tide, utilizing a camera. A hydrographic survey will be conducted aboard an appropriately equipped vessel. If deemed necessary, a topographic survey will be conducted on foot in areas from the top-of-bank down to 0 feet MLLW, or to a sufficiently low elevation to tie in with bathymetric survey data. Additional details on the objectives and methods are presented in the quality assurance project plan (Appendix A to the long-term monitoring and reporting plan).

## **1.2 ORGANIZATION**

This SHSP covers four field activities: surface sediment collection, visual inspections, hydrographic surveys, and topographic surveys. Chemical and physical hazard evaluations are presented in Sections 2 and 3, respectively. Specific health and safety guidelines associated with each task, including a brief description of the work, are discussed in Section 11 (Task-Specific Safety Procedures).

## **1.3 ROLES AND RESPONSIBILITIES**

All Integral personnel, subcontractors and consultants, and visitors on this site must comply with the requirements of this SHSP. The specific responsibilities and authority of management, safety and health, and other personnel on this site are detailed in the following paragraphs.

### **1.3.1 Site Safety Officer**

The SSO has full responsibility and authority to implement this SHSP and to verify compliance. He or she reports to the project manager and is onsite or readily accessible to the site during all work operations. The SSO is responsible for assessing site conditions and directing and controlling emergency response activities. The specific responsibilities of the SSO include the following:

- Managing the safety and health functions on this site
- Serving as the onsite point of contact for safety and health concerns
- Assessing site conditions for unsafe acts and conditions and ensuring corrective action
- Ensuring that all Integral employees and subcontractors understand and follow the SHSP
- Ensuring that daily work schedules and tasks are reasonable for the required levels of effort and weather conditions
- Confirming local emergency response phone numbers and locations
- Conducting and documenting the initial and daily or periodic health and safety briefings
- Evaluating and modifying the level of protective apparel and safety equipment, based on site conditions
- Ensuring that the field team observes all necessary decontamination procedures.

If the SSO determines that site conditions are unsafe, he or she has the authority to suspend field operations until the problem is corrected. The SSO can modify SHSP procedures in the field. Any changes must be documented in the field logbook, and field staff must be immediately informed of the change. The project manager and Integral's CHSM, as well as the City of Seattle and the EPA Project Manager, must be notified by phone or e-mail within 24 hours of any major changes to the SHSP.

### **1.3.2 Project Manager**

The project manager has overall responsibility to ensure that personnel working onsite are safe. The specific responsibilities of the project manager include:

- Ensuring that the SHSP is developed prior to the field work or site visit
- Reviewing and approving the SHSP prior to the field work or site visit
- Ensuring employee understanding of and compliance with the SHSP.

### 1.3.3 Corporate Health and Safety Manager

The CHSM provides guidance to the project manager and SSO on SHSP preparation and reviews and approves the SHSP. The CHSM also serves as an arbitrator if there is a conflict between the project manager, SSO, and field personnel. In addition, the CHSM<sup>1</sup> conducts periodic unannounced audits of Integral field operations to ensure compliance with the site-specific health and safety plan.

### 1.3.4 Field Personnel

All Integral personnel and subcontractors on this site are responsible for reading and complying with this SHSP, using the proper personal protective equipment (PPE), reporting unsafe acts and conditions, and following the work and safety and health instructions of the project manager and SSO. All Integral personnel, subcontractors, or consultants can and are encouraged to suspend field operations if they feel conditions have become unsafe.

## 1.4 SITE DESCRIPTION

- **Owners/tenants:** City of Seattle
- **Site history:** Slip 4 is a 6.4-acre navigational slip located 3 miles upstream from the confluence with Elliott Bay and Puget Sound. It is one of five priority EAAs identified within the 5.5-mile long Lower Duwamish Waterway Superfund site. A volume of 3.58 acres of sediment within the slip was contaminated with polychlorinated biphenyls (PCBs), along with metals, organic compounds, and petroleum products. The Slip 4 EAA includes an approximately 3.58-acre sediment and slope cap.
- **Current site use:** Navigational slip
- **Hazardous waste site:** Yes
- **Industrial waste site:** Yes
- **Topography (if applicable):** Riverbank, intertidal, and shallow subtidal land
- **Site access:** Via South Park Marina, accessible by boat
- **Nearest drinking water/sanitary facilities:** Bottled water will be provided

---

<sup>1</sup> The audit task may be delegated to an office health and safety representative by the CHSM.

- **Nearest telephone:** Cell phone will be used
- **Size of site:** approximately 3.58 acres (Slip 4 EAA)
- **Pathways for hazardous substance dispersion:** skin absorption, skin contact, eye contact, and possible inhalation of decontamination chemical (hexane) vapors, if used.

A vicinity map is provided in Attachment 1 to this SHSP.

## 1.5 PROJECT MANAGER AND OTHER KEY CONTACTS

The contact information for key project personnel is provided below. These individuals will be notified within 24 hours if significant changes are made to this HSP following its approval.

	<b>Name (Affiliation)</b>	<b>Work Telephone</b>	<b>Cell Phone</b>
EPA Project Manager	Karen Keeley (EPA Region 10)	(206) 553-2141	(206) 437-3284
Client Project Manager	Allison Crowley (Seattle City Light)	(206) 684-3167	N/A
Long-Term Monitoring Project Manager	Kim Magruder Carlton (Integral)	(360) 756-9296	same
SSO	Stefan Wodzicki (Integral)	(360) 303-2708	(360) 303-2708
CHSM	Eron Dodak (Integral)	(503) 943-3614	(503) 407-2933
Field Coordinator	Stefan Wodzicki (Integral)	(360) 303-2708	(360) 303-2708

## 2 CHEMICAL HAZARD EVALUATION

Potentially hazardous chemicals known to exist at the site are primarily PCBs, polycyclic aromatic hydrocarbons and bis(2-ethylhexyl)phthalate. Although cleanup has been completed, exposure to these chemicals in sediments may occur if the sediment and slope caps “fail” or if recontamination of sediments occurs from ongoing sources. The chemicals of concern, applicable chemical properties, and potential exposure routes are presented in the following sections.

The following table lists the historical site maximum constituent concentrations for constituents at the Slip 4 EAA. In addition, the table lists the properties of decontamination chemicals that may be used at the site (i.e., hexane). The table also lists the chemical properties and OSHA permissible exposure limit (PEL), short-term exposure limit (STEL), and immediately dangerous to life and health (IDLH) level.

Possible chemical exposure routes at the site include skin contact, skin absorption, and eye contact, and the inhalation of vapors from hexane, which may possibly be used during equipment decontamination. Skin and eye exposures are minimized by the PPE specified for field personnel (Section 4). The possible inhalation of hexane vapors will be minimized by requiring that, when needed, hexane only be used in well ventilated areas with personnel standing upwind of the chemical. As discussed in Section 5 (Air Monitoring) in this SHSP, additional respiratory protection is not expected to be needed, and air monitoring will not be conducted during sampling activities.

### Chemical Properties

Chemical of Concern	Concentration (site maximum or range expected) <sup>a</sup>	Medium	OSHA PEL (ppm)	OSHA STEL (ppm)	OSHA IDLH (ppm)	Odor Threshold (ppm)	IP(eV)	Carcinogen or Other Hazard
PCBs	150 mg/kg	Sediment	0.5 mg/m <sup>3</sup> (NIOSH REL 0.001 mg/m <sup>3</sup> )	--	5	NA	--	Ca
PAHs	37 mg/kg	Sediment	0.2 <sup>b</sup>	--	80	NA	--	
Bis(2-ethylhexyl) phthalate	110 mg/kg	Sediment	5	10	250	0.05	8.93	P, Ca
Hexane	Product	Decon	500	--	1,100	130	10.18	Volatile, Flammable, Ignitable

**Notes:** -- = none established  
 Ca = carcinogen  
 IDLH = immediately dangerous to life and health  
 IP(eV) = ionization potential (electron volts)  
 mg/kg = milligrams per kilogram  
 NA = not available  
 P = poison  
 PAH = polycyclic aromatic hydrocarbon  
 PCB = polychlorinated biphenyl  
 PEL = permissible exposure limit  
 ppm = parts per million  
 STEL = short-term exposure limit

<sup>a</sup> Maximum concentrations from samples collected in the project area (SEA 2004; Integral 2004).

<sup>b</sup> Benzene soluble fraction

The table below summarizes the chemical characteristics and potential chemical exposure routes at the site.

	Likely	Possible	Unlikely
<b>Potential Chemical Exposure Routes at the Site:</b>			
Inhalation		X <sup>a</sup>	X <sup>b</sup>
Ingestion			X
Skin absorption		X	
Skin contact		X	
Eye contact		X	
<b>Chemical Characteristics:</b>			
Corrosive			X
Flammable	X <sup>a</sup>		X <sup>b</sup>
Ignitable	X <sup>a</sup>		X <sup>b</sup>
Reactive		X <sup>a</sup>	X <sup>b</sup>
Volatile	X <sup>a</sup>		X <sup>b</sup>
Radioactive			X
Explosive			X
Biological agent			X
Particulates or fibers			X

If likely, describe: A small volume of hexane (less than or equal to 1 liter) will be on hand for potential use in equipment decontamination. Hexane is a volatile and flammable liquid, and the vapors may ignite if exposed to an ignition source. These hazards will be minimized by only using hexane in well-ventilated areas with personnel standing upwind of the chemical. In addition, the hexane will be kept physically isolated from ignition sources at all times.

**Notes:**

<sup>a</sup> Decontamination chemicals

<sup>b</sup> Sediment

### 3 PHYSICAL HAZARD EVALUATION AND GUIDELINES

The following sections present general physical hazards and overwater work guidelines.

#### 3.1 GENERAL PHYSICAL HAZARDS

The following table presents possible physical hazards that are expected to be present during field activities.

Possible Hazard	Yes	No	Proposed Safety Procedure
Heavy equipment		X	Stay back from operating equipment; wear safety vests and hard hats; coordinate and maintain eye contact with equipment operator.
Material handling	X		Lift properly; seek assistance if necessary; do not overfill coolers or boxes. Seek assistance if drums must be moved.
Compressed air equipment		X	Equipment must be equipped with pressure release valves, drains, and gauges.
Confined spaces		X	Integral personnel are not trained or authorized to enter confined spaces under any circumstances. Only qualified and properly trained subcontractors are allowed to enter confined spaces.
Adverse weather	X		Seek shelter during electrical storms; work in adverse weather conditions only with proper training and equipment.
Work in remote areas		X	Use buddy system; carry radio and/or cellular/satellite phone; bring sufficient equipment in case of accident or injury (first aid kit, shelter if appropriate).
Biohazard		X	Avoid contact with potential biological or infectious materials; wear impermeable gloves, disposable coveralls, and respirator, as appropriate; wash hands and face as soon as possible after contact and before eating or drinking. Use disinfectants as necessary.
Plant/animal hazards	X		Know local hazards and take appropriate precautions. Use insect repellent if mosquitoes are persistent.
Uneven terrain/tripping	X		Use caution, wear properly fitting shoes or boots, and keep work area orderly.
Heights		X	Integral personnel are not trained or authorized to work at heights greater than 6 ft above ground surface under any circumstances. Qualified subcontractors must use fall protection (harness, lanyard, or proper railings) when working above 6 ft above ground surface. All fall protection equipment needs to be inspected annually and replaced every 5 years.

Possible Hazard	Yes	No	Proposed Safety Procedure
Noise		X	Wear ear protection when working around heavy equipment and other noise sources.
Excavations		X	Do not enter excavations greater than 3 ft in depth without evaluation by a qualified person and implementation of applicable trenching and excavation safeguards as required by law.
Heat stress		X	Follow heat stress information (Attachment 3). <i>Note:</i> potential for heat stress will depend on season and location of the site.
Cold/hypothermia	X		Keep warm and dry; bring changes of clothes; do not work in extreme conditions without proper equipment and training. Follow cold stress information (Attachment 3). <i>Note:</i> potential for cold/hypothermia will depend on season and location of the site.
Falling objects	X		Wear hard hats near overhead hazards (i.e., winch).
Drill rigs		X	Avoid all pinch points; do not operate or stand near rig during electrical storms; stay a safe distance (25 ft) from power lines; level drill rig.

Summary of potential physical hazards posed by proposed site activities:

Activity	Potential Hazard
Sediment sampling	Uneven terrain/tripping, cold/hypothermia, drowning, falling objects, material handling, adverse weather, vessel operations
Visual Survey	Uneven terrain/tripping, cold/hypothermia, plant/animal hazards, adverse weather, heavy equipment operations on adjacent property
Hydrographic Survey	Cold/hypothermia, drowning, material handling, adverse weather, vessel operations
Topographic Survey	Uneven terrain/tripping, cold/hypothermia, drowning, plant/animal hazards, material handling, adverse weather, heavy equipment operations on adjacent property
Sample handling/mobilization	Material handling

## 3.2 OVERWATER WORK GUIDELINES

### 3.2.1 General Overwater Safety Guidelines

The overwater safety program requires the following:

- Wear U.S. Coast Guard (USCG) approved personal flotation device (PFD) at all times when working over water greater than 6 inches deep. Inspect the PFDs prior to use and do not use defective PFDs.

- The boat operator must have training in the safe operation of the boat (Section 6.1).
- No smoking is allowed on boats or near refueling activities.
- Keep sampling equipment on boats organized at all times.
- Boats are required to be equipped with a throwable life ring, fire extinguisher, first aid kit, eyewash bottle and water (if acids are taken on the boat), drinking water (for long trips), alternate propulsion mechanism (e.g., paddles), rope, and warning horn; each field member will be briefed on the storage location of this equipment on the first day of the field event.
- Use all equipment in accordance with the manufacturers’ recommendations.

The following table summarizes possible physical hazards that are expected to be present during overwater work field activities.

Possible Hazard	Yes	No	Proposed Safety Procedure
Water hazards	X		Wear a USCG-approved personal PFD at all times when working over water greater than 6 inches deep. Inspect the PFDs prior to use and do not use defective PFDs. Keep sampling equipment on boats organized at all times. Boats are required to be equipped with a throwable life ring, fire extinguisher, and warning horn, and each field member will be briefed on the storage location of these safety items on the first day of the field event.
Vessel operations	X		Exercise prudent overwater safety.

### 3.2.2 Sampling Vessel Operations

The physical hazards associated with the deployment and retrieval of sampling equipment from a sampling vessel result from the equipment’s weight and the method of deployment. Only trained personnel will deploy and retrieve sampling gear. Under circumstances of potentially dangerous waves or winds, the vessel pilot and field team leader will employ best professional judgment to ensure safe field operations.

To avoid injuries from heavy equipment, personnel will wear steel-toed boots when working on the work deck or loading/unloading heavy equipment from the vessel. Hard hats will be worn by personnel when present on the work deck due to the proximity of overhead gear. Sample handling equipment, containers, deck lines, hydraulic cables, and water hoses not in immediate use will be kept clear of walkways and work areas until needed. Each time sampling operations at a given location have been completed, excess sediment on the deck will be washed from the deck over the sampling location or, if specified in the field sampling plan (depending the

anticipated level of contamination), will be containerized in U.S. Department of Transportation-approved 55-gallon drums to 1) prevent personnel from slipping, 2) minimize personnel exposure to potentially contaminated sediment, and 3) limit cross-contamination between sample locations.

USCG-approved PFDs will be provided for and worn by all personnel working on the deck, or as directed by the Integral SSO or vessel operator. As mentioned above, the vessel must also be equipped with throwable life rings, fire extinguishers, and warning horns, and each crewmember will be briefed on the location of this equipment prior to initiation of the sampling event.

### **3.2.3 Small Craft Operation**

Safety procedures on small boats (i.e., length 20 ft or less) may necessitate an increased level of protection, depending on boat size, and location on the water body. Small boat procedures will include all the requirements listed above, except that a fire extinguisher is not necessary for a row boat and a throwable seat cushion may be used in place of a life ring. In addition, all personnel onboard will be required to wear USCG-approved PFDs at all times. Any Integral personnel or subcontractors operating small boats must have completed a Coast Guard Auxiliary *Boating Safely* course and have a demonstrated knowledge of the safe handling of these craft.

### **3.2.4 U.S. Coast Guard Notification**

If required for the body of water that will be sampled, the USCG will be notified of the schedule and scope of the overwater sampling work. If the USCG deems a notice to other mariners to be necessary, then information will be provided by Integral to the USCG to make barge and other river traffic aware of sampling activities.

## 4 PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT

The following sections address PPE and safety equipment required for completing the field activities.

### 4.1 PERSONAL PROTECTIVE EQUIPMENT

Based on the hazards identified above in Sections 2 and 3, the following table identifies the PPE required for site activities.

Site Activity	Level of Protection	
	Initial	Contingency <sup>a</sup>
Visual Survey	D	MD
Sediment Sampling	MD*	Leave site
Sample handling	D	MD
Hydrographic Survey	MD*	Leave site
Topographic Survey	MD*	Leave site
Decontamination	D	MD

<sup>a</sup> Based on unexpected change in site conditions

MD – Modified level D

MD\* - Modified level D with addition of personal floatation device

Each level of protection will incorporate the following PPE:

Level D	X	Long pants and shirt or work coveralls, hard hat, latex or nitrile gloves, eye protection, and steel-toed and steel-shanked boots are required. Hearing protection is required as needed.
Level MD	X	Same as Level D with addition of rain gear as needed.
Level MD*	X	Same as Level MD with addition of a personal floatation device.

#### 4.1.1 Respirator and Respirator Cartridge Information

Is there potential for a respirator to be donned during fieldwork?

Yes \_\_\_\_\_ No   X

## 4.2 SAFETY EQUIPMENT

The following safety equipment will be onsite during the proposed field activities.

### Air Monitoring (check the items required for this project)

- |   |  |
|---|--|
| <input type="checkbox"/> OVM  | <input type="checkbox"/> Air sampling pumps          |
| <input type="checkbox"/> LEL/O <sub>2</sub> meter                   | <input type="checkbox"/> MINIRAM (particle monitors) |
| <input type="checkbox"/> H <sub>2</sub> S meter                     | <input type="checkbox"/> Radiation meter             |
| <input type="checkbox"/> Detector pump and tubes<br>(e.g., benzene) | <input type="checkbox"/> Other: _____<br>_____       |

**First Aid Kit** (mandatory, including absorbent compress, adhesive bandages, adhesive tape, antiseptic, burn treatment, medical exam gloves, sterile pad, cardiopulmonary resuscitation [CPR] shield, triangle bandage, scissors [for cutting off the PPE from an injured person])  
(check additional items required for the site)

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Emergency blanket | <input checked="" type="checkbox"/> Sunscreen  |
| <input type="checkbox"/> Insect repellent             | <input type="checkbox"/> Other: _____<br>_____ |

### Other (check the items required for this project)

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Eyewash  | <input type="checkbox"/> Fit test supplies   |
| <input checked="" type="checkbox"/> Drinking water   | <input checked="" type="checkbox"/> Fire extinguisher (drill rigs and onboard larger sampling vessels) |
| <input type="checkbox"/> Stopwatch for monitoring heart rate for heat stress monitoring <sup>2</sup> | <input type="checkbox"/> Windsock  |
| <input type="checkbox"/> Thermoscan <sup>®</sup> thermometer for heat stress monitoring              | <input checked="" type="checkbox"/> Cellular phone   |
| <input type="checkbox"/> Survival kit <sup>3</sup>   | <input type="checkbox"/> Radio sets  |
| <input checked="" type="checkbox"/> Personal flotation device  | <input checked="" type="checkbox"/> Global positioning system  |
| <input type="checkbox"/> Cool vests  | <input checked="" type="checkbox"/> Other: <u>VHF Radio</u><br><u>Air horn</u>                         |

<sup>2</sup> Heart rate monitoring requires special training.

<sup>3</sup> Consult the CHSM for guidance for site-specific survival kits.

## **5 AIR MONITORING**

Previous investigations of the site indicate that the main chemicals of interest for worker health and safety during the sampling event(s) are PCBs. The sediments will be wet, so no dust will be generated. There is no evidence of significant concentrations of volatile chemicals within the sediments. The possible inhalation of hexane vapors will be minimized by the requirement that, if needed, hexane will only be used in well ventilated areas with personnel standing upwind of the chemical. Air monitoring will not be conducted during sampling activities. Respiratory protection is not expected to be needed and Level D PPE will be used.

In the event of noxious or perceivably hazardous odors within the vicinity, work will be suspended and workers will vacate the area. Site conditions will be re-evaluated to determine if sampling work may commence on the following day.

## 6 HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING

The following sections present requirements for health and safety training and medical monitoring.

### 6.1 HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING

State and federal laws establish training requirements for workers at uncontrolled hazardous waste sites (including areas where accumulations of hazardous waste create a threat to the health and safety of an individual, the environment, or both). Integral and subcontractor personnel are required to complete the following training requirements prior to working at the site.

### 6.2 TRAINING REQUIREMENTS

Staff	No Training	24-hour	40-hour <sup>a</sup>	Supervisor <sup>b</sup>	First Aid/CPR <sup>c</sup>	Medical Monitoring
Integral Field Personnel			X	X	X	X
Integral Subcontractors <sup>d</sup>			X			
Vessel operator / deckhands <sup>e</sup>			X			

**Notes:**

- <sup>a</sup> Must have current OSHA 8-hour refresher if it has been more than a year since the OSHA 40-hour training.
- <sup>b</sup> At least one person onsite must be OSHA HAZWOPER supervisor trained if this is a hazardous waste site.
- <sup>c</sup> At least one member of each team of two or more people onsite must be first aid/CPR trained.
- <sup>d</sup> Integral subcontractors and consultants may have requirements that are more stringent than those listed above. These are minimum training and monitoring requirements required to work on this site.
- <sup>e</sup> The vessel operator and deckhands are required to have Coast Guard training.

#### 6.2.1 Site Safety Meetings

Site safety meetings must be held before beginning new tasks or when new staff enter the site. Site safety meetings should be held at a minimum of once a week and should be held daily on complex or high hazard projects. Tailgate safety meetings should occur every morning during review of the day’s work plan, covering specific hazards that may be encountered. Additional meetings will be held at any time health and safety concerns are raised by any of the personnel. Attendance and topics covered, including tailgate meetings, are to be documented in the field logbook.

### 6.3 MEDICAL MONITORING

OSHA requires medical monitoring for personnel potentially exposed to chemical hazards in concentrations in excess of the PEL for more than 30 days per year and for personnel who must use respiratory protection for more than 30 days per year. Integral requires medical monitoring for all employees and subcontractors potentially exposed to chemical hazards.

Will personnel working at this site be enrolled in a medical monitoring program?

Yes     X     No

## 7 EMERGENCY RESPONSE PLAN

The following sections discuss emergency recognition and prevention, emergency response and notification, emergency decontamination, and site communications.

### 7.1 EMERGENCY RECOGNITION AND PREVENTION

It is the responsibility of all personnel to monitor work at the site for potential safety hazards. All personnel are required to immediately report any unsafe conditions to the SSO. The SSO is responsible to immediately take steps to remedy any unsafe conditions observed at the work site.

The following are examples of some emergency situations that could occur during the Long-Term Monitoring of Sediment in the Slip 4 EAA field activities

- Slips, trips and falls (on sloped areas, steel stairs, etc.)
- Lacerations from scrap metal (in soil, waste piles, etc.)
- Entrainment of clothes or objects in moving equipment or parts
- A person falls overboard
- Serious injury or illness (e.g., physical injury, heart attack).

Immediate actions will be taken by the field team under the leadership of the SSO in response to these emergencies.

### 7.2 EMERGENCY RESPONSE AND NOTIFICATION

If an emergency at the site warrants it, all personnel must immediately evacuate the affected work area and report to the SSO at the predetermined emergency assembly location:

#### Field vehicle

In case of injury, field personnel should take precautions to protect the victim from further harm and notify local or facility emergency services. In remote areas, it will be necessary to have first aid-trained personnel on the field team. The victim may require decontamination prior to treatment if practicable—requirements will vary based on site conditions.

Emergency medical care will be provided by:

- Local emergency medical provider (i.e., fire department)  
 Facility emergency medical provider

First aid-trained field staff (for remote areas only)

Local Resources	Name	Telephone	Notified Prior to Work (Yes/No)?
Fire		911	No
Police		911	No
Ambulance		911	No
Hospital	Harborview Hospital	911	No
Site phone	Stefan Wodzicki <sup>a</sup>	360-303-2708	No
Directions to the hospital:	Consult attached maps		

**Note:**

<sup>a</sup> If the designated field lead listed above is replaced, Integral will provide revised field lead contact information to EPA prior to monitoring event.

The SSO must confirm that the hospital listed is still in operation and that it has an emergency room. Maps with directions for possible routes to the hospital from the site are provided in Attachment 1. **It is required that the SSO drive to the hospital so that the directions are practiced and understood prior to initiating fieldwork.**

Corporate Resources	Name	Work Telephone	Cell Phone
Integral CHSM <sup>a</sup>	Eron Dodak	Office: (503) 943-3614	(503) 407-2933
Integral President	Lucinda Jacobs	Office: (206) 957-0328	(206) 999-3061
Integral Human Resources Manager	Amy Logan	Office: (720) 465-3312	NA
Medical Consultant	Dr. Calvin Jones (HealthForce Partners)	Office: (425) 806-5700	NA

**Notes:**

<sup>a</sup> If the CHSM cannot be reached, call Ian Stupakoff—Office: (360) 705-3534, ext. 420; Cell: (360) 259-2518.  
 If Ian Stupakoff cannot be reached, call David Livermore—Office: (503) 943-3613; Cell: (503) 806-4665.  
 If David Livermore cannot be reached, call Barbara Trenary—Office: (206) 248-9645; Cell: (206) 849-0882.

In case of serious injuries, death, or other emergency, the Integral CHSM must be notified immediately at the phone numbers listed above. The Integral CHSM will notify the project manager and Integral’s president. The project manager will notify the client.

### **7.3 EMERGENCY DECONTAMINATION PROCEDURES**

In case of an emergency, if possible, gross decontamination procedures will be promptly implemented. If a life-threatening injury occurs and the injured person cannot undergo decontamination procedures onsite, then the medical facility will be informed that the injured person has not been decontaminated and given information regarding the most probable chemicals of concern.

Decontamination procedures will only be used if practical and if they will not further injure the person or delay treatment. Decontamination procedures should not be implemented if there is not a reasonable possibility that the injured party requires such intervention. The SSO will make the determination on whether or not to decontaminate the injured person. The following steps will be followed for decontaminating injured personnel while onsite:

- If it will not injure the person further, cut off PPE using scissors or scrub the gross contamination from the injured person's PPE (e.g., Tyvek® coveralls, work boots) with a Liquinox® or Alconox® solution followed by a rinse with tap or deionized/distilled water
- Remove PPE if feasible without further injuring the person.

### **7.4 SITE COMMUNICATIONS**

Each field team will carry a cell phone or satellite phone that is in good working order. If there is any type of emergency that requires the site to be evacuated (e.g., severe thunderstorm with lightening, chemical release), the field team leader will blow an air horn three times. When the horn sounds, all personnel will meet at the predetermined emergency assembly location, provided the muster point is in safe territory. All other emergency notifications that do not require evacuation (e.g., a person falling overboard) will be conducted using a cell or satellite phone. Emergency phone numbers are listed above in Section 7.2.

### **7.5 BUDDY SYSTEM**

The buddy system will be used at the site at all times. The buddy system is a system of organizing employees into field teams in such a manner that each employee of the field team is designated to be observed by at least one other employee in the field team. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

## 8 WORK ZONES

Work zones are defined as follows:

<b>Exclusion zone</b>	Any area of the site where hazardous substances are present, or are reasonably suspected to be present, and pose an exposure hazard to personnel
<b>Contamination reduction zone</b>	Area between the exclusion and support zones that provides a transition between contaminated and clean zones
<b>Support zone</b>	Any area of the site, so designated, that is outside the exclusion and contamination reduction zones

Site control measures in work zones are described below for each type of field activity involving sediment sample collection and equipment decontamination.

### 8.1 SEDIMENT SAMPLING – VESSEL-BASED

**Exclusion zone:** The portion of the sampling vessel deck where sample collection and processing will occur will be designated as the exclusion zone. Only properly equipped and trained personnel (i.e., wearing modified D protective clothing and a personal floatation device) will be allowed in this area. The area will be washed with water between sample stations.

**Contamination reduction zone:** The portion of the sampling vessel deck where decontamination, sample storage, and sample handling functions occur will be designated as the contamination reduction zone. Only properly equipped and trained personnel (i.e., wearing modified D protective clothing and a personal floatation device) will be allowed in this area. If decontamination using hexane is required, it will occur away from other personnel, and in a cross breeze to minimize potential exposure to hexane vapors.

**Support zone:** The pilot house will be the support zone. No chemical or sample handling activities will occur in this area. Personnel will be required to wash chemicals and sediment from PPE before entering this area.

### 8.2 SEDIMENT SAMPLING – OVER LAND

**Exclusion zone:** An approximate 12-ft radius around the sampling area will be marked with orange traffic safety cones or caution tape. Only properly equipped and trained (i.e., wearing modified D protective clothing) personnel will be allowed in this area.

**Contamination reduction zone:** All decontamination activities will occur inside the exclusion zone.

**Support zone:** All areas outside the exclusion and contaminant reduction zones.

**Controls to be used to prevent entry by unauthorized persons:** A member of the field crew will be designated as responsible for ensuring that no unauthorized personnel enter the exclusion/contaminant reduction zone boundaries.

## 9 EQUIPMENT DECONTAMINATION AND PERSONAL HYGIENE

### 9.1 EQUIPMENT DECONTAMINATION PROCEDURES

After sampling or surveying is completed, the exclusion zone will be used as the contaminant reduction zone for decontamination activities, provided there is no contamination remaining after the sampling is completed. To minimize or prevent personal exposure to hazardous materials, all personnel working in the exclusion zone and contaminant reduction zone will comply with the following decontamination procedures:

- All personnel will wash sediment and chemicals from their equipment and PPE before leaving the exclusion/contamination reduction zone.
- All gloves, Tyvek, rain gear, and rubber boots will be removed prior to entering the field vehicle.

Hydrographic and topographic survey subcontractors are responsible for determining the proper decontamination procedures for their survey equipment. Decontamination equipment required at the site for sediment sampling includes the following:

- Buckets or tubs
- Laboratory grade distilled/deionized water
- Site water
- Scrub brushes (long-handled)
- Liquinox or Alconox detergent
- Nitrile gloves
- Hexane
- Plastic bags
- Safety glasses
- Foil
- Paper towels
- Garbage bags
- Clean garden sprayer

All non-disposable components of the sampling equipment (e.g., stainless steel spoons and bowls used for sample compositing) that contact the sediment will be decontaminated using the following steps:

1. Rinse with site water/tap water
2. Wash with Alconox or Liquinox detergent
3. Rinse with site water/tap water
4. Rinse with solvent (hexane) (only to be used if visible sheen on sampling equipment)
5. Rinse with site water (van Veen grab sampler) or distilled/deionized water using a garden sprayer (compositing equipment only)

6. Allow to air dry
7. Wrap up compositing equipment in aluminum foil.

Decontamination wastewater containing solvent rinsate will be collected in plastic tubs and allowed to evaporate in an area downwind of the field crew during the course of the decontamination activity. Any solvent rinsate that has not evaporated by the end of the decontamination activity will be containerized and disposed of in accordance with applicable regulations.<sup>4</sup>

## 9.2 PERSONAL HYGIENE

The following personal hygiene practices will be used at the site to reduce exposure to chemicals.

- Long hair will be secured away from the face so it does not interfere with any activities.
- All personnel leaving potentially contaminated areas will wash their hands, forearms, and faces in the contaminant reduction zone prior to entering any clean areas or eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as possible after leaving the site.
- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Single portion drink containers and drinking of replacement fluids for heat stress control will be permitted only in support areas.
- Smoking is prohibited by Integral personnel and subcontractors in all areas of the site because of the potential for contaminating samples and for the health of the field team.

---

<sup>4</sup> Integral personnel are not allowed to sign hazardous waste manifests. Hazardous waste manifest must be signed by the client or client's attorney.

## **10 VEHICLE SAFETY, SPILL CONTAINMENT, AND SHIPPING INSTRUCTIONS**

### **10.1 VEHICLE SAFETY**

Integral's vehicle safety program requires the following:

- Cell phone usage while driving is not allowed, including the use of hands-free devices. If it not feasible to wait to use the cell phone until arriving at your destination, pull off the road and park in a safe location to use the cell phone. Do not pull to the side of the road to use a cell phone because this significantly increases the risk of a rear-end collision.
- All vehicles are to be operated in a safe manner and in compliance with local traffic regulations and ordinances.
- Drivers are to practice defensive driving and drive in a courteous manner.
- Drivers are required to have a valid driver's license and liability insurance (per local state laws).
- Seat belts are to be worn by the driver and all passengers.
- No persons are allowed to ride in the back of any trucks or vans, unless equipped with seatbelts.
- Vehicles are to be driven in conformance with local speed limits.
- Personnel who are impaired by fatigue, illness, alcohol, illegal or prescription drugs, or who are otherwise physically unfit, are not allowed to drive or work on Integral field sites.
- Personnel are to avoid engaging in other distractions such as changing radio stations while driving.
- Motor vehicle accidents are to be reported to the responsible law enforcement agency, the Integral human resources manager, and the Integral CHSM on the same day of occurrence. Documentation of damage should be photographed.
- Personnel who have experienced work-related vehicle accidents or citations may be required to complete a defensive driving program.

### **10.2 SPILL CONTAINMENT**

All decontamination chemicals will be dispensed from the manufacturers' capped containers directly into laboratory safety squirt bottles that have been permanently marked with the name

of the chemical and that have screw caps. Decontamination chemicals will be poured into the pre-labeled squirt bottles while they are over shallow Rubbermaid® tubs to capture any possible overflow or spills. Any spills will be cleaned up and disposed of in accordance with applicable regulations.

### 10.3 SHIPPING INFORMATION

Federal laws and international guidelines place restrictions on what materials may be shipped by passenger and cargo aircraft. In addition, 49 CFR regulates labeling, manifesting, and shipment of all packages containing potentially hazardous materials. In the course of this field investigation, the following items will be shipped to and from the site as shown below:

<b>Item</b>	<b>Hazardous Constituent</b>	<b>Quantity</b>	<b>Packaging</b>	<b>How Shipped</b>
Samples	None	Up to 20 solid matrix samples	Coolers	Field vehicle

A 24-hour emergency response number (on any shipping documents such as a Uniform Hazardous Waste Manifest, Shipper's Declaration of Dangerous Goods, etc.) is required for shipments of all dangerous or hazardous goods. Integral does not have a 24-hour emergency contact number for dangerous or hazardous goods shipment. No dangerous or hazardous goods may be shipped by Integral until an account is set up with a 24-hour emergency response service, such as CHEM-TEL (1-813-248-0573). If any hazardous or dangerous goods need to be shipped for a project, they must be shipped directly to the site by the supplier. Any hazardous or dangerous goods that are not used in the course of the field effort must remain at the site.

The samples will be prepared and labeled for shipment in accordance with the sampling and analysis plan developed for the site.

Air shipment of equipment with lithium batteries is required to note the presence of these batteries. Warning labels are available from the equipment rental agency and can be copied.

## **11 TASK-SPECIFIC SAFETY PROCEDURE SUMMARY**

### **11.1 SEDIMENT SAMPLING – VESSEL-BASED**

Always wear a USCG-approved PFD when doing any work on the sampling vessel or dock. A hard hat, safety glasses, steel-toed boots, and nitrile gloves are required at all times without exception. Use hearing protection as needed.

Exercise caution when working on a boat deck. Always be aware of your surroundings and river wave action that can rock the sampling vessel without notice. Keep sampling equipment on boats organized at all times. Boats are required to be equipped with a throwable life ring, fire extinguisher, and warning horn; and each field member will be briefed on the storage location for this equipment.

Avoid getting sediment and decontamination chemicals on your clothes or skin. Wear a waterproof apron or coveralls when working with formalin. Exercise care when lifting, assembling, and decontaminating van Veen grab samplers. Always stay clear of the winch line and be aware of its location.

### **11.2 SEDIMENT SAMPLING – ON FOOT**

The buddy system will be used at the site at all times. A hard hat, safety glasses, steel-toed boots, and nitrile gloves are required at all times without exception. Use hearing protection as needed. Avoid getting soil on your skin.

Be aware of slip, trip, and fall hazards while walking in and near the bank along the slip. Be aware of sharp objects such as scrap metal amongst the rip rap. Keep equipment organized.

### **11.3 VISUAL BANK SURVEY**

The buddy system will be used at the site at all times. A hard hat, safety glasses, and steel-toed boots are required at all times without exception; nitrile or latex gloves are to be worn if needed. Use hearing protection as needed. Avoid getting soil on your skin. Always wear steel-toed and steel-shanked boots while doing the survey.

Be aware of slip, trip, and fall hazards while walking in and near the bank and intertidal sediments. Be aware of sharp objects such as scrap metal amongst the rip rap.

## **11.4 HYDROGRAPHIC SURVEY**

Hydrographic surveying will be performed by a subcontractor to Integral. The subcontractor and any accompanying personnel shall always wear a USCG-approved PFD when doing any work on the sampling vessel or dock. A hard hat, safety glasses, steel-toed boots, and nitrile gloves are required at all times without exception. Hearing protection is to be used as needed.

Exercise caution when working on a boat deck. Always be aware of your surroundings and river wave action that can rock the sampling vessel without notice. Keep sampling equipment on boats organized at all times. Boats are required to be equipped with a throwable life ring, fire extinguisher, and warning horn; and each field member will be briefed on the storage location for this equipment.

## **11.5 TOPOGRAPHIC SURVEY**

Topographic surveying (if required) will be performed by a subcontractor to Integral. The subcontractor and any accompanying personnel shall always wear a USCG-approved PFD when doing any work over water greater than 6 in. deep. The buddy system will be used at the site at all times. Steel-toed and steel shanked boots are required at all times without exception. Hearing protection is to be used as needed. Avoid getting soil on your skin. Be aware of slip, trip, and fall hazards while walking in and near the bank and intertidal sediments. Be aware of sharp objects such as scrap metal amongst the rip rap.

## **12 REFERENCES**

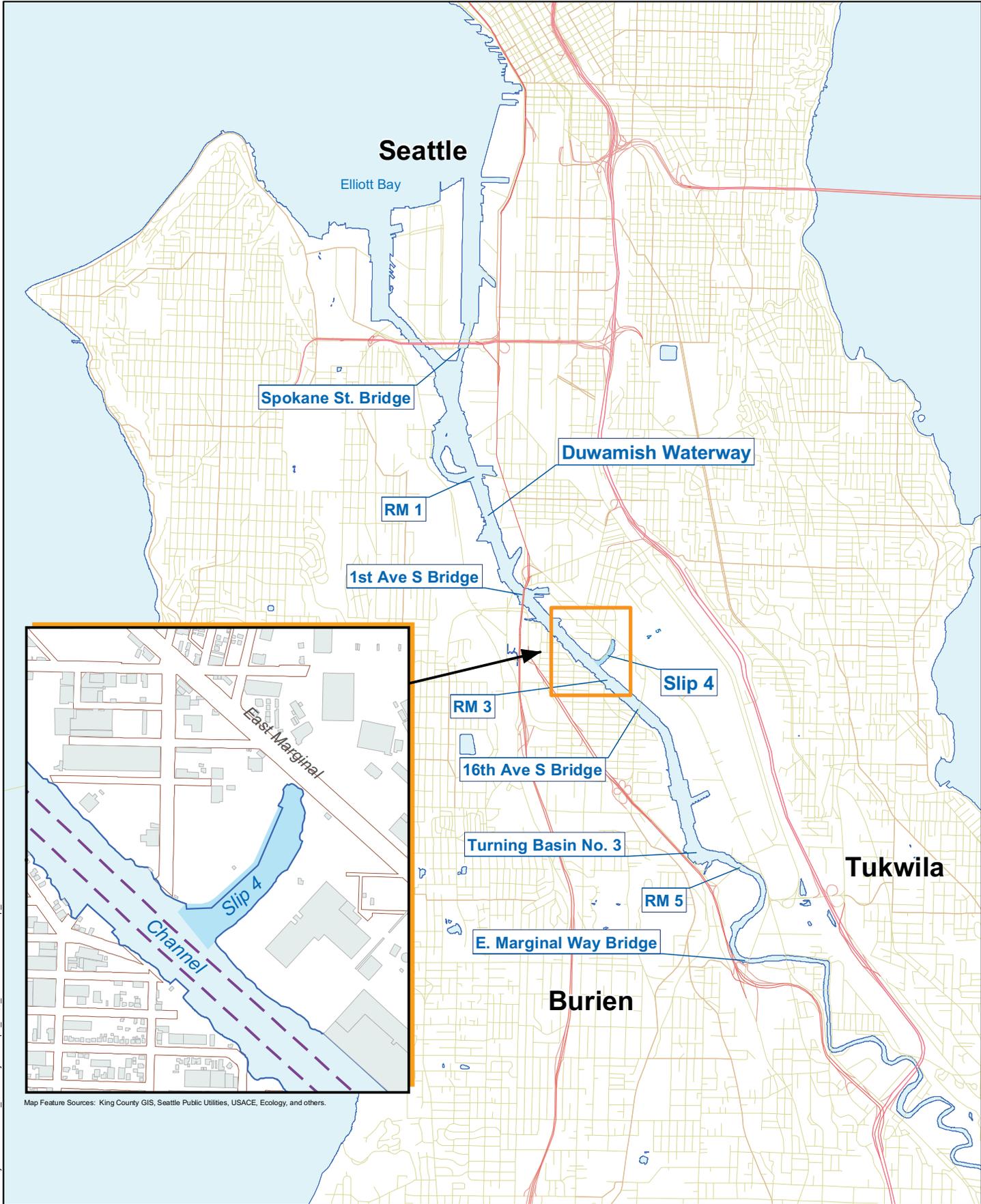
Integral. 2004. Lower Duwamish Slip 4 Early Action Area: Cruise and data report. Prepared for City of Seattle and King County Department of Natural Resources. Integral Consulting Inc., Olympia, WA.

SEA. 2004. Summary of existing information and identification of data gaps. Prepared for City of Seattle and King County Department of Natural Resources. Striplin Environmental Associates, Inc., Olympia, WA.

# **ATTACHMENT 1**

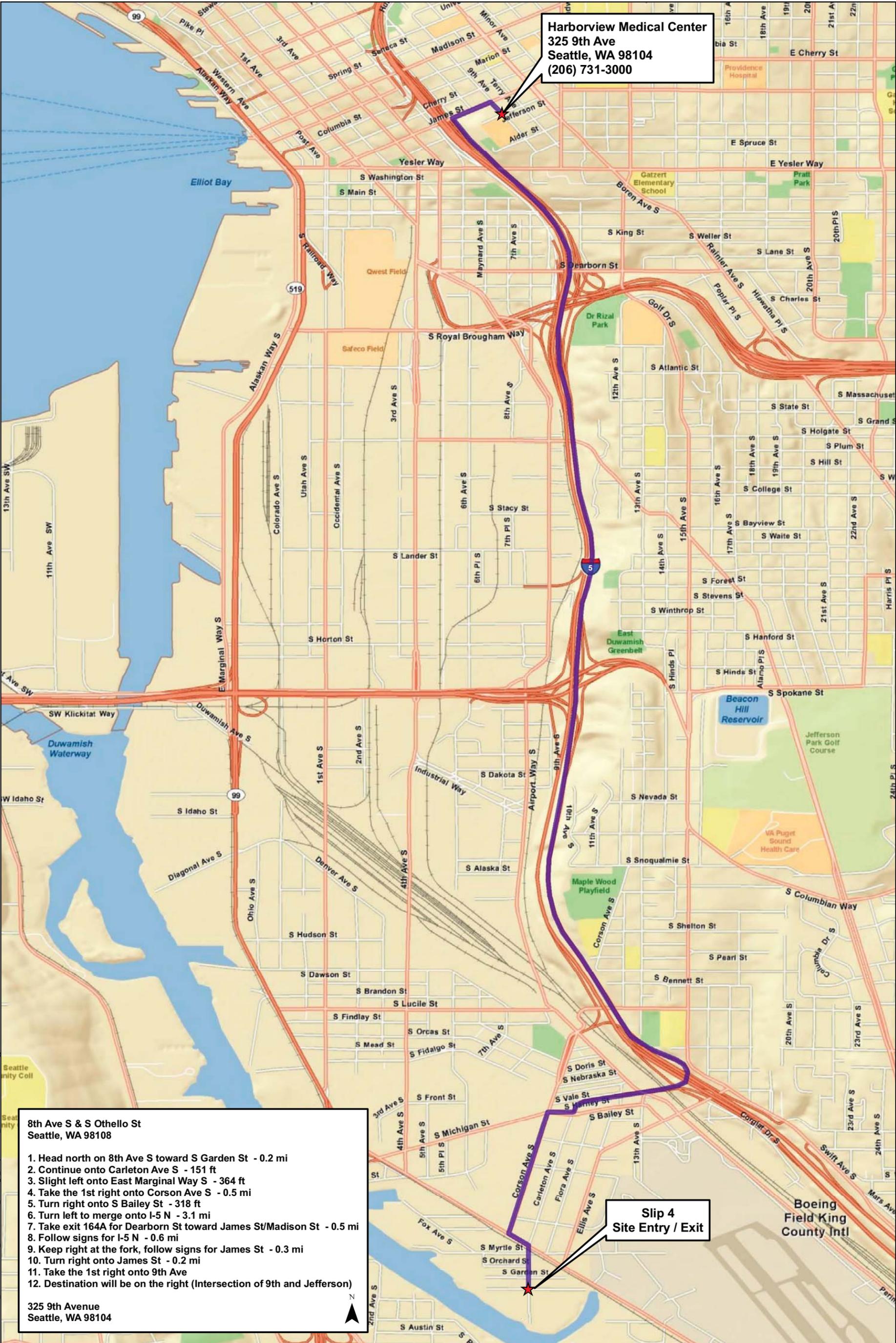
---

## **SITE MAP AND HOSPITAL ROUTE**



Map Feature Sources: King County GIS, Seattle Public Utilities, USACE, Ecology, and others.

S:\of\Projects\Duwamish\_OLY\Projects\Slip\_4\_60%\_DAR\SiteLocationMap\_08082011.mxd



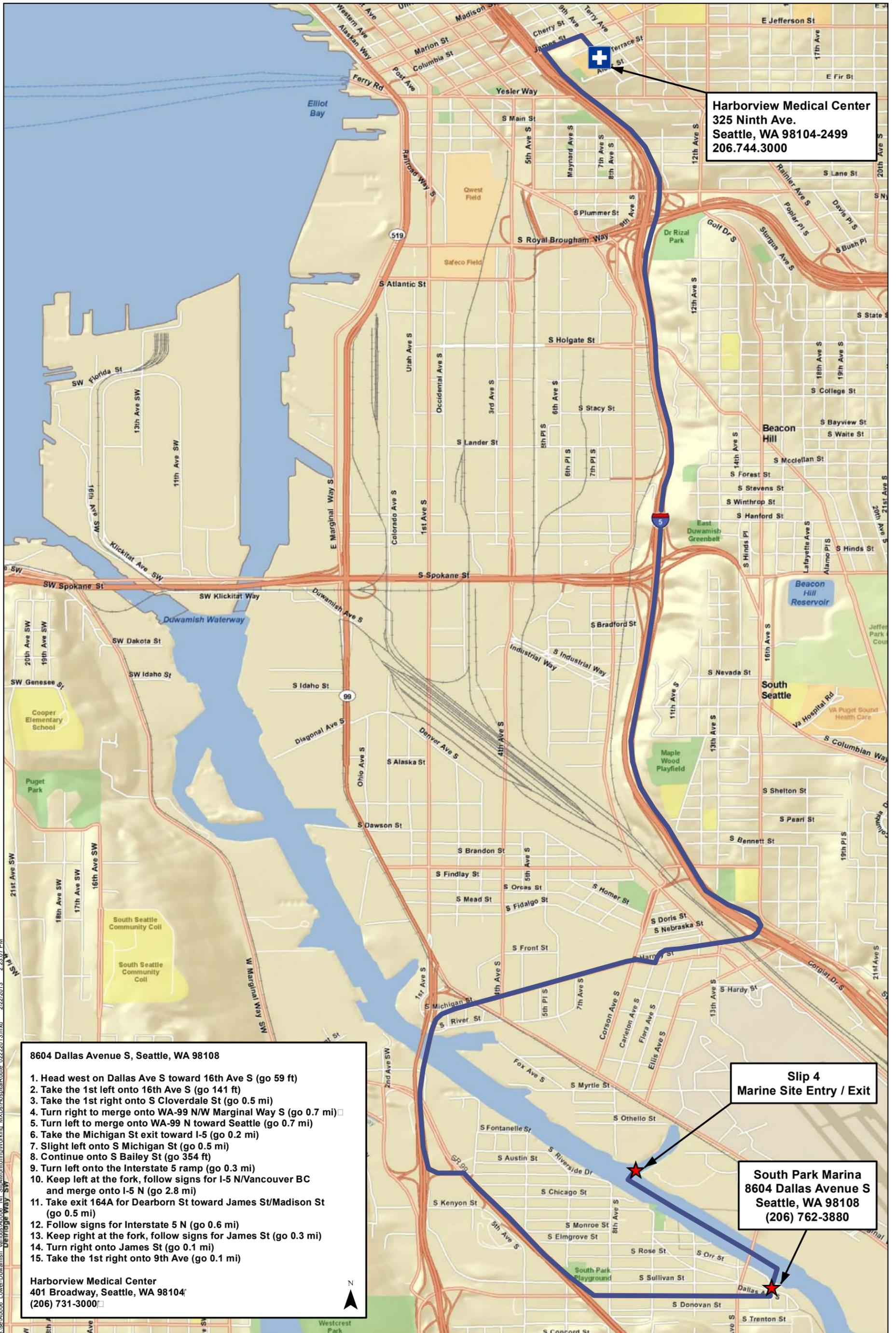
**Harborview Medical Center**  
 325 9th Ave  
 Seattle, WA 98104  
 (206) 731-3000

- 8th Ave S & S Othello St**  
 Seattle, WA 98108
1. Head north on 8th Ave S toward S Garden St - 0.2 mi
  2. Continue onto Carleton Ave S - 151 ft
  3. Slight left onto East Marginal Way S - 364 ft
  4. Take the 1st right onto Corson Ave S - 0.5 mi
  5. Turn right onto S Bailey St - 318 ft
  6. Turn left to merge onto I-5 N - 3.1 mi
  7. Take exit 164A for Dearborn St toward James St/Madison St - 0.5 mi
  8. Follow signs for I-5 N - 0.6 mi
  9. Keep right at the fork, follow signs for James St - 0.3 mi
  10. Turn right onto James St - 0.2 mi
  11. Take the 1st right onto 9th Ave
  12. Destination will be on the right (Intersection of 9th and Jefferson)
- 325 9th Avenue  
 Seattle, WA 98104

**Slip 4**  
 Site Entry / Exit



S:\m\A0006 - Lower-Duwamish - Various\A0006 - 149\Fig3 - HospitalRoute 06082011.mxd - 08/2011 @ 1:30:09 PM



**Harborview Medical Center**  
 325 Ninth Ave.  
 Seattle, WA 98104-2499  
 206.744.3000

**8604 Dallas Avenue S, Seattle, WA 98108**

1. Head west on Dallas Ave S toward 16th Ave S (go 59 ft)
2. Take the 1st left onto 16th Ave S (go 141 ft)
3. Take the 1st right onto S Cloverdale St (go 0.5 mi)
4. Turn right to merge onto WA-99 N/W Marginal Way S (go 0.7 mi)
5. Turn left to merge onto WA-99 N toward Seattle (go 0.7 mi)
6. Take the Michigan St exit toward I-5 (go 0.2 mi)
7. Slight left onto S Michigan St (go 0.5 mi)
8. Continue onto S Bailey St (go 354 ft)
9. Turn left onto the Interstate 5 ramp (go 0.3 mi)
10. Keep left at the fork, follow signs for I-5 N/Vancouver BC and merge onto I-5 N (go 2.8 mi)
11. Take exit 164A for Dearborn St toward James St/Madison St (go 0.5 mi)
12. Follow signs for Interstate 5 N (go 0.6 mi)
13. Keep right at the fork, follow signs for James St (go 0.3 mi)
14. Turn right onto James St (go 0.1 mi)
15. Take the 1st right onto 9th Ave (go 0.1 mi)

**Harborview Medical Center**  
 401 Broadway, Seattle, WA 98104  
 (206) 731-3000

**Slip 4**  
**Marine Site Entry / Exit**

**South Park Marina**  
 8604 Dallas Avenue S  
 Seattle, WA 98108  
 (206) 762-3880

S:\se\A0006 - Lower-Duwamish - Various\A0006\_141\_Slip4Monitoring\Working\_MXD\HospitalRoute\_02222013.mxd - 2/22/2013 2:23:07 PM

## **ATTACHMENT 2**

---

### **REGULATORY NOTICES**

# You Have a Right to a Safe and Healthful Workplace. IT'S THE LAW!

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



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

## 1-800-321-OSHA [www.osha.gov](http://www.osha.gov)

# Usted Tiene el Derecho a un Lugar de Trabajo Seguro y Saludable.

## ¡LO ESTABLECE LA LEY!

- Tiene el derecho de notificar a su empleador o a la OSHA sobre cualquier peligro en su lugar de trabajo. Puede pedir a la OSHA que mantenga su nombre en reserva.
- Tiene el derecho de solicitar una inspección de la OSHA si considera que existen condiciones peligrosas y poco saludables en su lugar de trabajo. Usted o su representante puede participar en la inspección.
- Puede presentar un reclamo a OSHA durante un plazo de 30 días si su empleador lo discrimina por presentar reclamos de seguridad y sanidad o por ejercer sus derechos de acuerdo con la Ley.
- Tiene el derecho de ver las citaciones de la OSHA enviadas a su empleador. Su empleador debe colocar las citaciones en un lugar visible en el sitio de la supuesta infracción o cerca de él.
- Su empleador debe corregir los peligros en el lugar de trabajo dentro del plazo indicado en la citación y debe certificar que dichos peligros se hayan reducido o eliminado.
- Tiene el derecho de recibir copias de su historial médico o de los registros de su exposición a sustancias o condiciones tóxicas y peligrosas.
- Su empleador debe colocar este aviso en un lugar visible de su lugar de trabajo.



La Ley de Seguridad y Salud Ocupacionales de 1970 (la Ley), P.L. 91-596, garantiza condiciones ocupacionales seguras y saludables para los hombres y las mujeres que desempeñen algún trabajo en toda la Nación. La Administración de Seguridad y Salud Ocupacionales (OSHA), dependiente del Departamento del Trabajo de los Estados Unidos, es la responsable principal de supervisar la Ley. Los derechos que se indican en este documento pueden variar según las circunstancias particulares. Para presentar un reclamo, informar sobre una emergencia o pedir consejo, asistencia o productos de la OSHA, llame al 1-800-321-OSHA o a la oficina de la OSHA más cercana a usted: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Ciudad de Kansas (816) 426-5861 • Nueva York (212) 337-2378 • Filadelfia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. El número TTY es 1-877-889-5627. Para presentar un reclamo en línea u obtener más información sobre los programas federales y estatales de la OSHA, visite el sitio Web de la OSHA en [www.osha.gov](http://www.osha.gov). Si su lugar de trabajo se encuentra en un estado que funciona según un plan aprobado por la OSHA, su empleador debe colocar en un sitio visible el equivalente estatal de este afiche.

**1-800-321-OSHA**  
**[www.osha.gov](http://www.osha.gov)**

## **ATTACHMENT 3**

---

### **SAFETY PROCEDURES**

## FROSTBITE

### What happens to the body:

Freezing in deep layers of skin and tissue; pale, waxy-white skin color; skin becomes hard and numb; usually affects fingers, hands, toes, feet, ears, and nose.

### What to do: (land temperatures)

- Move the person to a warm, dry area. Don't leave the person alone.
- Remove wet or tight clothing that may cut off blood flow to the affected area.
- **Do not** rub the affected area because rubbing damaged the skin and tissue.
- Gently place the affected area in a warm water bath (105°) and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast, causing tissue damage. Warming takes 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm.  
**Note:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

## How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train workers about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene.)
- Take frequent short breaks in warm, dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs.)
- Drink warm, sweet beverages (sugar water, sports-type drinks.)  
**Avoid drinks with caffeine** (coffee, tea, or hot chocolate) **or alcohol.**
- Eat warm, high-calorie foods like hot pasta dishes.

### Workers are at increased risk when...

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medications. Check with your doctor, nurse, or pharmacy and ask if medicines you take affect you while working in cold environments.
- They are in poor physical condition, have a poor diet, or are older.

## HYPOTHERMIA - (Medical Emergency)

### What happens to the body:

Normal body temperature (98.6°F/37°C) drops to or below 95°F/35°C; fatigue or drowsiness; uncontrolled shivering; cool, bluish skin; slurred speech; clumsy movements; irritable, irrational, or confused behavior.

### What to do: (land temperatures)

- Call for emergency help (i.e., ambulance or 911).
- Move the person to a warm, dry area. Don't leave the person alone.
- Remove wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if he is alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) **or alcohol.**
- Have the person move his arms and legs to create muscle heat. If he is unable to do this, place warm bottles or hot packs in the armpits, groin, neck, and head areas. **Do not** rub the person's body or place him in a warm water bath. This may stop his heart.

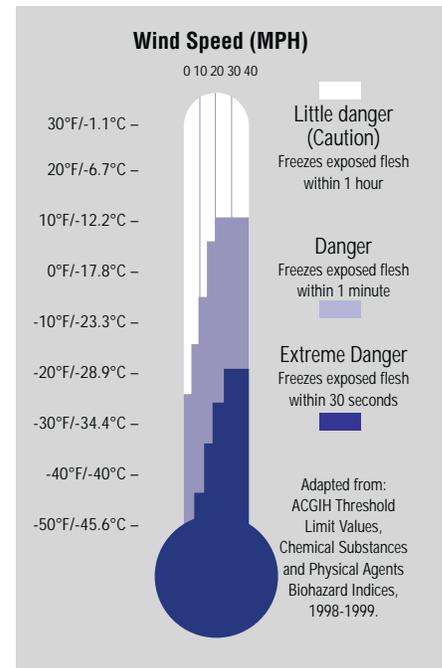
### What to do: (water temperatures)

- Call for emergency help (i.e., ambulance or 911). Body heat is lost up to 25 times faster in water.
- **Do not** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **Do not** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses body heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

## THE COLD STRESS EQUATION

### LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. **Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



## HEAT EXHAUSTION

### What happens to the body:

Headaches, dizziness, or light-headedness, weakness, mood changes, irritability or confusion, feeling sick to your stomach, vomiting, fainting, decreased and dark-colored urine, and pale, clammy skin.

### What should be done:

- Move the person to a cool shaded area. Don't leave the person alone. If the person is dizzy or light-headed, lay him on his back and raise his legs about 6-8 inches. If the person is sick to his stomach, lay him on his side.
- Loosen and remove heavy clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if he is not feeling sick to his stomach.
- Try to cool the person by fanning him. Cool the skin with a cool spray mist of water or wet cloth.
- If the person does not feel better in a few minutes call for emergency help (ambulance or call 911.)

*(If heat exhaustion is not treated, the illness may advance to heat stroke.)*

## How to Protect Workers

- Learn the signs and symptoms of heat-induced illnesses and what to do to help the worker.
- Train workers about heat-induced illnesses.
- Perform the heaviest work during the coolest part of the day.
- Slowly build up tolerance to the heat and the work activity (usually takes up to 2 weeks.)
- Use the buddy system (work in pairs.)
- Drink plenty of cool water (one small cup every 15-20 minutes.)
- Wear light, loose-fitting, breathable (like cotton) clothing.
- Take frequent short breaks in cool, shaded areas (allow your body to cool down.)
- Avoid eating large meals before working in hot environments.
- Avoid caffeine and alcoholic beverages (these beverages make the body lose water and increase the risk of heat illnesses.)

### Workers are at increased risk when...

- They take certain medications. Check with your doctor, nurse, or pharmacy to see if medicines you take affect you when working in hot environments.
- They have had a heat-induced illness in the past.
- They wear personal protective equipment.

## HEAT STROKE - A Medical Emergency

### What happens to the body:

Dry, pale skin (no sweating); hot red skin (looks like a sunburn); mood changes; irritability, confusion, and not making any sense; seizures or fits, and collapse (will not respond).

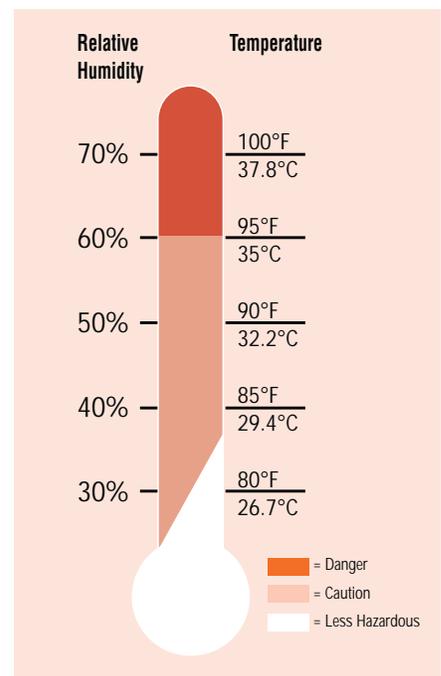
### What should be done:

- Call for emergency help (i.e., ambulance or 911.)
- Move the person to a cool, shaded area. Don't leave the person alone. Lay him on his back and if the person is having seizures, remove objects close to him so he won't hit them. If the person is sick to his stomach, lay him on his side.
- Remove heavy and outer clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if he is alert enough to drink anything and not feeling sick to his stomach.
- Try to cool the person by fanning him or her. Cool the skin with a cool spray mist of water, wet cloth, or wet sheet.
- If ice is available, place ice packs in armpits and groin area.

## THE HEAT EQUATION

### HIGH TEMPERATURE + HIGH HUMIDITY + PHYSICAL WORK = HEAT ILLNESS

When the body is unable to cool itself through sweating, **serious** heat illnesses may occur. The most severe heat-induced illnesses are **heat exhaustion** and **heat stroke**. If actions are not taken to treat heat exhaustion, the illness could progress to heat stroke and **death**.



## **ATTACHMENT 4**

---

### **MATERIAL SAFETY DATA SHEETS**

MSDS Number: **H2381** \* \* \* \* \* *Effective Date: 08/10/04* \* \* \* \* \* *Supercedes: 11/02/01*



From: Mallinckrodt Baker, Inc.  
222 Red School Lane  
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151  
CHEMTREC: 1-800-424-9300  
National Response in Canada  
CANUTEC: 613-996-6666  
Outside U.S. And Canada  
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# HEXANE

## 1. Product Identification

**Synonyms:** Hexanes, Normal Hexane; Hexyl Hydride; Hexane 95%

**CAS No.:** 110-54-3 (n-hexane)

**Molecular Weight:** 86.18

**Chemical Formula:** CH<sub>3</sub>(CH<sub>2</sub>)<sub>4</sub>CH<sub>3</sub> n-hexane

**Product Codes:** 9262, 9304, 9308, N168

## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hexane	110-54-3	85 - 100%	Yes
Methylcyclopentane	96-37-7	1 - 2%	Yes
Trace amount of Benzene (10 ppm)	071-43-2	*	No

## 3. Hazards Identification

### Emergency Overview

**DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.**

**J.T. Baker SAF-T-DATA<sup>(tm)</sup> Ratings (Provided here for your convenience)**

---

Health Rating: 2 - Moderate

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 0 - None

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES;

CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

---

**Potential Health Effects**

---

The health hazards addressed are for the major component: n-hexane.

**Inhalation:**

Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Greater exposure may cause muscle weakness, numbness of the extremities, unconsciousness and death.

**Ingestion:**

May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.

**Skin Contact:**

May cause redness, irritation, with dryness, cracking.

**Eye Contact:**

Vapors may cause irritation. Splashes may cause redness and pain.

**Chronic Exposure:**

Repeated or prolonged skin contact may defat the skin and produce irritation and dermatitis. Chronic inhalation may cause peripheral nerve disorders and central nervous system effects.

**Aggravation of Pre-existing Conditions:**

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance. May affect the developing fetus.

---

## 4. First Aid Measures

**Inhalation:**

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

**Ingestion:**

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Skin Contact:**

Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**Note to Physician:**

BEI=2,5-hexadione in urine, sample at end of shift at workweeks end, 5 mg/g creatine.

Also, measure n-hexane in expired air. Analgesics may be necessary for pain management, there is no specific antidote. Monitor arterial blood gases in cases of severe aspiration.

---

## 5. Fire Fighting Measures

### **Fire:**

Flash point: -23C (-9F) CC

Autoignition temperature: 224C (435F)

Flammable limits in air % by volume:

lel: 1.2; uel: 7.7

Extremely Flammable Liquid and Vapor! Vapor may cause flash fire. Dangerous fire hazard when exposed to heat or flame.

### **Explosion:**

Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Contact with oxidizing materials may cause extremely violent combustion. Explodes when mixed @ 28C with dinitrogen tetroxide. Sensitive to static discharge.

### **Fire Extinguishing Media:**

Dry chemical, foam or carbon dioxide. Water may be ineffective.

### **Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool. Vapors can flow along surfaces to distant ignition source and flash back. Vapor explosion hazard exists indoors, outdoors, or in sewers.

---

## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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

---

## 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from direct sunlight and any area where the fire hazard may be acute. Store in tightly closed containers (preferably under nitrogen atmosphere). Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid

static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

## 8. Exposure Controls/Personal Protection

### **Airborne Exposure Limits:**

N-Hexane [110-54-3]:

-OSHA Permissible Exposure Limit (PEL): 500 ppm (TWA)

-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA), Skin

other isomers of hexane

-ACGIH Threshold Limit Value (TLV): 500 ppm (TWA), 1000 ppm (STEL)

### **Ventilation System:**

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

### **Personal Respirators (NIOSH Approved):**

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).

### **Skin Protection:**

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

### **Eye Protection:**

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

---

## 9. Physical and Chemical Properties

### **Appearance:**

Clear, colorless liquid.

### **Odor:**

Light odor.

### **Solubility:**

Insoluble in water.

### **Specific Gravity:**

0.66

### **pH:**

No information found.

### **% Volatiles by volume @ 21C (70F):**

100

### **Boiling Point:**

ca. 68C (ca. 154F)

### **Melting Point:**

ca. -95C (ca. -139F)

### **Vapor Density (Air=1):**

3.0

**Vapor Pressure (mm Hg):**

130 @ 20C (68F)

**Evaporation Rate (BuAc=1):**

9

## 10. Stability and Reactivity

**Stability:**

Stable under ordinary conditions of use and storage. Heat will contribute to instability.

**Hazardous Decomposition Products:**

May produce acrid smoke and irritating fumes when heated to decomposition.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Strong oxidizers.

**Conditions to Avoid:**

Heat, flames, ignition sources and incompatibles.

## 11. Toxicological Information

N-Hexane: Oral rat LD50: 28710 mg/kg. Irritation eye rabbit: 10 mg mild. Investigated as a tumorigen, mutagen and reproductive effector.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Hexane (110-54-3)	No	No	None
Methylcyclopentane (96-37-7)	No	No	None
Trace amount of Benzene (10 ppm) (071-43-2)	Yes	No	1

## 12. Ecological Information

**Environmental Fate:**

When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is not expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has an estimated bioconcentration factor (BCF) of less than 100. This material has a log octanol-water partition coefficient of greater than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

**Environmental Toxicity:**

No information found.

## 13. Disposal Considerations

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

## 14. Transport Information

### Domestic (Land, D.O.T.)

-----

**Proper Shipping Name:** HEXANES

**Hazard Class:** 3

**UN/NA:** UN1208

**Packing Group:** II

**Information reported for product/size:** 215L

### International (Water, I.M.O.)

-----

**Proper Shipping Name:** HEXANES

**Hazard Class:** 3

**UN/NA:** UN1208

**Packing Group:** II

**Information reported for product/size:** 215L

## 15. Regulatory Information

```

-----\Chemical Inventory Status - Part 1\-----
Ingredient                                     TSCA   EC     Japan  Australia
-----
Hexane (110-54-3)                             Yes   Yes   Yes     Yes
Methylcyclopentane (96-37-7)                 Yes   Yes   No      Yes
Trace amount of Benzene (10 ppm) (071-43-2)  Yes   Yes   Yes     Yes

```

```

-----\Chemical Inventory Status - Part 2\-----
Ingredient                                     Korea  DSL   NDSL   Phil.
-----
Hexane (110-54-3)                             Yes   Yes   No     Yes
Methylcyclopentane (96-37-7)                 Yes   Yes   No     Yes
Trace amount of Benzene (10 ppm) (071-43-2)  Yes   Yes   No     Yes

```

```

-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                     -SARA 302-  -SARA 313-----
RQ   TPQ   List  Chemical Catg.
-----
Hexane (110-54-3)                             No   No    Yes    No
Methylcyclopentane (96-37-7)                 No   No    No     No
Trace amount of Benzene (10 ppm) (071-43-2)  No   No    Yes    No

```

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
Hexane (110-54-3)	5000	No	No
Methylcyclopentane (96-37-7)	No	No	No
Trace amount of Benzene (10 ppm) (071-43-2)	10	U019	No

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

**WARNING:**

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

**Australian Hazchem Code:** 3[Y]E

**Poison Schedule:** None allocated.

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

**NFPA Ratings:** Health: 1 Flammability: 3 Reactivity: 0

**Label Hazard Warning:**

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.

**Label Precautions:**

Keep away from heat, sparks and flame.  
Keep container closed.  
Use only with adequate ventilation.  
Wash thoroughly after handling.  
Avoid breathing vapor or mist.  
Avoid contact with eyes, skin and clothing.

**Label First Aid:**

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

No Changes.

**Disclaimer:**

\*\*\*\*\*

**Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is**

**intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.**

\*\*\*\*\*

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

ALDRICH CHEMICAL CO INC. -- LIQUI-NOX PHOSPHATE-FREE DETERGENT, 24302-7 --  
6810-00N016648

## ===== Product Identification =====

Product ID:LIQUI-NOX PHOSPHATE-FREE DETERGENT, 24302-7

MSDS Date:01/09/1990

FSC:6810

NIIN:00N016648

MSDS Number: BQTFQ

=== Responsible Party ===

Company Name:ALDRICH CHEMICAL CO INC.

Address:1001 W. ST. PAUL AVE

Box:355

City:MILWAUKEE

State:WI

ZIP:53201

Country:US

Info Phone Num:414-273-3850/FAX -4979

Emergency Phone Num:414-273-3850

CAGE:60928

=== Contractor Identification ===

Company Name:ALDRICH CHEMICAL CO INC

Address:1001 WEST ST PAUL AVE

Box:355

City:MILWAUKEE

State:WI

ZIP:53233

Country:US

Phone:414-273-3850

CAGE:60928

## ===== Composition/Information on Ingredients =====

Ingred Name:LIQUI-NOX, PHOSPHATE-FREE DETERGENT

## ===== Hazards Identification =====

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES

Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO

Health Hazards Acute and Chronic:ACUTE: MAY BE HARMFUL BY INHALATION,  
INGESTION, OR SKIN ABSORPTION. MAY CAUSE EYE IRRITATION. MAY CAUSE  
SKIN IRRITATION. TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL,  
PHYSICAL, AND TOXICOLOGICAL PROPERT IES HAVE NOT BEEN THOROUGHLY  
INVESTIGATED.

Explanation of Carcinogenicity:NOT RELEVANT

Effects of Overexposure:SEE HEALTH HAZARDS.

Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

## ===== First Aid Measures =====

First Aid:EYE: IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF WATER FOR  
AT LEAST 15 MIN. SKIN: IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS  
AMOUNTS OF WATER. INHAL: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE  
ART F RESP. IF BREATHING IS DIFFICULT, GIVEOXYGEN. CALL A  
PHYSICIAN. WASH CONTAMINATED CLOTHING BEFORE REUSE. INGEST: GET MD  
IMMEDIATELY .

=====  
Fire Fighting Measures  
=====

Extinguishing Media:WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL POWDER,  
ALCOHOL OR POLYMER FOAM.

Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA AND FULL  
PROTECTIVE EQUIPMENT TO PREVENT CONTACT WITH SKIN AND EYES.

Unusual Fire/Explosion Hazard:NONE SPECIFIED BY MANUFACTURER.

=====  
Accidental Release Measures  
=====

Spill Release Procedures:WEAR NIOSH/MSHA APPROVED RESP, CHEMICAL SAFETY  
GOGGLES, RUBBER BOOTS AND HEAVY RUBBER GLOVES. ABSORB ON SAND OR  
VERMICULITE AND PLACE IN CLOSED CONTAINERS FOR DISPOSAL. VENTILATE  
AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

=====  
Handling and Storage  
=====

Handling and Storage Precautions:KEEP TIGHTLY CLOSED. STORE IN A COOL  
DRY PLACE. AVOID INHALATION. AVOID CONTACT WITH EYES, SKIN AND  
CLOTHING. AVOID PROLONGED OR REPEATED EXPOSURE.

Other Precautions:NONE SPECIFIED BY MANUFACTURER.

=====  
Exposure Controls/Personal Protection  
=====

Respiratory Protection:NIOSH/MSHA APPROVED RESPIRATOR.

Ventilation:MECHANICAL EXHAUST REQUIRED.

Protective Gloves:COMPATIBLE CHEMICAL-RESISTANT GLOVES.

Eye Protection:CHEMICAL SAFETY GOGGLES.

Other Protective Equipment:SAFETY SHOWER AND EYE BATH.

Work Hygienic Practices:WASH THOROUGHLY AFTER HANDLING.

Supplemental Safety and Health

WASTE DISP: AND NEUTRALIZATION REACTIONS MAY GENRATE HEAT & FUMES WHICH  
CAN BE CONTROLLED BY THE RATE OF ADDITION. OBSERVE ALL FEDERAL,  
STATE AND LOCAL LAWS.

=====  
Physical/Chemical Properties  
=====

HCC:N1

Spec Gravity:1.051

Appearance and Odor:NONE SPECIFIED BY MANUFACTURER.

=====  
Stability and Reactivity Data  
=====

Stability Indicator/Materials to Avoid:YES

STRONG OXIDIZING AGENTS.

Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.

Hazardous Decomposition Products:NATURE OF DECOMPOSITION PRODUCTS NOT  
KNOWN.

=====  
Disposal Considerations  
=====

Waste Disposal Methods:SML QTYS: CAUTIOUSLY ADD TO A LRG STIRRED EXCESS  
OF WATER. ADJUST THE PH TO NEUTRAL, SEPARATE ANY INSOLUBLE SOLIDS  
OR LIQUIDS & PACKAGE THEM FOR HAZARDOUS-WASTE DISP. FLUSH THE  
AQUEOUS SOLN DOWN THE DRAIN W/PLENTY OF WATER. THE HYDROLYSIS  
(SUPP DATA)

Disclaimer (provided with this information by the compiling agencies):  
This information is formulated for use by elements of the Department

of Defense. The United States of America in no manner whatsoever, expressly or implied, warrants this information to be accurate and disclaims all liability for its use. Any person utilizing this document should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation.

# Monsanto

## Material Safety Data

### POLYCHLORINATED BIPHENYLS (PCBs)

Emergency Phone No.  
(Call Collect)  
314-694-1000

---

#### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

---

PRODUCT NAME: **POLYCHLORINATED BIPHENYLS (PCBs)**  
Aroclor® Series 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268  
Therminol® FR Series

MSDS Number: M00018515

Date: 12/95

Chemical Family: Chlorinated Hydrocarbons  
Chemical Name: Polychlorinated biphenyls  
Synonyms: PCBs, Chlorodiphenyls, Chlorinated biphenyls

Trade Names/Common Names:

PYRANOL® and INERTEEN® are trade names for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL is the generic name for a broad class of fire resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30 - 70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

PYDRAUL® is the trade name for hydraulic fluids that, prior to 1972, may have contained varying amounts of PCBs and other components including phosphate esters.

The product names/trade names are representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

In 1972, Monsanto restricted sales of PCBs to applications involving only closed electrical systems, (transformers and capacitors). In 1977, all manufacturing and sales were voluntarily terminated. In 1979, EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

**MONSANTO COMPANY, 800 N. LINDBERGH BLVD., ST. LOUIS, MO 63167**

**FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT**  
Call CHEMTREC - Day or Night - 1-800-424-9300 Toll free in the continental U.S., Hawaii, Puerto Rico, Canada, Alaska, or Virgin Islands. For calls originating elsewhere: 202-483-7616 (collect calls accepted)

For additional nonemergency information, call: 314-694-3344.

---

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

---

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile, oily liquids to white crystalline solids and hard noncrystalline resins. Technical products vary in composition, in the degree of chlorination, and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They were used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic, and other industrial fluids, plasticizers, carbonless copy paper, paints, inks, and adhesives.

<u>Component</u>	<u>CAS No.</u>
chlorinated biphenyl	1336-36-3
Aroclor 1016	12674-11-2
Aroclor 1221	11104-28-2
Aroclor 1232	11141-16-5
Aroclor 1242	53469-21-9
Aroclor 1248	12672-29-6
Aroclor 1254	11097-69-1
Aroclor 1260	11096-82-5
Aroclor 1262	37324-23-5
Aroclor 1268	11100-14-4

There are also CAS Numbers for individual PCB congeners and for mixtures of Aroclor® products.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Seventh).

---

## 3. HAZARDS IDENTIFICATION

---

### EMERGENCY OVERVIEW

Appearance and Odor: PCB mixtures range in form and color from clear to amber liquids to white crystalline solids. They have a mild, distinctive odor and are not volatile at room temperature. Refer to Section 9 for details.

**WARNING!**  
**CAUSES EYE IRRITATION**  
**MAY CAUSE SKIN IRRITATION**

**PROCESSING AT ELEVATED TEMPERATURES MAY RELEASE VAPORS OR FUMES WHICH MAY CAUSE RESPIRATORY TRACT IRRITATION**

### POTENTIAL HEALTH EFFECTS

#### Likely Routes

of Exposure: Skin contact and inhalation of heated vapors

Eye Contact: Causes moderate irritation based on worker experience.

Skin Contact: Prolonged or repeated contact may result in redness, dry skin and defatting based on human experience. A potential exists for developing chloracne. PCBs can be absorbed through intact skin.

Inhalation: Due to the low volatility of PCBs, exposure to this material in ambient conditions is not expected to produce adverse health effects. However, at elevated processing temperatures, PCBs may produce a vapor that may cause respiratory tract irritation if inhaled based on human experience.

Ingestion: No more than slightly toxic based on acute animal toxicity studies. Coughing, choking and shortness of breath may occur if liquid material is accidentally drawn into the lungs during swallowing or vomiting.

MSDS #: M00018515

Other: Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

Refer to Section 11 for toxicological information.

---



---

#### 4. FIRST AID MEASURES

---



---

IF IN EYES, immediately flush with plenty of water for at least 15 minutes. If easy to do, remove any contact lenses. Get medical attention. Remove material from skin and clothing.

IF ON SKIN, immediately flush the area with plenty of water. Wash skin gently with soap as soon as it is available. Get medical attention if irritation persists.

IF INHALED, remove person to fresh air. If breathing is difficult, get medical attention.

IF SWALLOWED, do NOT induce vomiting. Rinse mouth with water. Get medical attention. Contact a Poison Control Center. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

NOTE TO PHYSICIANS: Hot PCBs may cause thermal burn. If electrical equipment arcs between conductors, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce hydrochloric acid (HCl), a respiratory irritant. If large amounts are swallowed, gastric lavage may be considered.

---



---

#### 5. FIRE FIGHTING MEASURES

---



---

Flash Point: 284 degrees F (140 degrees C) or higher depending on the chlorination level of the Aroclor product

Fire Point: 349 degrees F (176 degrees C) or higher depending on the chlorination level of the Aroclor product

NOTE: Refer to Section 9 for individual flash points and fire points.

##### Extinguishing

Media: Extinguish fire using agent suitable for surrounding fire. Use dry chemical, foam, carbon dioxide or water spray. Water may be ineffective. Use water spray to keep fire-exposed containers or transformer cool.

PCBs are fire-resistant compounds. They may decompose to form CO, CO<sub>2</sub>, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

Dielectric fluids having PCBs and chlorinated benzenes as components have been reported to produce polychlorinated dibenzo-p-dioxins (PCDDs) and furans (PCDFs) during fire situations involving electrical equipment. At temperatures in the range of 600-650 degrees C in the presence of excess oxygen, PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

Federal regulations require all PCB transformers to be registered with fire response personnel.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state and local regulations.

Fire Fighting Equipment: Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

---

## 6. ACCIDENTAL RELEASE MEASURES

---

Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any cleanup or disposal of PCBs, PCB items, or PCB contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All nonessential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways, and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. Refer to Section 8 for personal protection equipment and clothing.

Personnel trained in emergency procedures and protected against attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks, and fight fires in PCB areas.

Refer to Section 13 for disposal information and Sections 14 and 15 for information regarding reportable quantity, and Section 7 for marking information.

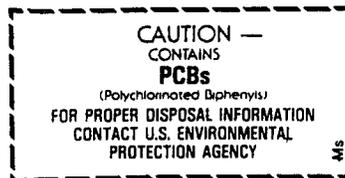
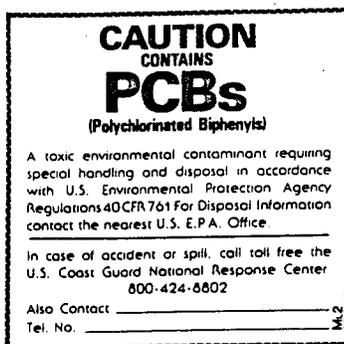
---

## 7. HANDLING AND STORAGE

---

Care should be taken to prevent entry into the environment through spills, leakage, use vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked (check regulations, 40 CFR 761, for details).



**Storage:** The storage of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB waste is strictly regulated by 40 CFR Part 761. The storage time is limited, the storage area must meet physical requirements, and the area must be labeled.

**Avoid contact with eyes.**  
**Wash thoroughly after handling.**  
**Avoid breathing processing fumes or vapors.**  
**Process using adequate ventilation.**

---



---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

---



---

**Eye Protection:** Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

**Skin Protection:** Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine the appropriate type glove for a given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contacted. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

ATTENTION! Repeated or prolonged skin contact may cause chloracne in some people.

**Respiratory Protection:** Avoid breathing vapor, mist, or dust. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended when airborne exposure limits are exceeded and, if used, replaces the need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.

ATTENTION! Repeated or prolonged inhalation may cause chloracne in some people.

**Ventilation:** Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of vapor or mist, such as open process equipment.

### Airborne Exposure Limits:

**Product:** Chlorodiphenyl (42% chlorine)

OSHA PEL: 1 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*  
ACGIH TLV: 1 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*

**Product:** Chlorodiphenyl (54% chlorine)

OSHA PEL: 0.5 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*  
ACGIH TLV: 0.5 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*

\*For Skin notation see Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Government Industrial Hygienists, 1995-1996.

---

**9. PHYSICAL AND CHEMICAL PROPERTIES**


---

PROPERTIES OF SELECTED AROCLORS <sup>®</sup>							
PROPERTY	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point			
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA—Not Available

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

---

**10. STABILITY AND REACTIVITY**


---

Stability: PCBs are very stable, fire-resistant compounds.

Materials to Avoid: None

Hazardous Decomposition

Products: PCBs may decompose to form CO, CO<sub>2</sub>, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surface.

Hazardous Polymerization: Does not occur.

---

**11. TOXICOLOGICAL INFORMATION**


---

Data from laboratory studies conducted by Monsanto and from the available scientific literature are summarized below.

Single exposure (acute) studies indicate:

Oral - Slightly Toxic (Rat LD50 - 8.65 g/kg for 42% chlorinated; 11.9 g/kg for 54% chlorinated)

MSDS #: M00018515

The liquid products and their vapors are moderately irritating to eye tissues. Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

There are literature reports that PCBs can impair reproductive functions in monkeys. The National Cancer Institute (NCI) performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay. There is sufficient evidence in the scientific literature to conclude that Aroclor 1260 can cause liver cancer when fed to rodents at high doses. Similar experiments with less chlorinated PCB products have produced negative or equivocal results.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed population, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Seventh Annual Report on Carcinogens.

## 12. ECOLOGICAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquid or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

## 13. DISPOSAL CONSIDERATIONS

The disposal of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB wastes is strictly regulated by 40 CFR Part 761. For example, all wastes and residues containing PCBs (wiping cloths, absorbent material, used disposable protective gloves and clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

## 14. TRANSPORT INFORMATION

The data provided in this section are for information only. Please apply the appropriate regulations to properly classify a shipment for transportation.

DOT Classification:	IF WEIGHT OF PCBs TO BE SHIPPED IS OVER ONE POUND, THE FOLLOWING CLASSIFICATION AND LABEL APPLY.
DOT Label:	LIQUID: Environmentally Hazardous Substance, liquid, n.o.s. (Contains PCB), 9, UN 3082, III
	SOLID: Environmentally Hazardous Substance, solid, n.o.s. (Contains PCB), 9, UN 3077, III
DOT Label:	Class: 9
DOT Reportable Quantity:	One Pound
IMO Classification:	Polychlorinated Biphenyls, IMO Class 9, UN 2315, II IMO Page 9034, EMS 6.1-02
IATA/ICAO Classification:	Polychlorinated Biphenyls, 9, UN2315, II

---

---

## 15. REGULATORY INFORMATION

---

---

For regulatory purposes, under the Toxic Substances Control Act, the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such a substance (40 CFR Part 761).

TSCA Inventory: not listed.

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370): Immediate, Delayed.  
SARA Section 313 Toxic Chemical(s): Listed-1993 (De Minimis concentration 0.1%.)

Reportable Quantity (RQ) under DOT (49 CFR) and CERCLA Regulations: 1 lb. (polychlorinated biphenyls) PCBs.

Release of more than 1 (one) pound of PCBs to the environment requires notification to the National Response Center (800-424-8802 or 202-426-2675).

Various state and local regulations may require immediate reporting of PCB spills and may also define spill cleanup levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill cleanup.

---

---

## 16. OTHER INFORMATION

---

---

Reason for revision: Conversion to the 16 section format. Supersedes MSDS dated 10/88.

Therminol®, Aroclor® and Pydraul® are registered trademarks of Monsanto Company  
Pyranol® is a registered trademark of General Electric Company  
Inerteen® is a registered trademark of Westinghouse Electric Corporation

FOR ADDITIONAL NONEMERGENCY INFORMATION, CONTACT:

Gary W. Mappes  
Manager, Product & Environmental Safety

Robert G. Kaley, II  
Director, Environmental Affairs

Monsanto Company  
800 North Lindbergh Boulevard  
St. Louis, MO 63167  
(314) 694-3344

---

---

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Monsanto Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Monsanto Company be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

---

---

## **ATTACHMENT 5**

---

### **NEAR-MISS INCIDENT REPORT**

**Near-Miss Incident Report**  
(completed by field staff)

Employee: \_\_\_\_\_

Office or site location: \_\_\_\_\_

Near-Miss Incident (check one or more): Exposure ( ) Physical injury ( ) Property damage ( )

Location (city and state): \_\_\_\_\_ Project and Contract No. \_\_\_\_\_

Date of incident: \_\_\_\_\_ Time of incident: \_\_\_\_\_

Fully describe the incident, including how it happened, persons involved, if chemicals were involved in the incident, etc.:

---

---

---

---

---

---

---

---

---

---

Was the operation being conducted under an established safety plan? (Yes / No)

If yes, attach a copy. If no, explain: \_\_\_\_\_

---

\_\_\_\_\_  
Employee's signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Project manager's signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Site safety officer's signature

\_\_\_\_\_  
Date

**Corporate Health and Safety Manager Review and Comments**

Corrective action/procedure changes carried out at the site:

---

---

---

Corrective actions to be taken to prevent similar incidents at other sites:

---

---

---

\_\_\_\_\_  
Corporate health and safety manager's signature

\_\_\_\_\_  
Date