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HEALTH MONITORING AND SAFETY TRAINING PLAN CONFIRMATION STUDY
VERIFICATION PHASE NS MAYPORT FL
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E C JORDAN

U.S. DEPARTMENT OF THE NAVY
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

HEALTH MONITORING
AND SAFETY TRAINING
PLAN

NACIP
CONFIRMATION STUDY
VERIFICATION PHASE

CONTRACT: N62467-86-C-0174

E.C. JORDAN PROJECT NO. 5097-00

PREPARED BY E.C. JORDAN CO.

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1.0 INTRODUCTION

The E.C. Jordan Co. (Jordan) began a formal program of site risk assessment and implementation of mitigative health and safety programs in March 1981. At that time, existing departmental policies/practices were collected and reviewed, additional needs identified and a corporate personnel health and safety plan drafted.

Currently, Jordan's seven-member Personnel Health and Safety Committee (PHSC) regularly reviews health and safety issues, updates practices as new information becomes available, oversees administration of the Health Monitoring Program and provides guidance for personnel training as appropriate. The PHSC is a corporate entity, effectively precluding any departmental and contract pressures on health and safety policy decisions.

Each project site is classified hazardous or non-hazardous by the PHSC after a review of available data. Prior to on-site activities at those sites classified as hazardous, a summary safety plan (Appendix A) must be completed by the project engineer/scientist. This is accomplished by a review of available information on the site to assess the potential risks and provide an initial determination of personal protection requirements. The summary safety plan is subsequently reviewed and must be approved by a member of the PHSC. The designated Site Safety Officer monitors actual site conditions and may alter these requirements as needed. In all cases, personnel safety is the paramount factor in decision-making.

2.0 HEALTH MONITORING AND SAFETY PROGRAM

To protect the health and safety of employees assigned to work at hazardous waste sites, Jordan has developed and implemented a Health and Safety Program. This program is administered by a committee consisting of representatives of Jordan technical department staffs with support from medical advisors. All personnel on-site must be enrolled in the Health Monitoring Program and must receive training appropriate for their assigned function.

In addition to Jordan employees, subcontractors and consultants working on hazardous waste sites will be enrolled in an equivalent Health Monitoring Program and receive health and safety indoctrination prior to commencing work on the site. Indoctrination, training and periodic followup is conducted as appropriate. Indoctrination and training includes:

- o site history;
- o inventory of site chemicals known or suspected (will be updated and reviewed at each stage of the field investigation program);
- o project organization;
- o work plan review;
- o project documentation;
- o review of site safety plan (site safety plans are updated as new information becomes available)
- o review of decontamination procedures;
- o proper use and care of personal protective equipment;
- o proper calibration and use of monitoring equipment;
- o emergency response procedures;
- o accident reporting procedures; and
- o contingency plans.

The site-specific information required to address the areas noted above is presented in summary safety plans prepared for the NAVSTA sites. The plans are intended to provide a framework within which information may be updated and ongoing decisions made regarding actual health and safety concerns at the site. The summary site safety plan format is presented as Appendix A.

3.0 MEDICAL SURVEILLANCE PROCEDURES

3.1 Health Monitoring Program

All on-site Jordan personnel and laboratory staff must be enrolled in the Health Monitoring Program which is implemented through Envirologic Data, Portland, Maine. Envirologic Data consists of a team of physicians and support personnel who specialize in toxicology. This program consists of an initial medical examination to establish the employee's general health profile and provides important baseline laboratory data for later comparative study. The contents of the initial comprehensive physical examination and laboratory testing routine is given in Table 3-1. Follow-up examinations are completed for all personnel enrolled in the health monitoring program on an annual basis, or more frequently if project assignments warrant testing following specific field activities. Followup examinations are tailored to the exposures recorded by the individual.

3.2 Review of Exposure Symptoms

Symptoms of exposure to hazardous materials will be reviewed for each site in order to indicate to personnel the recognized signs of possible exposure to those materials. This information will be supplemented with a discussion of the need for objectivity in the personal health assessment to account for normal reaction to stressful situations. The Site Safety Officer will be watchful for outward evidences of changes in worker health. These outward symptoms may include skin irritations, skin discoloration, eye irritation, muscular soreness, fatigue, nervousness or irritability, intolerance to heat or cold or loss of appetite. Employees will routinely be asked to assess their general state of health during the project.

Special medical monitoring may be identified for certain sites.

TABLE 3-1

BASELINE HEALTH MONITORING PROGRAM

1. PHYSICAL EXAMINATION

- a. Medical history
- b. Medical examination
- c. Vision:
 - o near/distant
 - o color
- d. Audiometry (optional, assignment dependent)
- e. Radiology: PA/LAT
- f. Spirometry
- g. Electrocardiogram (optional, age and history dependent)

2. LABORATORY ANALYSIS

a. Hematology

- complete blood count
- red blood cell count
- hemoglobin
- platelets
- sedimentation rate
- white blood cell count
- hematocrit
- indices: MCV, MCH, MCHC

b. Blood Chemistry

- Multi-22
- calcium
- glucose
- uric acid
- total protein
- bilirubin
- SGPT
- potassium
- creatinine
- globulin
- triglycerides
- gamma GT
- serum iron
- iron binding capacity
- acetyl cholinesterase
- plasma
- red blood cell
- free erythrocyte porphyrin
- inorganic phosphate
- blood urea nitrogen
- cholesterol
- albumin
- alkaline phosphatase sodium
- chloride
- CO
- CO/globulin ratio
- BUN/creatinine ratio
- T3 uptake
- Total T4
- Immunoprofile III

c. Urine Analysis

- Ph, specific gravity, appearance, sugar, etc.

4.0 PERSONAL PROTECTION LEVEL DETERMINATION

The level of personnel protective equipment required shall be determined by the type and levels of waste or spill material present at the site where project personnel may be exposed. In situations where the types of waste or spill material on-site are unknown, the hazards are not clearly established or the situation changes during on-site activities, the Site Safety Officer must make a reasonable determination of the level of protection that will assure the safety of investigators and response personnel until the potential hazards have been determined through monitoring, sampling, informational assessment, laboratory analyses or other reliable methods. Once the hazards have been determined, protective levels commensurate with the hazards will be used. Protection requirements will be evaluated on a continuous basis to reflect new information as it is acquired.

Preparation of site-specific plans will be based on the site-specific information made available through site files, IAS and FIT reports, as well as any other sources identified.

The levels of protection utilized by E.C. Jordan Co. are presented below:

Level A. Level A protection must be selected when the Site Safety Officer makes a reasonable determination that the highest available level of respiratory, skin and eye protection is needed. It should be noted that while Level A provides maximum available protection, it does not protect against all possible hazards. Consideration of the heat stress that can arise from wearing Level A protection should also enter into the subtask leaders decision. (Comfort is not a decision factor, but heat stress will influence work rate, scheduling, and other work practices.)

Level B. The Site Safety Officer must select Level B protection when the highest level of respiratory protection is needed, but hazardous material exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely.

Level C. The Site Safety Officer may select Level C when the required level of respiratory protection is known, or reasonably assumed to be, not greater than the level of protection afforded by full face air purifying respirators; and hazardous materials exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely. Level C requires carrying an emergency escape respirator.

Level D. Level D is the basic work uniform, selected when site hazards are judged to be minimal. Investigators and response personnel, however, must not be permitted to work in civilian clothes. Level D often requires carrying an escape respirator.

Fit testing of safety equipment is an important part of establishing adequate respiratory protection (see also Appendix F). Fit testing is accomplished prior to site explorations and each individual is assigned a fitted respirator for the duration of the project. These are tagged for identification. The equipment used for each level of protection is shown in Table 4.1.

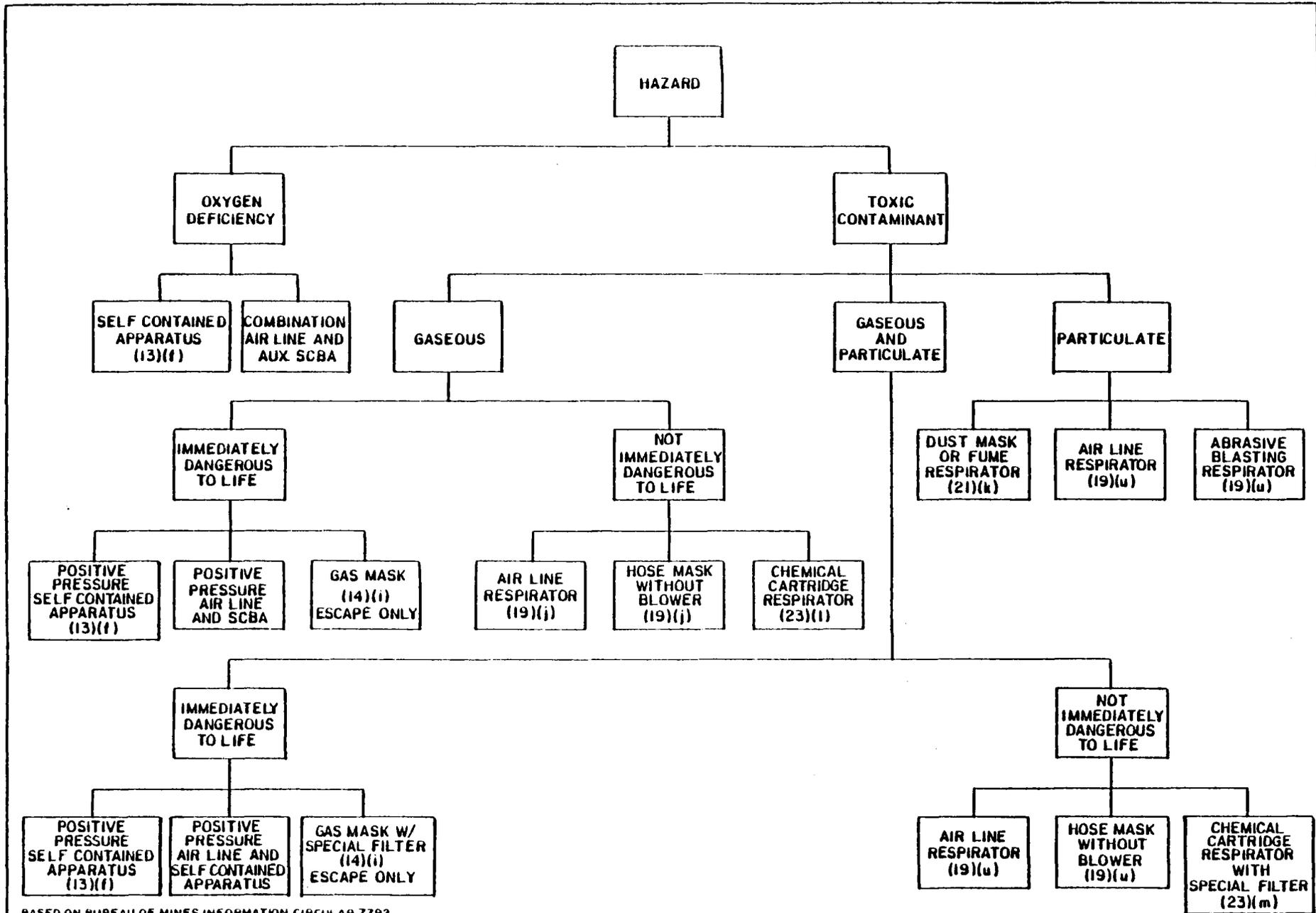
TABLE 4-1
Protective Gear

	Level D	Level C	Level B	Level A
Action Level ¹ and ³	0	0 to 5	5-500	500-1000
Respirator Type ²	Escape	Full Face & Escape	SCBA	SCBA
Clothing				
o Boots	X	X	X	X
o Safety glasses or equivalent	X	X	X	
o Hard hat	X	X	X	
o Gloves, inner and outer	X	X	X	X
o Booties		X	X	X
o Coveralls	X	X	X	
o Chemical protective coveralls		X	X	
o Totally encapsulated suit				X

¹ Action levels are defined as air quality degradation from background levels, in ppm, by volatile contaminants as measured by a photoionization meter calibrated in the clean (support) zone. The action required is review of contaminants and reassessment of appropriate protective gear by the Site Safety Officer.

² Use of an air purifying respirator is allowed only where identification of constituents has occurred and appropriate respirator cartridges have been obtained. (Refer to Figure 4-1)

³ It must be recognized that a photoionization meter's relative response varies with each compound. Action levels should be reviewed (when constituents are known) to determine appropriate modifications.



BASED ON BUREAU OF MINES INFORMATION CIRCULAR 7792
 NUMBERS IN PARENTHESIS REFER TO BUREAU OF MINES SCHEDULES
 LETTERS IN PARENTHESIS REFER TO SUBPART OF NIOSH/MESA 30 CFM PART II

FIGURE 4-1
SELECTION OF RESPIRATORY EQUIPMENT (LUNDIN, A., 1979)
 EC.JORDANCO

It should be recognized that situations exist where different combinations of respiratory and dermal protective gear are appropriate, e.g., where splash protection is required but no respiratory hazard exists. The Site Safety Officer may elect a modification of the above specified combinations.

4.1 Potential Hazards On-Site

Appendix B includes Chemical Hazard Data Sheets which summarize toxicity and properties of chemicals that may be found in soil and water on-site.

A review of physical hazards must also be performed.

The chemical hazard data sheets include the following information:

- o emergency response procedures for fire, exposure and water pollution;
- o response to discharge;
- o label category and class;
- o chemical designations;
- o observable characteristics;
- o health hazards;
- o fire hazards;
- o chemical reactivity;
- o water pollution;
- o shipping information;
- o hazard assessment code;
- o hazard classification; and
- o physical and chemical properties.

5.0 WORKER SAFETY PROCEDURES

5.1 General

Workers will be expected to adhere to the established safety practices for their respective specialties (e.g., drilling, laboratory analysis, construction, etc.). The need to exercise caution in the performance of specific work tasks is made more acute due to weather conditions, restricted mobility and reduced peripheral vision caused by the protective gear itself, the need to maintain the integrity of the protective gear and the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved. Among the most important of these principles for working at a hazardous waste site are:

1. In any unknown situation, always assume the worst conditions and plan responses accordingly.
2. Employ the buddy system. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals as conditions may greatly impair verbal communications.
3. Minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas and procedures to accomplish this. Do not place equipment on drums or on the ground. Do not sit on drums or other materials.
4. Employ disposable items when possible to minimize risks during decontamination and possible cross-contamination during sample-handling. This will require a common sense approach to potential risks and costs.
5. Smoking, eating, or drinking after entering the work zone and before decontamination will not be allowed. Oral ingestion of contaminants is probably the second most likely means of introduction of the toxic substances into the body (inhalation being first).
6. Avoid heat and other work stresses related to wearing the protective gear. Work breaks should be planned to prevent stress related accidents or fatigue. Appendix D provides a heat stress casualty prevention plan.
7. Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.
8. Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the Site Safety Officer to relieve any motivations or pressures to circumvent established safety policy.
9. Unauthorized breaches of specified safety protocol will not be allowed. Personnel unwilling or unable to comply with the established procedures will be replaced. Any changes in established procedure should be documented on the form provided. The change should have a very specific, valid basis and must be approved by the Site Safety Officer.

10. Be observant of not only one's own immediate surroundings but also that of others. Everyone will be working under constraints to awareness and it is a team effort to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment while utilizing personnel protective gear. Vision, hearing and communication are restricted by the protective gear.
11. Use of contact lenses will not be allowed on-site. These prevent proper flushing should corrosive or lachrymous substances enter the eyes.
12. Sites potentially requiring Level C or B protection will require the removal of facial hair (except moustaches) to allow a proper facepiece fit.
13. Rigorous contingency planning, and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.
14. Withdrawal from a hazardous situation to reassess procedures is the preferred course of action.
15. Be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol and working with an illness during field investigation assignments.
16. The site leader, the Site Safety Officer and sampling personnel shall maintain records in a bound notebook recording daily activities, meetings, facts, incidents, data, etc., relating to the project. These record books will remain on the site during the full duration of the project so that replacement personnel may add information in the same record book, maintaining continuity. These notebooks and daily records will become part of the permanent project file. Examples of forms, records and logs to be used at each site are given in Appendix C.

5.2 Site Entry Procedures

In most cases, Jordan teams are not the first on-site investigators. Considerable knowledge of site history and current status allows the preparation of a site safety plan with reasonable assurance that personnel are adequately protected. In the event that sufficient site information is not available to perform a summary risk assessment and assign the appropriate level of personnel protective equipment, the following procedures should be followed. It must be understood that verification of the level of contamination (even with background information) will always require some of the steps below.

1. Recognize that Jordan's presence on-site implies a perceived contamination potential by the client.
2. Assume that the site is contaminated and conduct a site safety reconnaissance.

- o establish contamination reduction zone (decontamination area);
 - o at the highest level of protection practicable, survey site beginning with a perimeter survey and gradually covering all areas of proposed activity with (as appropriate):
 - HNU photoionizer;
 - organic vapor analyzer;
 - radiation survey meter;
 - personal air sampling pumps;
 - chemically reactive indicating tubes
 - oxygen deficiency meter; and
 - explosive mixture meter.
 - o establish "hot zone"; and
 - o review data, assess risk and select the appropriate level of protection.
3. Prepare summary site safety plan and document all data acquired.

6.0 SITE SAFETY EQUIPMENT

In addition to personnel protective gear designated for the assigned level, various monitoring and safety equipment is maintained on-site. Minimum on-site equipment will generally include:

- o Photoionization meter;
- o Combustible gas indicator (explosimeter);
- o Oxygen meter or oxygen deficiency alarm;
- o Chemically reactive indicating tubes (specific to the site hazards);
- o Fire extinguishers;
- o First aid kits;
- o Eye wash station;
- o Radiation survey meter or radiation alert; and
- o Transportation suitable for emergency response.
- o Organic vapor analyzer (optional);

Additional equipment may be specified and obtained as field conditions dictate. An equipment list and field safety gear requirements are specified in the site safety summary (Appendix A).

7.0 EMERGENCY PLANNING

7.1 Emergency Medical Services

Dr. Frank Lawrence, M.D. and Bruce Campbell, R. Ph. of Envirologic Data serve as medical liasons between project staff and hospitals. Prior to site investigation or activity on hazardous sites, nearby health facilities will be evaluated to determine their capabilities in relation to the needs of on-site project staff. Criteria such as emergency department physician coverage, decontamination capabilities and available medical specialists are evaluated.

o On-site First Aid

- An industrial first-aid kit will be provided at the work site and contents of the kit will be checked weekly and restocked as necessary. Other equipment may include: oxygen, backboard and straps, splints, and a cervical collar.
- At least one person qualified to perform first aid will be present on-site at all times during work activity. This person will have earned a certificate in first-aid training from the American Red Cross or will have received equivalent training. Designated first aides will receive regular review training from the American Red Cross or an equivalent session.
- An emergency shower and eye-wash station will be provided at the work site, as well as flushing water for decontamination of boots, gloves, clothing, tools, etc.

o Transportation to Emergency Treatment:

- A vehicle will be available at all times for use in transporting personnel to the hospital (in the event an ambulance is unnecessary or unavailable).
- Personnel stretchers will be located at the work site for use in transporting personnel to the vehicle. Alternate transportation routes to area hospitals will be established prior to on-site activity.

7.2 Contingency Planning

Prior to commencement of on-site activities, field personnel will review safety considerations with the Site Safety Officer (SSO). The Site Safety Officer is responsible for adherence to the designated safety precautions and assumes the role of on-site coordinator in an emergency response situation.

All on-site personnel will be familiarized with both the primary and secondary route to the nearest hospital (which may be shown on a Figure or local map) as well as the location of the nearest working telephone or radio communication device. Each will receive a list of emergency phone numbers as shown in Appendix A.

The local hospital and emergency response team will be advised in advance by the Site Safety Officer of the work to be performed. The hospital will also be briefed on the availability of personnel health data and technical support through Envirolologic Data.

Emergency communication will be required to ensure positive pre-planned notification of emergency authorities in the event of episodes requiring initiation of contingency plans.

- o The communication will be coordinated with local agencies, fire department, police, ambulance and hospital emergency room.
- o Two-way radio communication may need to be established in the field, and a site alarm capable of warning site personnel and summoning assistance will be maintained (air horns).
- o Emergency evacuation for residents of nearby homes is an unlikely event, but a person will be designated on-site to be responsible for implementing the contingency plan. The person will be made aware of the total number of households within a radius of 2,000 feet. Appendix A will provide the emergency contacts that will be required and an additional table will provide a list of residences and identifiable operations in the area in the event that evacuation is judged to be a possibility for a particular site.
- o Prior to any activity, personnel will investigate possible routes of evacuation.

A copy of an accident report form is provided in Appendix C. It should be filled out by the Site Safety Officer and filed with the individual's supervisor and a copy retained in the project records if an accident occurs.

7.3 Potential Hazards for Monitoring Program

The most common hazards associated with hazardous waste site investigation include: 1) accidents; 2) contact or ingestion of hazardous materials; 3) explosion; and 4) fire.

7.3.1 Accidents. Accidents must be handled on a case by case basis. Minor cuts, bruises, muscle pulls, etc., will still allow the injured person to undergo reasonably normal decontamination procedures prior to receiving direct first aid. More serious injuries may not permit complete decontamination procedures to be undertaken, particularly if the nature of the injury is such that the victim should not be moved. The nature and degree of surface contamination at a site is generally low enough that emergency vehicles could reach the victim on-site without undue hazard. However, in the event that access on-site is limited, accident victims may be transported to a point accessible by an ambulance by Jordan personnel trained for this response.

7.3.2 Contact and/or Ingestion of Hazardous Materials. Properly prescribed and maintained protective clothing and adherence to established safety

procedures are designed to minimize this hazard. However, it is still a possibility that contact or ingestion of materials may occur. One possibility for exposure is the puncture of a buried drum of liquid during drilling operations which might cause the drum contents to contact personnel. Standard first aid procedures should be followed. The drilling rig will have a tank of water which may be useful in some circumstances, particularly to flush contaminants off any exposed skin areas. Eye wash bottles will also be maintained at the site in case of emergencies. In cases of ingestion or other than minor contact with known substances, the local Poison Control Center and hospital should be contacted and the victim brought there immediately for further treatment and observation.

7.3.3 Explosion. The drilling crew should be keenly aware of combustible gas meter readings and withdraw at any indication of imminently hazardous conditions (greater than 20% LEL). The detection of such conditions shall be reported to local agencies for potential execution of the evacuation plan should the situation be assessed as warranting such response.

7.3.4 Fire. The combustible gas meter also warns of imminent fire hazards at borings. The greatest fire hazard at the site should be recognized as handling the fluids (e.g., methanol, acetone) used for certain decontamination procedures. No smoking or open flames are allowed on site. Carbon dioxide fire extinguishers will be kept at the drilling rig, and the decontamination area/field office. The Fire Department, previously informed of site activities, will be called as needed.

7.4 Evacuation Response Levels

Evacuation responses will occur at three levels: (1) withdraw from immediate work area (100+ feet upwind); (2) site evacuation; and (3) evacuation of surrounding area. Anticipated conditions which might require these responses are described below:

Withdrawal Up-Wind (100 or more feet).

- o Sensing ambient air conditions as containing greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn. The work party may return upon donning greater respiratory protection and/or assessing the situation as transient and past.
- o Breach in protective clothing or minor accident. The party may return when tear or other malfunction is repaired and first aid or decontamination has been administered.
- o Respirator malfunctions and must be replaced.

Site Evacuation.

- o Sensing ambient air conditions as containing explosive and persistent levels of combustible gas or excessive levels of toxic gases,

- o Fire or major accident
- o Imminent explosion or explosion

Surrounding Area Evacuation.

- o Persistent, unsuppressable release of toxic or explosive vapors from test pits or borings (possible pressure release from punctured drum). Air quality should be monitored at several distances downwind to assess danger to surrounding area before initiating this response.

7.5 Evacuation Procedures

7.5.1 Withdrawal Upwind. The work party will continually note general wind directions while on-site. (A simple wind sock may be set up near the work site for visual determinations.) Upon noting the conditions warranting movement away from the work site, the crew will move upwind a distance of approximately 100 feet or further as indicated by the site monitoring instruments. Donning SCBA and a safety harness and line, the Site Safety Officer or a member of the crew may return to the work site to determine if the condition noted was transient or persistent. If persistent, then an alarm should be raised to notify on-site personnel of the situation and the need to leave the site or don SCBA. An attempt should be made to decrease emissions only if greater respiratory protection is donned. The Site Safety Officer and client will be notified of conditions. When access to the site is restricted and escape may thus be hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

7.5.2 Site Evacuation. Upon determination of conditions warranting site evacuation, the work party will proceed upwind of the work site and notify the security force, Site Safety Officer and the field office of site conditions. If the decontamination area is upwind and greater than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation. There the respirators may be removed (if instrumentation indicates an acceptable condition). As more facts are determined from the field crew, these will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and carried out by the Site Safety Officer.

7.5.3 Evacuation of Surrounding Area. When the Site Safety Officer determines that conditions warrant evacuation of downwind residences and commercial operations, the local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

7.6 Training

The following matrix (Figure 7-1) will be completed and included with each site safety plan thus indicating the training received by on-site personnel. All personnel must become familiar with the capabilities of each team member as displayed by this matrix to minimize response times in the event emergency action is required.

ON-SITE PERSONNEL TRAINING

TOPIC	HRS	T. ALLEN	E. THOMAS	T. GREENHALGH	C. GOODWIN	J. DUMEYER	K. PETERSON								
INTRODUCTION/REFRESHER	4	●		●	●		●								
FIRST AID	8		●		●										
CPR (OPTIONAL)	8		●		●										
NUS COURSE OR EQUIVALENT	30	●	●			●	★								
OVA	16	●	●		●										
PI METER	2	●	●	●	●	●									
SCBA REVIEW	4	●	●												
SAMPLING	-	●	●	●	●	●	★								
HEALTH MONITORING	-	●	●	●	●	●	●								

 INDICATES REQUIRED TRAINING COMPLETED
 INDICATES TRAINING BEING CONDUCTED

CERTIFIED BY Raymond A. Allen Jr.

8.0 DECONTAMINATION

8.1 Personnel Decontamination Procedure

Decontamination procedures are carried out by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. A generalized procedure for removal of protective clothing is as follows:

- o Drop tools, monitors, samples and trash at designated drop stations. These will be plastic containers or drop sheets.
- o Step into designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots. If necessary, wash boots down with clear water in designated wash pit area.
- o Remove tape from boots and remove boots. Discard in disposal container.
- o Remove outer gloves and place in container.
- o Remove hard hat and respirator and place or hang in the designated area.
- o Remove outer garment and discard in container.
- o Remove inner gloves and discard in container.
- o If the site required utilization of a decontamination trailer, all personnel would also shower before leaving the site at the end of the work day.

Note: Disposable items (Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis unless there is reason for changing sooner. Dual respirator canisters will be changed daily unless more frequent changes are deemed appropriate by site surveillance data or personnel assessment.

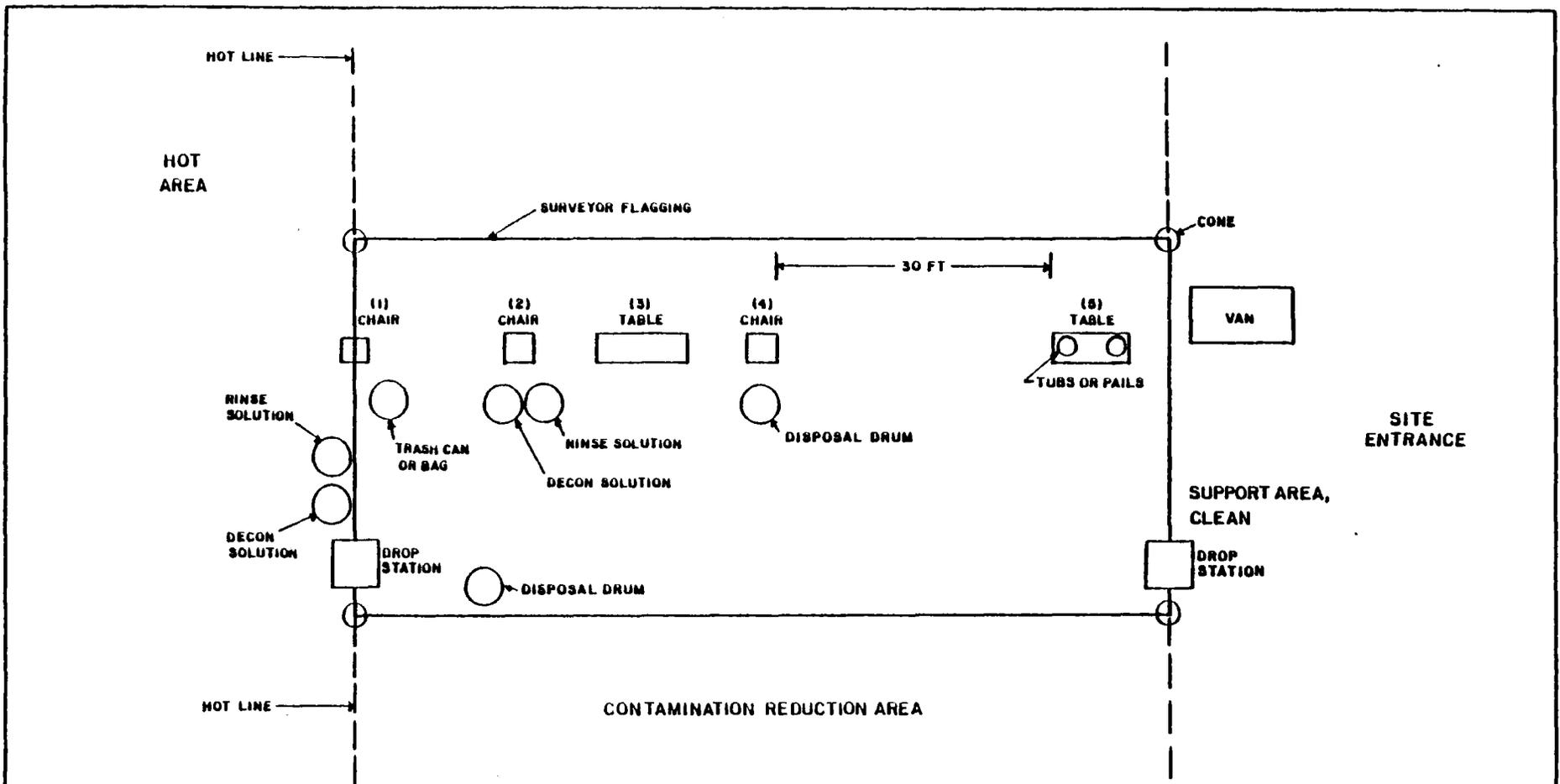
Pressurized sprayers or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples and equipment.

A schematic of a typical decontamination area is shown in Figure 8-1.

8.2 Equipment Decontamination

Equipment to be decontaminated during the project may include: (1) drill rig; (2) tools; (3) monitoring equipment; (4) respirators; (5) sample containers; (6) truck or trailer and (7) laboratory equipment.

All decontamination will be done by personnel in protective gear appropriate for the level of decontamination, determined by the Site Safety Officer. The decontamination work tasks will be split or rotated among support and work crews. Decontamination procedures within the trailer (if used) should take



TASK

- (1) Wash boots
- (2) Wash gloves—Rinse gloves
- (3) SCBA Tank change over table w/spare tanks
- (4) Remove boots, gloves
- (5) Remove SCBA, wash mask in pails or tubs

NOT TO SCALE

**FIGURE 8-1
TYPICAL PERSONNEL DECONTAMINATION STATION**

place only after other personnel have cleared the "hot area", moved to the clean area and the door between the two areas closed.

Miscellaneous tools and samplers will be dropped into a plastic pail, tub or other container. They will be brushed off and rinsed (outside, if possible) and transferred into a second pail to be carried to further decontamination stations. They will be washed with a detergent solution, rinsed with isopropyl alcohol (if required), rinsed with a detergent solution and finally rinsed with clean water.

8.2.1 Drilling Rig and Tools. It is anticipated that the drill rigs will be contaminated during test pit/borehole activities. They will be cleaned with high pressure water or portable high pressure steam followed by soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will usually be at Level D protection.

8.2.2 Sample Containers. Exterior surfaces of sample bottles will be decontaminated prior to packing for transportation to the analytical laboratory. Sample containers will be wiped clean at the sample site, but it will be difficult to keep the sample containers completely clean. The samples will be taken to the decontamination area. Here they will be further cleaned as necessary and transferred to a clean carrier and the sample identities noted and checked off against the chain-of-custody record. The samples, now in a clean carrier, will be stored in a secure area prior to shipment.

8.2.3 Monitoring Equipment. Monitoring equipment will be protected as much as possible from contamination by draping, masking or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The HNU meter, for example, can be placed in a clear plastic bag which allows reading of the scale and operation of the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes and dried. The units will be checked, standardized and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

8.2.4 Respirators. Respirators will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside and the rest placed in a cleansing solution. (Parts will be precoded, e.g., #1 on all parts of mask #1). After an appropriate time within the solution, the parts will be removed and rinsed off with tap water. The old cartridges will be marked so as to indicate length of usage (if means to evaluate the cartridges' remaining utility are available) or will be discarded into the contaminated trash container for disposal. In the morning the masks will be re-assembled and new cartridges installed if appropriate. Personnel will inspect their own masks to be sure of proper readjustment of straps for proper fit (see also Appendix F).

9.0 DOCUMENTATION AND RECORDKEEPING

Samples of field activity documentation forms are attached (see Appendix C). Minimum documentation consists of:

- o daily field records kept by the site technical leader or designee;
- o site surveillance record kept by the Site Safety Officer;
- o sampling - related records kept by sample collection team;
- o chain-of-custody records for each sample collected; and
- o daily exposure record for each person on-site.

10.0 UPDATING OF HEALTH AND SAFETY PLAN

The Site Safety Officer is responsible for maintaining proper documentation regarding daily safety log sheets. If any deficiency is encountered in the health and safety plan, a report will be prepared and forwarded to the health and safety coordinator at Jordan and copies sent to the project manager and technical director. The Site Safety Officer will immediately initiate necessary changes to improve protection of field staff.

During the remedial investigation process or after initial field investigation, any new chemical hazard encountered will be evaluated and safety plans modified to reflect the effect of that chemical hazard. Similarly, any physical hazards that are discovered will be addressed by the Site Safety Officer and reported.

11.0 REFERENCE GUIDES FOR HAZARDOUS MATERIALS

Reference guides for material classification determinations are:

- 1) The Merck Index, 9th Edition, Merck, Sharp & Dohme Ltd., 1980.
- 2) Handbook of Chemistry & Physics, 64th Edition, CRC Press, 1984.
- 3) Pocket Guide to Chemical Hazards, 1980 Edition, NIOSH/OSHA, DHEW (NIOSH) Publication No. 78-120.
- 4) Registry of Toxic Effects of Chemical Substances, 8th edition NIOSH, 1978.
- 5) Dangerous Properties of Industrial Materials, Sax, N.I., Sixth edition, Van Nostrand Reinhold Co., 1984.
- 6) Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, 1983-84. Adopted by ACGIH.

APPENDIX A
SUMMARY SITE SAFETY PLAN

E.C. JORDAN CO.
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: MAYPORT NAVAL STATION

SITE OWNER/CONTACT: BARRY LESTER (SDIV), JOSE NEGRON (NAVSTA)

LOCATION: MAYPORT, FLORIDA

PLAN PREPARED BY: THOMAS GREENHALGH DATE: 10/26/86

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): To maintain health and safety during Verification Phase of
investigations activities.

PROPOSED DATE(S) OF INVESTIGATION: January 1986 to February 1986

BACKGROUND REVIEW: Complete: X Preliminary: _____

OVERALL HAZARD: Serious: _____ Moderate: _____ Low: X Unknown: _____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid X Sludge X Gas _____

CHARACTERISTICS: Corrosive X Ignitable X Radioactive _____
Volatile X Toxic X Reactive _____ Unknown _____

SITE DESCRIPTION: The Mayport Naval Station (NASTA) is an active Naval
Station and Naval Air Field. The eleven sites to be investigated are
5 landfills; 1 old fire training area; 1 neutralization basin; waste oil pit;
fuel spill area; mercury/oily waste spill site; and a transformer storage
yard. Investigations will consist of geophysical survey; soil borings;
monitoring well installation; aquifer testing; elevational survey; sampling of
monitoring wells, soils, surface water and sediment.

Principal Disposal Method (type and location): Trench method in the
landfills; spilling, leaking and dumping of wastes at other sites.

Unusual Features (dike integrity, power lines, terrain, etc.): Fuel
tanks in fuel farm are contained by soil bunkers. Underground pipelines and
utilities to be avoided during drilling.

Status: (active, inactive, unknown): Fuel farm, neutralization basin
and transformer storage yard are active, all other sites are inactive.

History: (Worker or non-worker injury; complaints from public; previous
agency action): None known

C. HAZARD EVALUATION

Chemicals which personnel may be exposed to are solvents and wastes
containing volatile organic compounds, fuel hydrocarbons, and inorganic
chemicals such as chromium, mercury and lead contained in sludges and other
wastes. A chemical Hazard Information Sheet for each compound
suspected of being present on-site is contained in Appendix B.

Landfills 2, 4, 5 and 6 are suspected of supporting a large population of
Eastern Diamondback Rattlesnakes. Snake bite kits will be present on-site
during all operations.

D. SITE SAFETY PROCEDURES

Map/Sketch Attached? Yes

Site Secured? Yes

Perimeter Identified? Yes Zone(s) of Contamination Identified? Yes

Perimeter Establishment: Access to Mayport NAVSTA is restricted at all points.

PERSONNEL PROTECTION

TASK

MINIMUM LEVEL OF PROTECTION

All Sites Active

Level D

Modifications: Level C protection will be used as a contingency should photoionization meter readings exceed 5.0 ppm in ambient air and if identification of the compounds present can be made.

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring and upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established on-site. Field work preparation, staging, and decontamination will take place in this area (see Figure 8.1)

TEAM ORGANIZATION:

<u>Team Member</u>	<u>Responsibility</u>
<u>T. Allen</u>	<u>Site Safety Officer</u>
<u>E. Thomas</u>	<u>Team Leader</u>
<u>T. Greenhalgh</u>	<u>Sampler</u>
<u>C. Goodwin</u>	<u>Sampler</u>
<u>R. Allen</u>	<u>Geophysics</u>
<u>J. Dumeyer</u>	<u>Drilling Inspector</u>
<u>K. Peterson</u>	<u>Drilling Inspector</u>
<u> </u>	<u> </u>

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as
restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL:

Personnel will use Level D Protection. See p. A-8 for a list of personnel
protective gear. Decontamination fluids will be containerized and turned over
to base personnel to incorporate with their hazardous waste.

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance 246-5444
Hospital Emergency Room 246-5648/5640
Poison Control Center 1-800-682-9211
Police 246-5592
Fire Department 246-5333
Airport (NAF) 241-6150
Explosives Unit _____
EPA Contact _____

SITE RESOURCES

Water Supply J. Riley, 246-5215
Telephone J. Riley, 246-5215
Utilities J. Riley, 246-5215
Security 241-6301
Other _____

EMERGENCY CONTACTS

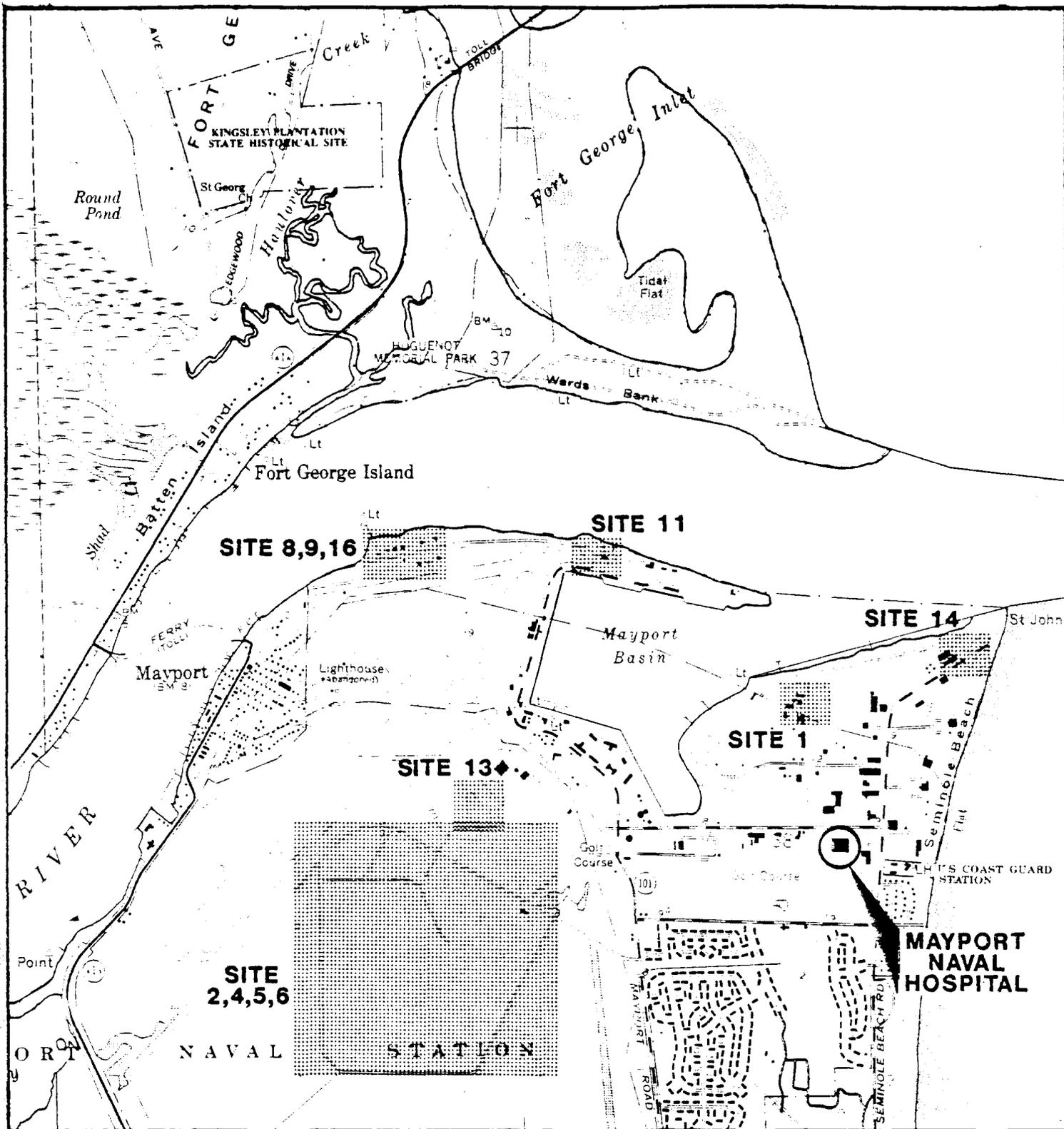
1. Dr. Frank Lawrence (207) 871-2617
2. Bruce Campbell, RPh. (207) 871-2449
3. Maine Poison Control Center. (207) 871-2950
4. E.C. Jordan (Maine). (207) 775-5401
5. E.C. Jordan (Florida). (904) 656-1293
6. E.C. Jordan (Detroit). (313) 569-3955
7. Envirologic Data (207) 773-3020
8. USEPA Emergency Response (800) 424-8802
- 9.
- 10.

F. EMERGENCY ROUTES

(Give road or other directions; attach map)

HOSPITAL: Base medical facility is located at Building No. 1363 on Massey Avenue. Approximately 500 feet east of the intersection of Massey Avenue and Bon Homme Richard Road (see Map).

SITE EVACUATION: On the event that the site needs to be evacuated, Jordan personnel will notify base security and Jose' Negron of Civil Engineering and evacuate through the nearest gate.



MAP LOCATION



SCALE



<p>EC JORDAN CO. CONSULTING ENGINEERS</p>		<p>TITLE NAVSTA HOSPITAL LOCATION</p>	
<p>CLIENT U.S. DEPARTMENT OF THE NAVY</p>		<p>VERIFICATION PHASE NACIP CONFIRMATION STUDY</p>	
<p>SITE MAYPORT NAVAL STATION MAYPORT, FLORIDA</p>		<p>JOB NO. 5097-00</p>	<p>FIGURE A-1</p>

TABLE A-2

DECONTAMINATION EQUIPMENT/MATERIALS

Quantity	Type	Remarks
4	. . . . . wash tubs	
	<u>High pressure water sprayer</u>	
2	. . . . . cold	
0	. . . . . hot	
2	. . . . . steam sprayer	
4	. . . . . scrub brushes	
	<u>Containers</u>	
2	. . . . . contaminated liquids	
60	. . . . . contaminated disposables	trash bags
4 bx	. . . . . detergent	
10 gal	. . . . . methanol/acetone/ <u>(isopropanol)</u>	
90 gal	. . . . . deionized water	
6 rolls.	. . . . . disposable wipes	
0	. . . . . plastic wrap	
100	. . . . . Ziploc bags	

APPENDIX B
CHEMICAL HAZARD DATA SHEETS

BENZENE

BNZ

<p>Common Synonyms Benzol Benzole</p>		<p>Wetery liquid Colorless Gasoline-like odor</p>	<p>Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.</p>																																				
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>																																							
<p>Fire</p>	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>																																						
<p>Exposure</p>	<p>CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>																																						
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>																																						
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>																																					
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C₆H₆ 3.3 IMO/UN Designation: 3.2/1114 3.4 DOT ID No.: 1114 3.5 CAS Registry No.: 71-43-2</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic, rather pleasant aromatic odor; characteristic odor</p>																																					
<p>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene. 5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, Coma and possible death. 5.3 Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen. 5.4 Threshold Limit Value: 10 ppm 5.5 Short Term Inhalation Limits: 75 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3. LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Leukemia 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 4.68 ppm 5.11 IDLH Value: 2,000 ppm</p>																																							
<p>6. FIRE HAZARDS 6.1 Flash Point: 12°F C.C. 6.2 Flammable Limits in Air: 1.3%-7.9% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back 6.7 Ignition Temperature: 1097°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 6.0 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																																							
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>																																							
<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm/6 hr/minnow/lethal/distilled water 20 ppm/24 hr/sunfish/TL₅₀/tap water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days 8.4 Food Chain Concentration Potential: None</p>																																							
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: Industrial, pure 99 + % Thiophene-free 99 + % Nitration 99 + % Industrial 90% 85 + % Reagent 99 + % 9.2 Storage Temperature: Open 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>																																							
<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p>																																							
<p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 MFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>				Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	1	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	1	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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Flammability (Red)	3																																						
Reactivity (Yellow)	0																																						
<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 78.11 12.3 Boiling Point at 1 atm: 178°F = 80.1°C = 353.3°K 12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K 12.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K 12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m² 12.7 Specific Gravity: 0.879 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 2.7 12.11 Ratio of Specific Heats of Vapor (Gas): 1.061 12.12 Laten Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 x 10⁴ J/kg 12.13 Heat of Combustion: -17,460 Btu/lb = -9698 cal/g = -406.0 x 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 30.45 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.22 psia</p>																																							
<p>NOTES</p>																																							

CADMIUM SULFATE

CMS

<p>Common Synonyms</p>	<p style="text-align: center;">Solid White Odorless</p> <p style="text-align: center;">Sinks and mixes slowly with water.</p>
<p>AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear a dust respirator. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.</p>
Exposure	<p>CALL FOR MEDICAL AID</p> <p>DUST POISONOUS IF INHALED. If inhaled will cause headache, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
Water Pollution	<p>Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-water contaminant Disperse and flush</p>	<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Not listed 3.2 Formula: CdSO₄ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2570 3.5 CAS Registry No.: 10124-36-4</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None</p>
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: BU. Mines approved respirator; rubber gloves; safety goggles 5.2 Symptoms Following Exposure: Inhalation may cause dryness of throat, coughing, constriction in chest, and headache. Ingestion may cause salivation, vomiting, abdominal pains, or diarrhea. Contact with eyes causes irritation. 5.3 Treatment of Exposure: INHALATION: remove victim from exposure and consult a physician. INGESTION: induce vomiting, then allay irritation with milk or egg whites given at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 10 min.; consult a physician. SKIN: wash with soap and water. 5.4 Threshold Limit Value: 0.05 mg/m³ (as cadmium) 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3; oral mouse LD₅₀ = 88 mg/kg 5.7 Late Toxicity: Delayed liver, kidney, and lung damage has followed respiratory exposures to cadmium salts in industry. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless 5.11 IDLH Value: 40 mg/m³ as Cd</p>	

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic cadmium oxide fume may form in fires. 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">SS</p>
<p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Not listed 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 1000 ppm/ /fish/LC₅₀/fresh water *Time period not specified 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Shellfish concentrate cadmium 900-1600 times</p>	<p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 208.46 12.3 Boiling Point at 1 atm: Not pertinent (decomposes) 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 4.7 at 20°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: -92 Btu/lb = -51.3 cal/g = -2.15 X 10⁴ J/kg 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 22.9 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical: 6/3 Hydrate grade; Reagent 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>	<p style="text-align: center;">NOTES</p>

CHROMIC SULFATE

CHS

<p>Common Synonyms Chromium sulfate Dichromium sulfate Chromium III sulfate Dichromium trisulfate Sulfuric acid, Chromium (3+) salt (3-2)</p>	<p>Solid Peach, Violet, Dark green Sink and rinse with water.</p>	<p>Odorless</p>	
<p>Avoid contact with solid and solution. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber gloves. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	Fire data not available.		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>DUST Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration.</p> <p>SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-water contaminant. Chemical and physical treatment. Disperse and flush.</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not listed</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Not listed 3.2 Formula: Cr₂(SO₄)₃ Cr₂(SO₄)₃ · 10H₂O (technical) 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 9100 3.5 CAS Registry No.: 10101-53-8</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid 4.2 Color: Peach-anhydrous, green and violet-hydrated forms, technical product-dark green 4.3 Odor: None</p>	
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Rubber gloves, safety glasses, laboratory coat, dust mask. 5.2 Symptoms Following Exposure: INHALATION: Corrosive action on mucous membranes. SKIN: May elicit an allergic reaction. Corrosive action on skin. Lesions confined to exposed parts. 5.3 Treatment of Exposure: Call a physician. EYES: Wash with plenty of water. SKIN: Wash exposed parts well with water. 5.4 Threshold Limit Value: 0.5 mg/m³ as Cr. 5.5 Short Term Inhalation Limits: 1.5 mg/m³. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 mg/kg. 5.7 Late Toxicity: A potential carcinogen for man. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent 5.11 IDLH Value: 250 mg/m³</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Any media suitable for the supporting fire. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Decomposes to chromic acid when heated. 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Add water slowly, stir in slight excess of soda ash. Let stand 24 hours. Neutralize with 6N HCl. Flush with large excess of water. 7.5 Polymerization: Will not occur. 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p> <p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Lethal concentration to sticklebacks 1.2 mg/l. Fish critical concentration 1 mg/l. 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Cr⁶⁺ lowers 5-day BOD 50% at concentrations from 82.5 to 117 mg/l. 8.4 Food Chain Concentration Potential: Data not available</p> <p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Store in cool, dry place. 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) II (anhydrous salt) SS (hydrated forms)</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-E 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 MFPA Hazard Classification: Not listed</p> <p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 392.20 12.3 Boiling Point at 1 atm: Loses water of hydration Cr₂(SO₄)₃ · 18 loses 12 Cr₂(SO₄)₃ · 15 loses 10 12.4 Freezing Point: 212°F = 100°C = 373.1°K 12.5 Critical Temperature: Data not available 12.6 Critical Pressure: Data not available 12.7 Specific Gravity: 3.012 at room temperature for anhydrous salt. Hydrated: 1.887 at 17°C for 15 H₂O Hydrated: 1.7 at 22°C for 18 H₂O 12.8 Liquid Surface Tension: Data not available 12.9 Liquid Water Interfacial Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: Data not available 12.11 Ratio of Specific Heats of Vapor (Gas): Data not available 12.12 Latent Heat of Vaporization: Data not available 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Data not available 12.15 Heat of Solution: Data not available 12.16 Heat of Polymerization: Data not available 12.17 Heat of Fusion: Data not available 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: Data not available</p>
<p>NOTES</p>	

ETHYLBENZENE

ETB

Common Synonyms Ethylbenzene EB		Liquid Colorless Sweet, gasoline-like odor Floats on water. Flammable, irritating vapor is produced.
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. Victims will experience dizziness or difficult breathing. Victims should be removed to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic hydrocarbon 3.2 Formula: C ₈ H ₁₀ CH ₃ 3.3 IMO/UN Designation: 3.3/1175 3.4 DOT ID No.: 1175 3.5 CAS Registry No.: 100-41-4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles. 5.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. 5.3 Treatment of Exposure: INHALATION: If ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonia. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 200 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 0.5 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 140 ppm 5.11 IDLH Value: 2,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: 80°F O.C.; 59°F C.C. 6.2 Flammable Limits in Air: 1.0%-8.7% 6.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back. 6.7 Ignition Temperature: 860°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data Not Available (Continued)	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data Not Available 7.8 Reactivity Group: 32	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td>3</td> </tr> <tr> <td>Health.....</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td>2</td> </tr> <tr> <td>Poisons.....</td> <td>2</td> </tr> <tr> <td>Water Pollution.....</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td>2</td> </tr> <tr> <td>Reactivity.....</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td>1</td> </tr> <tr> <td>Water.....</td> <td>0</td> </tr> <tr> <td>Self Reaction.....</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>2</td> </tr> <tr> <td>Flammability (Red).....</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	3	Health.....		Vapor Irritant.....	2	Liquid or Solid Irritant.....	2	Poisons.....	2	Water Pollution.....		Human Toxicity.....	1	Aquatic Toxicity.....	3	Aesthetic Effect.....	2	Reactivity.....		Other Chemicals.....	1	Water.....	0	Self Reaction.....	0	Category	Classification	Health Hazard (Blue).....	2	Flammability (Red).....	3	Reactivity (Yellow).....	0
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8. WATER POLLUTION 8.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days 8.4 Food Chain Concentration Potential: None	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.17 12.3 Boiling Point at 1 atm: 277.2°F = 136.2°C = 409.4°K 12.4 Freezing Point: -139°F = -95°C = 178°K 12.5 Critical Temperature: 651.0°F = 343.9°C = 617.1°K 12.6 Critical Pressure: 523 psia = 35.6 atm = 3.61 MN/m ² 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g = 3.35 X 10 ⁴ J/kg 12.13 Heat of Combustion: -17,780 Btu/lb = -9877 cal/g = -413.5 X 10 ³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: Data Not Available 12.20 Limiting Value: Data Not Available 12.27 Reid Vapor Pressure: 0.4 psia																																				
9. SHIPPING INFORMATION 9.1 Grades of Purity: Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum	6. FIRE HAZARDS (Continued) 6.11 Stoichiometric Air to Fuel Ratio: Data Not Available 6.12 Flame Temperature: Data Not Available																																				

GASOLINES: STRAIGHT RUN

GSR

<p>Common Synonyms</p> <p>Watery liquid Colorless Gasoline odor</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>			<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: (a) <0°F C.C. (b) 0-73°F C.C. 6.2 Flammable Limits in Air: (a) 1.3%-7.1% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Class I, group D 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p>																																			
<p>Fire</p> <p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.</p>			<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td>1</td> </tr> <tr> <td>Poisons.....</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td>0</td> </tr> <tr> <td>Water.....</td> <td>0</td> </tr> <tr> <td>Self Reaction.....</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>1</td> </tr> <tr> <td>Flammability (Red).....</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	3	Health		Vapor Irritant.....	1	Liquid or Solid Irritant.....	1	Poisons.....	2	Water Pollution		Human Toxicity.....	1	Aquatic Toxicity.....	2	Aesthetic Effect.....	2	Reactivity		Other Chemicals.....	0	Water.....	0	Self Reaction.....	0	Category	Classification	Health Hazard (Blue).....	1	Flammability (Red).....	3	Reactivity (Yellow).....	0
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<p>Exposure</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting.</p>			<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>																																				
<p>Water Pollution</p> <p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes.</p>			<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 58-275°F = 14-135°C = 287-408°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.71-0.747 at 15°C (liquid) 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 3.4 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10⁴ J/kg 12.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>																																				
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>	<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>																																						
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not pertinent 3.3 IMO/UN Designation: 3.1, 3.2/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline</p>																																						
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, subaternal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat. 5.3 Treatment of Exposure: Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2: LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLM Value: Data not available</p>																																							
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 90 ppm/24 hr/Juvenile American shad/TL₅₀/fresh water 91 ppm/24 hr/Juvenile American shad/TL₅₀/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p>																																							
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Composition varies with range of distillation temperatures used. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																							
<p>NOTES</p>																																							

LEAD SULFIDE

LSU

<p>Common Synonyms Galena Plumbous sulfide</p>	<p>Solid, powder or crystal Black, silver</p> <p>Sinks in water.</p>
<p>AVOID CONTACT WITH POWDER OR DUST. Keep people away. Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>Not flammable. Poisonous and irritating gases produced when heated. Wear goggles and self-contained breathing apparatus.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>DUST. POISONOUS IF INHALED. Irritating to skin and eyes. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>SOLID. POISONOUS IF SWALLOWED. Flush affected area with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS or having CONVULSIONS, do nothing except keep victim warm.</p>
Water Pollution	<p>Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-Water pollutant. Restrict access. Should be removed. Chemical and physical treatment.</p>	<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CB Compatibility Class: Not listed 3.2 Formula: PbS 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2811 3.5 CAS Registry No.: 1314-87-0</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid 4.2 Color: Black powder or silver gray metallic crystals. 4.3 Odor: Data not available</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Protective clothing, rubber gloves, safety goggles, or face mask and an approved respirator. 5.2 Symptoms Following Exposure: INHALATION OR INGESTION: Abdominal pain, loss of appetite, weight loss, constipation, apathy or irritability, vomiting, fatigue, headache, weakness metallic taste and muscle incoordination. Lead line on gums. EYES: Irritation. May cause corneal destruction. SKIN: Pain and severe burns. 5.3 Treatment of Exposure: Call a doctor. INHALATION: Remove from exposure. EYES: Flush with running water. SKIN: Wash with soap and water. INGESTION: Gastric lavage if vomiting is not extensive. Give egg white or milk as demulcent. 5.4 Threshold Limit Value: 0.15 mg/m³. 5.5 Short Term Inhalation Limit: 0.45 mg/m³. 5.6 Toxicity by Ingestion: Grade 1. LD₅₀ 5-15 g/kg. 5.7 Late Toxicity: Accumulative poison: repeated exposure can lead to damage to the liver, kidney, blood and nervous system. A suspected carcinogen of the lungs and kidney. Some evidence of teratogenic effects in laboratory animals. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Use appropriate media to suppress exposure fire. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: At fire temperatures emits highly toxic and irritating sulfur oxides. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) II</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-E 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: > 1000 ppm/96 hr/fn fish/TL₅₀ 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Positive, is concentrated in the food chain.</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 18°C and 1 atm: Solid 12.2 Molecular Weight: 239.27 12.3 Boiling Point at 1 atm: 2337.8°F = 1281°C = 1554.2°K. 12.4 Freezing Point: 2037.2°F = 1114°C = 1387.2°K. 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 7.5 at 20°C. 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: 8.25 (calculated). 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 17.3 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Data not available 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available</p>	
<p>NOTES</p>	

MERCURIC SULFATE

MRS

Common Synonyms Mercury bisulfate Mercury persulfate Mercury (II) sulfate (1:1)		Solid Sinks in water.	White	Odorless
Avoid contact with dust or solid. Keep people away. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Not flammable.		
Exposure		CALL FOR MEDICAL AID. DUST Irritating to skin, eyes, and nose. If inhaled, will cause coughing, pain, and breathing difficulty. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning, water contaminant, poison. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 2.1 Category: Poison 2.2 Class: 6		
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: HgSO ₄ 3.3 IMO/UN Designation: 6.1/1845 3.4 DOT ID No.: 1845 3.5 CAS Registry No.: 7783-35-9		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Odorless		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, rubber gloves, protective clothing, rubber apron, and safety goggles. 5.2 Symptoms Following Exposure: INHALATION: Acute poisoning: Tightness in chest, breathing difficulty, coughing, and pain. EYES: Ulceration of conjunctiva and cornea. SKIN: Irritation; may cause sensitization dermatitis. INGESTION: Necrosis, pain, vomiting, severe purging. Patient may die within a few hours from peripheral vascular collapse. 5.3 Treatment of Exposure: Get medical attention. INHALATION: Remove from exposure. EYES: Flush with water. SKIN: Flush with water. INGESTION: Give egg whites, milk, or activated charcoal, then induce vomiting. Consult physician. 5.4 Threshold Limit Value: 0.1 mg/m ³ as Hg. 5.5 Short Term Inhalation Limits: 0.15 mg/m ³ as Hg. 5.6 Toxicity by Ingestion: Grade 4; LD ₅₀ = 50 mg/kg. 5.7 Late Toxicity: Damaged kidney, heart, lung, and brain. Psychic and emotional disturbances: fine tremors of hands, head, lips, tongue, and jaw. Salivation, gingivitis, and digestive disturbances are common. Stomatitis is sometimes severe. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact. 5.10 Odor Threshold: Odorless. 5.11 IDLH Value: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) SS	
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: Decomposes into yellow insoluble basic sulfate and H ₂ SO ₄ . 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Data not available 7.5 Polymerization: Will not occur 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available		11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Poison, B 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed	
8. WATER POLLUTION 8.1 Aquatic Toxicity: Mercuric ions are considered highly toxic to aquatic life. 0.004 to 0.02 mg/l Hg have been reported harmful to freshwater fish. 0.01 mg/l HgSO ₄ has killed minnows in 80 to 92 days. 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 296.66 12.3 Boiling Point at 1 atm: Not pertinent - decomposes 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Data not available 12.6 Critical Pressure: Data not available 12.7 Specific Gravity: 6.47 at room temperature 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Data not available 12.12 Latent Heat of Vaporization: Data not available 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Data not available 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 4.6 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available	
9. SHIPPING INFORMATION 9.1 Grades of Purity: 100% 9.2 Storage Temperature: Cool 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available		NOTES	

METHYL CHLORIDE

MTC

Common Synonyms Chloromethane Arlic		Gas Colorless Odorless or sweet odor
Floats and boils on water. Flammable, visible vapor cloud is formed.		
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.	
Exposure	CALL FOR MEDICAL AID. VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.	
Water Pollution	Not harmful to aquatic life.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability, air contaminant Restrict access Evacuate area		2. LABEL 2.1 Category: Flammable gas 2.2 Class: 2
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH ₂ Cl 3.3 IMO/UN Designation: 2.0/1063 3.4 DOT ID No.: 1063 3.5 CAS Registry No.: 74-87-3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Faint, sweet, non-irritating; faint ether-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister mask; leather or vinyl gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances; high concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite. 5.3 Treatment of Exposure: Remove to fresh air. Call a doctor and have patient hospitalized for observation of slowly developing symptoms. 5.4 Threshold Limit Value: 50 ppm 5.5 Short Term Inhalation Limits: 100 ppm for 5 min. 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it evaporates quickly. May cause frostbite. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 10,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: <32°F C.C. 6.2 Flammable Limits in Air: 8.1%-17.2% 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide. Stop flow of gas. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion: Products: Toxic and irritating gases are generated in fires. 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 1170°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 2.2 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: 4.078 (Est) 6.12 Flame Temperature: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Reacts with zinc, aluminum, magnesium, and their alloys; reaction is not violent. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36
8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
9. SHIPPING INFORMATION 9.1 Grades of Purity: Technical grade: "Arlic" refrigerant grade 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Safety relief

10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-B-C-D-E-F-G																																				
11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable gas 11.2 NAB Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td>4</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td>0</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td>0</td> </tr> <tr> <td>Poisons.....</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td>0</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td>0</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td>1</td> </tr> <tr> <td>Water.....</td> <td>0</td> </tr> <tr> <td>Sell Reaction.....</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>2</td> </tr> <tr> <td>Flammability (Red).....</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	4	Health		Vapor Irritant.....	0	Liquid or Solid Irritant.....	0	Poisons.....	2	Water Pollution		Human Toxicity.....	0	Aquatic Toxicity.....	1	Aesthetic Effect.....	0	Reactivity		Other Chemicals.....	1	Water.....	0	Sell Reaction.....	0	Category	Classification	Health Hazard (Blue).....	2	Flammability (Red).....	4	Reactivity (Yellow).....	0
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Flammability (Red).....	4																																			
Reactivity (Yellow).....	0																																			
12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Gas 12.2 Molecular Weight: 50.49 12.3 Boiling Point at 1 atm: -11.8°F = -24.2°C → 249°K 12.4 Freezing Point: -143.9°F = 97.7°C = 175.5°K 12.5 Critical Temperature: 290.5°F = 143.6°C = 416.6°K 12.6 Critical Pressure: 969 psia = 65.9 atm = 6.68 MN/m ² 12.7 Specific Gravity: 0.997 at -24°C (liquid) 12.8 Liquid Surface Tension: 16.2 dynes/cm = 0.0162 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at -24°C 12.10 Vapor (Gas) Specific Gravity: 1.7 12.11 Ratio of Specific Heats of Vapor (Gas): 1.259 12.12 Latent Heat of Vaporization: 182.3 Btu/lb = 101.3 cal/g = 4.241 X 10 ⁴ J/kg 12.13 Heat of Combustion: -5290 Btu/lb = -2939 cal/g = -123.1 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 116.7 psia																																				
NOTES																																				

MINERAL SPIRITS

MNS

<p>Common Synonyms Petroleum spirits Naphtha</p>	<p>Watery liquid Floats on water.</p>	<p>Colorless</p>	<p>Gasoline-like odor</p>		
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>					
Fire	<p>Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>				
Exposure	<p>CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>				
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>				
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>			
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1300 3.4 DOT ID No.: 1300 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline</p>			
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Plastic gloves; goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: INHALATION: mild irritation of respiratory tract. ASPIRATION: severe lung irritation and rapidly developing pulmonary edema; central nervous system excitement followed by depression. INGESTION: irritation of stomach. 5.3 Treatment of Exposure: INHALATION: remove victim to fresh air. ASPIRATION: enforce bed rest; give oxygen; call a doctor. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: 4000-7000 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>					
<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 105–140°F C.C., depending on grade 6.2 Flammable Limits in Air: 0.8%-5.0% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Do not use straight hose water stream. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 540°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>			<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>		
<p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>			<p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Combustible liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue)..... 0 Flammability (Red)..... 2 Reactivity (Yellow)..... 0</p>		
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p>			<p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 310–395°F = 154–202°C = 428–475°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.78 at 20°C (liquid) 12.8 Liquid Surface Tension: Data not available 12.9 Liquid Water Interfacial Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.030 12.12 Latent Heat of Vaporization: Data not available 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: Data not available 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: 0.13 psia</p>		
<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Various grades available. 70-100% of the materials are derived from petroleum, and 0-30% are aromatic hydrocarbons like benzene and toluene. Flash points vary with the exact composition but are usually above 100°F. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>			<p style="text-align: center;">NOTES</p>		

OILS: DIESEL

ODS

<p>Common Synonyms Fuel oil 1-D Fuel oil 2-D</p>	<p>Oil; liquid Yellow-brown Lube or fuel oil odor</p>	<p>Floats on water.</p>	
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixture 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.1/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light brown 4.3 Odor: Like fuel oil</p>	
<p>5. HEALTH HAZARDS</p>			
<p>5.1 Personal Protective Equipment: Goggles or face shield. 5.2 Symptoms Following Exposure: If liquid is ingested, an increased frequency of bowel movements will occur. 5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. SKIN: wipe off, wash with soap and water. EYES: wash with copious amounts of water for at least 15 min. 5.4 Threshold Limit Value: No single TLV applicable. 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: (1-D) 100°F C.C.; (2-D) 125°F C.C. 6.2 Flammable Limits in Air: 1.3-8.0 vol.% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: (1-D) 350-525°F (2-D) 490-545°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>								
<p>II. HAZARD CLASSIFICATIONS</p>									
<p>11.1 Code of Federal Regulations: Combustible liquid 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>0</td> </tr> <tr> <td>Flammability (Red).....</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue).....	0	Flammability (Red).....	2	Reactivity (Yellow).....	0
Category	Classification								
Health Hazard (Blue).....	0								
Flammability (Red).....	2								
Reactivity (Yellow).....	0								
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>									
<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 550-640°F = 288-338°C = 561-612°K 12.4 Freezing Point: 0 to -30°F = -18 to -34°C = 255 to 239°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.841 at 15°C (liquid) 12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: -18,400 Btu/lb = -10,200 cal/g = 429 X 10⁶ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Varies</p>									
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 204 mg/l/24 hr/Juvenile American shad/TL₅₀/salt water 8.2 Waterfowl Toxicity: > 20 ml/kg /LD₅₀/mallards 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>									
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Diesel Fuel 1-D (ASTM); Diesel Fuel 2-D (ASTM) 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>									
<p>NOTES</p>									

OILS, MISCELLANEOUS: LUBRICATING

OLB

<p>Common Synonyms</p> <p>Crackcase oil Transmission oil Motor oil</p>	<p>Oily liquid</p> <p>Yellow-brown</p> <p>Lube oil odor</p>	<p>Floats on water.</p>
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
Fire	<p>Combustible.</p> <p>Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed.</p> <p>Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook)</p> <p>Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures</p> <p>3.2 Formula: Not applicable</p> <p>3.3 IMO/UN Designation: 3.3/1270</p> <p>3.4 DOT ID No.: 1270</p> <p>3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow fluorescent 4.3 Odor: Characteristic</p>
<p>5. HEALTH HAZARDS</p> <p>6.1 Personal Protective Equipment: Protective gloves; goggles or face shield.</p> <p>6.2 Symptoms Following Exposure: INGESTION: minimal gastrointestinal tract irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure.</p> <p>6.3 Treatment of Exposure: INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.</p> <p>6.4 Threshold Limit Value: Data not available</p> <p>6.5 Short Term Inhalation Limits: Data not available</p> <p>6.6 Toxicity by Ingestion: Grade I; LD₅₀ = 5 to 15 g/kg</p> <p>6.7 Late Toxicity: Data not available</p> <p>6.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>6.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.</p> <p>6.10 Odor Threshold: Data not available</p> <p>6.11 IDLH Value: Data not available</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 300°F C.C.</p> <p>6.2 Flammable Limits in Air: Data not available</p> <p>6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water of foam may cause frothing.</p> <p>6.5 Special Hazards of Combustion Products: Not pertinent</p> <p>6.6 Behavior in Fire: Not pertinent</p> <p>6.7 Ignition Temperature: 500°F-700°F</p> <p>6.8 Electrical Hazard: Not pertinent</p> <p>6.9 Burning Rate: 4 mm/min.</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>								
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Not listed</p> <p>11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed</p> <p>11.3 NFPA Hazard Classification</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td style="text-align: right;">Health Hazard (Blue)</td> <td style="text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">Flammability (Red)</td> <td style="text-align: right;">1</td> </tr> <tr> <td style="text-align: right;">Reactivity (Yellow)</td> <td style="text-align: right;">0</td> </tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): Data not available</p> <p>8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: Not pertinent</p> <p>12.3 Boiling Point at 1 atm: Very high</p> <p>12.4 Freezing Point: Not pertinent</p> <p>12.5 Critical Temperature: Not pertinent</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity: (est.) 0.902 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 36-37.5 dynes/cm = 0.036-0.0375 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 33-54 dynes/cm = 0.033-0.054 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent</p> <p>12.12 Latent Heat of Vaporization: Not pertinent</p> <p>12.13 Heat of Combustion: -18,486 Btu/lb = -10,270 cal/g = -429.98 X 10³ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: Data not available</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: Data not available</p>								
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Various viscosities</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Open (flame arrester)</p>	<p style="text-align: center;">NOTES</p>								

OILS, MISCELLANEOUS: MINERAL

OMN

<p>Common Synonyms White oil Liquid Petroleum</p>	<p>Oily liquid Colorless Odorless</p> <p>Floats on water.</p>
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p>Fire</p>	<p>Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Very faint</p>
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Goggles or face shield. 5.2 Symptoms Following Exposure: Ingestion of liquid can cause very loose bowel movements. 5.3 Treatment of Exposure: EYES: wash with water. 5.4 Threshold Limit Value: 5 mg/m³ (mist) 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent 5.11 IDLM Value: Data not available</p>	

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 380°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 500–700°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>
<p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Not listed 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) 0 Flammability (Red) 1 Reactivity (Yellow) 0</p>
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.822 at 20°C (liquid) 12.8 Liquid Surface Tension: 27 dynes/cm = 0.027 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 47 dynes/cm = 0.047 N/m at 70°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Commercial; refined 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>	
<p>NOTES</p>	

OILS, MISCELLANEOUS: PENETRATING

OPT

<p>Common Synonyms Preservative oil Water displacing oil</p>	<p>Oily liquid Flots on water.</p>	<p>Yellow</p>	<p>Motor oil-like odor</p>		
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>					
Fire	<p>Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.</p>				
Exposure	<p>CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>				
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>				
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>			
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designator: 3.3/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellowish 4.3 Odor: Like motor oil</p>			
<p>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield. 5.2 Symptoms Following Exposure: Liquid may irritate stomach and increase frequency of bowel movements. 5.3 Treatment of Exposure: INGESTION: have victim drink water or milk; do NOT induce vomiting. ASPIRATION: check for delayed development of pulmonary irritation by serial x-rays. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available 5.11 IDLN Value: Data not available</p>					
<p>6. FIRE HAZARDS 6.1 Flash Point: 295°F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>					
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>					
<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>					
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: Commercial 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>					
<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>					
<p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Not listed 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>					
<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very High 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.8961 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.8 dynes/cm = 0.0298 N/m at 24°C 12.9 Liquid Water Interfacial Tension: 5.5 dynes/cm = 0.0055 N/m at 22°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: (est.) -18,000 Btu/lb = -10,000 cal/g = -420 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>					
<p>NOTES</p>					

OILS, MISCELLANEOUS: TRANSFORMER

OTF

<p>Common Synonyms Insulating oil Electrical insulating oil Petroleum insulating oil</p>	<p>Oily liquid Floats on water.</p>	<p>Colorless to light brown</p>	<p>Motor oil-like odor</p>
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>Combustible. Extinguish with foam, dry chemical, carbon dioxide. Water may be ineffective on fire.</p>		
Exposure	<p>CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light brown 4.3 Odor: Like motor oil</p>	
<p>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Ingestion of liquid may irritate stomach and cause increased frequency of bowel movements. If taken into lungs, delayed pulmonary irritation may occur. 5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. ASPIRATION: check for delayed irritation by serial X-rays. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>			

<p>6. FIRE HAZARDS 6.1 Flash Point: 285°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Not listed 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue)..... 0 Flammability (Red)..... 1 Reactivity (Yellow)..... 0</p>
<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: -75°F = -59°C = 214°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.891 at 15°C (liquid) 12.8 Liquid Surface Tension: Data not available 12.9 Liquid Water Interfacial Tension: 49 dynes/cm = 0.049 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: Data not available 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: Data not available</p>
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>	
<p>NOTES</p>	

SULFURIC ACID

SFA

Common Synonyms Oil of vitriol Battery acid Fertilizer acid Chamber acid		Oily liquid	Colorless	Odorless
Sinks and mixes violently with water. Irritating mist is produced.				
<p>AVOID CONTACT WITH LIQUID. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
Fire		<p>Not flammable. May cause fire on contact with combustibles. Flammable gas may be produced on contact with metals. POISONOUS GAS MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing. DO NOT USE WATER ON ADJACENT FIRES. Extinguish with dry chemical or carbon dioxide.</p>		
Exposure		<p>CALL FOR MEDICAL AID. MIST Irritating to eyes, nose and throat. If inhaled, will cause coughing, difficult breathing, or loss of consciousness. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution		<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-corrosive Restrict access Disperse and flush with care</p>		<p>2. LABEL 2.1 Category: Corrosive 2.2 Class: 8</p>		
<p>3. CHEMICAL DESIGNATIONS 3.1 CD Compatibility Class: Sulfuric acid 3.2 Formula: H₂SO₄ 3.3 IMO/UN Designation: 8.0/1830 3.4 DOT ID No.: 1830 3.5 CAS Registry No.: 7664-93-0</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless (pure) to dark brown 4.3 Odor: Odorless unless hot, then choking</p>		
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Safety shower; eyewash fountain; safety goggles; face shield; approved respirator (self-contained or air-line); rubber safety shoes; rubber apron. 5.2 Symptoms Following Exposure: Inhalation of vapor from hot, concentrated acid may injure lungs. Swallowing may cause severe injury or death. Contact with skin or eyes causes severe burns. 5.3 Treatment of Exposure: Call a doctor. INHALATION: observe victim for delayed pulmonary reaction. INGESTION: have victim drink water if possible; do NOT induce vomiting. EYES AND SKIN: wash with large amounts of water for at least 15 min.; do not use oils or ointments in eyes; treat skin burns. 5.4 Threshold Limit Value: 1 mg/m³ 5.5 Short Term Inhalation Limits: 10 mg/m³ for 5 min.; 5 mg/m³ for 10 min.; 2 mg/m³ for 30 min.; 1 mg/m³ for 60 min. 5.6 Toxicity by Ingestion: No effects except those secondary to tissue damage. 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors from hot acid (77-98%) cause moderate irritation of eyes and respiratory system. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: 77-98% acid causes severe second- and third-degree burns of skin on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Greater than 1 mg/m³ 5.11 IDLH Value: 80 mg/m³</p>				

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits In Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Water used on adjacent fires should be carefully handled. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not flammable 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: None 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>		<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-O</p>																																					
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: Reacts violently with evolution of heat. Spattering occurs when water is added to the compound. 7.2 Reactivity with Common Materials: Extremely hazardous in contact with many materials, particularly metals and combustibles. Dilute acid reacts with most metals, releasing hydrogen which can form explosive mixtures with air in confined spaces. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Dilute with water, then neutralize with lime, limestone, or soda ash. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent</p> <p style="text-align: right;">(Continued)</p>		<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Corrosive material</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>0</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>4</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>4</td> </tr> <tr> <td>Water</td> <td>3</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table> <p style="text-align: right;">W</p>		Category	Rating	Fire	0	Health		Vapor Irritant	2	Liquid or Solid Irritant	4	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	4	Water	3	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	2
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 24.5 ppm/24 hr/bluegill/lethal/fresh water 42.5 ppm/48 hr/drawn/LC50/salt water 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p>		<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 98.08 12.3 Boiling Point at 1 atm: 644°F = 340°C = 613°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.84 at 20°C (liquid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: -418.0 Btu/lb = -232.2 cal/g = -9.715 X 10⁴ J/kg 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Low</p> <p>*Physical properties apply to concentrated (98%) acid unless otherwise stated. More dilute acid is more water-like.</p>																																					
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: CP; USP; Technical, at 33% to 98% (50° Be to 66° Be). 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>		<p>7. CHEMICAL REACTIVITY (Continued)</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 2</p>																																					

TETRACHLOROETHYLENE

TTE

<p>Common Synonyms Tetracap Perclene Perchloroethylene Perk</p>	<p>Watery liquid Colorless Sweet odor</p>	<p>Sinks in water. Irritating vapor is produced.</p>
<p>Stop discharge if possible. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
Fire	<p>Not flammable. Poisonous gases are produced when heated.</p>	
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>	
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment	2. LABEL 2.1 Category: None 2.2 Class: Not pertinent	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: C ₂ Cl ₄ 3.3 IMO/IUM Designation: 9.0/1897 3.4 DOT ID No.: 1897 3.5 CAS Registry No.: 127-18-4	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ethereal; like chloroform; mildly sweet	
5. HEALTH HAZARDS		
<p>6.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves.</p> <p>6.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.</p> <p>6.3 Treatment of Exposure: INHALATION: If illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.</p> <p>6.4 Threshold Limit Value: 50 ppm</p> <p>6.5 Short Term Inhalation Limits: 100 ppm for 60 min.</p> <p>6.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg</p> <p>6.7 Lethal Toxicity: None</p> <p>6.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or throat if present in high concentrations. The effect is temporary.</p> <p>6.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.</p> <p>6.10 Odor Threshold: 5 ppm</p> <p>6.11 IDLH Value: 500 ppm</p>		

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic, irritating gases may be generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p> <p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p> <p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Dry cleaning and industrial grades: 95+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X</p> <p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-A</p> <p>11.2 NAB Hazard Rating for Bulk Water Transportation: Category Rating Fire..... 0 Health Vapor Irritant..... 1 Liquid or Solid Irritant..... 1 Poisons..... 2 Water Pollution Human Toxicity..... 1 Aquatic Toxicity..... 3 Aesthetic Effect..... 2 Reactivity Other Chemicals..... 1 Water..... 0 Self Reaction..... 1</p> <p>11.3 NFPA Hazard Classification: Not listed</p> <p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 165.83</p> <p>12.3 Boiling Point at 1 atm: 250°F = 121°C = 394°K</p> <p>12.4 Freezing Point: -8.3°F = -22.4°C = 250.8°K</p> <p>12.5 Critical Temperature: 657°F = 347°C = 620°K</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity: 1.83 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0313 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 25°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.116</p> <p>12.12 Latent Heat of Vaporization: 90.2 Btu/lb = 50.1 cal/g = 2.10 X 10⁴ J/kg</p> <p>12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.16 Heat of Solution: Not pertinent 12.18 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.28 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p> <p style="text-align: center;">NOTES</p>
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TOLUENE

TOL

<p>Common Synonyms</p> <p>Toluol Methylbenzene Methylbenzol</p>	<p>Watery liquid</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>	<p>Colorless</p>	<p>Pleasant odor</p>
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area</p>		<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C₇H₈ 3.3 IMO/UN Designation: 3.2/1204 3.4 DOT ID No.: 1204 3.5 CAS Registry No.: 108-88-3</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, aromatic, benzene-like; distinct, pleasant</p>	
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. 5.3 Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 600 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Kidney and liver damage may follow ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.17 ppm 5.11 IDLH Value: 2,000 ppm</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 40°F C.C.; 55°F O.C. 6.2 Flammable Limits in Air: 1.2%-7% 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 997°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.7 mm/min. 6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;"><i>(Continued)</i></p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 1180 mg/l/96 hr/sunfish/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0%, 5 days; 38% (theor), 8 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 92.14 12.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K 12.4 Freezing Point: -139°F = -85.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.6°C = 591.8°K 12.6 Critical Pressure: 596.1 psia = 40.55 atm = 4.100 MN/m² 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.089 12.12 Latent Heat of Vaporization: 155 Btu/lb = 66.1 cal/g = 3.61 X 10⁴ J/kg 12.13 Heat of Combustion: -17,430 Btu/lb = -9688 cal/g = -405.5 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 17.17 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 1.1 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research, reagent, nitration-all 99.8 + %, industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons: 90/120: less pure than industrial. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																					
<p>6. FIRE HAZARDS (Continued)</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																																					

TRICHLOROETHANE

TCE

<p>Common Synonyms 1,1,1-Trichloroethane Methylchloroform Aurothene Chlorothene</p>		<p>Wetery liquid Colorless Sweet odor</p>																																					
<p>Sinks in water. Irritating vapor is produced.</p>																																							
<p>Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>																																							
<p>Fire</p>		<p>Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.</p>																																					
<p>Exposure</p>		<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, may produce nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>																																					
<p>Water Pollution</p>		<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>																																					
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>																																					
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH₂Cl₃ 3.3 IMO/IUM Designation: Not listed 3.4 DOT ID No.: 2831 3.5 CAS Registry No.: 71-55-6</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like; sweetish</p>																																					
<p>5. HEALTH HAZARDS</p> <p>6.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves; chemical safety goggles and face shield; neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection.</p> <p>6.2 Symptoms Following Exposure: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis.</p> <p>6.3 Treatment of Exposure: Get medical attention for all eye exposures and any other serious over-exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, supply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water.</p> <p>6.4 Threshold Limit Value: 350 ppm 6.5 Short Term Inhalation Limits: 1,000 ppm for 60 min. in man 6.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig) 6.7 Lethal Toxicity: Data not available 6.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 6.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 6.10 Odor Threshold: 100 ppm 6.11 IDLH Value: 1,000 ppm</p>																																							
<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: 7%-16% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion: Products: Toxic and irritating gases are generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 932°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: (est.) 2.9 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																																							
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: Reacts slowly, releasing corrosive hydrochloric acid. 7.2 Reactivity with Common Materials: Corrodes aluminum, but reaction is not hazardous. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36</p>																																							
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 75-150 ppm*/pinfish/TL₅₀/salt water *Time period not specified. 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>																																							
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Uninhibited; inhibited; industrial inhibited; white room; cold cleaning 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>																																							
<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y</p>																																							
<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-A 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>				Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0
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Flammability (Red)	1																																						
Reactivity (Yellow)	0																																						
<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 133.41 12.3 Boiling Point at 1 atm: 165°F = 74°C = 347°K 12.4 Freezing Point: <-38°F = <-39°C = <234°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.31 at 20°C (liquid) 12.8 Liquid Surface Tension: 25.4 dynes/cm = 0.0254 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 4.8 12.11 Ratio of Specific Heats of Vapor (Gas): 1.104 12.12 Latent Heat of Vaporization: 100 Btu/lb = 56 cal/g = 2.4 X 10⁴ J/kg 12.13 Heat of Combustion: (est.) 4700 Btu/lb = 2600 cal/g = 110 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 4.0 psia</p>																																							
<p>NOTES</p>																																							

TRICHLOROETHYLENE

TCL

<p>Common Synonyms</p> <p>Trichloroethylene Triclene; Alytlen Chlorylene Germalgene Triethylene Trichloron; Triena</p>		<p>Watery liquid</p> <p>Sinks in water. Irritating vapor is produced.</p>	<p>Colorless</p>	<p>Sweet odor</p>
<p>Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
<p>Fire</p>		<p>Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.</p>		
<p>Exposure</p>		<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
<p>Water Pollution</p>		<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>		
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: $\text{CHCl}_2-\text{CCl}_2$ 3.3 IMO/UN Designation: 9.0/1710 3.4 DOT ID No.: 1710 3.5 CAS Registry No.: 79-01-6</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like; etheral</p>		
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or vinyl gloves; chemical safety goggles; face-shield; neoprene safety shoes; neoprene suit or apron for splash protection.</p> <p>5.2 Symptoms Following Exposure: INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation.</p> <p>5.3 Treatment of Exposure: Do NOT administer adrenalin or epinephrine; get medical attention for all cases of overexposure. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon epsom salts in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water.</p> <p>5.4 Threshold Limit Value: 50 ppm 5.5 Short Term Inhalation Limits: 200 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; $\text{LD}_{50} = 50$ to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 50 ppm 5.11 IDLH Value: 1,000 ppm</p>				

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 90°F C.C.; practically nonflammable 6.2 Flammable Limits in Air: 8.0%-10.5% 6.3 Fire Extinguishing Agents: Water fog 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are produced in fire situations. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 770°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>		<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y</p>	
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36</p>		<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-A 11.2 MAS Hazard Rating for Bulk Water Transportation: Category Rating Fire..... 1 Health Vapor Irritant..... 1 Liquid or Solid Irritant..... 1 Poisons..... 2 Water Pollution Human Toxicity..... 1 Aquatic Toxicity..... 2 Aesthetic Effect..... 2 Reactivity Other Chemicals..... 0 Water..... 1 Self Reaction..... 1 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue)..... 2 Flammability (Red)..... 1 Reactivity (Yellow)..... 0</p>	
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 660 mg/l/40 hr/daphnia/kill/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>		<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 16°C and 1 atm: Liquid 12.2 Molecular Weight: 131.39 12.3 Boiling Point at 1 atm: 189°F = 87°C = 360°K 12.4 Freezing Point: -123.5°F = -86.4°C = 186.8°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.46 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.3 dynes/cm = 0.0293 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 34.5 dynes/cm = 0.0345 N/m at 24°C 12.10 Vapor (Gas) Specific Gravity: 4.5 12.11 Ratio of Specific Heats of Vapor (Gas): 1.116 12.12 Latent Heat of Vaporization: 103 Btu/lb = 57.2 cal/g = 2.4 X 10⁶ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 2.5 psia</p>	
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical; dry cleaning; degreasing; extraction 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>		<p>NOTES</p>	

TRICHLOROFLUOROMETHANE

TCF

Common Synonyms F-11; Freon 11 Genetron 11 Arcton 9 Isocron 11; Eskimon 11 Frigen 11 Isotron 11; Ucon 11		Liquid Colorless Odorless Sinks in water. Harmful vapor is produced. Boiling point is 75°F.	
Stop discharge if possible. Keep people away. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire		Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.	
Exposure		CALL FOR MEDICAL AID. VAPOR If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Not harmful.	
Water Pollution		Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: CFC12 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 75-69-4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Odorless; weak chlorinated solvent	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air line respirator; rubber gloves; monogoggles 5.2 Symptoms Following Exposure: Breathing concentrations approaching 10% in air will cause dizziness and drowsiness. Contact with tissues may cause frostbite. 5.3 Treatment of Exposure: INHALATION: remove victim to non-contaminated area and apply artificial respiration if breathing has stopped; call a physician immediately; oxygen inhalation may be utilized. SKIN: if frostbite has occurred, flush areas with warm water. 5.4 Threshold Limit Value: 1000 ppm 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Non-irritating 5.9 Liquid or Solid Irritant Characteristics: May cause frostbite. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Produces irritating and toxic products when heated to decomposition temperatures. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-C-I-J	
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available		11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Not listed 11.2 HAS Hazard Rating for Bulk Water Transportation: Data not available 11.3 NFPA Hazard Classification: Data not available	
8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Data not available 12.2 Molecular Weight: Data not available 12.3 Boiling Point at 1 atm: Data not available 12.4 Freezing Point: Data not available 12.5 Critical Temperature: Data not available 12.6 Critical Pressure: Data not available 12.7 Specific Gravity: Data not available 12.8 Liquid Surface Tension: Data not available 12.9 Liquid Water Interfacial Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: Data not available 12.11 Ratio of Specific Heats of Vapor (Gas): Data not available 12.12 Latent Heat of Vaporization: Data not available 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available	
9. SHIPPING INFORMATION 9.1 Grade of Purity: Technical 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Safety relief		NOTES	

m-XYLENE

XLM

<p>Common Synonyms 3-Dimethylbenzene Xylol</p>	<p>Watery liquid Colorless Sweet odor</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p style="text-align: center;">Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<p style="text-align: center;">Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<p style="text-align: center;">Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: m-C₈H₁₀(CH₃)₂ 3.3 IMO/UN Designator: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 108-36-3</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic</p>
<p>5. HEALTH HAZARDS</p>	
<p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm</p> <p>5.5 Short Term Inhalation Limits: 300 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 g/kg</p> <p>5.7 Late Toxicity: Kidney and liver damage.</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.</p> <p>5.10 Odor Threshold: 0.05 ppm</p> <p>5.11 IDLH Value: 10,000 ppm</p>	

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 84°F C.C. 6.2 Flammable Limits in Air: 1.1%-6.4% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 966°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p> <p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available</p> <p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p> <p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons.....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water.....</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction.....</td> <td style="text-align: right;">0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Flammability (Red).....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td style="text-align: right;">0</td> </tr> </tbody> </table> <p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 268.4°F = 131.9°C = 405.1°K 12.4 Freezing Point: -54.2°F = -47.9°C = 225.3°K 12.5 Critical Temperature: 650.6°F = 343.8°C = 617.0°K 12.6 Critical Pressure: 513.8 atm = 34.95 psia = 3.540 MN/m² 12.7 Specific Gravity: 0.864 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.6 dyne/cm = 0.0286 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.4 dyne/cm = 0.0364 N/m at 30°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 147 Btu/lb = 81.9 cal/g = 3.43 X 10⁴ J/kg 12.13 Heat of Combustion: -17,554 Btu/lb = -8752.4 cal/g = -408.31 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.20 Heat of Fusion: 26.01 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.34 psia</p> <p style="text-align: center;">NOTES</p>	Category	Rating	Fire.....	3	Health		Vapor Irritant.....	1	Liquid or Solid Irritant.....	1	Poisons.....	2	Water Pollution		Human Toxicity.....	1	Aquatic Toxicity.....	3	Aesthetic Effect.....	2	Reactivity		Other Chemicals.....	1	Water.....	0	Self Reaction.....	0	Category	Classification	Health Hazard (Blue).....	2	Flammability (Red).....	3	Reactivity (Yellow).....	0
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o-XYLENE

XLO

<p>Common Synonyms 2-Dimethylbenzene Xylol</p>	<p>Watery liquid Colorless Sweet odor</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p>Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<p>Water Pollution</p>	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: $C_8H_{10}(CH_3)_2$ 3.3 IMO/UM Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-8</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; characteristic aromatic</p>
<p>5. HEALTH HAZARDS</p>	
<p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 63°F C.C.; 75°F O.C. 6.2 Flammable Limits in Air: 1.1%-7.0% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 669°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: > 100 mg/l/96 hr/D, magna/TL₁₀₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 2.5% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 201.9°F = 144.4°C = 417.6°K 12.4 Freezing Point: -13.3°F = -25.2°C = 248.0°K 12.5 Critical Temperature: 874.8°F = 357.1°C = 630.3°K 12.6 Critical Pressure: 541.5 atm = 36.84 pale = 3.732 MN/m² 12.7 Specific Gravity: 0.880 at 20°C (liquid) 12.8 Liquid Surface Tension: 30.53 dynes/cm = 0.03053 N/m at 15.5°C 12.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.03606 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.068 12.12 Latent Heat of Vaporization: 148 Btu/lb = 82.9 cal/g = 3.47 X 10⁴ J/kg 12.13 Heat of Combustion: -17,558 Btu/lb = -9754.7 cal/g = -408.41 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: 30.84 cal/g 12.27 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.26 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Codes of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No reaction 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																					
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p-XYLENE

XLP

<p>Common Synonyms 1, 4-Dimethylbenzene Xylol</p>		Watery liquid	Colorless	Sweet odor
<p>Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.</p>				
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
Fire	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>			
Exposure	<p>CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>			
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>			
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>		
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: p-C₆H₄(CH₃)₂ 3.3 IMO/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-42-3</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic</p>		
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm</p> <p>5.5 Short Term Inhalation Limits: 300 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg</p> <p>5.7 Late Toxicity: Kidney and liver damage.</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.</p> <p>5.10 Odor Threshold: 0.05 ppm</p> <p>5.11 IDLH Value: 10,000 ppm</p>				

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 81°F C.C. 6.2 Flammable Limits in Air: 1.1%-8.6% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 870°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.6 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>		<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																					
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Reactivity (Yellow).....	0																																						
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days 8.4 Food Chain Concentration Potential: Data not available</p>		<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 200.9°F = 138.3°C = 411.5°K 12.4 Freezing Point: 55.9°F = 13.3°C = 266.5°K 12.5 Critical Temperature: 649.4°F = 343.0°C = 616.2°K 12.6 Critical Pressure: 509.4 atm = 34.65 psia = 3.510 MN/m² 12.7 Specific Gravity: 0.861 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.3 dynes/cm = 0.0283 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 150 Btu/lb = 81 cal/g = 3.4 X 10⁶ J/kg 12.13 Heat of Combustion: -17,559 Btu/lb = -9754.7 cal/g = -406.41 X 10⁶ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 37.83 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.34 psia</p>																																					
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>		<p>NOTES</p>																																					

APPENDIX C
MISCELLANEOUS REPORTS

SITE SAFETY FOLLOW-UP REPORT

(To be completed for each field change in plan.)

Was the Safety Plan followed as presented? ___yes ___no

DESCRIBE IN DETAIL ANY CHANGES TO THE SAFETY PLAN:

REASON FOR CHANGES:

APPROVED BY SITE MANAGER:
SITE SAFETY OFFICER:

DATE:
DATE:

EVALUATION OF SITE SAFETY PLAN

Was the Safety Plan adequate? ___yes ___no

WHAT CHANGES WOULD YOU RECOMMEND?

ACCIDENT REPORT

Report No.:

SITE:
LOCATION:

PROJECT NO.:

DATE OF REPORT:
NAME AND ADDRESS OF INJURED:

PREPARERS NAME:
SSN: AGE:
SEX:

YEARS OF SERVICES: TIME ON PRESENT JOB: TITLE/CLASSIFICATION:
DIVISION/DEPARTMENT: DATE OF ACCIDENT: TIME:

ACCIDENT CATEGORY: Motor Vehicle Property Damage Fire
 Chemical Exposure Near Miss Other

SEVERITY OF INJURY OR ILLNESS: Non-disabling Disabling
 Medical Treatment Fatality

AMOUNT OF DAMAGE: \$ PROPERTY DAMAGED:

ESTIMATED NUMBER OF DAYS AWAY FROM JOB:

NATURE OF INJURY OR ILLNESS:

CLASSIFICATION OF INJURY

- | | | |
|--|--|--|
| <input type="checkbox"/> Fractures | <input type="checkbox"/> Heat Burns | <input type="checkbox"/> Cold Exposure |
| <input type="checkbox"/> Dislocations | <input type="checkbox"/> Chemical Burns | <input type="checkbox"/> Frostbite |
| <input type="checkbox"/> Sprains | <input type="checkbox"/> Radiation Burns | <input type="checkbox"/> Heat Stroke |
| <input type="checkbox"/> Abrasions | <input type="checkbox"/> Bruises | <input type="checkbox"/> Heat Exhaustion |
| <input type="checkbox"/> Lacerations | <input type="checkbox"/> Blisters | <input type="checkbox"/> Concussion |
| <input type="checkbox"/> Punctures | <input type="checkbox"/> Toxic Respiratory | <input type="checkbox"/> Faint/Dizziness |
| <input type="checkbox"/> Bites | <input type="checkbox"/> Exposure | <input type="checkbox"/> Toxic Respiratory |
| <input type="checkbox"/> Respiratory Allergy | <input type="checkbox"/> Toxic Ingestion | <input type="checkbox"/> Dermal Allergy |
| <input type="checkbox"/> Other (explain) | _____ | |

PART OF BODY AFFECTED:

DEGREE OF DISABILITY:

DATE MEDICAL CARE WAS RECEIVED:

WHERE MEDICAL CARE WAS RECEIVED:

EMERGENCY SERVICE:

ADDRESS (if off-site):

FOLLOW-UP EXAMINATION REQUIRED:

ACCIDENT LOCATION

Causative agent most directly related to accident (object, substance, material, machinery, equipment, conditions):

WAS WEATHER A FACTOR?

UNSAFE MECHANICAL/PHYSICAL/ENVIRONMENTAL CONDITION AT TIME OF ACCIDENT (be specific):

UNSAFE ACT BY INJURED AND/OR OTHERS CONTRIBUTING TO THE ACCIDENT (be specific, must be answered):

PERSONAL FACTORS (improper attitude, lack of knowledge or skill, slow reaction, fatigue):

LEVEL OF PERSONAL PROTECTION EQUIPMENT REQUIRED IN SITE SAFETY PLAN:

MODIFICATIONS

WAS INJURED USING REQUIRED EQUIPMENT?

IF NOT, HOW DID ACTUAL EQUIPMENT USE DIFFER FROM PLAN?

WHAT CAN BE DONE TO PREVENT A RECURRENCE OF THIS TYPE OF ACCIDENT (modification of machine; mechanical guards; correct environment; training):

DETAILED NARRATIVE DESCRIPTION (how did accident occur, why; objects, equipment, tools used, circumstance assigned duties. Be specific.):

(Use back of sheet as required)

WITNESSES TO ACCIDENT

Signature of Preparer:
Signature of Site Manager:

APPENDIX D
HEAT STRESS CASUALTY PREVENTION PLAN

HEAT STRESS CASUALTY PREVENTION PLAN

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

A. IDENTIFICATION AND TREATMENT

1. Heat Exhaustion

- a) Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, breathing is shallow. The victim may faint unless he lies down. This may pass, but sometimes it persists and, while heat exhaustion is generally not considered life threatening, death could occur.
- b) First Aid: Immediately remove the victim to the Decontamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make the victim lie down, raise feet 6-12 inches, maintain body temperature but loosen all clothing.) If the victim is conscious, it may be helpful to give sips of water. Transport victim to a medical facility.

2. Heat Stroke

- a) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107°- 110°F. The victim will have a red face and will not be sweating. First there is often pain in the head, dizziness, nausea, oppression, and a dryness of the skin and mouth. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly. Heat stroke is always serious.
- b) First Aid: Immediately evacuate the victim to a cool and shady area in the Decontamination Reduction Zone. Remove all protective outer wear and all personal clothing. Lay the victim on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head and groin. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place in a tub of cool water. The main objective is to cool without chilling. Give no stimulants. Transport the victim to a medical facility as soon as possible.

B. PREVENTION OF HEAT STRESS

- 1) One of the major causes of heat casualties is the depletion of body fluids. Fluids should be maintained in the support zone. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1% salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.
- 2) A work schedule will be established during warm weather so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.
- 3) A work/rest schedule will be implemented for personnel required to wear Level B or C protection (i.e. impervious outer garment). A sufficient period will be allowed for personnel to "cool down". This may require shifts of workers during operations in addition to the breaks provided by required air tank changes (Level B). Maximum time between breaks at Level B or C shall be two hours regardless of temperature. At elevated temperatures, breaks should be scheduled as described below.

<u>Ambient Temperatures</u>	<u>Maximum Time Between Cooldown Breaks</u>
Above 90 ^o F	1/4 hr.
85 ^o -90 ^o F	1/2 hr.
80 ^o -85 ^o F	1 hr
70 ^o -80 ^o F	1-1/2 hr.

- 4) Periodic breaks for "cooldown" and liquid replenishment should also be scheduled while wearing any chemical resistant outer wear.

C. HEAT STRESS MONITORING

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature 70^oF or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85^oF, workers should be monitored for heat stress after every work period. The following are important considerations:

1. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats/minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.7°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure that it has dropped below 99°F.
3. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

APPENDIX E
LEVEL B OPERATIONS

I. Introduction

Level B protection is selected when respiratory and dermal hazards are severe, but total encapsulation is not indicated. Level B protection includes a self-contained breathing apparatus (SCBA), a hard hat, steel-toed chemical resistant boots, two pair of chemical resistant gloves and chemical resistant coveralls. A rubber apron to protect the SCBA harness assembly and regulator from contamination may be needed at sites where high chemical concentrations and splash potential are anticipated. Decontamination workers should utilize Level C protection whenever site workers have selected Level B as they may also be exposed to highly volatile liquids, highly toxic materials, or other hazardous substances in the decontamination area.

II. Team Size

Team size and organization will depend upon the degree of difficulty of tasks and the site-specific requirements of the individual investigation. An important consideration during Level B operations is that each team member receive sufficient training to readily complete an emergency response task that may occur on the site. This means that every person on the site who is part of the operating team must be able to respond to an emergency by using all available safety equipment and, if necessary, entering the contaminated zone.

A minimum of three people are required, but four are recommended, for any Level B operation. There should always be at least one person outside the contaminated zone dressed at the same level of protection as the downrange people, filling the functions of emergency response person and site safety officer.

Site Safety Officer

The site safety officer usually remains at the decontamination area in order to monitor all downrange operations. Downrange personnel are either in the safety officer's line of sight or other individuals are located between the safety officer and downrange personnel in order to maintain an unbroken person to person line of sight. In some operations constant radio contact between the site safety officer and downrange personnel may be sufficient. The specific responsibility of the site safety officer during a Level B operation is to: 1) monitor "on-air" work time and physical conditions of all personnel (especially heat stress & fatigue); 2) to make all decisions concerning protective equipment; and 3) monitor all activities to remove personnel from any developing unsafe work conditions or unsafe work activities.

Decontamination Person

This individual is responsible for organizing decontamination stations, assisting/supervising all decontamination operations, changing air tanks, disassembling the decontamination stations, and disposing of all contaminated fluids.

Emergency Response Person

This person is outfitted in Level B protection but normally is not utilizing his containerized air supply. The rescue person remains at the decontamination station and goes downrange only to assist with emergency evacuations. On small teams, the rescue and decontamination task can be handled by a single individual.

Sample/Field Personnel

These are individuals who complete all downrange operations. On large teams, the field personnel who are not currently downrange can assist with decontamination or command post operations.

Other Personnel

In some operations it is considerably more efficient to dedicate a person to record notes transmitted by radio from downrange personnel, to fill out sample claim-of-custody and other paperwork or to monitor and refill tanks for the longer operations. Other personnel must be planned on a task specific basis.

III. Record Keeping

In addition to the basic records kept during any field activity, a record containing the chronology of operations must be completed. This record includes all personnel and the times they were utilizing a self-contained breathing apparatus.

APPENDIX F
RESPIRATORY PROTECTION PROGRAM

E.C. JORDAN CO.
RESPIRATORY PROTECTION PROGRAM

I. INTRODUCTION

This program has been developed to govern the selection and use of respiratory protective devices by E.C. Jordan Co. (Jordan) personnel. The program is intended to comply with Occupational Safety and Health Administration (OSHA) requirements as set forth in 29 CFR 1910.134(b). The scope of this program is limited to activities related to field investigations of potentially hazardous waste disposal sites.

II. PERSONNEL REQUIREMENTS

All personnel assigned to field activities at hazardous or potentially hazardous locations are currently required by Jordan's Health and Safety policies to be enrolled in the corporate Health Monitoring Program. A portion of this program involves spirometry, a measure of the respiratory system status. No personnel may be assigned to the use of, or withdraw from stock, any respiratory protective device without physician certification that use of such a device will not be injurious to health. Psychological limitations, e.g. claustrophobia, are also considered in personnel assignments. Training in the use of the selected device and fit testing, as described herein, are also required.

No personnel will be assigned duties which require a respirator when facial hair, skullcaps or eye glasses will interfere with a proper fit. No contact lenses may be worn with any respiratory protective device. Eyeglass frames which fit inside the respirator facepiece are provided as necessary.

III. APPLICABLE EQUIPMENT

Jordan maintains the following respiratory protective equipment:

- o full-face chemical/mechanical air purifying respirators
- o self-contained breathing apparatus
- o full-face air line-supplied breathing apparatus
- o 5-minute escape air supply

This equipment is intended for use on an as needed basis, to be determined by an evaluation of on-site conditions. Respiratory protective equipment should not be used arbitrarily by any Jordan personnel.

Selection criteria are presented separately; training is required in the use of each type of equipment prior to drawing from stock.

IV. PERSONNEL TRAINING

Training of personnel in the proper use and care of respiratory protective equipment is considered essential to the success of the program. Training encompasses:

- o respiratory protection principles
- o selection of appropriate equipment
- o use of equipment
- o maintenance of equipment
- o fit testing

Information regarding each topic is presented as standard respiratory protection procedures.

V. STANDARD RESPIRATORY PROTECTION PROCEDURES

The following information has been organized and presented by topic as Standard Respiratory Protection Procedures, to be used both in training and as reference material for field operations.

<u>Standard Respiratory Protection Procedure No.</u>	<u>Topic</u>
1	Respiratory Protection Principles
2	Selection of Respirators
3	Fit Testing
4	Inspection/Maintenance/Storage

These procedures are attached.

VI. PROGRAM ADMINISTRATION AND DOCUMENTATION

The administration of Jordan's Respiratory Protection Program is the responsibility of the Personnel Health and Safety Committee (PHSC). Administration includes:

- o respirator selection
- o personnel training
- o fit testing

- o respirator maintenance
- o documentation
- o program evaluation and improvements
- o personnel pulmonary testing and certification

Written health and safety plans for each site, and site hazard assessments result in respirator selection in accordance with the decision logic set forth in Standard Respiratory Protection Procedure No. 2.

Fit testing and respirator maintenance is performed by the equipment manager of Jordan's Sample Control and Staging Center under the administration of PHSC. Major maintenance is performed by manufacturer certified technicians only. Personnel training in respiratory protection is one aspect of PHSC's ongoing personnel training programs.

Program evaluation is a dynamic process, occurring each time a Project Health and Safety Plan is prepared.

Medical supervision of personnel occurs as part of Jordan's Health Monitoring Program, also administered by PHSC. Medical surveillance is required for all personnel assigned to hazardous or potentially hazardous site activities.

Documentation of the various elements of Jordan's Respiratory Protection Program is achieved through several media:

- o Documentation of respirator selection is included in the hazard assessment of each site's Health and Safety Plan.
- o Documentation of personnel training is maintained in both hard-copy and computerized files.
- o Documentation of medical surveillance is achieved indirectly by maintaining a list of enrolled employees in the Health Monitoring Program and directly through physician certification of personnel allowed to be assigned respiratory protective devices.
- o Documentation of fit-testing is maintained on file with the equipment manager of the Sample Control and Staging Center, utilizing the appropriate form. (Exhibit 1)
- o Documentation of site surveillance is required both by this program and by the Health and Safety Plan for each site. Records of site surveillance are created by the Site Safety Officer and maintained in project files.
- o Respirator inspection and maintenance records are created and maintained for each respirator, SCBA, and escape respirator by the equipment manager. (Exhibit 2)

Inspection and documentation occurs before each unit is removed from stock and when it is returned, or monthly.

Exhibit 1
Respirator Fit Test Worksheet

Exhibit 2

Respirator Use & Maintenance Record

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 1
RESPIRATORY PROTECTION PRINCIPLES

1.1 INTRODUCTION

Since the lungs are not completely effective in protecting the body against respirable chemical hazards, they must be artificially protected from toxic gases, vapors, and particulates. In addition, the body must be supplied with enough oxygen to maintain a normal capacity to perform tasks.

1.2 ROUTES OF EXPOSURE

The volume of air inhaled during "normal" activities is approximately 6 l/min. The volume of air inhaled during brisk activity or during periods of stress can go up to 75 l/min (a 12-fold increase).

Air is inhaled through the nose and mouth and travels an extremely turbulent path to the lungs. This turbulency results in the air impinging on many sites, thus allowing the insoluble particulates to become impacted and soluble particulates, vapors, and gases to become absorbed.

The inhaled air passes through the pharynx, the common passageway for both food and air, and enters the trachea at the larynx. The trachea (or windpipe) divides into two bronchi, which lead to the two lungs. All of these organs are collectively called the conducting tubes, since they lead the air to the alveoli, the site of gaseous exchange with the pulmonary capillaries (i.e., the blood).

Toxic substances may be absorbed at any point in the respiratory tract. The conducting tubes are lined with mucus and cilia. Insoluble contaminants caught in the mucus are swept up to the esophagus by the cilia and swallowed, thus causing an ingestion problem.

1.3 OXYGEN DEFICIENCY

1.3.1 Oxygen and the Respiratory Process

The chemical composition of normal air is presented below as Table 1.

Table 1. Atmospheric Composition

Gas	Volume (%)	Partial Pressure (mm Hg at sea level)
Nitrogen	78.9	594
Oxygen	20.95	159
Argon	0.93	7
Carbon dioxide	0.04	0.03

It is not the percentage of O₂ in the air, but rather its partial pressure (pO₂), that is important in respiration. As one increases in altitude, the percentage of O₂ stays constant, but pO₂ drops. Additionally, as the percentage of O₂ in the air drops, so does its partial pressure.

The "anatomic dead space volume" of the respiratory tract is about 150 ml. The average breath draws in about 500 ml of air; this air is mixed with the air remaining in the dead space from the previous exhalation, which has been depleted in oxygen due to the normal respiratory process. The overall effect is a lower pO₂ in the respiratory tract as compared with the ambient air. The average respirator adds about 100 ml of dead space to the respiratory system, which further lowers the pO₂ in the respiratory system, causing a slight oxygen deficiency.

1.3.2 Oxygen Levels/Physiological Effect

The currently accepted National Institute for Occupational Safety and Health (NIOSH) standards specify that if an atmosphere contains less than 19.5 percent by volume O₂ at sea level, then an atmosphere-supplying device must be used.

Note that as altitude increases, the percentage of O₂ stays constant, but the pO₂ drops. There is currently no standard that accounts for the drop in pO₂ with altitude; the problem is currently under study by NIOSH.

The physiological effects of oxygen deficiency are indicated in Table 2.

1.4 PARTICULATE CONTAMINANTS - AEROSOLS

Aerosol is a term used to describe particulates in air without regard to their origin. Particulates are collected on the walls of the respiratory tract depending upon their size as follows:

1. Pharynx - 10-30 um
2. Trachea - 10 um
3. Bronchus - 5-10 um
4. Alveoli - 0.1-1 um

Particulates less than 0.5 um may never be deposited in the respiratory tract and may simply be exhaled.

Particulates affect the human body as follows:

1. Nuisances - inert substances that cause no lung damage but inhibit proper functioning of the lungs.
2. Inert pulmonary reaction causing substances - substances that produce nonspecific pulmonary effects.

Table 2. Physiological Effects of Oxygen Deficiency

<u>O₂ Volume Percentage at Sea Level</u>	<u>Physiological Effect</u>
16-12	Increased breathing volume. Accelerated heartbeat. Impaired attention and thinking. Impaired coordination.
14-10	Very faulty judgment. Very poor muscular coordination. Muscular exertion causes rapid fatigue that may cause permanent heart damage. Intermittent respiration.
10-6	Nausea. Vomiting. Inability to perform vigorous movement, or loss of all movement. Unconsciousness, followed by death.
Less than 6	Spasmodic breathing. Convulsive movements. Death in minutes.

3. Pulmonary fibrosis causing substances - substances that produce effects ranging from nodule production to serious diseases such as asbestosis.
4. Irritants - substances that irritate, inflame, or ulcerate lung tissues.
5. Systemic poisons - substances that cause injury to specific organs and body systems.
6. Allergens - substances that produce hypersensitivity.

1.5 GASEOUS CONTAMINANTS

Gaseous contaminants are "filtered" to a small degree by the respiratory tract before they reach the alveolar spaces. However, if the contaminants are soluble, they can be directly absorbed through the walls of the respiratory tract.

Gaseous contaminants affect the human body as follows:

1. Irritants - corrosive compounds that injure and inflame tissue.
2. Asphyxiants - substances that displace oxygen or prevent the use of oxygen by the body.
3. Anesthetics - substances that depress the central nervous system and cause intoxication or loss of sensation.
4. Systemic poisons - substances that cause diseases.

1.6 EXPRESSING AIR CONTAINMENT CONCENTRATIONS

Any substances that are not normal components of breathing air (oxygen, nitrogen, etc.) are considered to be contaminants. The respiratory threat posed by contaminants is a function of the actual contaminant and its concentration in the air. The concentration is expressed in a variety of ways, as listed below.

1. Particulates
 - a. mppcf - millions of particulates per cubic foot.
 - b. ppcc₃ - particles per cubic centimeter.
 - c. mg/m³ - milligrams per cubic meter.
2. Gases and Vapors
 - a. ppm - volumes per million volumes of air (parts per million).
 - b. ppb - volumes per billion volumes of air (parts per billion).
 - c. mg/m³ - milligrams of gas per cubic meter.

- d. Conversion of units. The following equation converts mg/m^3 to ppm, at 24°C and 760 mm Hg.

$$\text{ppm} = \frac{24.45}{\text{molecular weight}} \text{mg}/\text{m}^3,$$

This equation is extremely useful for determining respiratory protection requirements.

1.7 MEASURES OF RESPIRATORY HAZARDS

Every contaminant contained in breathing air has a limit, above which it becomes a threat to human health. These limits are determined either from animal studies or from epidemiological data. Unfortunately, animal studies can only approximate human response and may vary widely for individual chemicals. Epidemiological studies, although capable of providing a more precise forecast of human response, are limited by a lack of accurate records and a lack of controlled studies. Therefore, the "safe" limits of various chemicals must be viewed only as guidelines. Furthermore, these guidelines are primarily designed for the industrial situation where an individual is being exposed to one or two well-defined substances. These guidelines do not address the problems of synergism, potentiation, or allergic response.

The guidelines used in measuring respiratory hazards are listed below.

1. Threshold Limit Value. The threshold limit value (TLV) is recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) and is derived from consensus review. It is a time-weighted average concentration set for a particular substance that represents a level that almost all workers can be exposed to for an 8-hr day (40-hr week) without suffering adverse health effects. It is assumed that following each 8-hr. exposure there will be a 16-hr. recovery period and that after 5 days there will be a 48-hr. recovery period. The TLV lists are revised on a yearly basis.
2. Permissible Exposure Limits. The permissible exposure limits (PELs) are set forth in the Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910.1000, Tables Z₁, Z₂, and Z₃. These levels were promulgated initially from the ACGIH TLV lists (1968). As part of the law, they represent the legal maximum concentrations for personnel exposure. They are not updated on a yearly basis, as is the TLV list. Therefore, the most current ACGIH TLV is used in determining respiratory protection, rather than the PEL listing.
3. Immediately Dangerous to Life and Health. 30 CFR 11.3 defines conditions that are immediately dangerous to life and health (IDLH) as "conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants such as radioactive materials, which are likely to have an adverse cumulative or delayed effect on health".

OSHA adds these criteria:

- a. The worker must be able to escape without losing his life or suffering permanent health damage within 30 minutes.
 - b. The worker must be able to escape without severe eye or respiratory irritation or other reactions.
4. Lower Flammable Limit. The lower flammable limit (LFL) is the lowest concentration by volume of a gas or vapor in air that will explode when there is an ignition source.

1.8 RESPIRATORY PROTECTION

When it has been determined that the ambient atmosphere is hazardous, it becomes necessary to protect the individual by:

1. avoiding and/or minimizing exposure;
2. applying engineering controls such as ventilation; and
3. using a respirator to either filter the air or supply air.

The legal requirements for respiratory protection are summarized below.

1. Williams and Steiger Occupational Safety and Health Act of 1970 established standards that state that "approved or accepted respirators shall be used when they are available".
2. 29 CFR 1910.134 gives legal requirements for the selection and use of respiratory equipment as promulgated by OSHA and based on American National Standards Institute (ANSI) Standard Z88.2, "American National Standards Practices for Respiratory Protection". Standard Z88.2 was originally a consensus standard, but now has been cited as a Federal regulation.
3. 30 CFR Part 11 describes tests for permissibility of respiratory protective apparatus and updates or deletes approvals. 30 CFR Part 11 also cites ANSI Z88.2 as the basis for respiratory protection.

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 2
SELECTION OF RESPIRATORS

2.1 INTRODUCTION

This text is based on "Joint NIOSH/OSHA Standards Completion Program - Respirator Decision Logic". The text is excerpted for the purpose of covering the major points of the respirator decision logic. For the complete text, see John S. Pritchard's, "A Guide to Industrial Respiratory Protection" (U.S. Department of Health, Education, and Welfare, U.S. Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Cincinnati, Ohio, June 1976). It is not intended to be all-inclusive in content.

The purpose of the respirator decision logic is to provide technical accuracy and uniformity in the selection of respirators and to provide necessary criteria to support this selection. The decision logic is a step-by-step elimination of inappropriate respirators until only those that are acceptable remain. Judgment by persons knowledgeable of inhalation hazards and respiratory protection equipment is essential to ensure appropriate selection of respirators.

The primary technical criteria for what constitutes a permissible respirator are based on the technical requirements of 30 CFR 11. The health standards will allow only respirators approved under 30 CFR 11. Classes of respirators are only included when at least one device has been approved.

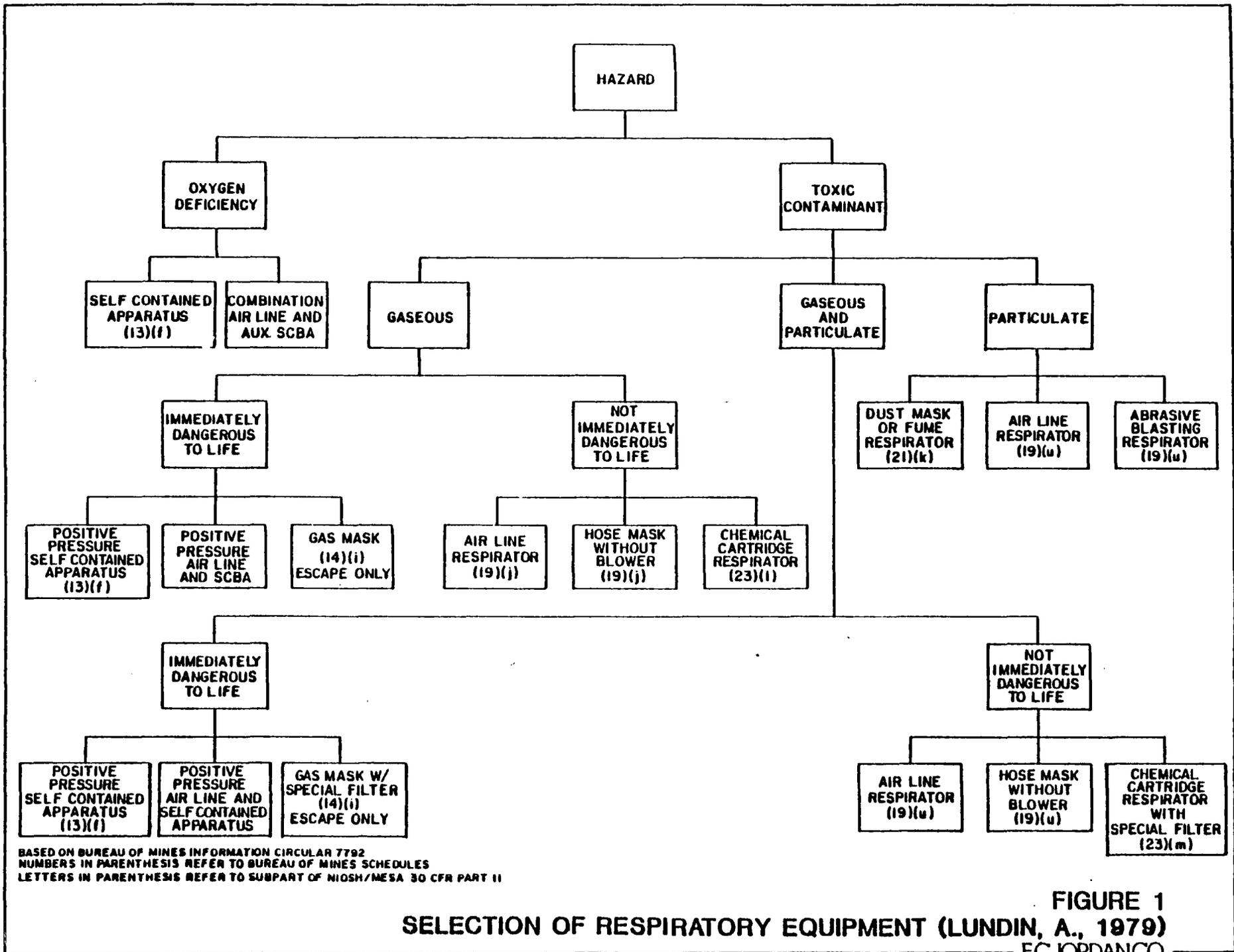
Protection factors are criteria used in determining what limiting concentrations are to be permitted for each respirator type that will afford adequate protection to the wearer. The referenced Subparts of 30 CFR 11 give technical descriptions concerning each type or class of respirators referenced in the decision logic; 30 CFR 11 should be used with the decision logic in order to properly understand the criteria for the specification of allowable respirators.

Throughout this text, reference is made to PELs. Prudent, accepted practice dictates the use of current ACGIH TLVs, which are updated each year, in the place of the PEL, which is only periodically updated.

2.2 GENERAL DECISION LOGIC FLOWCHART

The following material used in concert with the decision logic chart (Figure 1) provides a formalized selection guide for respiratory protection.

1. Step 1 - Assemble Information on Substance. Assemble necessary toxicological, safety, and research information for the particular contaminant. The following are required:
 - a. Permissible exposure limits specified in 29 CFR 1910.1000 (Tables Z-1, Z-2, and Z-3).
 - b. Warning properties if the substance is a gas or a vapor.
 - c. Eye irritation potential of the substance.



BASED ON BUREAU OF MINES INFORMATION CIRCULAR 7792
 NUMBERS IN PARENTHESIS REFER TO BUREAU OF MINES SCHEDULES
 LETTERS IN PARENTHESIS REFER TO SUBPART OF NIOSH/MESA 30 CFR PART II

FIGURE 1
SELECTION OF RESPIRATORY EQUIPMENT (LUNDIN, A., 1979)
 ECJORDANCO

- d. LFL for the substance.
 - e. IDLH concentration for the substance.
 - f. Any possibility of poor sorbent efficiency at IDLH concentration and below.
 - g. Any possibility of systemic injury or death resulting from absorbance of the substance (as a gas or vapor) through the skin.
 - h. Any possibility of severe skin irritation resulting from contact of the skin with corrosive gases, vapors, or particulates.
 - i. The vapor pressure of the substance (and equivalent ppm).
 - j. Any possibility of high heat of reaction with sorbent material in cartridge or canister.
2. Step 2 - Determine Physical State of Substance. Determine the physical state(s) of the substance as it is likely to be encountered in the occupational environment. It will be either (1) gas or vapor; (2) particulate (dust, fume or mist); or (3) combination of (1) and (2).
 3. Step 3 - Assemble a Table of Permissible Respiratory Protection for Substance. This is done using the material from Step 1 and the appropriate specific decision logic chart from Section 2.3 below and respirator protection factors. Classes of respirators are only included where at least one device has been approved.
 4. IF STEPS 1 THROUGH 3 CANNOT BE COMPLETED, THE ATMOSPHERE IS UNKNOWN AND MUST BE CLASSIFIED IDLH. ONLY POSITIVE PRESSURE SCBA MAY BE SELECTED.

2.3 SPECIFIC DECISION LOGIC CHARTS

A decision logic chart for respiratory protection against gases or vapors and against particulates is shown as Figure 1.

2.4 DECISION LOGIC CRITERIA

2.4.1 Skin Absorption and Irritation

Respirator selection criteria are based primarily on the inhalation hazard of the substance. A supplied-air suit may protect the skin from extremely toxic substances that may be absorbed through the skin or from substances which may cause severe skin irritation or injury.

Supplied-air suits are not covered in 30 CFR 11. Data are not available upon which to make recommendations for supplied-air suits for all types of exposures.

Where information is available indicating systemic injury or death resulting from absorbance of gas or vapor through the skin or where severe skin irritation or injury may occur from exposure to a gas, corrosive vapor, or particulate, the following statement is included as a footnote to the respirator tables, and both the employee and employer are cautioned in the appendices concerning their use:

Use of supplied-air suit may be necessary to prevent skin contact and respiratory exposure from airborne concentrations of (specific substance). Supplied-air suits should be selected, used, and maintained under the immediate supervision of persons knowledgeable in the limitations and potential life-endangering characteristics of supplied-air suits. Where supplied-air suits are used above a concentration which may be IDLH (concentration), an auxiliary positive-pressure self-contained breathing apparatus must also be worn.

As a guideline for inclusion of the supplied air-suit statement for substances that are sorbed through the skin, a single skin penetration LD₅₀ of 2 g/kg for any species is used.

2.4.2 Poor Warning Properties (Refer to Table 1)

It is important to realize that 30 CFR 11 approvals for air-purifying (organic vapor) devices prohibit use against organic vapors with poor warning properties.

Warning properties include odor, eye irritation, and respiratory irritation. Warning properties relying upon human senses are not foolproof. However, they provide some indication to the wearer of possible sorbent exhaustion or of poor facepiece fit or other respirator malfunction.

Adequate warning properties can be assumed when the substance odor, taste, or irritation effects are detectable and persistent at concentrations at or below the permissible exposure limit.

If the odor or irritation threshold of a substance is more than three times greater than the permissible exposure limit, this substance should be considered to have poor warning properties. If the substance odor or irritation threshold is somewhat above the permissible exposure limit (not in excess of three times the limit) and there is no ceiling limit, consideration is given to whether undetected exposure in this concentration range could cause serious or irreversible health effects. If not, the substance is considered to have adequate warning properties. Some substances have extremely low thresholds of odor and irritation in relation to the permissible exposure limit. Because of this, these substances can be detected by a worker within the facepiece of the respirator even when the respirator is functioning properly. These substances are, therefore, considered to have poor warning properties.

Though 30 CFR 11 does not specifically eliminate air-purifying respirators for pesticides with poor warning properties, prudent practice dictates that a respirator should not be used to protect against any substance with poor warning properties.

TABLE 1. COMPARISON OF ODOR THRESHOLDS AND TLVs
FOR SELECTED CHEMICAL COMPOUNDS

Compounds	Odor Threshold (ppm)	TLV (ppm)
Group 1 - Odor Threshold and TLV Approximately the Same		
Acrylonitrile	21	20
Arsine	0.21	0.05
Cyclohexane	300	300
Cyclohexanol	100	50
Epichlorhydrin	10	5
Ethyl benzene	200	100
Ethylene diamine	11	10
Hydrogen chloride	10	5
Methyl acetate	200	200
Methylamine	10	10
Methyl chloroform	500	350
Nitrogen dioxide	5	5
Propyl alcohol	200	200
Styrene monomer	200	100
Turpentine	200	100
Group 2 - Odor Threshold from 2 to 10 Times the TLV		
Acrolein	0.2	0.1
Allyl alcohol	7	2
Carbon tetrachloride	75	10
Chloroform	200	25
1,2 Dichloroethylene	500	200
Dichloroethyl ether	35	5
Dimethyl acetamide	46	10
Hydrogen selenide	0.3	0.05
Isopropyl glycidyl ether (IGE)	300	50
Group 3 - Odor Threshold Equal to or Greater Than 10 Times TLV		
Bromoform	530	0.5
Camphor (synthetic)	1.6-200	2
Carbon disulfide	(a)	20
Chloroacetophenone	1	0.05
Chloropicrin	1	0.1
Crotonaldehyde	7	0.1
Diglycidyl ether (DGE)	5	0.5
Dimethyl formamide	100	0
Ethylene oxide	500	50
Mercury vapor	(a)	0.5 mg/m ³
Methyl bromide	(a)	15
Methyl chloride	(a)	100

TABLE 1. COMPARISON OF ODOR THRESHOLDS AND TLVs
FOR SELECTED CHEMICAL COMPOUNDS (cont.)

Compounds	Odor Threshold (ppm)	TLV (ppm)
Group 3 - Odor Threshold Equal to or Greater Than 10 Times TLV (cont.)		
Methyl formate	2000	100
Methanol	2000	200
Methyl cyclohexanol	500	50
Phosgene	1.0	0.1
Phosphine	(a)	0.3
Radioactive gases and vapors	(a)	
Toluene 2,4 diisocyanate (TDI)	2	0.2

(a) Information not available

2.4.3 Sorbents

There are certain limitations involved with the use of sorbents in cartridge/canister sorbents. When the following conditions occur, a sorbent cartridge is not recommended:

1. Where supporting evidence exists of immediate (less than 3 min.) breakthrough time at the IDLH concentration and below for a cartridge or canister sorbent, air-purifying devices shall not be allowed for any use, escape or otherwise. See Table 2.
2. Where there is reason to suspect that commonly used sorbents (e.g., activated charcoal) do not provide adequate sorption efficiency against a specific contaminant, use of such sorbents shall not be allowed. However, where another sorbent material has been demonstrated to be effective against a specific contaminant, approved respirators using the effective sorbent material shall be allowed.
3. Where there is reason to suspect that a sorbent has a high heat of reaction with a substance, use of that sorbent is not allowed.
4. Where there is reason to suspect that a substance sorbed on a sorbent of a cartridge or canister is shock sensitive, use of air-purifying respirators is disallowed.

2.4.4 Eye Irritation

In addition to respiratory protection, it is important to consider a chemical's potential for producing eye irritation or damage. The following guidelines deal with eye protection:

1. For routine work operations, any perceptible eye irritation is considered unacceptable. Therefore, only full facepiece respirators are permissible in contaminant concentrations that produce eye irritation. Protection may be required in certain concentrations of gases and vapors. For escape, some eye irritation is permissible if it is determined that such irritation would not inhibit escape and such irritation is reversible.
2. Where quantitative eye irritation data cannot be found in literature references, and theoretical considerations indicate that substance should not be an eye irritant, half-facepiece respirators are allowed.
3. Where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, the data will be evaluated to determine whether quarter- or half-facepiece respirators can be used.

2.4.5 IDLH

The definition of IDLH provided in 30 CFR 11.3(t) is as follows:

TABLE 2. EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a

Solvent	Time to Reach 1 Percent Breakthrough (10 ppm) (Min)
Aromatics	
Benzene	73
Toluene	94
Ethyl benzene	84
m-Xylene	99
Cumene	81
Mesitylene	86
Alcohols	
Methanol	0.2
Ethanol	28
Isopropanol	54
Allyl alcohol	66
n-Propanol	70
Sec-Butanol	96
Butanol	115
2-Methoxyethanol	116
Isoamyl alcohol	97
4-Methyl-2-pentanol	75
2-Ethoxyethanol	77
Amyl alcohol	102
2-Ethyl-1-butanol	76.5
Monochlorides	
Methyl chloride	0.05
Vinyl chloride	3.8
Ethyl chloride	5.6
Allyl chloride	31
1-Chloropropane	25
1-Chlorobutane	72
Chlorocyclopentane	78
Chlorobenzene	107
1-Chlorohexane	77
o-Chlorotoluene	102
1-Chloroheptane	82
3-Chloromethyl heptane	63

TABLE 2. EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a (cont.)

Solvent	Time to Reach 1 Percent Breakthrough (10 ppm) (Min)
Dichlorides	
Dichloromethane	10
Trans-1,2-dichloroethylene	33
1,1-Dichloroethane	23
cis-1,2-Dichloroethylene	30
1,2-Dichloroethane	54
1,2-Dichloropropane	65
1,4-Dichlorobutane	108
o-Dichlorobenzene	109
Trichlorides	
Chloroform	33
Methyl chloroform	40
Trichloroethylene	55
1,1,2-Trichloroethane	72
1,2,3-Trichloropropane	111
Tetra- and Pentachlorides	
Carbon tetrachloride	77
Perchloroethylene	107
1,1,2,2-Tetrachloroethane	104
Pentachloroethane	93
Acetates	
Methyl acetate	33
Vinyl acetate	55
Ethyl acetate	67
Isopropyl acetate	65
Isopropenyl acetate	83
Propyl acetate	79
Allyl acetate	76
sec-Butyl acetate	83
Butyl acetate	77
Isopentyl acetate	71
2-Methoxyethyl acetate	93
1,3-Dimethylbutyl acetate	61
Amyl acetate	73
2-Ethoxyethyl acetate	80
Hexyl acetate	67

TABLE 2. EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a (cont.)

Solvent	Time to Reach 1 Percent Breakthrough (10 ppm) (Min)
Ketones	
Acetone	37
2-Butanone	82
2-Pentanone	104
3-Pentanone	94
4-Methyl-2-pentanone	96
Mesityl oxide	122
Cyclopentanone	141
3-Heptanone	91
2-Heptanone	101
Cyclohexanone	126
5-Methyl-3-heptanone	86
3-Methylcyclohexanone	101
Diisobutyl ketone	71
4-Methylcyclohexanone	111
Alkanes	
Pentane	61
Hexane	52
Methylcyclopentane	62
Cyclohexane	69
Cyclohexene	86
2,2,4-Trimethylpentane	68
Heptane	78
Methylcyclohexane	69
5-Ethylidene-2-norbornene	87
Nonane	76
Decane	71
Amines	
Methyl amine	12
Ethyl amine	40
Isopropyl amine	66
Propyl amine	90
Diethyl amine	88
Butyl amine	110
Triethyl amine	81
Dipropyl amine	93
Diisopropyl amine	77
Cyclohexyl amine	112
Dibutyl amine	76

TABLE 2. EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a (cont.)

Solvent	Time to Reach 1 Percent Breakthrough	
	(10 ppm)	(Min)
Miscellaneous Materials		
Acrylonitrile		49
Pyridine		119
1-Nitropropane		143
Methyl iodide		12
Dibromomethane		82
1,2-Dibromoethane		141
Acetic anhydride		124
Bromobenzene		142

^a The above cartridge pairs were tested at 1000 ppm, 50 percent relative humidity, 22°C, and 53.3 l/min. (equivalent to a moderately heavy work rate). The time to achieve a 1 percent breakthrough is noted for each cartridge pair. Cartridges were preconditioned at room temperature and 50 percent relative humidity for at least 24 hours prior to testing.

"Immediately dangerous to life or health" means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health.

The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape without injury or irreversible health effects from an IDLH concentration in the event of failure of the respiratory protective equipment. The IDLH is considered a maximum concentration above which only highly reliable breathing apparatus providing maximum worker protection is permitted. Since IDLH values are conservatively set, any approved respirator may be used up to its maximum use concentration below the IDLH.

In establishing the IDLH concentration the following factors are considered:

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.
2. Severe eye or respiratory irritation or other reactions that would prevent escape without injury.

IDLH should be determined from the following sources:

1. Specific IDLH provided in the literature, such as the AIHA Hygienic Guides.
2. Human exposure data.
3. Acute animal exposure data.

Where such data are lacking, acute toxicological data from analogous substances may be considered.

The following guidelines should be used to interpret toxicological data reported in the literature for animal species:

1. Where acute animal exposure data are available (30 min. to 4-hr. exposures), the lowest exposure concentration causing death or irreversible health effects in any species is determined to be the IDLH concentration.
2. Chronic exposure data may have no relevance to the acute effects and should be used in determining the IDLH concentration only upon competent toxicologic judgment.
3. Where there is no toxicologic evidence of an IDLH concentration, 500 times the permissible exposure limit shall determine the upper limit above which only highly reliable breathing apparatus providing maximum worker protection is used.

2.4.6 Lower Flammable Limit

In addition to toxic chemicals and irritants, it is necessary to consider flammable substances. In any atmosphere where there is a likelihood of a chemical fire, there is the risk of creating toxic vapors in the fire or of

asphyxiation cause by reduction of the oxygen content by the products of combustion.

Contaminant concentrations in excess of the LFL are considered to be IDLH. At or above the LFL, the use of respirators is limited to those devices that provide the maximum protection (i.e., positive pressure self-contained breathing apparatus (SCBA) and the combination positive pressure supplied-air respirators with auxiliary positive pressure SCBA).

2.4.7 Protection Factors

The protection factors of respiratory protection devices are a useful numerical tool to assist in the choice of a protective system. Protection factors are a measure of the overall effectiveness of a respirator. Filtering efficiency is a part of the protection factor and becomes a significant consideration for less efficient air-purifying respirators.

The protection factor of a given respirator for a specific user times the PEL (or TLV) for a given substance is the maximum allowable concentration for that substance for which the respirator may be used. For example, say the protection factor for a full-face mask respirator will provide protection up to 1000 ppm. Note that there is a difference between "quantitative" protection factors and "qualitative" protection factors. The correct protection factor must be used in determining the maximum allowable concentration.

2.4.8 Escape

Jordan provides and requires employees to carry an escape respirator where exposure may occur to extremely toxic substances. This escape respirator provides a 5-minute self-contained air supply. (An extremely toxic substance is defined as a gas or vapor having an LC_{50} of less than 10 ppm.)

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 3
RESPIRATOR FIT TESTING - QUALITATIVE

3.1 RESPIRATOR QUALITATIVE FITTING METHODS

Despite the care that goes into respirator design and manufacture to give maximum protection, efficiency will be lost if there is an improper match between the facepiece and the user, or other improper wearing practices. The problem is twofold. Since more than one brand of particular type of facepiece is available, the first problem is to determine which fits best. The second problem is whether the user knows when the respirator fits properly. Both problems can be solved by the use of a fitting test, which is in fact an OSHA requirement. A number of tests and fitting procedures can be performed easily, as outlined below.

Note: During any fitting test, the respirator head straps must be as comfortable as possible. Tightening the straps will sometimes reduce the facepiece leakage, but the user may be unable to tolerate the respirator for any length of time.

3.1.1 Test 1 - Negative Pressure Test

The user will perform this test alone in the field. It consists of merely closing off the inlets of the canister, cartridge(s), or filter(s) by covering with the palm(s) or replacing the seals over the canister or cartridge inlets, or by squeezing breathing tubes so that air cannot pass; inhaling gently so the facepiece collapses slightly; and holding the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage is detected, the respirator is probably tight enough.

Although this test is simple, it has several major drawbacks, primarily that the user must handle the respirator after it has supposedly been positioned on the face. Handling can modify the facepiece-to-face seal. When the respirator is to be used in a relatively toxic atmosphere, this test should be used only as a very gross determination of fit. The user will perform this test just before entering any toxic atmosphere.

3.1.2 Test 2 - Positive Pressure Test

This test is very much like the negative pressure test; it has the same advantages and limitations. It is conducted by closing off the exhalation valve and exhaling gently into the facepiece. The fit is considered satisfactory if slight positive pressure can be built up inside the facepiece without any evidence of outward leakage. For some respirators, this method requires the user to remove the exhalation valve cover and then carefully replace it after the test, often a most difficult task which can disturb the respirator fit even more than does the negative pressure test. If removing and replacing the valve cover is required, this test should be used sparingly. For respirators whose valve covers have a single small port that can be covered by the palm or finger, this test is easy. Where applicable, this test will be performed just before entering any hazardous atmosphere.

3.1.3 Test 3 - Isoamyl Acetate Vapor (Banana Oil) Test

The chemical isoamyl acetate has a pleasant, easily detectable odor, so it is used widely in checking respirator fit.

The test gives the user the required opportunity to wear the respirator in a test atmosphere. Generally, it consists of creating an atmosphere containing banana oil around the user of an atmosphere-supplying or air-purifying respirator with an organic vapor removing cartridge(s) or canister. If the hazard is particulate matter or a non-organic vapor or gas, the organic vapor cartridge(s) or canister must be replaced with a particulate filter(s) or proper cartridge(s) or canister after this test. Thus, this test can be used for any facepiece that has the capability of accepting chemical cartridges and particulate filters. It must be emphasized, however, that the correct cartridge, canister or filter must be replaced on the facepiece before the user enters the specific exposure area.

The isoamyl acetate test is performed with single use capsules, or may be performed by saturating a piece of cotton or cloth with the liquid and passing it close to the respirator near the sealing surface, taking care to avoid skin contact.

In general, the isoamyl acetate fitting test will be performed as follows:

1. The user puts on the respirator in a normal manner in an area where he/she cannot smell banana oil and thus not be influenced by the odor while performing the fitting test. If it is an air-purifying device, it must be equipped with a cartridge(s) or canister specifically designed for protection against organic vapors.
2. The capsule or saturated cloth is passed close to the respirator sealing surfaces.
3. If the user smells banana oil, he readjusts the facepiece and/or adjusts the head straps without unduly tightening them.
4. The user repeats step 2. If banana oil is not smelled, there is assumed to be a satisfactory seal. If the wearer smells the vapor, an attempt should be made to find the leakage point. If the leak cannot be located, another respirator of the same type and brand should be tried. If this leaks, another brand of respirator with a facepiece of the same type but slightly different shape or size should be tried.
5. After a fit is obtained, if the respirator is an air-purifying device, it must be equipped with the correct filter(s), cartridge(s) or canister for the anticipated hazard.

During the test, the subject must make movements that approximate a normal working situation. These will include, but not necessarily be limited to, the following:

1. Normal breathing.
2. Deep breathing like during a heavy exertion period: this should not be done long enough to cause hyper ventilation.

3. Slowly performing side-to-side and up-and-down head movements: these movements should be exaggerated, but should approximate those that take place on the job.
4. Talking: this is most easily accomplished by reading prepared text loudly enough to be understood by someone standing nearby.
5. Other exercises may be added depending upon the situation: for example, if users are going to spend a significant part of their time bent over at some task, it will include an exercise approximating this bending.

When the test is used in training workers and selecting the respirators that fit best, they will perform the complete set of exercises. However, the number of exercises may be reduced when the test is used as a quick field check before routine entry into a contaminated atmosphere.

3.1.4 Test 4 - Irritant Smoke Test

This test is similar to the isoamyl acetate test in concept. It involves exposing the respirator wearer to an irritating aerosol produced by stannic chloride or titanium tetrachloride smoke tubes normally used to check the quality of ventilation systems. (Note: Other types of smoke tubes such as acetic acid are available, but should not be used for respirator fitting.) When the tube ends are broken and air is passed through it, the material inside reacts with the moisture in the air to produce a dense, highly irritating smoke, consisting of hydrochloric acid absorbed in small solid particles. As a qualitative means of determining respirator fit, this test has a distinct advantage in that the user usually reacts involuntarily to leakage by coughing or sneezing. The likelihood of this giving a false indication of proper fit is reduced. On the other hand, the aerosol is very irritating and must be used carefully to avoid injury.

This test can be used for both air-purifying and atmosphere-supplying respirators, but air-purifying respirators must have a high-efficiency filter(s). After the test, it may be necessary to replace the high-efficiency filter(s) on the air-purifying respirator with another type of air-purifying element(s) depending upon the hazard to which the respirator user is to be exposed. This test can be used for worker training or respirator selection.

The irritant smoke test must be performed with proper safeguards because the aerosol is highly irritating. The procedure is as follows:

1. The user puts on the respirator normally, taking care not to tighten the headstrap uncomfortably and stands with his/her back to a source of exhaust ventilation.
2. The tester tells the user to close his/her eyes, even if wearing a full facepiece respirator, and to keep them closed until told to open them.
3. The tester lightly puffs smoke over the respirator, holding the smoke tube at least two feet from it. At this time, the test should keep the amount of smoke minimal and pause between puffs to note the user's reaction.

4. If the user detects no leakage, the tester will increase the smoke density and move the smoke tube progressively closer to the subject, still remaining alert to any reactions.
5. When the smoke tube has been brought to within about 6 inches of the respirator with no leakage detected, the tester will start to direct smoke specifically at potential sources of leakage, around the sealing surfaces and exhalation valve, while the subject's head is still.
6. At this point, if no leakage has been detected, the user may cautiously begin the head movements described in the isoamyl acetate test. The tester should remain especially alert and be prepared to stop producing smoke immediately.
7. If leakage is detected at any time, the tester should stop the smoke and let the user readjust the facepiece or head strap tension. The tester should then start the test at step 2.

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 4
INSPECTION/MAINTENANCE/STORAGE

4.1 INTRODUCTION

Respirator maintenance is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all. Personnel wearing defective devices think they are protected when, in reality, they are not. Emergency escape and rescue devices are particularly vulnerable to poor maintenance as they generally are used infrequently, and then in the most hazardous and demanding circumstances. Serious injury or death can result from wearing a defective device during emergency escape or rescue.

This program includes:

1. Inspection for defects (including a leak check).
2. Cleaning and disinfecting.
3. Repair as required.
4. Proper and sanitary storage of equipment.

4.2 INSPECTION FOR DEFECTS

The most important part of a respirator maintenance program is continual inspection of the devices. If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. Two types of inspections will be performed.

1. While the respirator is in use.
2. While it is being cleaned.

Since the use and cleaning will, to a large extent, be performed by the same personnel, these inspections may become concurrent.

4.3 FREQUENCY OF INSPECTION

OSHA requires that "All respirators be inspected before and after each use" and that those not used routinely, i.e., emergency escape and rescue devices, "shall be inspected after each use and at least montly..." Obviously, emergency escape and rescue devices do not require inspection before each use. Records of inspections are kept on forms presented in Section VI-Program Administration and Documentation.

4.4 INSPECTION PROCEDURES

Respirator inspection shall include checking of:

1. Tightness of the connections.
2. Facepiece.
3. Valves.

4. Connecting tubes.
5. Canisters, filters, or cartridges.

In addition, the regulator and warning devices on a SCBA shall be checked for proper functions.

4.5 FIELD INSPECTION OF AIR-PURIFYING RESPIRATORS

Routinely used air-purifying respirators will be checked as follows before and after each use:

1. Examine the facepiece for:
 - a. Excessive dirt.
 - b. Cracks, tears, holes or physical distortion of shape from improper storage.
 - c. Inflexibility of rubber facepiece (stretch and knead to restore flexibility).
 - d. Cracked or badly scratched lenses in full facepieces.
 - e. Incorrectly mounted full facepiece lenses, or broken or missing mounting clips.
 - f. Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s).
2. Examine the head straps or head harness for:
 - a. Breaks.
 - b. Loss of elasticity.
 - c. Broken or malfunctioning buckles and attachments.
 - d. Excessively worn serrations on head harness, which might permit slippage (full facepieces only).
3. Examine the exhalation valve for the following after removing its cover:
 - a. Foreign material, such as detergent residue, dust particles or human hair under valve seat.
 - b. Cracks, tears or distortion in the valve material.
 - c. Improper insertion of the valve body in the facepiece.
 - d. Cracks, breaks or chips in the valve body, particularly the sealing surface.
 - e. Missing or defective valve cover.
 - f. Improper installation of the valve in the valve body.
4. Examine the air-purifying element(s) for:

- a. Incorrect cartridge, canister or filter for the hazard.
- b. Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder.
- c. Expired shelf-life date on the cartridge or canister.
- d. Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc. over the inlet.
- e. Identical cartridges if more than one are used.

4.6 CARE AND CLEANING OF SELF-CONTAINED BREATHING APPARATUS (SCBA)

The proper care of SCBAs involves:

- 1. Inspection for defects.
- 2. Cleaning and disinfecting.
- 3. Repair.
- 4. Storage.

The following checklist is to be used by personnel whenever they have to check out an SCBA. (Note: Any discrepancy found should be cause to set the unit aside until it can be repaired by a certified repair-person.)

- 1. Preliminary inspection. Check to ensure that:
 - a. High-pressure hose connector is tight on cylinder fitting.
 - b. Bypass valve is closed.
 - c. Mainline valve is closed.
 - d. There is no cover or obstruction on regulator outlet.
 - e. Pressure in the tank is at least 1800 psi.
- 2. Backpack and harness assembly.
 - a. Straps
 - 1. Visually inspect for complete set.
 - 2. Visually inspect for frayed or damaged straps that may break during use.
 - b. Buckles
 - 1. Visually inspect for mating ends.
 - 2. Check locking function.
 - c. Backplate and cylinder lock
 - 1. Visually inspect backplate for cracks and for missing rivets or screws.
 - 2. Visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged.

3. Cylinder and cylinder valve assembly

a. Cylinder

1. Physically check cylinder to ensure that it is tightly fastened to backplate.
2. Check hydrostatic test date to ensure that it is current.¹
3. Visually inspect cylinder for large dents or gouges in metal.

b. Head and valve assembly

1. Visually inspect cylinder valve lock for presence.
2. Visually inspect cylinder gauge for condition of face, needle, and lens.
3. Open cylinder valve and listen or feel for leakage around packing. (If leakage is noted, do not use until repaired.). Note function of valve lock.

4. Regulator and high-pressure hose

a. High-pressure hose and connector

Listen or feel for leakage in hose or at hose-to-cylinder connector. (Bubble in outer hose covering may be caused by seepage of air through hose when stored under pressure. This does not necessarily mean a faulty hose.)

b. Regulator and low-pressure alarm

1. Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1800 psi and not more than rated cylinder pressure).
2. Close cylinder valve and slowly move hand from regulator outlet to allow slow flow of air. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 650 and 550 psi. Remove hand completely from outlet and close mainline valve.
3. Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without any loss of air. Next, establish a slight negative pressure in regulator and hold for 5 to 10 sec. Vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus.

¹Monthly inspection only.

4. Open cylinder valve.
 5. Place hand over regulator outlet and open mainline valve. Remove hand from outlet and replace in rapid movement. Repeat twice. Air should escape when hand is removed each time, indicating a positive pressure in chamber. Close mainline valve and remove hand from outlet.
 6. Ascertain that no obstruction is in or over the regulator outlet. Open and close the bypass valve momentarily to ensure flow of air through bypass system.
5. Facepiece and corrugated breathing tube.
- a. Facepiece
 1. Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.
 2. Visually inspect lens for proper seal in rubber facepiece, retaining clamp properly in place, and cracks or large scratches.
 3. Visually inspect exhalation valve for visible deterioration or foreign materials buildup.
 - b. Breathing tube and connector
 1. Stretch breathing tube and visually inspect for deterioration and holes.
 - (2) Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.
 - (3) Negative pressure test on facepiece.²
 - (a) Don backpack and facepiece.
 - (b) With facepiece held tightly to face or facepiece properly donned, stretch breathing tube to open corrugations and place thumb or hand over end of connector.
 - (c) Inhale. Negative pressure should be created inside mask, causing it to pull tightly to face. This negative pressure should be maintained for 5 to 10 sec. If negative pressure leaks down, the facepiece assembly is not adequate and should not be worn.

²For regular monthly inspection, only steps (b) and (c) of procedure are necessary.

6. Storage of units. Check that:
 - a. Cylinder is refilled as necessary and unit is cleaned and inspected.
 - b. Cylinder valve is closed.
 - c. High-pressure hose connector is tight on cylinder.
 - d. Pressure is bled off high-pressure hose and regulator.
 - e. Bypass valve is closed.
 - f. Mainline valve is closed.
 - g. All straps are completely loosened and laid straight.
 - h. Facepiece is properly stored to protect against dust, sunlight, heat, extreme cold, excess moisture, and damaging chemicals.

4.7 CLEANING AND SANITIZING

Any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one step operation. Reliable, effective disinfectants may be made from readily available household solutions, including:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Clorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.
2. Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of water, or one teaspoon of tincture of iodine per gallon of water. Again, a two-minute immersion is sufficient.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140°F but it should not be less than 120°F to ensure adequate cleaning.

4.8 RINSING

The cleaned and disinfected respirators should be rinsed thoroughly in water (140°F maximum) to remove all traces of detergent and disinfectant. This is very important for preventing dermatitis.

4.9 DRYING

The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes, but care must be taken not to damage or distort the facepieces.

4.10 REASSEMBLY AND INSPECTION

The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The inspection procedures have been discussed; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks.

For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check performed.

4.11 MAINTENANCE AND REPAIR

Replacement or repair shall be done only by trained, experienced persons with parts designed for the respirator. Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval of the device.

This restriction applies particularly to maintenance of the more complicated devices, especially SCBA, and more specifically, regulator valves and low pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair.

No problems are anticipated in repairing and maintaining most simple respirators, particularly the commonly used air-purifying type.

4.12 RESPIRATOR STORAGE

Respirators must be stored to protect against:

1. Dust.
2. Sunlight.
3. Heat.
4. Extreme cold.
5. Excessive moisture.
6. Damaging chemicals.
7. Mechanical damage.

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt or in a vehicle.

Freshly cleaned respirators should be placed in reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set".

APPENDIX G

VAPOR EMISSION RESPONSE PLAN

APPENDIX G
VAPOR EMISSION RESPONSE PLAN

The vapor emission response plan is divided into three sections, the minor and major emission responses and a borehole location evacuation plan.

Minor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background in the breathing zone at the work zone perimeter (i.e., approximately 3-5 feet from and above borehole), the drilling activities will be halted and monitoring continued. If the organic level decreases below 5 ppm, then drilling activities can resume with increased monitoring.

Drilling activities can also resume (with appropriate personnel protection) if the organic level is above 5 ppm and below 50 ppm at the work zone perimeter, other parameters permitting (e.g., the LEL at the wellhead is below 20%, and the H₂S level is below 10 ppm). However, the organic level 200 feet downwind of the work zone must not exceed 5 ppm above background.

If the organic level is above 50 ppm, or the H₂S level is above 10 ppm at the work zone perimeter, then the Site Safety Officer must be notified and well drilling activities stopped.

If the LEL level exceeds 20% all drilling activities shall be stopped immediately and all engines (ignition sources) will be turned off. Drilling personnel will leave the area and notify the Site Safety Officer.

Major Emission Response Plan

If any of the following levels are identified approximately 200 feet downwind from the work zone perimeter, all drilling activities must stop:

- 1) organic levels greater than 5 ppm above background.
- 2) LEL greater than 20% or
- 3) H₂S levels greater than 10 ppm.

If any of the above levels persist after cessation of drilling activities then the following contingency plan shall be placed into effect.

1. The perimeter of the closest downwind residential or commercial property will be monitored. If organic vapor levels approach 5 ppm, or if H₂S levels approach 10 ppm above background, then the local police authorities will be immediately contacted by the Site Safety Officer.
2. The appropriate personnel listed on the Master Phone List are to be notified by the Site Safety Officer.

In the event of a significant gas release (sudden visual and/or audible release) or excessive volatile emissions (organic level greater than 5 ppm above background located 200 feet downwind) during the well drilling program, the response action described below will be carried out.

Response Action

The well drillers will immediately proceed as follows:

- 1) Break the drill rods at the nearest joint unless the rods can be removed from the hole in one lift.
- 2) As soon as possible, leave the Site and notify the Site Safety Officer. The well drillers shall not proceed with remedial efforts until instructed to do so by the Site Safety Officer.

The Site Safety Officer will determine if a Minor or Major Vapor Emission condition (as defined in the previous Section) exists and will activate the appropriate Vapor Emission Response Plan.

If a major emission response action is warranted, the drillers, wearing the proper level of protection, will then seal off the borehole using a bentonite slurry grout and abandon the hole.