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WORK PLAN FIREFIGHTER TRAINING AREA AND LIGHTER AMPHIBIOUS RESUPPLY CARGO (LARC) 60 MAINTENANCE AREA FORT STORY VA

6/28/1994

INTERNATIONAL TECHNOLOGICAL CORPORATION

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INTERNATIONAL TECHNOLOGY CORPORATION

Project No. 519029
April 1993

Work Plan

Fire Training Area No. 4 and Lake Area
Fort Story, Virginia

Contract No. DACW45-90-D-9002
Delivery Order No. 55

Prepared for:

Department of the Army
Omaha District, Corps of Engineers
Omaha, Nebraska

Prepared by:

IT Corporation
Monroeville, Pennsylvania

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

WORK PLAN
FIRE TRAINING AREA NO. 4 AND LARC AREA
FORT STORY, VIRGINIA

CONTRACT NO. DACW45-90-D-9002
DELIVERY ORDER NO. 55
IT PROJECT NO. 519029

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MARCH 1993

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Table of Contents

1.0 Introduction 1
2.0 Scope of Work 3
2.1 Site Assessment/Visit 3
2.2 Technical Review 4
2.3 Advance Sampling 4
2.4 Plan Preparation 4
2.5 Mobilization/Demobilization 5
2.6 Meetings/Training/Site Preparation 5
2.6.1 Meetings/Training 5
2.6.2 Site Preparation 6
2.7 Preliminary Quantification of FTP Volumes 7
2.8 Air Monitoring 9
2.9 Administrative and Technical Support 9
2.10 Removal of FTP Water 9
2.11 Stabilization and Removal of FTP Sludge 10
2.12 Demolition of FTP Concrete 10
2.13 Removal of Underlying Soils 11
2.14 Installation of Recovery Trench 11
2.15 Backfilling and Regrading All Excavations 12
2.16 Monitoring Well Installation 12
2.17 UST Soil Disposal 13
2.18 Sampling and Analytical Testing 13
2.18.1 Field Screening of Excavated Soils 13
2.18.2 Confirmation Sampling 14
2.19 Site Teardown/Equipment Decontamination 14
2.19.1 Site Teardown 14
2.19.2 Equipment Decontamination 14
2.20 Transportation and Disposal 15
2.21 Submittals/Final Project Report 15
2.21.1 Submittals 15
2.21.1.1 Daily Submittals 15
2.21.1.2 Weekly/Bi-Monthly Submittals 16

Table of Contents *(Continued)*

2.21.1.3 Miscellaneous Submittals 17
2.21.2 Final Project Report 17
3.0 Management, Staff, and Schedule 19
3.1 Management and Staff 19
3.2 Schedule 20
Figures
Appendix A - Contractor Sampling and Analysis Plan (CSAP)
Appendix B - Site Safety and Health Plan (SSHP)
Appendix C - LARC Area Bioremediation Work Plan
Appendix D - Analytical Results

1.0 Introduction

The following Work Plan has been prepared by IT Corporation (IT) for the U.S. Army Corps of Engineers (USACE), Omaha District, and concerns Rapid Response Contract No. DACW45-90-D-9002 and Delivery Order No. 55.

The Work Plan addresses the removal and disposal of Fire Training Area No. 4, and the treatment of the soils within the Lighter Amphibious Resupply Cargo (LARC) Area at the Fort Story Military Reservation in Fort Story, Virginia. The project activities include the following:

- Prepare the site for remedial activity by developing a support zone, a contamination reduction zone (CRZ), and an exclusion zone
- Design and install a bermed equipment decontamination (decon) pad
- Remove and containerize Fire Training Pit (FTP) materials, including water, concrete, and debris
- Excavate the contaminated soil surrounding the concrete pad of the FTP until an action level of 50 ppm is met
- Transport the excavated soils to the LARC area for treatment
- Demolish the 42 foot square, concrete lined, FTP
- Remove the monitoring well at the edge of the FTP
- Install a recovery trench in the base of the FTP excavation of minimum dimensions 42 foot square using gravel to backfill the excavated FTP area
- Dispose of offsite two piles of soil previously stockpiled adjacent to the LARC area which are believed to contain F-listed solvents
- Design and install an in situ bioremediation program for the treatment of TPH contaminated soils
- Bioremediate the soil within the LARC area to a level of less than 50 ppm
- Provide analysis of remediated soils to ensure cleanup levels

- Backfill and regrade all excavations
- Return the site to preremedial condition by removing all temporary structures and returning all rental items
- Transport and dispose of concrete and liquid wastes from the FTP.

This project will be staffed with personnel from the IT Remediation Services office in Pittsburgh, Pennsylvania.

2.0 Scope of Work

The Scope of Work for the removal of Fire Training Area No. 4 at Fort Story, as outlined by the USACE Scope of Services, pertains to the following activities:

- Site Assessment/Visit
- Advanced Sampling
- Plan Preparation
- Mobilization/Demobilization
- Site Preparation
- Remove FTP Water
- Remove FTP Debris
- Remove FTP Sludges
- Demolish FTP Concrete
- Remove Underlying Soils
- Install Recovery Trench
- Transport FTP Soils to LARC Area
- Backfill and Regrade All Excavations
- Dispose Previous Stockpiled Soils offsite
- Bioremediate Soils in the LARC Area
- Sampling and Analytical Testing
- Air Monitoring
- Site Teardown
- Transportation and Disposal
- Final Project Report.

2.1 Site Assessment/Visit

The Predelivery Order Site Visit took place on November 12, 1992 with USACE, Omaha District; IT; and Fort Story personnel in attendance. The purpose of this visit was to view the FTP, the conditions, the surrounding area, to establish volumes, to review regulatory concerns, to establish lines of communication, and to understand the Scope of Work.

A brief site history was discussed, and a rough Scope of Work and schedule were drafted for the remediation of the site.

A subsequent site visit took place on January 12, 1993 with the USACE, IT, and several potential subcontractors in attendance. The purpose of this second visit was to allow the potential subcontractors to view the site conditions of the FTP and the LARC areas and to

clarify the Scope of Work. The subcontractors were asked to provide quotes on the remediation of the contaminated soils in the areas by either thermal treatment, bioremediation, or offsite disposal. The proposed work for the LARC area was an increase in the scope of work from that originally presented.

2.2 Technical Review

A technical review meeting took place at the USACE offices in Omaha, Nebraska with representatives of the USACE and IT present. The purpose of this meeting was to discuss the proposals received for the soil treatment of the LARC area, FTP and UST excavation and to determine the most cost effective and technically sound approach. Solutions Environmental Associates of Chesapeake, Virginia was selected as the subcontractor to perform this portion of the project. Solutions Environmental Associates has proposed in situ bioremediation for the cleanup of the LARC area and the FTP soils. The soils from the UST excavation will be disposed of offsite.

2.3 Advance Sampling

An advance sample of the FTP water was collected on January 21, 1993 for the purpose of disposal analysis. The samples were shipped to IT Analytical Services (ITAS) in Export, Pennsylvania for analysis. The results of this analysis are included in Appendix D. The FTP water exhibited non-detect levels for most parameters tested, however elevated levels of calciu, iron, magnesium, potassium and sodium were detected.

Three samples were also collected from the area surrounding SB-117 in the LARC area and analyzed for TCLP Lead. The results of this analysis showed concentrations of 0.765, 0.138, and 2.54 ppm for these samples. This analysis was requested to enhance the feeling that hazardous levels of lead do not exist and would not present a problem during soil treatment.

2.4 Plan Preparation

Incorporated into the Plan Preparation are the response to the Preliminary Order Notice, the Predelivery Order site assessment, the Scope of Services, and the preparation of various site-specific documents as required in the Delivery Order.

The work performed under this activity also includes the preparation of plans as required in the Delivery Order. These plans are as follows:

- Work Plan (WP)
- Contractor Sampling and Analysis Plan (CSAP)
- Site Safety and Health Plan (SSHP).

Copies of the CSAP and the SSHP will be submitted as appendices to the WP. All plans will be reviewed and discussed with the USACE, revised, and resubmitted in accordance with the bar chart schedule in Section 3.2 of this document.

2.5 Mobilization/Demobilization

The project field crew, as well as all health and safety materials, vehicles, and small equipment, will be mobilized from IT's regional office in Pittsburgh, Pennsylvania. This point of origin is entirely contingent upon availability of personnel and/or equipment when the project begins.

The heavy equipment and subcontracted services will be obtained within close proximity of Fort Story. This will allow for a substantial savings in equipment and personnel transport charges.

The time allotted for the field crew to travel to and from Fort Story, Virginia is ten hours. This activity has been estimated as a one time occurrence. Should the schedule be extended due to additional work, IT policy is to allow an interim visit home every three weeks and for major holidays. Travel time and cost under this circumstance are a compensable expense and shall be considered as additional to the present Scope of Services.

2.6 Meetings/Training/Site Preparation

2.6.1 Meetings/Training

The Preconstruction Meeting will be held with all supervisory level personnel immediately following mobilization. This is standard practice for all USACE projects and generally offers an explanation of Corps policies and procedures, the organization of Corps personnel (chain-of-command), points of contact throughout site activities, a rough schedule of operations, and emergency contingency/health and safety plans.

Coordination meetings, if practical, will be conducted on a weekly basis and will provide Fort Story personnel with a schedule of anticipated events at the FTP and the LARC area.

Site-specific training will be conducted with all employees and subcontractors, as per IT policy, prior to admittance to the site. This session will inform everyone of the potential hazard and risk associated with the project, and the Health and Safety rules and regulations that will be strictly enforced. For a more detailed explanation, please refer to the SSHP in Appendix B of this document.

2.6.2 Site Preparation

Prior to the start of remedial activities at the FTP and the LARC area, there are a few preliminary tasks that must take place. These tasks include the following:

- Obtain all necessary permits from state and local authorities
- Establish an exclusion zone (work zone), a CRZ, and a support zone
- Install construction fencing where necessary and hang proper warning signs in strategic locations to notify unsuspecting personnel of the potential danger
- Provide all necessary utility sources (i.e., electricity, telephone, and water)
- Locate and markout underground utilities and/or obstructions in the immediate vicinity of the excavation
- Construct an equipment/materials decontamination pad
- Conduct real time air monitoring prior to any field operations
- Install any erosion control measures which may be necessary to satisfy State of Virginia requirements
- Inventory and stock supplies and prepare the emergency eye wash and other necessary health and safety equipment
- Accept and inspect all heavy equipment to be used on site.

The support zone will be located at an area which is pre-approved by the USACE onsite representative and located a safe distance (preferably upwind) from exclusion zone activities.

This area will include office space, provided by Fort Story, communications equipment, portable rest room facilities, a trash dumpster, and a place to park jobsite-related vehicles and equipment.

Commercial utilities for the management staff will also be provided by Fort Story. Temporary site plumbing, if necessary, will be installed by IT personnel. To compensate for the lack of commercial service near the exclusion zone, portable units (i.e., generator and water tank) will be utilized as required.

The CRZ will be located adjacent to the exclusion zone and will provide an area to remove soiled clothing and to clean grossly contaminated health and safety gear. This area may be the same area which is used as the equipment decontamination area. An emergency eye wash, first aid kit, and fire extinguishers will also be located in the immediate vicinity.

The exclusion zone is an area where the highest concentration of contamination is normally found. The FTP area, where demolition and excavation will take place, will be fully enclosed with construction/snow fencing, and labeled with the proper warning signs to keep out unauthorized personnel. As a result, the project will then comply with the IT and OSHA standard policies of barricading open excavations. In the LARC area, access is required to be maintained at all times and, hence, no construction fencing will be installed to delineate the exclusion zone.

A temporary cell for the decontamination of equipment will be developed and strategically located adjacent to the exclusion zones by placing a permalon liner on the ground. This 20 x 30 foot bermed cell will be utilized to clean the bucket of the trackhoe, loader, and valuable, small hand tools. This area will be utilized primarily during the site teardown phase, and will only be constructed when necessary to avoid the accumulation of unwanted rainwaters.

IT will work closely with the USACE onsite representative to assure that all site preparation items are acceptable and in compliance with local, state, and federal regulations that apply.

2.7 Preliminary Quantification of FTP Volumes

The volume of water, soil, concrete, and debris is estimated. A degree of accuracy for the amount of contaminated underlying soils will be difficult to present, and excavation will

proceed based upon field screenings and materials encountered. The concrete, water, and debris are more readily visible and will be easier to quantify. As a result, the following assumptions have been made based on the information gathered during the initial site assessment, and from the USACE Scope of Services. These calculations are subject to change:

Water

V = length x width x depth x 7.48
V = 20 ft. x 20 ft. x 2 ft. x 7.48
V = 5984 gallons

Sludge

V = length x width x depth ÷ 27
V = 20 ft. x 20 ft. x 1 ft. ÷ 27
V = 14.81 cubic yards

Concrete

V = length x width x depth x 1.25% ÷ 27
V = 42 ft. x 42 ft. x 1 ft. x 1.25% ÷ 27
V = 1764 cu. ft. x 1.25% ÷ 27
V = 81.67 cubic yards

W = cubic yards x 3800 lbs. ÷ 2000
W = 81.67 cu. yd. x 3800 lbs. ÷ 2000
W = 155 ton

Soil-Center

V = length x width x depth ÷ 27
V = 20 ft. x 20 ft. x 3.5 ft. ÷ 27
V = 1400 cu. ft. ÷ 27
V = 51.85 cu. yds. x 1.15 swell
V = 59.63 cubic yards

W = 59.63 cu. yd. x 3000 lbs.
W = 178,890 lbs. ÷ 2000 = 89.45 ton

Soil-Outer

V = length x width x depth - center ÷ 27
V = 52 ft. x 52 ft. x 6.5 ft. - (1764 + 1400) ÷ 27
V = 17,576 cu. ft. - (3164 cu. ft.) ÷ 27
V = 533.78 cu. yd. x 1.15 swale
V = 613.85 cubic yards

W = 613.85 cu. yd. x 3000 lbs. ÷ 2000
W = 920.78 ton

Gravel Fill

V = length x width x depth ÷ 27
V = 52 ft. x 52 ft. x 6.5 ft. ÷ 27

V = 650.96 cubic yards

W = 650.96 cu. yd. x 3000 lbs. ÷ 2000
W = 976.44 ton

The quantity of gravel backfill may be adjusted when the size of the recovery trench required is determined.

2.8 Air Monitoring

In order to assess worker exposure to airborne contaminants, JP4 aviation fuel, and the level of protection required, real time air monitoring will be performed at various times throughout the project. An HNu Photoionization Detector (PID) with an 11.7eV probe and/or a 128 Organic Vapor Analyzer Flame Ionization Detector (OVA FID) will be used for the detection of organic vapors. Calibration of these instruments will be performed each day as per manufacturer's specifications. Instrument calibration will be recorded on an IT Real Time Air Monitoring Log form.

Also, based on the current available information, IT does not anticipate the use of OSHA monitoring for benzene. For a more detailed review of air monitoring procedures, please refer to the SSHP in Appendix B of this document.

2.9 Administrative and Technical Support

In support of onsite field activities, IT will provide a strong administrative and technical quality control staff. The overall contractual management will be the responsibility of a joint administrative team from IT's Environmental Services Groups in Pittsburgh, Pennsylvania and Cincinnati, Ohio. IT Health and Safety in Cincinnati will develop the SSHP, while Pittsburgh will enforce it and oversee the real time air monitoring program. Solutions Environmental Associates will provide the technical oversight and field labor required for the LARC area bioremediation.

2.10 Removal of FTP Water

There are approximately 6,000 gallons of water contained within the FTP. Analytical procedures have been performed on this material and the results of this effort are included in Appendix D of this Work Plan.

If the waste approval process is complete, a vacuum truck service will be utilized to remove and transport this material to the chosen TSD facility. The water will be removed by placing the suction hose of the vacuum truck within the existing sump of the FTP.

In any instance, by eliminating storage tanks and double handling of materials, direct disposal is the most cost effective alternative.

2.11 Stabilization and Removal of FTP Sludge

There are approximately 15 cubic yards of sludge, and some miscellaneous debris, present in the base of the FTP. The debris consists of tree branches, shrubbery, and wood. Every effort will be made to separate these materials prior to removing the sludges. However, this task could grow tedious when dealing with the smaller items. As a result, some may have to be excavated along with the sludge.

The sludge will be solidified prior to excavating by homogenizing it with stained soils from the perimeter of the FTP. The dry soil will be added to the pit as necessary, then mixed and blended with the bucket of the 215 excavator, or an equivalent piece of machinery, until a certain stiffness or consistency is attained. Excavation will then follow with the 215 casting the material directly into trucks to transport the soil to the LARC area for treatment. The entire stabilization process will transform this soft, sticky substance into a more manageable form for excavation and transportation.

2.12 Demolition of FTP Concrete

The FTP is located in an open field with no overhead obstructions and will be easily accessed with the large track machines that will be necessary to remove it. This 42-foot square, 1-foot thick, concrete structure has a 20-foot square center opening which contains sludges and water.

Prior to demolition, the concrete will be high pressure washed to remove any visible contamination or residues which may exist. This process will be conducted three times.

The structure will be dismantled utilizing a Case 580 rubber tire backhoe equipped with a 1,500 psi breaker attachment. As the concrete is broken, it will be allowed to remain in place. When demolition is complete, the 215 trackhoe will excavate and carefully cast the

material directly into rolloffs or trucks to haul to the selected local industrial landfill. This procedure will be repeated until all materials have been safely contained or removed. There will be an estimated 155 ton of concrete removed in this fashion. The debris which exists in the FTP will be included with the concrete for disposal.

Reinforcement rods and/or wire meshing will be cut by a technician using an acetylene torch or demolition saw, whichever is the most safe and practical. The existing montoring well will be removed during the demolition of the FTP.

2.13 Removal of Underlying Soils

When the demolition of the FTP is complete, a certain amount of underlying, and lateral soils must be addressed. All visibly contaminated soils will be excavated with the 215 trackhoe. This effort is anticipated to extend 5 feet laterally in each direction from the outermost edges of the FTP, and 6-1/2 feet deep for a total approximate volume of 594 cubic yards (refer to Section 2.7 for estimated quantities). Soils will be characterized in the field through the use of HNu/Hanby Hydrocarbon Test Kits. These colormetric kits will measure the concentration present in the soil. The action limit for this site has been established at 50 ppm. The limits of excavation will be determined by the results observed by the test kits or as directed by the USACE onsite representative.

The soils will be excavated in gridded sections, approximately 10 foot wide and 52 foot long. Soils will then be cast into the dump trucks with the trackhoe and transported to the LARC area for treatment. Saturated soils will be stabilized with existing dry material, if enough remains. Since the soil materials are being transported within the limits of the base, no bills of laiding or manifests are anticipated to be required.

2.14 Installation of Recovery Trench

When the vertical and lateral limits of contamination have been reached, the excavation will be backfilled with 3/4" stone to act as a recovery trench. This will allow for the collection of suspended product, should this be necessary in the future. The exact location and extent of the trench will be determined in the field by the USACE onsite representative and the IT site superintendent. If the excavated area is significantly greater than required for the recovery trench, the remainder of the excavation will be backfilled with similar imported borrow material and placed in lifts. The 3/4" stone will be stockpiled onsite from an outside source,

then placed in lifts with the track loader. The borrow material will b eplaced first to delineate the limits of the recovery trench and then the stone will be placed as required.

2.15 Backfilling and Regrading All Excavations

A rough grading of the area surrounding the FTP will be performed at the conclusion of the project. All depressions will be filled in lifts with the track loader utilizing materials imported from an outside source. The backfill will be tracked in to achieve compaction, which will be sufficient for a nonconstruction area. Additionally, the entire area will be crowned approximately one foot to compensate for any settlement that may occur over time.

2.16 LARC Area Soil Treatment

The LARC area was utilized for the maintenance and wash area for the Lighter Amphibious Resupply Cargo vehicles. This area is approximately 200 feet by 400 feet and contains TPH contaminated soils. The intent of this remedial effort is to reduce the TPH level of the soils to below 50 ppm. The proposed method of treatment by the selected subcontractor, Solutions Environmental Associates of Chesapeake, Virginia, is an in situ bioremediation process. This process consists of placing inoculants in the soil which consume the contaminants. The entire process is detailed in the work plan provided by Solutions Environmental Associates, which is included in Appendix C. The details of this work plan may have to be expanded based on the initial studies at the site and the subsequent design of the treatment methods.

Solutions Environmental Associates will also treat the soils which will be placed in the LARC area from the FTP. The soils will be moved by IT personnel and placed at Solutions Environmental Associates direction. These additional soils may be treated for alternate organic constituents than the soils of the LARC area, but in no case will there be treatment for any inorganics, pesticides, or metal contamination.

IT Corporation will oversee Solutions Environmental's operations at the LARC area and will coordinate all correspondence between Solutions, the USACE and the State of Virginia. IT's site supervisor will be responsible for monitoring the progress of the work in the LARC area and maintaining contact with the base personnel.

2.17 UST Soil Disposal

Several piles of soil from a previous UST removal project at the base have been stockpiled north of the concrete pad adjacent to the LARC area. These soils (approximately 40 cubic yards) have been determined to be an F-listed wast e and therefore must be disposed of offsite. A composite soil sample has been collected and analyzed for disposal purposes.

Upon receipt of the analytical results, the soils will be disposed of in compliance with all federal, state and local laws that apply.

2.18 Sampling and Analytical Testing

2.18.1 Field Screening of Excavated Soils

Field screening to determine the extent of excavation required at the FTP will be performed using hydrocarbon field test kits manufactured by HNu/Hanby. These field kits will measure the concentrations present in the soil in approximately ten minutes from the time of sample collection.

Soil samples will be collected when visually stained soils are excavated or when it is felt the limit of contaminated soil has been removed. The sample will then be processed according to the manufacturer's procedures. The general procedure is as follows:

- Place a five gram soil sample in a beaker
- A 10 ml ampule of solvent is added to the soil which is agitated for three minutes
- After allowing the soil to settle, the solvent is poured into a screw-top test tube
- One vial of color development catalyst is added and the test tube is vigorously shaken for three minutes
- The hue and intensity are compared to color standards to determine the contamination type and concentration.

If the soil tested is determined to have a concentration exceeding 50 ppm TPH, the excavation will continue and additional tests run until the level of contamination is below 50 ppm or the USACE onsite representative determines the excavation limits.

2.18.2 Confirmation Sampling

Confirmation samples will be collected at the FTP to ensure that the cleanup levels have been achieved. One sample will be collected from each wall of the excavation and one from the bottom of the excavation for a total of five samples.

The samples for confirmation will be analyzed for TPH-L and TPH-H at ITAS in Export, Pennsylvania in normal turnaround time.

For a more detailed explanation of the confirmation sampling, please refer to the CSAP in Appendix A of this document.

2.19 Site Teardown/Equipment Decontamination

2.19 Site Teardown

At the conclusion of remedial activities at Fire Training Area No. 4 and the LARC area, the sites will be restored to preremedial condition. All temporary structures will be dismantled and removed from site, small tools and health and safety gear will be inventoried and packed, and the affected areas will be regraded.

The revegetation of the affected areas is not anticipated, and, therefore, has not been included.

2.19.2 Equipment Decontamination

The heavy equipment to be used on site will be thoroughly decontaminated prior to demobilization. It is anticipated that this effort will be limited to cleaning the following items: The buckets of the 215 excavator and the 555 track loader, the 1,500 psi breaker attachment, and all small pumps and hand tools that were necessary to complete the project. Any equipment utilized by Solutions Environmental Associates will also require decontamination.

Each individual piece will be scraped free of mud with hand scrapers, a square shovel, and a wire brush. The same unit will then be scrubbed with a long handle brush, dipped in a solution of citric acid/demulsifying agent and water. A final rinse with a 1,500 psi, gas powered pressure washer will complete the process. By keeping the equipment tracks and undercarriages free of contamination, and by extensive hand cleaning, the excessive generation of unwanted wash waters is hoped to be minimal.

A final inspection will then be made by the IT health and safety officer and the USACE onsite representative prior to demobilization.

2.20 Transportation and Disposal

The following is a list of potential disposal facilities:

- Disposal of Water - Petro Chem Recovery Services, Norfolk, VA
- Transportation of Water - Petro Chem Recovery Services, Norfolk, VA
- Disposal of Concrete and Debris - BFI Industries, Chesapeake, VA
- Transportation of Concrete and Debris - BFI Industries, Chesapeak, VA

Transportation and disposal will be accomplished using vendors pre-approved by IT and in compliance with all federal, state, and local laws that apply.

2.21 Submittals/Final Project Report

2.21.1 Submittals

Submittals required under this Delivery Order will be provided complete, and in a timely fashion.

2.21.1.1 Daily Submittals

Throughout the course of this project, daily submittals will be presented to the USACE onsite representative at the end of each business day, or by 8:00 a.m. the next morning. The daily submittals will include the following:

- Rapid Response Daily Work Order
- Rapid Response Quality Control Daily Report

- Daily Rapidday cost summaries
- Field modifications, including Scope of Work modification, estimated impact, and justification for modification.

2.21.1.2 Weekly/Bi-Monthly Submittals

A Weekly Status Report will be submitted from the initiation of the Delivery Order until demobilization from site. After site work is complete, the report shall be transmitted every two weeks until final payment is made. This progress report will include a revised schedule for the project, an explanation of any schedule slippages, and the following information:

- Project name
- Date of report
- Name, title, telephone and telefax numbers, address, company, and name of person completing the report
- Summary of work performed, both onsite and offsite
- Deviation from Scope of Services and Work Plan
- Problems encountered
- Recommendations
- Anticipated personnel changes
- Work anticipated to be performed within the next week
- Percent field work complete
- Project percent complete
- Tabulation, with breakout by waste stream, of hazardous wastes/substances and any that were sampled and transported for the week and to date
- Records of conversations with regulatory agencies, public, news media, property owners, and other significant individuals
- Weekly cost summary.

2.21.1.3 Miscellaneous Submittals

During the execution of site work, minutes will be taken of all meetings and conference calls. This documentation will be submitted to the USACE onsite representative within 72 hours for distribution to all participants.

2.21.2 Final Project Report

A Final Project Report will be issued within 60 days of completion of site activities. There is to be a total of 8 copies of this report issued per the submittal register in the Scope of Services. These include:

- Six copies to the USACE Engineering Office in Omaha
- Two copies to the USACE Construction Office in Fort Crook.

In addition, three copies will be prepared for IT's internal files.

The Final Project Report shall consist of a summary of work performed, including the following:

- A narrative Scope of Work
- Project objectives
- Mobilization and demobilization
- Site setup, operations, and environmental protection
- Safety
- Quality control
- Recommendations and lessons learned
- Conclusions, with site manager's address, telephone and telefax numbers, and any unique or special tasks performed or situations documented
- Final Scope of Work
- Completed permits
- Licenses

- Warranties or guarantees
- Weekly Status Report
- Rapid Response Daily Work Orders
- Sampling/analysis documentation and results
- Chain of Custody records
- Disposal records
- Photo documentation
- Cost data
- Certificate of Disposal at the TSD facility
- Hazardous waste weigh tickets, manifests, and nonhazardous weigh tickets
- List of visitors
- Project points of contact
- Survey reports and backup notes
- Meeting highlights.

3.0 Management, Staff, and Schedule

This Section presents the management, staffing, and schedule for the remedial action at the Fort Story Military Installation at Fort Story, Virginia. A project team has been selected to assure a technical and efficient execution of this project.

3.1 Management and Staff

The Program Director for this Delivery Order will be Mr. Al Meyers, who will ensure that contractual obligations are met. Mr. Doug Wehner will serve as Project Administrator for this project assuring that all reporting, scheduling, and budgetary obligations are met.

Mr. Thomas Mathison will serve as Project Manager and will oversee the coordination of the entire project, administer all instructions, and obtain answers to all questions from the USACE project manager. Mr. Mathison will also monitor the budget and schedule on a day-to-day basis.

Mr. Bill Simpson will be the Onsite Superintendent and will be responsible for maintaining contact with the USACE onsite construction representative and Fort Story Base personnel. Mr. Simpson will supervise all onsite activities, prepare the daily submittals and the weekly status report, and maintain close contact with IT project management.

Mr. Larry Verdier will be the Certified Industrial Hygienist (CIH) and will prepare the SSHP and assure IT's health and safety obligations are being met.

Mr. Jack Boberg will be the onsite Health and Safety Specialist and will be responsible for executing the SSHP. Mr. Boberg will conduct the site-specific training, tailgate safety sessions, and will have the overall responsibility of the real time air monitoring program, as requested in the USACE Scope of Services.

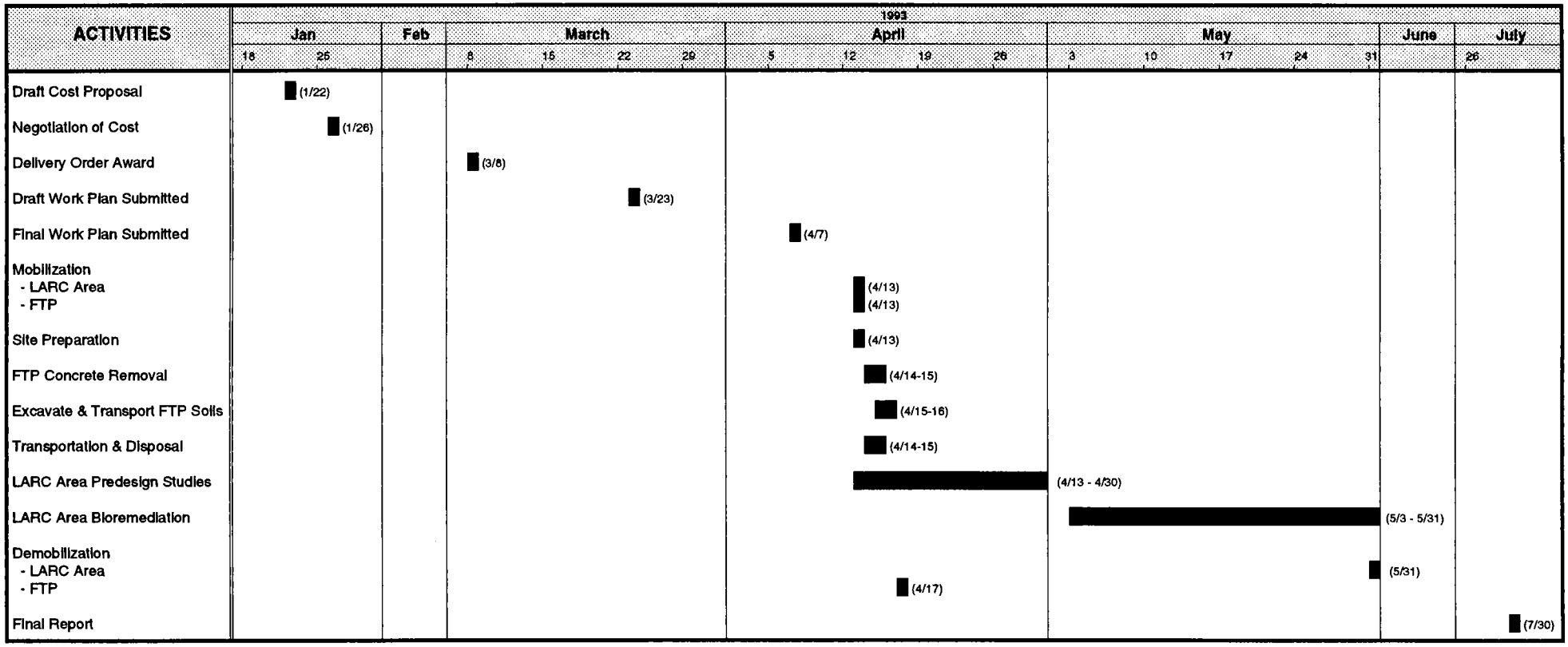
Mr. Quentin Nichols will be the Regulatory Specialist and will review and submit all manifests and waste profiles for USACE approval.

Mr. Bob Twaddle will be the Site Administrator and will be responsible for tracking all costs associated with this project, using the Rapidday Job Tracking System.

3.2 Schedule

Field activities will be completed in one phase. A bar chart schedule is provided to illustrate the detailed work activities.

Fort Story, Va
LARC Area and Fire Training Pit
Proposed Schedule
Contract No. DACW45-90-D-9002



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APPENDIX A
CONTRACTOR SAMPLING AND ANALYSIS PLAN (CSAP)

Contractor Sampling and Analysis Plan (CSAP)
For Remediation Services of
NAPL Removal - LARC Maintenance
and Fire Training Area
Fort Story, Virginia

Contract No. DACW45-90-D-9002
Delivery Order No. 55
IT Project No. 519029

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TABLE OF CONTENTS

		Page
1.0	Introduction	1
	1.1 Site History	1
	1.2 Project Description	2
	1.3 Chemical Quality Data Objectives	2
2.0	Sampling Locations and Methods	3
	2.1 Sampling Equipment	3
	2.2 Wastestream Sampling Methods	4
	2.2.1 Mixing and Compositing Procedures for Soil Sampling	4
	2.2.2 Wastewater Sampling	4
	2.2.3 Screening of Soils During Excavation/Trenching	4
	2.2.4 Composite Sampling of Stockpiled Soil	5
	2.2.5 Field Screening/Calibration Sampling	5
	2.2.6 Confirmatory Soil Sampling - Fire Training Area Excavation	7
	2.3 Decontamination Procedures and Sample Location Logs	7
3.0	Sample Labeling, Handling, and Shipment	8
4.0	Quality Assurance/Quality Control Samples	10
5.0	Reporting Requirements	11

LIST OF APPENDICES

Appendix A Analytical Requirements for Fort Story

Appendix B Cooler Receipt Forms

Appendix C Holding Times and Detection Limits

Appendix D HNu Hanby Test Kit Specifications

1.0 INTRODUCTION

This document represents the Contractor Sampling and Analysis Plan (CSAP) for the Fire Training Area removal interim rapid response action. The CSAP addresses all necessary procedures and methods for the sample collection and analyses associated with this project. This document serves three purposes:

1) The CSAP provides a methods and procedures manual to be used by the International Technology Corporation (IT) field crew and analytical staff as a guide in conducting all sampling and analysis activities.

2) The CSAP presents the formal sampling and analysis documentation to the USACE, and Fort Story site representatives for their review and approval.

3) The CSAP is the basis for ensuring the QA/QC of all analytical results obtained during this project.

The collection, handling, and analysis of samples will be addressed in this CSAP. Neither sampling nor analysis will proceed without the prior approval of this plan by USACE.

1.1 Site History

Fort Story is approximately 10 miles east of Norfolk, Virginia, near Virginia Beach. This action will cover the S-4 Fire Training Area and LARC Maintenance Area located in the southwestern section of Fort Story.

The S-4 Fire Training Area was used for exercises in the extinguishing of fuel fires, primarily JP-4 jet fuel. Prior to 1980, JP-4 was released and ignited directly on the surface soil, and was extinguished using a mixture of fire fighting foam and water.

The existing fire pit was constructed in 1980. Monthly exercises consisted of filling the pit with 75 to 400 gallons of fuel (JP-4 fuel, contaminated fuels and hydraulic fluid) and several inches of water. The mixture was then ignited and extinguished using 50 to 150 gallons of firefighting foam. The residues and remaining liquids were left to evaporate.

The LARC Maintenance Area, specifically the wash rack area, was first used during the 1950's as a Barge Amphibious Resupply Cargo (BARC) motorpool and maintenance facility. In 1964, the BARC vehicle was phased out and the Lighter Amphibious Resupply Cargo (LARC) vehicle was prototyped. Presently, this is the only facility on the east coast available to the Army Transportation Corps for amphibious training.

1.2 Project Description

The intention of this delivery order is to remove and dispose of petroleum contaminated concrete, excavate and transport to the LARC area the contaminated soils from the Fire Training Area, and bio-remediate the LARC with the Fire Training Area, and associated soils, as specified in the Scope of Services as prepared by the USACE Omaha District dated March 2, 1993.

1.3 Chemical Quality Data Objectives

The objectives of sampling and analysis data obtained throughout the project include:

- Accurate characterization of existing soils for design for bio-remediation;
- Accurate characterization of waste streams for proper classification and disposal; and
- Once installed, to judge the effectiveness of the bio-remediation system.

2.0 SAMPLING LOCATIONS AND METHODS

2.1 Sampling Equipment

The following equipment will be required for field sampling activities:

Liquid Sampling
- Clean dip and sample jars
- Pole or extension for dipping

Field Screening of Excavated Soils
- HNU or OVA
- Stainless steel split spoon sampler
- Stainless steel or disposable trowels
- Aluminum foil
- Clean 8 oz. sample jars
- Decon supplies
- Chlor-n-soil kit
- HNu/Hanby hydrocarbon test kit

Composite Sampling of Contaminated Soils
- Stainless steel or disposable trowels
- Clean sample jars
- Stainless steel bowl
- Decon supplies

Groundwater Sampling
- Stainless steel or disposable bailers
- pH
- Conductivity
- Temp meter
- Clean 40 ml vials
- Water level meter
- Decon supplies

Confirmation Soil Sampling
- Stainless steel split spoon sampler
- Clean jars
- Decon supplies

2.2 Wastestream Sampling Methods

The following waste streams are identified for sampling for disposal at the S-4 site and LARC area:

- Wastewater encountered during excavation/trenching and decontamination
- Concrete and debris encountered during excavation/trenching activities
- Residual liquids from fire training exercises.

A representative sample of each of these waste streams will be required for characterization and profiling into disposal facilities.

2.2.1 Mixing and Compositing Procedures for Soil Samples

Mixing and compositing will be accomplished by first placing the individual sample, or subsamples to be composited, into a stainless steel mixing pan or bowl. Next the samples are split into four equal portions, each quarter is then individually mixed and recombined into one. This process is repeated once before transferring the sample into appropriate containers.

2.2.2 Wastewater Sampling

Prior to excavation and trenching operations, IT anticipates that contaminated water will be encountered. The water will be collected and stored in a bulk storage tank or pool in a convenient location adjacent to the excavation area. Decontamination water from the decontamination area(s) will also be consolidated into the wastewater storage tank. Once an ample amount is stored and a representative sample can be obtained, a composite liquid sample will be taken for profiling into disposal facilities. The sample will be analyzed for constituents as presented in Appendix A.

The liquid in the storage tank will be sampled with clean dip jars and analyzed for the parameters as presented in Appendix A. Pending these results, it may be necessary to collect representative samples for potential disposal facilities' confirmation analysis.

2.2.3 Screening of Soils During Excavation/Trenching

Field screening to determine the extent of excavation required at the FTP will be performed using hydrocarbon field test kits manufactured by HNu/Hanby. These field kits

will measure the concentrations present in the soil in approximately ten minutes from the time of sample collection.

Soil samples will be collected when visually stained soils are excavated or when it is felt the limit of contaminated soil has been removed. The sample will then be processed according to the manufacturer's procedures. The general procedure is a s follows:

- Place a five gram sample in a beaker
- A 10 ml ampule of solvent is added to the soil which is agitated for three minutes
- After allowing the soil to settle, the solvent is poured into a screw-top test tube
- One vial of color development catalyst is added and the test tube is vigorously shaken for three minutes
- The hue and intensity are compared to color standards to determine the contamination type and concentration

If the soil tested is determined to have a concentration exceeding 50 ppm TPH, the excavation will continue and additional tests run until the level of contamination is below 50 ppm or the USACE onsite representative determines the excavation limits. See Appendix D for more information concerning this test method.

2.2.4 Composite Sampling of Stockpiled Soil

Two composite stockpiles from previous underground storage tank removal product will be sampled for disposal option. These representative composite samples will be collected from the stockpiled material using a stainless steel hand auger or other appropriate tools depending on the material to be sampled. Five (5) subsamples will be collected and composited per every 200 yards of material to be disposed. Additional compositing may be done to further reduce the number of samples submitted for off-site analysis. Mixing and compositing will be performed as described in Section 2.2.1. Analyses required to meet waste acceptance criteria for disposal will be coordinated with the disposal facility.

2.2.5 Field Screening/Calibration Sampling

Calibration samples will be collected to correlate the HNu/Hanby hydrocarbon test kit to the 50 ppm TFH action level as defined by the State of Virginia. Five (5) samples will be collected and sent to ITAS, Export for a Rush analysis for TFH418.1 and 8015.

These sample swill be collected using a stainless steel hand auger or a disposable spoon. The soil samples will be placed into clean glass jars, labeled and prepared for shipment.

Two (2) additional samples will be taken every week until the initiation of confirmation sampling.

2.2.6 Confirmatory Soil Sampling - Fire Training Area Excavation

One soil sample shall be collected from each wall of the excavation and one from the bottom of the excavation for a total of five (5) samples. Confirmatory sampling will be required after the excavation of petroleum contaminated soils. The samples will be acquired by using a stainless steel hand auger or disposable spoon. The soil samples will be placed in clean glass jars, labeled and prepared for shipment. The samples will be analyzed for parameters as specified in Appendix A.

2.3 Decontamination Procedures and Sample Location Logs

Split spoons and any other stainless steel sampling equipment will be deconned as follows:

- Nonphosphate detergent wash and brushing
- Tap water rinse
- Organic free deionized water rinse
- Pesticide grade isopropanol rinse
- Double deionized organic free water rinse

All sample locations will be clearly marked on a drawing that denotes locations relative to geographical features or landmarks. This drawing will include an indication of scale and north direction. The Onsite Supervisor will keep a bound field notebook recording sample locations, times of collection, observations, and all pertinent data on field measurements. The data will be recorded using legible, indelible ink.

3.0 SAMPLE LABELING, HANDLING, AND SHIPMENT

All samples will be assigned ID numbers and logged in the field log book. The following numbering system shall be used: where XX is the sample number, 519029/SXX for the soil/sludge; 519029/LXX for the wastewater; 519029/PXX for the product; 519029/CXX for the concrete/debris/PPE. These ID numbers, as well as the following information, will appear on each sample label:

- Name of collector
- Date and time of collection
- Place of collection
- Required analysis
- Preservatives used
- Designation between "Grab" or "Composite" samples
- Sample type
- Project number and name

Immediately after collection, the threads of each jar are to be wiped with a dry paper towel. This is done to eliminate any sand or grit that may prevent a good seal. The lid will be screwed on tightly and tape will be wrapped around the lid to prevent loosening during shipment. Sample jars will then be placed, individually, in ziploc storage bags and stored in a chilled cooler.

When shipping soil samples, they are to be placed in the cooler in such a way that there is at least one to two inches between each jar. All void spaces will then be filled with plastic bubble wrap or vermiculite. Bubble wrap is the preferred method. Styrofoam "peanuts" are to be avoided, since these may permit the jars to shift if the cooler is roughly handled. Sample containers may be layered, provided there is at least one to two inches of bubble wrap or some other type of cushion between layers.

All samples must be kept at a temperature of 4 degrees Centigrade or below. Blue ice is the recommended coolant, since it occupies less space in the cooler, melts at a slower rate than ice, and will not result in a free liquid as it melts. When shipment to an out-of-town laboratory by overnight courier is required, samples will be prechilled to maintain the integrity of preservation. Blue ice, if used, should be frozen for a period of not less than eight hours, and must be placed in a ziplock bag. The coolers will also contain a VOA trip blank prepared by the laboratory for groundwater samples only. All field blanks will be prepared by the Site Sampling Technician at the time of cooler packaging.

A Chain of Custody and Request For Analysis Form will be sealed in a ziploc bag and taped to the lid of each cooler. The coolers will be bound securely, taping completely around each end of the cooler. Two or three signed custody seals will be taped on the outside corners of the cooler to verify integrity through shipment. Samples will be delivered to the ITAS-Export laboratory, or shipped by overnight delivery service to this or another

laboratory on the same day as collection (no samples shall remain on site for more than 24 hours).

Samples will be shipped to:

ITAS-Export Laboratory
5103 Old William Penn Highway
Export, PA 15632

This laboratory will have USACE certification for performing analytical which requires that any subcontracted analytical outside of this laboratory must have prior approval of USACE.

4.0 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

One duplicate will be run on the confirmation samples submitted to ITAS. Matrix spikes for TCLP data will be run on all wastestreams that will be disposed of as petroleum contaminated as per existing CFR requirements. One trip blank will be sent with the aqueous liquid for volatiles analysis.

Disposal samples will not require QA/QC samples to be submitted, for the disposal facilities will run confirmatory analytical and any discrepancies will be identified.

The QA/QC parameters, as indicated in Appendix C, will be maintained. With respect to ITAS analytical results all internal quality control, calibration procedures and frequencies, detection limits, and reporting of data for all analytical procedures shall be the responsibility of the ITAS laboratory.

No samples will be supplied to USACE's MRD laboratory.

5.0 REPORTING REQUIREMENTS

Upon receipt of the analytical data, IT personnel will prepare a final report. The report will discuss the scope of the field activities, the analytical data, and our recommendations. At a minimum, the report will include:

- Rapid Response Quality Control Daily Reports
- Rapid Response Daily Work Order
- Sampling and analysis documentation and results
- Exposure limits (if applicable)
- Laboratory quality control records
- Laboratory QA reporting requirements (MS, MSD, surrogate recoveries, batch sizes)
- Chain of Custody records
- Disposal records (if required)
- Photo documentation
- Maps and surveying results

The final report will be submitted to USACE and its designees in draft form, and will have all comments incorporated prior to issuance of the final report.

APPENDIX A

ANALYTICAL REQUIREMENTS FOR FORT STORY

TABLE 1
ANALYTICAL REQUIREMENTS FOR FORT STORY SITE

Description	Matrix	Quantity	Dup/ Splits	Type	Parameter	Method	TA Time
Residual liquid	Liquid	2+	0	Disposal	Total Semivolatiles Total Metals Total Volatiles Pesticides/PCB's Flashpoint Total Amenable Cyanide	SW846, 8270 SW846,3010,6010,7470 SW846, 8240 SW846, 8080 SW846, 1010 SW846, 9010	Normal
LARC Area	Soil	3	0	Hazard Status	TCLP Lead	SW840, 6010, 1311	Normal
Decon Waters	Liquid	1	0	Disposal	Total Metals Total Volatiles Total Semivolatiles Pesticides/PCB's	SW846,3010,6010,7470 SW846, 8240 SW846, 8270 SW846, 8080	Normal
Excavation	Soil	Numerous	0	Field screening	TPH	HNu/Hanby Test Kit	On-site
Fire training site	Soil	5	0	Confirmation	TPH (jet fuel) TPH Total Total Metals Total Volatiles Total Semivolatiles	SW846, 8015 EPA 418.1 SW846,3010,6010,7470 SW846, 8240 SW846, 8270	Rush 2 day

TABLE 1 (CONTINUED)
ANALYTICAL REQUIREMENTS FOR FORT STORY SITE

Description	Matrix	Quantity	Dup/ Splits	Type	Parameter	Method	TA Time
Stockpiled soils	Soil	2	0	Disposal	Flashpoint BTEX Reactivity pH Paint Filter	SW846, 1010/1020 SW846, 8240 SW846 SW846, 9040/9045 SW846	10 day
Calibration	Soil	7	0	Calibration	TPH (jet fuel) TPH Total	SW846, 8015 EPA 418.1	Normal

* Number of samples dependent on delineation of contamination.

\+ One sample each from the Larc Area and the Fire Training Site. The analytical for the Fire Training Site is included in an Appendix of the Work Plan.

APPENDIX B

COOLER RECEIPT FORMS

COOLER RECEIPT FORM

PROJECT: _____ LIMS# _____

USE OTHER SIDE OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS.

A. PRELIMINARY EXAMINATION PHASE: Date cooler opened: _____ C-of-C Number: _____

by (print) _____ (sign) _____

1. Did cooler come with a shipping slip (air bill, etc)?..... YES NO

   If YES, enter carrier name & air bill number here: _____

2. Were custody seals on outside of cooler?..... YES NO

   How many & where: _____, seal date: _____, seal name _____

3. Were custody seals unbroken and intact at the data and time of arrival?..... YES NO

4. Did you screen samples for radioactivity using the Geiger Counter?..... YES NO

5. Were custody papers sealed in a plastic bag & taped inside to the lid?..... YES NO

6. Were custody papers filled out properly (ink, signed, etc.)?..... YES NO

7. Did you sign custody papers in the appropriate place?..... YES NO

8. Was project identifiable from custody papers?. If yes, enter project name at the top of this form.... YES NO

9. If required, was enough ice used?..... Type of ice: _____..... YES NO

10. Have designated person initial here to acknowledge receipt of cooler: _____ (date) _____

B. LOG-IN PHASE: Date samples were logged-in: _____

by (print) _____ (sign) _____

11. Describe type of packing in cooler: _____

12. Were all bottles sealed in separate plastic bags?..... YES NO

13. Did all bottles arrive unbroken & were labels in good condition?..... YES NO

14. Were all bottle labels complete (ID, date, time, signature, preservative, etc.)?..... YES NO

15. Did all bottle labels agree with custody papers?..... YES NO

16. Were correct containers used for the tests indicated?..... YES NO

17. Were correct preservatives added to samples?..... YES NO

18. Was a sufficient amount of sample sent for tests indicated?..... YES NO

19. Were bubbles absent in volatile samples? If NO, list by Sample # _____ YES NO

20. Was the project manager called and status discussed?. If yes, give details on the back of this form. YES NO

21. Who was called? _____ By whom? _____ (date) _____

APPENDIX C

HOLDING TIMES AND DETECTION LIMITS

FORT STORY AQUEOUS LIQUID

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Volatiles			
Benzene	None	14 days	25 mg/L
Carbon tetrachloride	None	14 days	25 mg/L
Chlorobenzene	None	14 days	25 mg/L
Chloroform	None	14 days	25 mg/L
1,4-Dichlorobenzene	None	14 days	25 mg/L
1,2-Dichloroethane	None	14 days	25 mg/L
1,1-Dichloroethylene	None	14 days	25 mg/L
Methyl ethyl ketone	None	14 days	50 mg/L
Tetrachloroethylene	None	14 days	25 mg/L
Trichloroethylene	None	14 days	25 mg/L
Vinyl chloride	None	14 days	50 mg/L
Other			
Flashpoint	None	N/A	4°C
PCB's	None	7 days until extraction, 40 days after excavation	.5 ug/L
Total amenable cyanide	NaOH to pH >12[5],[6]	14 days	.02 mg/L

FORT STORY AQUEOUS LIQUID (CONTINUED)

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Semivolatiles			
M-Cresol	None	7 days until solvent extraction,	40 mg/L
		40 days after extraction	40 mg/L
o-Cresol	None	"	40 mg/L
p-Cresol	None	"	40 mg/L
Total Cresol	None	"	40 mg/L
2,4-Dinitrotoluene	None	"	40 mg/L
Hexachlorobenzene	None	"	40 mg/L
Hexachlorobutadiene	None	"	40 mg/L
Hexachloroethane	None	"	40 mg/L
Nitrobenzene	None	"	40 mg/L
Pentachlorophenol	None	"	200 mg/L
Pyridine	None	"	40 mg/L
2,4,5-Trichlorophenol	None	"	200 mg/L
2,4,6-Trichlorophenol	None	"	200 mg/L

FORT STORY AQUEOUS LIQUID (CONTINUED)

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Total Pesticides			
Alpha-BHC	None	7 days until solvent extraction, 40 days after extraction	0.05 mg/L
Beta-BHC	None	"	0.05 mg/L
Delta-BHC	None	"	0.05 mg/L
Gamma-BHC (Lindane)	None	"	0.05 mg/L
Heptachlor	None	"	0.05 mg/L
Heptachlor Epoxide	None	"	.1 mg/L
Endosulfan I	None	"	.1 mg/L
Aldrin	None	"	.05 mg/L
Dieldrin	None	"	.1 mg/L
4,4'-DDE	None	"	.1 mg/L
Endrin	None	"	.1 mg/L
Endosulfan II	None	"	.1 mg/L
4,4'-DDD	None	"	.1 mg/L
4,4'-DDT	None	"	.1 mg/L
Endosulfan Sulfate	None	"	.1 mg/L
Methoxychlor	None	"	.5 mg/L
Chlordane	None	"	1 mg/L
Toxaphene	None	"	5 mg/L
Endrin Aldehyde	None	"	.1 mg/L
Isodrin	None	"	.1 mg/L
Kepone	None	"	(.5) mg/L

FORT STORY AQUEOUS LIQUID (CONTINUED)

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Metals (total)			
Arsenic	HNO_3 to pH <2	6 months	.001 mg/L
Barium	HNO_3 to pH <2	6 months	.003 mg/L
Cadmium	HNO_3 to pH <2	6 months	.005 mg/L
Chromium	HNO_3 to pH <2	6 months	.010 mg/L
Lead	HNO_3 to pH <2	6 months	.100 mg/L
Mercury	HNO_3 to pH <2	28 days	.0002 mg/L
Selenium	HNO_3 to pH <2	6 months	.002 mg/L
Silver	HNO_3 to pH <2	6 months	.010 mg/L
Copper	HNO_3 to pH <2	6 months	.006 mg/L
Nickel	HNO_3 to pH <2	6 months	.016 mg/L
Zinc	HNO_3 to pH <2	6 months	.004 mg/L
Baryllium	HNO_3 to pH <2	6 months	.003 mg/L

(1) All samples should be kept cool to 4 ◦C.

(2) Holding time is for chemically preserved sample where applicable.

(3) Four drop 10% $Na_2S_2O_3$ per 40 ml should be used only in the presence of residual chlorine (thiosulfate reduces residual chlorine).

(4) 1 ml 10% $Na_2S_2O_3$ per liter should be used only in the presence of residual chlorine (thiosulfate reduces residual chlorine).

(5) Hold time is 24 hours when sulfide is present. Use lead acetate paper before pH adjustment in order to determine if sulfide is present. If it is, remove by the addition of cadmium nitrate powder until a negative spot test is obtained. Then, filter the sample and add NaOH to pH >12.

(6) In presence of residual chlorine, also 0.6g ascorbic acid.

(7) 2 ml 2N zinc acetate per liter, sodium hydroxide to pH >9.

FORT STORY SOLID/NON-AQUEOUS LIQUID

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Volatiles (TCLP)			
Benzene	None[1]	14 days until TCLP extraction, 14 days after TCLP extraction.	5 mg/kg
Carbon tetrachloride	None[1]	"	5 mg/kg
Chlorobenzene	None[1]	"	5 mg/kg
Chloroform	None[1]	"	5 mg/kg
1,4-Dichlorobenzene	None[1]	"	5 mg/kg
1,2-Dichloroethane	None[1]	"	5 mg/kg
1,1-Dichloroethylene	None[1]	"	5 mg/kg
Methyl ethyl ketone	None[1]	"	10 mg/kg
Tetrachloroethylene	None[1]	"	5 mg/kg
Trichloroethylene	None[1]	"	5 mg/kg
Vinyl chloride	None[1]	"	10 mg/kg

FORT STORY SOLID/NON-AQUEOUS LIQUID (CONTINUED)

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Semivolatiles (TCLP)			
M-Cresol	None[1]	14 days until TCLP extraction, 7 days to solvent extraction, 40 days after TCLP extraction.	200 mg/kg
o-Cresol	None[1]	"	200 mg/kg
p-Cresol	None[1]	"	200 mg/kg
Total Cresol	None[1]	"	200 mg/kg
2,4-Dinitrotoluene	None[1]	"	0.13 mg/kg
Hexachlorobenzene	None[1]	"	0.13 mg/kg
Hexachlorobutadiene	None[1]	"	0.5 mg/kg
Hexachloroethane	None[1]	"	3.0 mg/kg
Nitrobenzene	None[1]	"	2.0 mg/kg
Pentachlorophenol	None[1]	"	100.0 mg/kg
Pyridine	None[1]	"	5.0 mg/kg
2,4,5-Trichlorophenol	None[1]	"	400.0 mg/kg
2,4,6-Trichlorophenol	None[1]	"	2.0 mg/kg

FORT STORY SOLID/NON-AQUEOUS LIQUID (CONTINUED)

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Total Pesticides			
Alpha-BHC	None	7 days until solvent extraction, 40 days after extraction.	1.7 mg/kg
Beta-BHC	None	"	1.7 mg/kg
Delta-BHC	None	"	1.7 mg/kg
Gamma-BHC (Lindane)	None	"	1.7 mg/kg
Heptachlor	None	"	1.7 mg/kg
Heptachlor Epoxide	None	"	3.3 mg/kg
Endosulfan I	None	"	3.3 mg/kg
Aldrin	None	"	1.7 mg/kg
Dieldrin	None	"	3.3 µg/kg
4,4'-DDE	None	"	3.3 µg/kg
Endrin	None	"	3.3 µg/kg
Endosulfan II	None	"	3.3 µg/kg
4,4'-DDD	None	"	3.3 µg/kg
4,4'-DDT	None	"	3.3 µg/kg
Endosulfan Sulfate	None	"	3.3 µg/kg
Methoxychlor	None	"	17 µg/kg
Chlordane	None	"	33 µg/kg
Toxaphene	None	"	170 µg/kg
Endrin Aldehyde	None	"	3.3 µg/kg
Isodrin	None	"	3.3 µg/kg
Kepone	None	"	17 µg/kg

FORT STORY SOLID/NON-AQUEOUS LIQUID (CONTINUED)

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Other			
pH	None[1]		N/A
Flashpoint	None[1]		4°C
PCBs	None[1]	14 days until extraction, 40 days after extraction.	0.017 mg/g
BTEX	None[1]	14 days	5 mg/kg
TPH	None[1]	N/A	.1 mg/kg
Reactivity	None[1]	N/A	.1 mg/kg

FORT STORY SOLID/NON-AQUEOUS LIQUID (CONTINUED)

Parameter	Chemical Preservative[1]	Holding Time[2]	PQL
Metals (total)			
Arsenic	None[1]	6 months	0.05 ug/g
Barium	None[1]	6 months	0.2 ug/g
Cadmium	None[1]	6 months	0.3 up/g
Chromium	None[1]	6 months	0.5 ug/g
Lead	None[1]	6 months	5 ug/g
Mercury	None[1]	28 days	0.05 ug/g
Selenium	None[1]	6 months	0.1 ug/g
Silver	None[1]	6 months	0.5 ug/g
Metals (TCLP)			
Arsenic	None[1]	6 months until TCLP extraction, 6 months after TCLP extraction.	.001 mg/l
Barium	None[1]	"	.003 mg/l
Cadmium	None[1]	"	.005 mg/l
Chromium	None[1]	"	.010 mg/l
Lead	None[1]	"	.10 mg/l
Mercury	None[1]	28 days until TCLP extraction, 28 days after TCLP extraction.	.0002 mg/l
Selenium	None[1]	6 months until TCLP extraction, 6 months after TCLP extraction.	.002 mg/l
Silver	None[1]	"	.010 mg/l

(1) All samples should be kept cool to 4°C.

(2) Holding time is for chemically preserved sample where applicable.

APPENDIX D

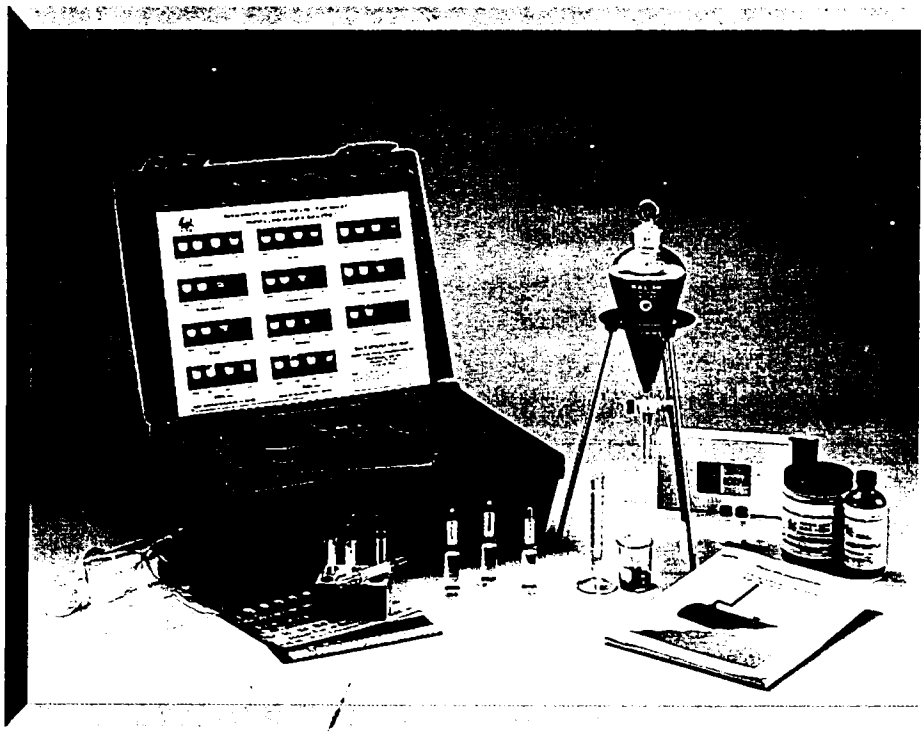
HNu HANBY TEST KIT SPECIFICATIONS

Fast, Low-Cost Water & Soil Analysis

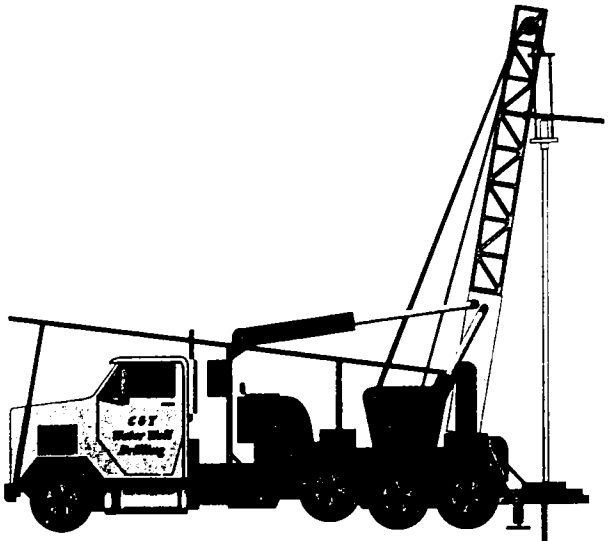
for Aromatics & Petroleum Hydrocarbons

hanby ENVIRONMENTAL FIELD TEST KITS

- Gasoline • Diesel • Heating Fuel • Crude Oil • PCBs • DDT



The Hanby Method "provides quantitative results with high levels of precision and accuracy."
—U.S. Environmental Protection Agency report number 530/UST-90/003



HNU-Hanby Environmental Field Test Kits

Inexpensive	*On-site tests are conducted for less than $20† each.*
Fast	*The entire procedure is completed in under 10 minutes.*
Easy To Use	*After performing a simple direct extraction technique, a special reagent for color development is added: hue and intensity are then compared to color standards.*
Accurate	*The direct extraction/colorimetric method is accurate to low-ppm levels regardless of sample conditions.*

† does not include initial purchase price of the test kit

The Hanby Method was recently documented in EPA report number 530/UST-90/003 Field Measurements: Dependable Data When You Need It, published September 1990.

In this report, the procedure is said to "...[provide] quantitative results with high levels of precision and accuracy."

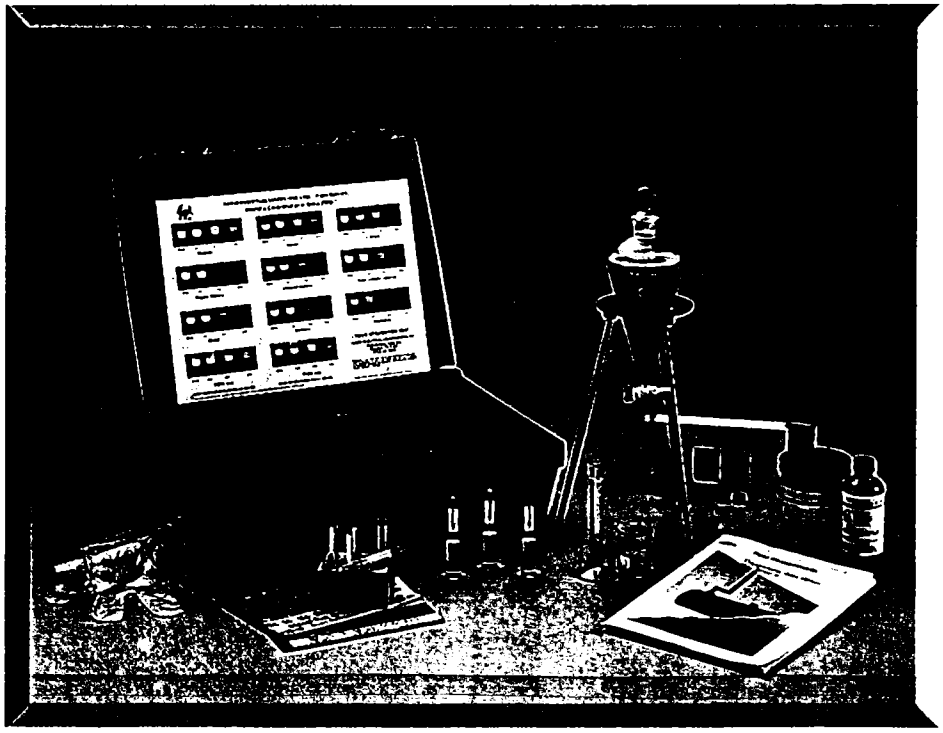
HNU-Hanby Environmental Field Test Kits have proven effective in:

- quantifying the level of contamination;
- determining the lateral and vertical extent of the contamination plume;
- isolating the source of leaks;
- establishing the placement of monitor wells;
- investigating leaking underground storage tanks;
- surveying effectiveness of biological treatments;
- selecting which samples should be sent for more detailed and costly laboratory analysis.

HNU-Hanby Environmental Field Test Kits come in a rugged, plastic carrying case. Each kit contains: a 10-ml graduated cylinder, 36 screw-top test tubes, 30 ampules of extraction reagent (20-ml for soil kits/5-ml for water kits), 30 vials of color development reagent, a 500-ml separatory funnel, a tripod-ring stand, 1 pair of safety glasses, 6 pair of plastic gloves, instructional video, a color chart depicting test results (standards) for eleven typical aromatics, and individual standards for both gasoline and diesel fuel in soil. In addition, the soil kit contains a 50 ml beaker and a stainless steel spatula. The carrying case dimensions are 15H x 19W x 8D inches; shipping weight is 17 lbs.

Typical Minimum Detection Limits

Product	Soil	Water
BTEX	1 ppm	1 ppm
Unleaded Gasoline	1 ppm	1 ppm
Diesel Fuel	1 ppm	1 ppm
Crude Oil	1 ppm	1 ppm
Heating Oil	1 ppm	1 ppm
PCBs	5 ppm	0.5 ppm



The Hanby Method: US Patent Number 4,992,379; Granted February 12, 1991

Soil Analysis

A five-gram soil sample (approx. 2 ml) is placed in a beaker. A 10-ml ampule of solvent is added to the soil which is agitated for three minutes. After allowing the soil to settle, the solvent is poured into a screw-top test tube to the 4.2 ml mark.

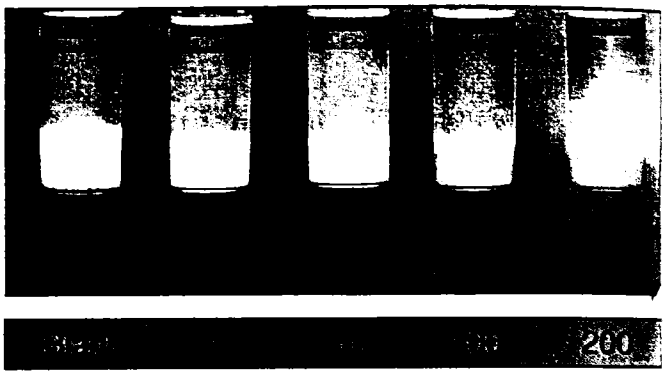
One vial of color development catalyst is added and the test tube is vigorously shaken for three minutes. The hue and intensity are compared to color standards to determine the contaminant type and concentration. A portable spectrophotometer with both reflectance and transmission modes offers direct readout in ppm.

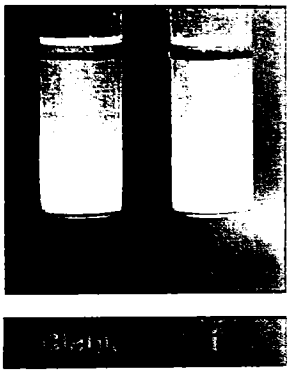
Water Analysis

A 500-ml water sample is placed in a separatory funnel which is set in a ringstand. A 5-ml ampule of extraction reagent is added to the water sample and the funnel is vigorously shaken for two minutes (with occasional release of pressure build-up). The funnel is then set aside for five minutes allowing the extraction phase to separate to the bottom. After phase separation is complete, the lower extraction level is drained into a screw-top test tube to the 4.2-ml mark allowing a small amount of the extraction solvent to remain in the funnel.

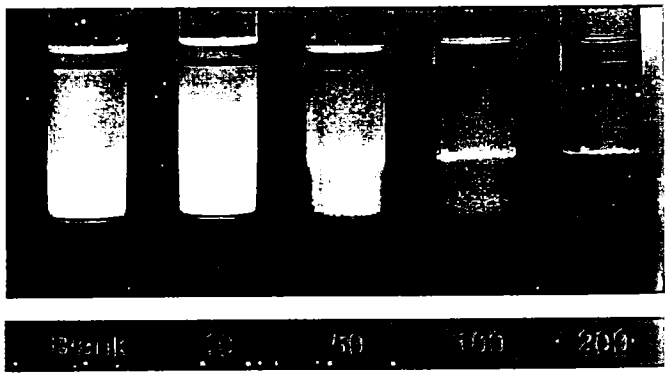
One vial of color development reagent is added and the tube is vigorously shaken for two minutes or until a uniform color develops. The hue and intensity are compared to color standards to determine the contaminant type and concentration. A portable spectrophotometer with both reflectance and transmission modes offers direct readout in ppm.

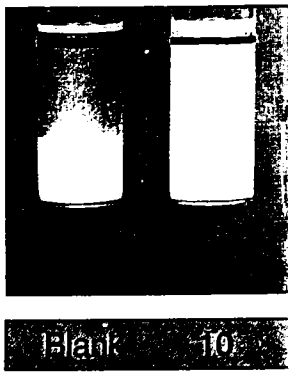
Unleaded Gasoline (ppm)

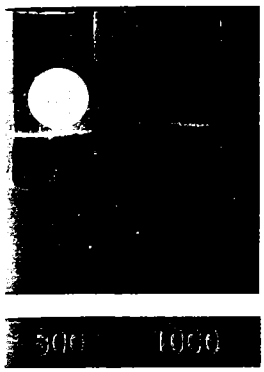




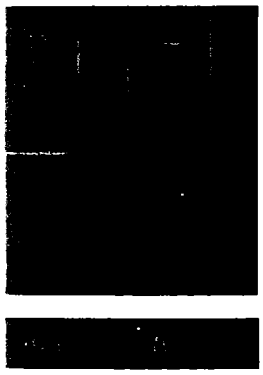
Crude Oil (ppm)



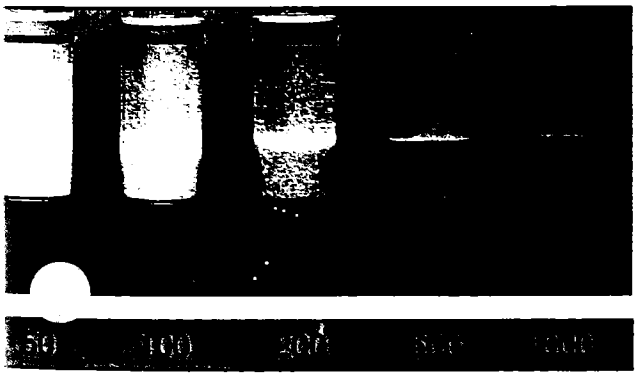




Diesel Fuel (ppm)



Heating Oil (ppm)



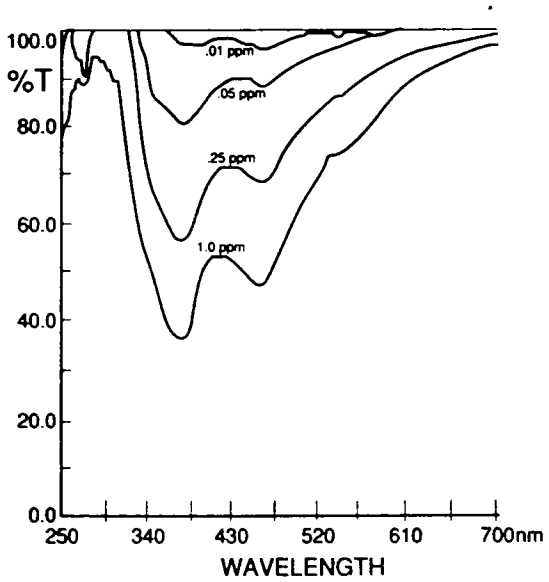
Color Standards

Color standards have been developed for a number of substances, including all types of gasoline and diesel fuels, crude oil, heating fuels, used motor oil, DDT, and PCBs.

These extremely accurate color standards are produced by preparing exact concentrations of the substances in water and soil; analyzing the samples with an HNU-Hanby Environmental Field Test Kit; and photographing the results under studio conditions.

Spectrophotometer

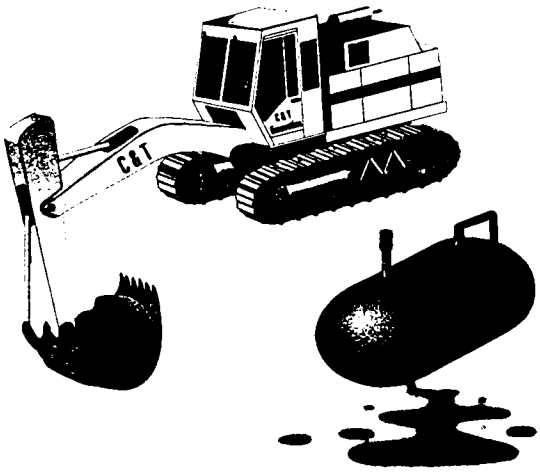
A new portable reflectance/transmission spectrophotometer is now available to quantitatively measure the color development from the test kit. The figure below shows a spectrum for benzene in water. Spectra such as this are used to program the instrument to read out ppm as mg/liter (water) or mg/Kg (soil).



HNU-Hanby Environmental Field Test Kits In Practice

Leaking Underground Storage Tanks

In the United States and throughout the world thousands of underground petroleum storage tanks are being replaced to meet regulatory requirements. At sites where leaks or spills have occurred, all contaminated soils must be excavated and replaced with clean fill. HNU-Hanby Environmental Test Kits are currently being used by numerous companies and organizations to immediately determine where and how far the excavation must go to insure compliance.



In August 1989, 500 gallons of gasoline was spilled while filling underground storage tanks at a gas station in Houston, Texas. Immediately following the spill, the test kit was used to quickly screen the soil to determine the vertical and lateral spread of the fuel. During this investigation, it was determined that the underground tanks were leaking. The test kit helped remediation efforts move ahead more quickly.

In April 1990, a damaged fuel line caused 400–500 gallons of heating oil to leak from a domestic basement storage tank. The fuel severely impacted a shallow well on neighboring property and could have potentially reached the ocean (1,100 feet down grade). The test kit was used during excavation and soil remediation to rapidly screen samples on-site.

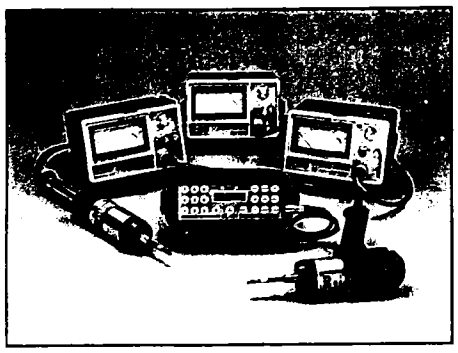
Oil Spills

In March 1989, the Exxon Valdez ran aground on Bligh Reef in Alaska's Prince William Sound spilling more than 10-million gallons of crude oil. HNU-Hanby Environmental Field Test Kits were and continue to be used to monitor the effects of the spill. The Alaska Department of Environmental Conservation is using the test kit to analyze the water in and around salmon hatcheries most impacted by the spill.

The Norwegian tanker Mega Borg leaked oil and burned for four days in Galveston Bay (Texas). Several test kits were employed by the research vessel Gyre (Texas A&M) to analyze water samples taken at various depths. The test kits were also used to monitor affected shoreline and marshland areas of the bay.

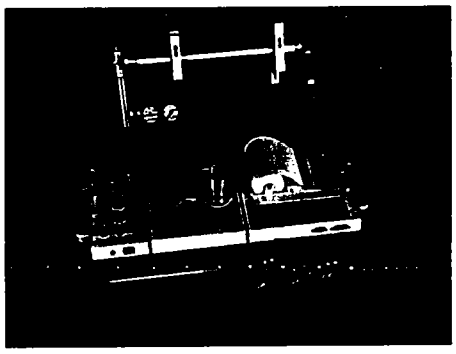
The collapse of an oil storage tank in Pennsylvania caused approximately one-million gallons of diesel fuel to spill into the Monongahela River. The test kit was used around the clock to monitor facilities that take water downriver from the spill.

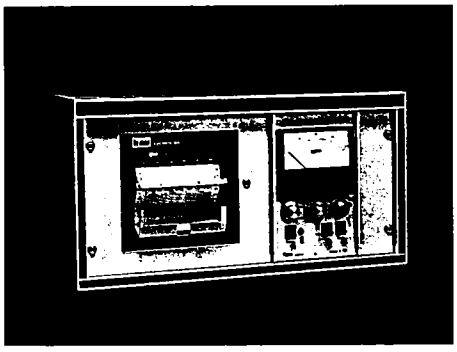
Other Environmental Instruments from HNU Systems, Inc.



HNU Model 101 Portable Analyzers are designed to make detecting and measuring volatile organic compounds (VOCs) easier. They incorporate HNU's unique patented ion chamber that provides the best low-end sensitivity and enables the user to electronically zero the instrument. The original PI-101 and the HW-101 Hazardous Waste Analyzer are both certified for use in Class I, Division II, Groups ABCD Areas. The IS-101 is certified Intrinsically Safe and meets Harmonized European Standards. The new DL-101 provides datalogging for up to 255 sites, interchangeable lamps, and four modes of operation.

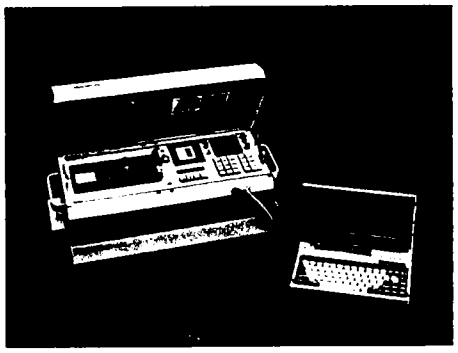
The HNU Model 311 Portable Gas Chromatograph provides lab-quality data in the field. Applications include: measurement of VOCs in petroleum contaminated soil and water, landfill monitoring, hazardous waste analysis, and industrial hygiene. The rugged and versatile 311 is fully programmable, has an automated sampling system, and is manufactured in a variety of single- and dual-detector configurations. Detectors available include: photoionization (organics), electron capture (chlorinated hydrocarbons), and far ultraviolet (organics/inorganics).





The HNU Model 201 Continuous Gas Monitor provides early detection of leaks from underground storage tanks. This highly-sensitive instrument may also be used to monitor stack gas, process streams, ambient air, fugitive emissions, soil gases, as well as VOCs in soil and water from stripping/remediation operations. The low-maintenance photoionization detector provides the fast response time, stability, and wide dynamic range needed for continuous monitoring.

The HNU Model SEFA-P Portable X-ray Fluorescence Analyzer is designed for field screening heavy metal contaminants and other materials at hazardous waste sites. Other applications include mixed waste, lead in paint, and waste oil analysis. The state-of-the-art Si(Li) x-ray detector provides the high resolution, precision and accuracy needed to meet EPA field screening requirements. The instrument is safety-interlocked, provides for three radioisotope sources, and has multi-sample capability for faster sample throughput.



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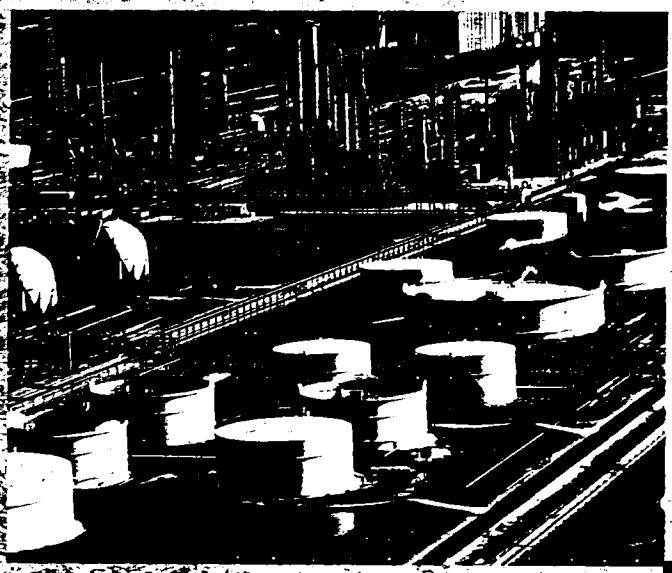
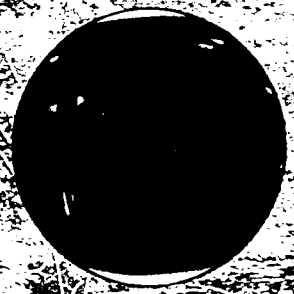


HNU Systems, Inc., manufactures and supports the widest range of environmental monitoring instrumentation available. HNU also manufactures x-ray fluorescence analyzers, microanalysis systems, and sensitive balances for scientific gas blending and other ultraprecise weighing. Our quality management system has been certified to the prestigious ISO 9002 standard—by which world-class companies are measured. HNU has offices in the USA, Canada, England, Germany, and Finland, with distributors the world over.



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APPENDIX B
SITE SAFETY AND HEALTH PLAN (SSHP)

SITE SAFETY AND HEALTH PLAN
FORT STORY, VIRGINIA
FIRE TRAINING AREA NUMBER 4/LARC MAINTENANCE AREA

Contract No. DACW45-90-D-9002
Delivery Order No. 55
IT Project No. 519029

Prepared by:

IT Corporation
11499 Chester Road
Cincinnati, Ohio 45246
(513) 782-4509

Prepared for:

U.S. Army Corps of Engineers
Omaha District
215 N. 17th Street
Omaha, Nebraska 68102-4978

Adopted By: _____ Date: _____
IT Corporation's Site Supervisor

Adopted By: Larry Verdier CIH Date: 4-7-93
IT Corporation's Safety and Health Manager

Adopted By: _____ Date: _____
USACE Representative

April, 1993

Table of Contents

		Page
Attachments		iv
Glossary of Acronyms and Terms		v
List of Tables and Figures		vii
Health and Safety Plan Approvals		viii
Site Safety and Health Plan Acknowledgement		ix
1.0	Introduction	1-1
1.1	Objective	1-1
1.2	Site Description and Contamination Characterization	1-1
1.3	Policy Statement	1-2
1.4	References	1-3
2.0	Organization, Qualifications, and Responsibilities	2-1
2.1	All Personnel	2-1
2.2	Safety and Health Manager (SHM)	2-1
2.3	Site Safety and Health Officer (SSHO)	2-1
2.4	Project Manager (PM)	2-2
2.5	Site Supervisor (SS)	2-2
2.6	Subcontractors, Visitors and Other On-Site Personnel	2-2
3.0	Job Hazard/Risk Analysis (Accident Prevention Plan)	3-1
3.1	Scope of Work	3-1
3.2	Job Hazard Assessment	3-1
	3.2.1 Task 1 Hazards and Controls	3-1
	3.2.2 Task 2 Hazards and Controls	3-3
	3.2.3 Task 3 Hazards and Controls	3-3
	3.2.4 Task 4 Hazards and Controls	3-4
	3.2.5 Task 5 Hazards and Controls	3-6
	3.2.6 Task 6 Hazards and Controls	3-8
3.3	Chemical Hazards	3-9
4.0	Standard Operating Safety Procedures, Engineering Controls, and Work Practices	4-1
4.1	General Practices	4-1
	4.1.1 Buddy System	4-3
4.2	Project Specific Practices	4-3
4.3	Hearing Conservation	4-3
4.4	Confined Spaces	4-4

4.5	Sanitation	4-4
	4.5.1 Trash Collection	4-4
5.0	Personal Protective Equipment	5-1
5.1	Respiratory Protection	5-1
5.2	Levels of Protection	5-1
	5.2.1 Level A Protection	5-1
	5.2.2 Level B Protection	5-1
	5.2.3 Level C Protection	5-2
	5.2.4 Level D Protection	5-2
5.3	Activity Specific Levels of Protection	5-4
6.0	Site Control Measures	6-1
6.1	Clean Zone/Support Zone	6-1
6.2	Decontamination Zone/Contamination Reduction Zone	6-1
6.3	Exclusion Zone/Hot Zone	6-1
6.4	Emergency Entry and Exit	6-1
6.5	Site Entry Requirements	6-2
7.0	Decontamination	7-1
7.1	Procedures for Equipment Decontamination	7-1
7.2	Procedures for Personnel Decontamination	7-2
8.0	Exposure Monitoring/Air Sampling Program	8-1
8.1	Routine Air Monitoring Requirements	8-1
8.2	Site Specific Air Monitoring/Sampling Requirements	8-1
9.0	Training	9-1
9.1	General	9-1
	9.1.1 Tailgate Safety Meetings	9-1
9.2	Basic Training	9-1
9.3	Site Specific Training	9-1
9.4	First Aid and CPR	9-2
9.5	Hazard Communication	9-2
10.0	Medical Surveillance	10-1
10.1	Medical Examination	10-1
10.2	Medical Records	10-2

11.0 Emergency Response and Contingency Procedures 11-1

11.1 Emergency Contacts for Fort Story, Va. Site 11-2
11.1.1 Additional Emergency Numbers 11-3
11.2 Emergency Equipment Available On-Site 11-3
11.3 Project Personnel Responsibilities During Emergencies 11-4
11.4 Medical Emergencies 11-5
11.5 Fire or Explosion 11-5
11.6 Spills or Leaks 11-6
11.7 Adverse Weather Conditions/Natural Disasters 11-6
11.8 Evacuation Routes 11-6

12.0 Record Keeping and Data Management 12-1

Attachments

Attachment A	Site Safety and Health Plan Amendments
Attachment B	Site and Hospital Location Maps
Attachment C	Hazardous Chemical Information
Attachment D	Heat Stress
Attachment E-1	Safety-Training Meeting Records
Attachment E-2	Personnel Training Certification
Attachment F	Air Monitoring/Sampling Forms
Attachment G	ENG Form 3394 - Accident Report
Attachment H	IT Accident/Injury Reports
Attachment I	OSHA Poster 2203
Attachment J	IT Policies and Procedures HS001-999 Table of Contents
Attachment K	Intrusive Work Checklists
Attachment L	Subcontractor HASP

Glossary of Acronyms and Terms

ABIH	-	American Board of Industrial Hygiene
AFFF	-	Aqueous Film Forming Foam
ANSI	-	American National Standards Institute
APR	-	Air Purifying Respirator
ACGIH	-	American Conference of Governmental Industrial Hygienists
CFR	-	Code of Federal Regulations
CGI	-	Combustible Gas Indicator
CIH	-	Certified Industrial Hygienist
CO	-	Contracting Officer
CRZ	-	Contamination Reduction Zone
DECON	-	Decontamination
FID	-	Flame Ionization Detector
FTP	-	Fire Training Pit
GFCI	-	Ground Fault Circuit Interrupter
HASP	-	Health and Safety Plan
IDLH	-	Immediately Dangerous to Life or Health
IT	-	IT Corporation
LARC	-	Lighter Amphibious Resupply Cargo
MREM/hr	-	Milli-Roentgens Equivalent in Man Per Hour
NIOSH	-	National Institute for Occupational Safety and Health
NRR	-	Noise Reduction Rating
OSHA	-	Occupational Safety and Health Administration
PEL	-	Permissible Exposure Limit
PID	-	Photoionization Detector
PM	-	Project Manager
PPM	-	Parts Per Million
SCBA	-	Self-Contained Breathing Apparatus
SHM	-	Safety and Health Manager
SS	-	Site Supervisor

SSHO	-	Site Safety and Health Officer
SSHP	-	Site Safety and Health Plan
TPH	-	Total Petroleum Hydrocarbons
TLV	-	Threshold Limit Value
TWA	-	Time Weighted Average
USACE	-	U.S. Army Corps of Engineers
U.S. EPA	-	U.S. Environmental Protection Agency
UST	-	Underground Storage Tank

List of Tables and Figures

Tables

3.1 Hazardous Chemicals and Exposure Guidelines

8.1 Environmental and Personal Monitoring/Sampling Requirements

Figures

2.1 Key Personnel and Chain of Command

Fort Story
Health and Safety Plan Approvals

Health and Safety Plans require specific approvals as described below. Note that all plans require the approval of a degreed HS professional.

Category	Approvals
Level A PPE, IDLH, Variance from corporate procedures, special circumstances.	Project Manager, Project/Location HS Staff, Region/Division HS Manager, Corporate Director HS, CIH.
Level B PPE.	Project Manager, Project/Location HS Staff, Region/Division HS Manager (or designee), CIH.
Level C or D PPE.	Project Manager, Project/Location HS Staff.

Approvals

I have read and approved this HASP with respect to project hazards, regulatory requirements, and IT procedures (please indicate if CIH).

_____
Project Manager/Date

_____
Project/Location HS Staff/Date

Larry Verdier CIH 4-7-93
_____
Region/Division HS Manager/Date

_____
Corporate Director HS/Date

Form HS052

SITE SAFETY AND HEALTH PLAN ACKNOWLEDGEMENT FORM

I have been informed of, and will abide by the procedures set forth in the Site Safety and Health Plan and its Amendments for the Fort Story, VA Fire Training Area.

Printed Name	Signature	Representing	Date

1.0 INTRODUCTION

1.1 Objective

This document describes the health and safety guidelines developed to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials at the Fort Story sites. The procedures and guidelines contained herein were based upon the best available information at the time of the plan's preparation. Specific requirements may be revised if new information is received or conditions change. A written amendment will document all changes made to the plan. Any amendments to this plan will be included in Attachment A. Where appropriate, specific OSHA standards or other guidance documents will be cited and applied. This document and amendments to it will be made available to the Contracting Officer (CO).

1.2 Site Description and Contamination Characterization

Fort Story Fire Training Area site 4 is located in the southwestern section of Fort Story, Virginia, along Hospital Road and adjacent to the fuel farm (see Attachment B). A hospital facility formerly located on this site was relocated in 1960 and the building structure was demolished. From 1960 through 1978, the southern boundary along U.S. 60 was used as a wildlife game preserve.

Prior to 1980, fire training exercises consisted of extinguishing JP-4 aviation fuel released and ignited directly on the surface soil of the site. The releases were extinguished by a mixture of firefighting foam and water. The existing concrete fire pad, which is 42 feet x 42 feet, was constructed in 1980 to be used for firefighter training exercise. A 15 feet x 15 feet x 2 feet pit is situated in the center of the pad. Once each month, the pad was filled with several inches of water and 75 to 400 gallons of fuel (JP-4) fuel, contaminated fuels, and hydraulic fluid. The mixture was then lit and allowed to burn. During the exercise, three or four firefighters performed extinguishing exercises using 50 to 150 gallons of fire-fighting foam. Once the fire was extinguished, the residues with the mixtures were left for natural evaporation. An 8-inch concrete pad with residual liquid is still present.

A second location at the Fort Story site requiring remedial work is the Lighter Amphibious Resupply Cargo (LARC) Maintenance Area. This area is located off Atlantic Avenue and Lingayan Gulf Road and includes Buildings 1081, 1082, 1083, and 1084. The LARC Maintenance Area includes a Wash Rack Area. During the 1950's the Wash Rack Area was first used as the Barge Amphibious Resupply Cargo (BARC) Motorpool and maintenance facility. In 1964, the BARC vehicle was phased out and the LARC vehicle was prototyped. Previous maintenance and training activities at this location along with stockpiled contaminated soils in the area may have caused the need for soil treatment in the area. The Wash Rack Area (or sand box area) is designated to be treated until an action limit of less than 50 ppm of Total Petroleum Hydrocarbons (TPH) is reached. The Wash

Rack Area is approximately 400 feet x 200 feet. There's potential for the soils from these areas to contain more contaminants than just TPH.

During a past Underground Storage Tank (UST) removal the Base placed two soil piles, combined amounting to approximately 1000 cubic yards, to the west of the LARC concrete pad. These soils will also be included in the LARC area clean-up.

1.3 Policy Statement

It is the policy of International Technology (IT) Corporation to provide a safe and healthful workplace for all employees, subcontractors, and consultants in compliance with governmental requirements. Additionally, the requirements of our clients shall take precedence provided that their requirements exceed those of IT and governmental regulations.

We believe in two fundamental principles of safety: all accidents, injuries and occupational illnesses are preventable; and if an operation cannot be done safely, we will not do it. To put these principles into practice, every associate will receive the appropriate training, equipment, and other resources necessary to complete assigned tasks in a safe and efficient manner.

Safety, industrial hygiene, and loss prevention are the direct responsibility of all members of management, who must create an environment in which everyone shares a concern for their own safety and the safety of their associates. Safety shall take precedence over expediency or short cuts. It is a condition of employment that all employees work safely and follow established safety rules and procedures.

Managers must conduct their businesses in compliance with governmental safety regulations and company procedures. All IT health and safety procedures must be implemented for all IT employees on all projects where IT is the subcontractor, or a joint venture partner. If IT is the prime contractor, IT procedures shall be applied to all IT and subcontractor personnel.

The implementation of effective safety and health practices is a key measure of managerial performance. Management, with the assistance of the internal health and safety professional staff, will conduct audits to assess the effectiveness of the safety program(s) in place, and to identify areas for improvement. All deficiencies shall be corrected promptly.

All injuries, occupational illnesses, vehicle accidents, and incidents with potential for injury or loss will be investigated. Appropriate corrective measures will be taken to prevent recurrence, and to continually improve the safety of our workplace.

1.4 References

Title 29, Code of Federal Regulations (CFR), Part 1910 - Occupational Safety and Health Standards, Revised July 1, 1992 (especially 29 CFR 1910.120 - Hazardous Waste Operations and Emergency Response).

Title 29, Code of Federal Regulations (CFR), Part 1926 - Safety and Health Regulations for Construction, Revised July 1, 1992.

U.S. Army Corp of Engineers, Safety and Health Requirements Manual, EM 385-1-1, October 1992.

NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, October 1985.

NIOSH, Pocket Guide to Chemical Hazards, Publication No. 90-117, Revised 1990.

ACGIH, Threshold Limit Values and Biological Exposure Indices for 1992-1993.

CHRIS Hazardous Chemical Data, U.S. Department of Transportation, United States Coast Guard, Commandment Instruction M.16465.12A, June 1985.

Material Safety Date Sheet Collection, Genium Publishing Corporation, Schenectady, NY, March 1992.

2.0 ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

2.1 All Personnel

All site personnel will be responsible for continuous adherence to health and safety procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the intent of this plan or the inherent safety and environmental cautions outlined in this plan. After due warnings, personnel violating safety procedures will be dismissed from the site and possibly terminated from further work.

2.2 Safety and Health Manager (SHM)

The SHM is responsible for the development, implementation, and oversight of the Safety and Health Program and the Site Safety and Health Plan (SSHP). The SHM may designate a fully trained and experienced individual, such as the Site Supervisor, to implement and continually enforce safety policies and activities on-site.

The SHM will have a minimum of three (3) years of working experience in the chemical or hazardous waste disposal industry. The SHM will have expertise in the chemical or hazardous waste disposal industry. The SHM will have expertise in air monitoring techniques, development of PPE programs for working in potentially toxic atmospheres, and he/she must have working knowledge of applicable Federal, State, and local occupational Health and Safety regulations. The SHM will oversee/review the site operations and review and approve this SSHP. The SHM will have a formal education and training in occupational Health and Safety or a related field and certification in Industrial Hygiene by the American Board of Industrial Hygiene (ABIH).

2.3 Site Safety and Health Officer (SSHO)

The SSHO is responsible for providing technical assistance to the Site Supervisor with respect to health and safety matters. The SSHO will conduct daily inspections to determine if operations are being conducted in accordance with the SSHP, USACE contract requirements, U.S. EPA health and safety guidelines, and OSHA regulations. The SSHO will report to the SHM and the Site Supervisor. In the absence of a SSHO, the Site Supervisor will assume the responsibilities of the SSHO.

The SSHO will have a minimum of one (1) year of working experience at hazardous waste sites where EPA Level C and Level B PPE is required. Specialized training in PPE and respiratory protective equipment, program implementation, proper use of air monitoring instruments, air sampling methods, and interpretation of results is required. He/she must be certified as having completed First Aid and CPR by a recognized organization such as the American Red Cross and he/she must have working knowledge of applicable Federal,

State, and local occupational Health and Safety regulations. The SSHO must meet the site entry requirements described in Section 6.5.

2.4 Project Manager (PM)

The PM is responsible for ensuring that the necessary personnel are available for this project and that the reporting, scheduling, and budgetary obligations for this project are met.

The PM will have a minimum of three (3) years of experience in management of hazardous waste operations and/or emergency response, and an education in the environmental profession or a related field.

2.5 Site Supervisor (SS)

The SS, as the on-site representative of IT, is responsible for maintaining contact with the U.S. Army Corps of Engineers (USACE) representative, the SHM, and the PM. The SS is also responsible for coordinating and enforcing health and safety activities for all individuals on site at all times. The SS will report to the PM and work directly with the USACE representative.

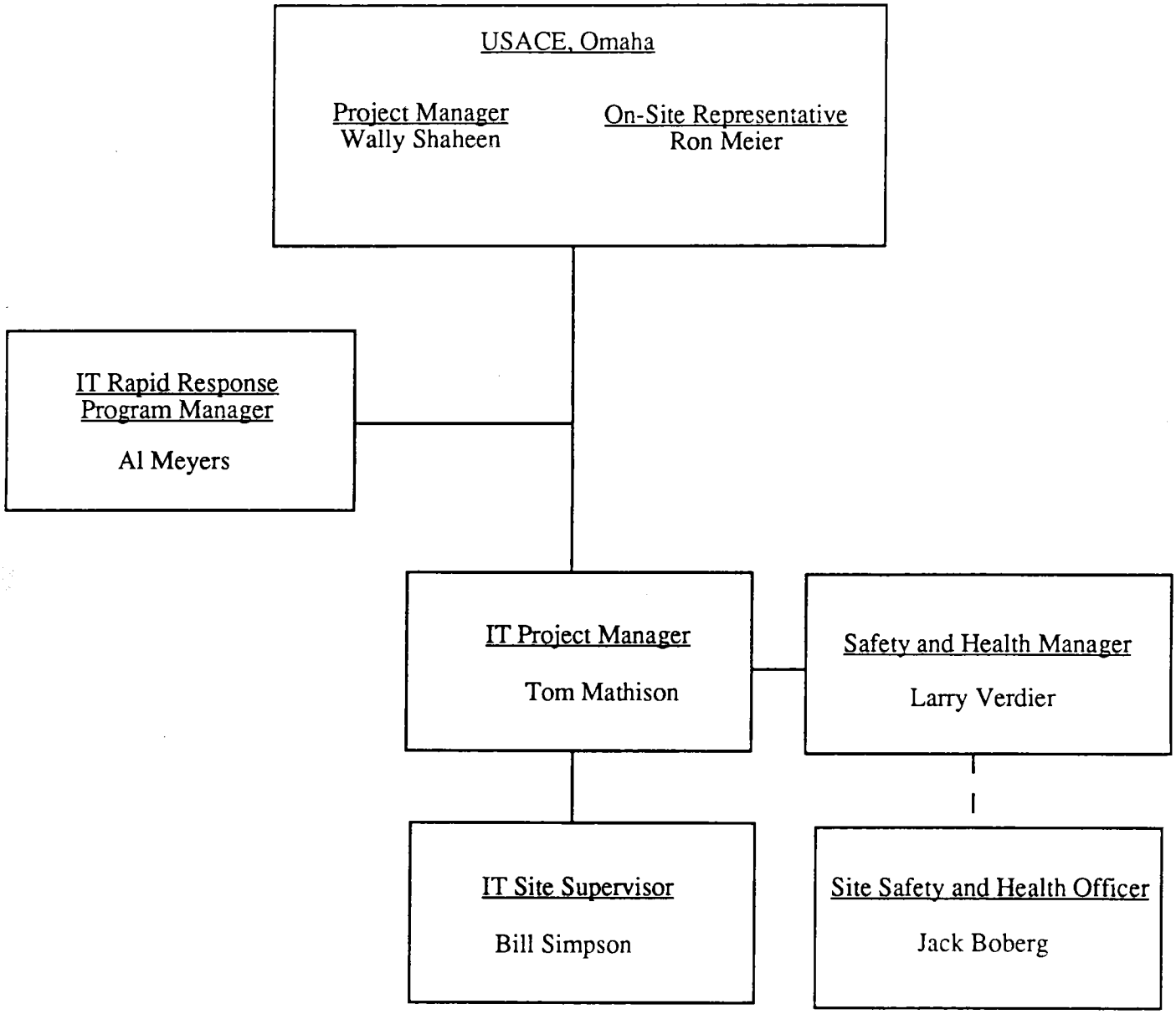
The SS will have a minimum of two (2) years of field experience and supervisory experience. The SS will be competent, experienced and knowledgeable in the field of hazardous and toxic waste cleanup and specific activities identified in the Delivery Order. The SS will have completed an Eight Hour Supervisor Course as required by 29 CFR 1910.120 in addition to complying with the site entry requirements described in Section 6.5.

2.6 Subcontractors, Visitors and Other On-Site Personnel

Subcontractors are responsible for the health and safety of their employees and for complying with the standards established in this SSHP. Subcontractors will report to the SS.

Any person who observes unsafe acts or conditions or other safety problems should immediately report observations/concerns to appropriate personnel as provided in Figure 2-1 "Key Personnel and Chain of Command". If there is any dispute with regard to health and safety, on-site staff will attempt to resolve the issue on-site and if the issue cannot be resolved, they will consult off-site technical staff and supervisors for assistance. The specific task or operation in question shall be discontinued until the issue is resolved. All subcontractors, visitors, and other on-site personnel must check in with the SS prior to gaining access to the site, in order to verify that appropriate entry requirements are met.

FIGURE 2.1 KEY PERSONNEL AND CHAIN-OF-COMMAND
FORT STORY



3.0 JOB HAZARD/RISK ANALYSIS (ACCIDENT PREVENTION PLAN)

3.1 Scope of Work

The purpose of this project is to remove soil and concrete associated with the Fire Training Area No. 4, dispose of the concrete, and transport the soils to the LARC Area for treatment. Additionally, contaminated soils will be removed from the LARC Maintenance Area. The existing stockpiled soils at the LARC Area, along with those excavated from the LARC Area and Fire Training Area, will be treated. This SSHP will address the tasks associated with demolishing the fire training facilities and treating soils at the LARC Maintenance Area. The subject tasks include: Task 1 - Mob/Demob and Site Preparation, Task 2 - Removal of Liquid from the concrete training pad, Task 3 - Demolition of Fire Training Pad, Task 4 - Monitoring Well Installation, Task 5 - LARC Area Excavation, and Task 6 - Backfilling.

The activity hazard analysis is an ongoing process from initiation of the SSHP to implementation and completion of field work. The job hazard analysis provided in this plan is the first phase in a two phase process. The second phase consists of further hazard analysis in the field. This SSHP serves as the Accident Prevention Plan (APP) and preliminary activity hazard analysis.

3.2 Job Hazard Assessment

3.2.1 Task 1 - Hazards and Controls

The hazards and controls for Task 1 - Mob/Demob and Site Preparation are as follows:

3.2.1.1 Operating and working around heavy equipment

Hazards: Equipment backing up and striking people/objects.
Above-ground utility lines.
Personnel in the area of a swinging boom or similar moving equipment.
Noise.

Controls: All equipment must have operational backup alarms.
Personnel must make eye contact with the operator before approaching a machine.
Operators must be aware of personnel in the area and use proper hand signals before maneuvering.

Operators must wear hard hats when operating machines unless heavy equipment has an enclosed cab or cage cover.
Operators must wear hard hats when going to and from their machines.
Operators must maintain at least 10 feet of clearance for 0-50 kv systems when maneuvering equipment near overhead power lines (reference EM 385-1-1, 11.E.04 for higher kv systems). Refer to Attachment K for Underground/Overhead Utility Checklist.
Wear hearing protection and other prescribed PPE (see Section 5.3).

3.2.1.2 Clearing, grubbing, brush removal, and grading

Hazards: Slip, trip, fall, and cut.
Noise.
Contact with moving parts/cuts.

Controls: Follow manufacturer's instructions on use of clearing/grading equipment (safety training).
Be certain of footing and keep work areas free of obstructions.
Keep clothing seems tightly fastened and tucked in.
Wear hearing protection and other prescribed PPE (see Section 5.3).

3.2.1.3 Temporary construction of facilities/material handling

Hazards: Electrical shock.
Heavy material handling.
Slip, trip, fall, and cut.
Nip/pinch points.

Controls: Use only qualified electricians for electrical work.
Utilize appropriate material handling equipment.
Follow proper lifting and moving techniques, do not lift over 60 lbs. without assistance.
Wear prescribed PPE (see Section 5.3).

3.2.1.4 Equipment decontamination

Hazards: Slip, trip, and fall.
Contact with contaminants and cleaning solutions.

Hit by pressure washer or hand tools.

Controls: Be sure of footing.
Wear prescribed PPE (see Section 5.3).
Follow prescribed personnel decontamination procedures.

3.2.2 Task 2 - Hazards and Controls

Approximately 6000 gallons of water is contained within the fire training pit. The hazards and controls for Task 2 - Removal of Liquid from the Concrete Training Pad are as follows:

3.2.2.1 Water management

Hazards: Muscle strains from heavy lifting.
Personnel falling into the pit - slip, trip, and fall.
Personnel splashed by liquid and contact with chemical contaminants (see Table 3.1).
Cut/puncture from hose.
Noise.

Controls: Do not lift over 60 lbs without assistance.
Work in the Buddy System.
Utilize life lines or life jackets as necessary.
Inspect pump and hose prior to use.
Wear prescribed PPE (see Section 5.3).

3.2.3 Task 3 - Hazards and Controls

The fire training pad is a 42 square foot concrete structure approximately one foot thick. In the center of the pad is a 15 square foot pit. The fire training pad is located in an open field and is easily accessible. An estimated 120 tons of concrete will be removed from the site. The hazards and controls for Task 3 - Demolition of Fire Training Pad are as follows:

3.2.3.1 Operating and working around heavy equipment

Hazards: Equipment backing up and striking people/objects.
Utility lines.
Personnel in the area of a swinging boom or similar moving equipment.
Noise.
Chemical contaminants (see Table 3.1).

Controls: All equipment must have operational backup alarms.
Personnel must make eye contact with the operator before approaching a machine.
Operators must be aware of personnel in the area and use proper hand signals before maneuvering.
Operators must wear hard hats when operating machines unless heavy equipment has an enclosed cab or cage cover.
Operators must wear hard hats when going to and from their machines.
Operators must maintain at least 10 feet of clearance for 0-50 kv systems when maneuvering equipment near overhead power lines (reference EM385-1-1, 11.E.04 for higher kv systems).
Wear hearing protection and other prescribed PPE (see Section 5.3).

3.2.3.2 Excavation

Hazards: Striking unexpected underground utilities.
Potential of running soils and falling concrete, dislodging spoil, and cave-ins.
Personnel and equipment adjacent to unprotected drop in elevation.
Lack of quick access and egress.
Chemical contaminants (see Table 3.1).

Controls: Perform utility check prior to intrusive work (reference Attachment K for Underground/Overhead Utility Checklist).
Place spoils 2-4 feet from excavation.
Slope excavation (reference IT Procedure HS307 and Attachment K for Trench/Excavation Notification Worksheet).
Barricade excavation area.
Limit work area to necessary personnel only.
Wear prescribed PPE (see Section 5.3).

3.2.4 Task 4 - Hazards and Controls

A monitoring well will be placed at the fire training area. The hazards and controls for Task 4 - Monitoring Well Installation are as follows:

3.2.4.1 Material handling

Hazards: Potential uneven walking/working surfaces.
Heavy material handling.

Chemical contaminants (see Table 3.1).

Controls: Be sure of footing and path of travel prior to moving materials.
Utilize appropriate material handling equipment such as wheel barrows, dollies and loaders.
Wear prescribed PPE (see Section 5.3).
Comply with air monitoring protocol and action levels (see Table 8.1).

3.2.4.2 Working with powered hand tools and electrical work

Hazards: Electrical shock.
Nip/pinch points and cut.

Controls: Use only qualified electricians for electrical work.
Utilize a GFCI on branch circuits for all electrical equipment not a part of permanent wiring.
Follow manufacturer's instructions when using power tools.
Wear prescribed PPE, including work gloves (see Section 5.3).

3.2.4.3 Drilling

Hazards: Striking underground utilities.
The derrick man on a well drilling operation performs his tasks from various elevated work platforms in the mast. He is exposed to falls when not utilizing fall protection equipment while climbing the derrick ladder, while working with the pipe stands, and while moving from the ladder to his platform station.
Contact with chemical contaminants (see Table 3.1).

Controls: Prior to the start of site work, the drilling subcontractor will inspect all drilling equipment in the presence of the SS. The inspection will be documented in the field records. If field operations last longer than one week, the drilling equipment inspection must be repeated on a weekly basis.
The location of all underground utilities must be ascertained and confirmed prior to the start of drilling operations. In addition to obtaining the utility locations from the USACE, the SS or a qualified subcontractor

will make a utility survey of each drilling point. The utility survey shall include both magnetometer and ground penetrating radar survey. Documentation that nearby utilities have been marked on the ground and that the drill site has been cleared shall be in the possession of the SS (or his designee) prior to commencement of the intrusive investigation at that point of the site.
Wear prescribed PPE (see Section 5.3).

3.2.5 Task 5 - Hazards and Controls

Contaminated soils will be removed from the LARC Maintenance Area and staged at a nearby predetermined location. Soils from the fire training pad and from the previous UST project will also be staged at this location. The soils will be treated (bioremediated) at this location by a subcontractor (Solutions Environmental Associates, Inc.). The Subcontractor Health and Safety Plan is provided in Attachment L for reference purposes.

The hazards and controls for Task 5 - LARC Area Excavation are as follows:

3.2.5.1 Soil Excavation and Staging

Hazards: Heavy equipment striking personnel or other obstructions.
Material being handled striking the operator or other personnel.
Contact with contaminated materials.
Potential for running soils, dislodging spoil, and cave-ins.
Personnel and equipment adjacent to unprotected drop in elevation.
Airborne dust.
Inhalation of toxic gases/vapors.
Noise.

Controls: Equipment must have backup alarms.
Pedestrians make eye contact with equipment operator when approaching equipment and vice versa.
Utilize signalmen when necessary.
Delineate work areas with physical barriers and posted signs where required.
Allow sufficient clearance when maneuvering equipment near obstructions. Maintain at least 10 feet of clearance for 0-50 kv power lines (reference EM 385-1-1, 11.E.04 for higher kv systems). Reference the

Underground/Overhead Utility Checklist in Attachment K.
Equipment operators must wear a hard hat when operator/others going to and from equipment. Operators must wear hard hat when on equipment unless equipment has an enclosed cab or cage cover.
Limit work area to necessary personnel only.
Do not pass under suspended loads or pass suspended loads over personnel.
Wear prescribed PPE: hard hat, Polytyvek™ coveralls, steel toe boots, viton gloves, respirator (Level B or C as necessary), and taped seams.
Avoid spreading potentially contaminated materials to other areas of site and equipment.
Place spoils 2-4 feet from excavation (refer to Attachment K for Trench/Excavation Notification Worksheet).
Slope Excavation.
Barricade excavation area.
Limit work area to necessary personnel only.
Utilize a water truck with spray as necessary.
Wear prescribed PPE: Level C respiratory protection, Level B if 250 ppm organic vapors/gases.
Wear hearing protection if noise is $\geq$ 85 decibels (dBA) TWA.

3.2.5.2 Soil Treatment

Hazards: Heavy equipment (excavator/bulldozer) striking people, objects or aboveground utility lines.
Personnel in the area of a suspended load or overhead moving equipment.
Hit by sprayer contents.
Contact with contaminant (TPH), inoculation solution, nutrient (ammonia, phosphate), or caustic/acid (ammonia hydroxide/hydrochloric acid).
Slip, trip and fall. Open excavation.
Striking underground utility.
The derrick man on drilling operation is exposed to falls when not utilizing fall protection while climbing the derrick ladder, working with pipe stands, and while moving from the ladder.
Noise.

Controls: Heavy equipment must have operational backup alarms.
Personnel must make eye contact with equipment operators before approaching a machine.
Operators must be aware of personnel in the area and use proper hand signals before maneuvering.
Operators (drill rig and heavy equipment) must maintain proper clearance for overhead power lines.
Complete a utility survey (see Attachment K).
Operators must wear a hard hat when going to and from equipment and while on equipment if it doesn't have an enclosed cab.
Direct sprayer away from personnel and only trained personnel may operate the sprayer.
Reference MSDS sheets in Attachment C.
Have emergency eye wash/shower readily available when handling caustics.
Be sure of footing and keep work areas free of obstructions.
Wear fall protection as required.
Wear hearing protection and other prescribed PPE (see Section 5.3).

3.2.6 Task 6 - Hazards and Controls

The backfilling of the fire training pad and the LARC Maintenance Area will be performed after soil treatment is complete.

The hazards and controls for Task 6 - Backfilling are as follows:

3.2.6.1 Operating and working around heavy equipment

Hazards: Equipment backing up and striking people/objects.
Above-ground utility lines.
Personnel in the area of a swinging boom or similar moving equipment.
Noise.
Chemical contaminants (see Table 3.1).

Controls: All equipment must have operational backup alarms.
Personnel must make eye contact with the operator before approaching a machine.
Operators must be aware of personnel in the area and use proper hand signals before maneuvering.

Operators must wear hard hats when operating machines unless heavy equipment has an enclosed cab or cage cover.
Operators must wear hard hats when going to and from their machines.
Operators must maintain at least 10 feet of clearance for 0-50 kv systems when maneuvering equipment near overhead power lines (reference EM385-1-1, 11.E.04 for higher kv systems).
Wear hearing protection and other appropriate PPE (see Section 5.3).

3.3 Chemical Hazards

Previous sampling, analytical data and other information have indicated that the chemical hazards provided in Table 3.1 either exist at the site or have the potential to exist at the site. When referencing exposure limits, the most stringent limits will be used. Detailed hazard information for these chemicals is available in Attachment C, Hazardous Chemical Information.

TABLE 3.1 HAZARDOUS CHEMICALS AND EXPOSURE GUIDELINES

Contaminant	Exposure Limits		Route of exposure[d]	Symptoms	First Aid
	TLV[a]/PEL[b]	IDLH[c]			
Oil mist (mineral)	5 mg/m^3/ 5 mg/m^3	None exists	Inh.	None reported.	Skin: wash with soap. Breath: get to fresh air.
Jet Fuel (JP4)	200 ppm	Data not available	Inh. Ing.	Vapor causes slight irritation of eyes and nose, if taken into lungs causes coughing, distress and rapidly developing pulmonary edema. These symptoms can lead to unconsciousness. May cause central nervous system depression.	Remove contaminated clothing and shoes, flush effected areas with plenty of water. Soap wash effected areas, 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. If inhaled get to fresh air.
Benzene (a component of fuel)	10 ppm/ 1 ppm	3000 ppm	Con. Inh. Ing. Abs.	Same as above. **Ca**	Same as above.

[a] TLV - Threshold Limit Values and Biological Exposure Indices for 1992-1993 from ACGIH.
[b] PEL - Permissible Exposure Limits from 29 CFR 1910.1000, Table Z-1A.
[c] IDLH - Immediately Dangerous to Life or Health from NIOSH - Pocket Guide to Chemical Hazards.
[d] Inh. = inhalation; Abs. = skin absorption; Ing. = ingestion; Con. = skin and/or eye contact.
[c] Symptoms and First Aid from Genium Publishing Corporation, Revision A, 9/91.
Ca = Carcinogen.

4.0 STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

4.1 General Practices

- Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or set equipment on the ground. Stay away from any waste drums if possible. Protect equipment from contamination by bagging it.

- The Contamination Reduction Zone and Exclusion Zone, as established on the site, shall be observed. Entry into the CRZ and Exclusion Zone shall be by prior notification and authorization of the SS. All required protective clothing shall be worn prior to entering these zones.

- Contaminated equipment and contaminated PPE, such as respirators, gloves, boots, etc. (if not discarded) shall not be removed from the CRZ until they have been properly cleaned. Proper decontamination will be determined by the SS or a designate.

- Legible and understandable precautionary labels shall be affixed prominently to containers of contaminated scrap, waste, debris, and clothing.

- Contaminated materials shall be stored in tightly-closed containers in well-ventilated areas.

- No food or beverages shall be present or consumed in the CRZ and Exclusion Zone. These are only allowed in designated areas of the Support Zone. Workers must wash their face and hands prior to eating or drinking.

- No tobacco products shall be present or used, and cosmetics shall not be applied in the CRZ and Exclusion Zone. These are only allowed in designated areas of the Support Zone.

- Beards, facial hair, or other facial obstructions that interfere with respirator fit will preclude admission to the Exclusion Zone when respirators are required.

- Emergency equipment shall be located outside storage areas, in readily accessible locations, which will remain minimally contaminated.

- Field personnel must observe each other for signs of toxic exposure. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin discoloration
- Changes in coordination
- Changes in demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern

- Field personnel shall be cautioned to inform each other of non-visual effects of toxic exposure such as:

  - Headaches
  - Dizziness
  - Nausea
  - Blurred vision
  - Cramps
  - Irritation of eyes, skin, or respiratory tract

- Any detected effects of toxic exposure shall be reported to the SS immediately.

- The wearing of contact lenses is not allowed in the CRZ and Exclusion Zone.

- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury, splash, etc., must have approved eye wash units locally available as per 29 CFR 1910.151 (c).

- Enter work-site upwind (as possible) from visible contamination; this area should be marked as an entrance by flagging.

- If any on-site activities, including decontamination, continue later than dusk, adequate lighting must be provided. Work areas must have adequate lighting for employees to see to work and identify hazards (5-foot candles minimum). Personnel should carry flashlights in all normally dark areas for use in the event of a power failure. Applicable OSHA standards for lighting - 29 CFR 1910.120 (m) shall apply.

- Hazardous work such as handling hazardous materials and heavy loads, and equipment operation etc., should not be conducted during severe storms.

- All electrical power must have a ground fault circuit interrupter (GFCI) as part of it's circuit if the circuit is not a part of permanent wiring. All equipment must be suitable and approved for the class of hazard present. Applicable OSHA standards for electrical - 29 CFR 1926 Subpart "K" shall apply.

- The movement and opening of drums will be done in accordance with 29 CFR 1910.120 (j).

- When the temperature falls below 40°F, cold stress protocol shall be followed. Employees must be supplied with adequate clothing to maintain core temperature. Cold stress protocol is discussed in detail in IT Procedure HS401.

- When the temperature exceeds 70°F and personnel are wearing protective clothing, a heat stress monitoring program shall be implemented as appropriate. Employees shall have access to break periods and drinking water as necessary. Heat stress protocol is further described in Attachment D.

- Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk of fire. Non-sparking tools and fire extinguishers shall be used or available as appropriate. Sources of ignition shall be removed. When necessary, explosion-proof instruments and/or bonding and grounding techniques will be used to prevent fire or explosion.

- Overhead and underground utility hazards shall be identified and or inspected prior to conducting operations involving potential contact with utility lines.

4.1.1 Buddy System

- The "buddy system" will be used at all times by all field personnel in the hot zone. No one is to perform field work alone. Maintain visual, voice, or radio communication at all times.

4.2 Project Specific Practices

Reference Attachment J, IT Policies and Procedures Table of Contents for procedures marked specifically for this project.

4.3 Hearing Conservation

A hearing conservation program will be implemented at the site when exposures equal or exceed an 8 hour TWA of 85 decibels. Hearing loss caused by noise is a problem that can be prevented. As part of the criteria for the medical surveillance program established for this site, audiometric testing is conducted to monitor each worker's ability to hear. Noise monitoring will be conducted as required.

Caution should be taken at or around loud locations. Engineering controls such as mufflers and baffles should be utilized when feasible to reduce noise. Hearing protection, such as

E-A-R™ plugs (NRR of 35), is required to be worn by personnel working with or around heavy equipment and as noise monitoring dictates.

4.4 Confined Spaces

A confined space is a space having limited means for entry and exit and unfavorable natural ventilation which could cause or produce dangerous air contaminants, flammable/explosive atmospheres, and/or oxygen deficient atmospheres. Confined space entry is not anticipated during this project. Should questions or concerns arise regarding confined spaces, reference IT Procedure HS300 (PRO 9531.1B).

4.5 Sanitation

A break area will be designated and provided in an area in the support zone (outside of contaminated zones). Outdoor and indoor areas, such as trailers, may be designated. The designated areas will be clean and will facilitate the number of workers using it. Eating, drinking and tobacco may be permitted in break areas.

IT will provide an adequate supply of drinking water. These drinks will be dispensed in an approved potable water system and in a manner which prevents contamination between the consumer and dispenser. All outlets dispensing nonpotable water will be posted "Caution - Water Unfit for Drinking, Washing, or Cooking". All containers used for storing and dispensing drinking water will be clearly marked and not used for any other purposes. Systems furnishing nonpotable water and systems furnishing potable water will be constructed and remain completely independent of each other.

IT will provide a chemical toilet for the personnel on-site (USACE's "Safety and Health Requirements Manual", Section 02.B). Arrangements will be made for the routine servicing and cleaning of this unit. Water and cleaning compounds will be made available for decontamination, washing face and hands, and sanitation purposes.

4.5.1 Trash Collection

Adequate trash receptacles will be placed around the job site for trash collection. Contaminated trash must be segregated from sanitary trash. Sanitary trash receptacles will be labeled "Sanitary Trash".

High housekeeping standards must be maintained. Trash receptacles shall be emptied on an as-needed basis.

5.0 PERSONAL PROTECTIVE EQUIPMENT

5.1 Respiratory Protection

Respiratory protective equipment shall be NIOSH-approved and respirator use shall conform to ANSI Z88.2 and OSHA 29 CFR 1910.134 requirements. Each employer shall maintain a written respiratory protection program detailing selection, use, inspection, cleaning, maintenance, storage, and fit testing of respiratory protective equipment. IT Procedure HS601 further defines the respiratory protection program.

All personnel (including visitors) performing on-site activities, and using a negative pressure respirator must have successfully passed a qualitative respirator fit test in accordance with OSHA 29 CFR 1910.134 within the last 12 months. Documentation of fit testing is the responsibility of each employer. Fit testing and any training related to respiratory protection for IT personnel will be documented on the IT Respiratory Training Completion Form (see Attachment E-1).

5.2 Levels of Protection

The following is a brief description of the personal protective equipment which may be required during various phases of the project. The U.S. EPA terminology for protective equipment will be used; Levels A, B, C and D. At a minimum four (4) sets of appropriate personal protective equipment will be maintained at the site for visitor usage.

5.2.1 Level A Protection **(Level A Protection is not anticipated during this project)**

(NOTE: Use of Level A personal protective equipment requires that at least two (2) persons must be available as backup, ready to provide emergency assistance. Authorization from Corporate Health and Safety staff is needed).

5.2.2 Level B Protection

Level B Protection Shall Be Used When:

- A substance has been identified and requires a high level of respiratory protection but less skin protection than Level A;
- Concentrations of chemicals in the air are IDLH or above the maximum use limit of an air purifying respirator (APR) with full-face mask;
- Oxygen deficient atmospheres (<20.0%) or potentially oxygen deficient atmospheres exist; and/or
- Confined space atmospheric test results require Level B.

Level B Protective Equipment at a Minimum Shall Consist of:

- Chemical resistant coveralls (Poly Tyvek™ or equivalent);
- Chemical resistant boot covers (rubber or equivalent) worn over steel toe and shank work boots or chemical resistant steel toe and shank work boots (rubber or equivalent);
- Chemical resistant inner gloves (disposable vinyl or latex);
- Chemical resistant outer gloves (nitrile or equivalent);
- Pressure demand SCBA or airline system with egress bottle;
- Hearing protection (E-A-R™ plugs with NRR of 35 or equivalent) as needed;
- Hard hat; and
- Ankles/wrists taped with duct tape. (NOTE: Use of Level B personal protective equipment requires that at least one (1) person must be available, ready to summon emergency assistance if needed.)

5.2.3 Level C Protection

Level C Protection Shall Be Used When:

- The same level of skin protection as Level B, but a lower level of respiratory protection is required;
- The types of air contaminants have been identified, concentrations have been measured, and an APR is available that can remove contaminants; or
- The substance has adequate warning properties and all criteria for the use of an APR has been met.

Level C Protective Equipment at a Minimum Shall Consist of:

- Chemical resistant coveralls (Poly Tyvek™ or equivalent);
- Chemical resistant boot covers (rubber or equivalent) worn over steel toe and shank work boots or chemical resistant steel toe and shank work boots (rubber or equivalent);
- Chemical resistant inner gloves (disposable vinyl or latex);
- Chemical resistant outer gloves (nitrile or equivalent);
- Full-face APR with organic vapor/acid gas HEPA combination cartridges;
- Hearing protection (E-A-R™ plugs with NRR of 35 or equivalent) as needed;
- Hard-hat; and
- Ankles/wrists taped with duct tape.

5.2.4 Level D Protection

Level D Protection Shall Be Used When:

- The atmosphere contains no known hazard;

- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of harmful chemicals; and
- Atmospheric concentrations of contaminants are less than the TLV.

Level D Protection Equipment at a Minimum Shall Consist of:

- Standard work uniforms or coveralls;
- Steel toe and shank work boots;
- Boot covers as needed;
- Gloves as needed;
- Safety glasses as needed;
- Hearing protection (E-A-R™ plugs with NRR of 35 or equivalent) as needed;
- Splash shield as needed; and
- Hard-hat.

Modified Level D Protective Equipment at a Minimum Shall Consist of:

- Chemical resistant coveralls (Poly Tyvek™ or equivalent);
- Chemical resistant boot covers (rubber or equivalent) worn over steel toe and shank work boots or chemical resistant steel toe and shank work boots (rubber or equivalent);
- Chemical resistant inner gloves (disposable vinyl or latex);
- Chemical resistant outer gloves (nitrile or equivalent);
- Hearing protection (E-A-R™ plugs with NRR of 35 or equivalent) as needed;
- Hard-hat; and
- Ankles/wrists taped with duct tape.

5.3 Activity Specific Levels of Protection

The required level of protection is specific to the activity being conducted. At this site the minimum levels of protection are as follows:

Activity*	Level of protection	Special requirements
Task 1	Level D	Use chemical protective boot covers, gloves and apron when working with potentially contaminated material (minimize skin contact).
Task 2	Modified Level D	Upgrade to Level C if air monitoring action level (Table 8.1) mandates.
Task 3	Modified Level D	Routine air monitoring/sampling. Upgrade to Level C if air monitoring action level (Table 8.1) mandates.
Task 4	Level D	Use chemical protective boot covers, gloves and apron when working with potentially contaminated material (minimize skin contact). Routine air monitoring/sampling. Upgrade to Level C if air monitoring action level (Table 8.1) mandates.
Task 5	Modified Level D	Routine air monitoring/sampling. Upgrade to Level C if air monitoring action level (Table 8.1) mandates.
Task 6	Level D	Backfilling

* Tasks are described in Section 3.0.

6.0 SITE CONTROL MEASURES

The primary purpose for site control is to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas and to prevent access or exposure to hazardous materials by unauthorized persons. At the end of each workday, the site should be secured or guarded to prevent unauthorized entry. Site work zones will include a Support Zone, Decontamination Zone, and an Exclusion Zone.

6.1 Clean Zone/Support Zone

The uncontaminated Support Zone or clean zone will be the area outside the Exclusion and Decontamination Zones and within the geographic perimeters of the site. The area is used for staging of materials, parking of vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the Exclusion Zone. All personnel arriving in the Support Zone will upon arrival, report to the site office and sign the site entry/exit log. There will be one controlled entry/exit point from the clean zone to the Decontamination Zone.

6.2 Decontamination Zone/Contamination Reduction Zone

The Decontamination Zone or Contamination Reduction Zone (CRZ) will provide a location for removal of contaminated personal protective equipment and final decontamination of personnel and equipment. All personnel and equipment should exit via the decon area. A separate decontamination area will be established for heavy equipment.

6.3 Exclusion Zone/Hot Zone

The Exclusion Zone will be the "hot zone" or contaminated area inside the site perimeter. Entry to and exit from this zone will be made through a designated point and the SS will note in the daily log all personnel who entered the hot zone. Appropriate warning signs to identify the Exclusion Zone should be posted (i.e. "DANGER - AUTHORIZED PERSONNEL ONLY", "PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT", etc.). Exit from the Exclusion Zone must include personnel and equipment decontamination.

6.4 Emergency Entry and Exit

A map of the site and surrounding area is provided in Attachment B. Work zones and evacuation routes will be included on the map by the SS, with concurrence of the SHM, prior to commencing operations. During an emergency the evacuation routes noted on the site map should be followed. If conditions such as wind direction or physical hazards do not

allow access to the prescribed evacuation routes, evacuate by the safest means available and decontaminate to the greatest extent possible.

6.5 Site Entry Requirements

In order to allow an individual into potentially contaminated areas of the site (decon zone and hot zone) he/she must meet the following requirements.

- Documentation of completing training requirements as described in Section 9 (including review of this SSHP and signing off as such).
- Documentation of completing medical surveillance requirements as described in Section 10.
- Respiratory fit testing as necessary (Section 5.1).
- A hazard briefing which includes current operations at the site, hazards that exist and control measures to follow.
- Signing the site entry log.

7.0 DECONTAMINATION

In general, everything that enters the Exclusion Zone at this site, must either be decontaminated or properly discarded upon exit from the Exclusion Zone. All personnel must enter and exit the hot zone through the decon area. Prior to demobilization, contaminated equipment will be decontaminated and inspected by the SS or a designate before it is moved into the clean zone. This inspection shall be noted in the daily log.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for this site is soap (facial/body deoderant soap for personnel decon and DOW™ Bacteria Soap or equivalent for equipment decon) and water. At a minimum, decontamination solution will be changed daily.

7.1 Procedures for Equipment Decontamination

Any item or vehicle taken into the Exclusion Zone must be assumed to be contaminated and must be carefully inspected and/or decontaminated prior to leaving the site. A visual inspection of the frame and tires of all vehicles and equipment leaving the Exclusion Zone will be completed. In order for a vehicle/equipment to pass inspection it must be in a broom-clean condition, water washed and free of loose dirt or sludge material on tailgates, axles, wheels, etc.

An equipment decontamination pad will be established in the Decontamination Zone. This pad will be utilized to remove soil from all equipment leaving the work area. Decontamination procedures will consist of washing equipment to remove mud and/or dirt. A special "clean area" will be utilized by personnel who must come in contact with soil during vehicle maintenance and repair. All equipment requiring maintenance or repair will be staged in the Decontamination Zone prior to servicing.

Equipment wash water residues will be collected for disposal. The water will be collected through a collection sump at the site. Any material that is generated by decontamination procedures will be stored in a designated area in the Exclusion Zone until disposal arrangements are made.

Personnel assigned to vehicle decontamination will wear the protective equipment, clothing, and respiratory protection consistent with this SSHP. Seats and flooring in equipment and vehicles that are to be used in the Exclusion Zone will be covered to the greatest extent possible with disposable polyethylene.

7.2 Procedures for Personnel Decontamination

These decontamination procedures apply to personnel wearing Level C protection. A field wash station will be established on-site for personnel decontamination. These are the minimum acceptable requirements:

Station 1: Equipment Drop

Deposit equipment used on-site (tools, sampling devices and monitoring instruments, radios, etc.) on plastic drop cloths. These items must be decontaminated or discarded as waste prior to removal from the Exclusion Zone.

Station 2: Outer Boot and Glove Removal

Remove outer boots and gloves. If outer boots and gloves are disposable, deposit in container with plastic liner. If non-disposable, store in a clean dry place.

Station 3: Outer Garment Removal

Remove chemical resistant outer garments and deposit in container lined with plastic. Decontaminate or dispose of splash suits as necessary.

Station 4: Respiratory Protection Removal

Remove hard-hat and face-piece. APR cartridges will be discarded when break through or load up occurs. Wash and rinse respirator after each use. Wipe off and store respirator in a clean, dry location.

Station 5: Inner Glove Removal

Remove inner gloves and deposit in container for disposal.

Station 6: Field Wash

Thoroughly wash hands and face, and shower at the end of each shift.

8.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

According to 29 CFR 1910.120 (h) Air Monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on-site. The following sections apply unless the SS and SSHO deems that monitoring for a specific activity may be discontinued or omitted.

8.1 Routine Air Monitoring Requirements

- Upon initial entry to rule out IDLH conditions;
- When the possibility of an IDLH condition or flammable/explosive atmosphere has developed;
- When work begins on a different portion of the site;
- Contaminants other than those previously identified are being handled;
- A different type of operation is initiated;
- Employees are handling leaking drums or containers or working in areas with obvious liquid contamination;
- During confined space work; and
- When respiratory protection is being used.

8.2 Site Specific Air Monitoring/Sampling Requirements

At a minimum, air monitoring will consist of the criteria listed in Table 8.1. All air monitoring data will be documented on the IT Real Time Air Monitoring Log (see Attachment F) and submitted to the SS. These will be available in the site office for review by all interested persons.

Real time monitoring for organic vapors will be performed at various times throughout the project using a HNu PID with a 11.7eV probe and/or a 128 Organic Vapor Analyzer (OVA) Flame Ionization Detector (FID) and monitoring for benzene will be performed with colorimetric detector tubes and a pump.

All instruments will calibrated on a daily basis per the manufactures' specification and will be recorded on the IT Real Time Air Monitoring Log Form.

Personal air sampling results shall be provided to appropriate personnel in accordance with ITC PRO 9550.1 - Employee Notification of Industrial Hygiene Monitoring Results. The "IT Employee Notification of Results of Monitoring for Exposure to Hazardous Substances or Harmful Physical Agents" form will be completed (see Attachment F). Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications. The IT Calibration Log will be used to document calibration results (see Attachment F).

TABLE 8.1 Environmental and Personal Monitoring/Sampling Requirements

Instrument	Compounds to detect	Frequency	Comments/action level
Combustible Gas Indicator (CGI)	Explosive/flammable atmospheres	Prior to beginning operations, routinely while working with contaminated materials. Continuous while performing hot work.	<10% LEL: Continue investigation, ≥10% LEL: Explosion hazard--withdraw from area.
Oxygen Meter	Oxygen	Prior to beginning operations, routinely while working with contaminated materials. Continuous while performing hot work.	<20% O_2: Continue monitoring wearing self-contained breathing apparatus, work not permitted. 20-22% O_2: Continue monitoring, work is permitted. >22% O_2: Fire hazard potential--withdraw from area.
PID FID	Organic Vapors and gases	Prior to beginning operations, routinely while working with contaminated materials.	Levels ≥ 200 ppm total vapors/gases: Level C protection required. Levels ≥ 1,000 ppm total vapors/gases: Level B protection required. TLV's and PEL's should be referenced to ensure adequate protection against known contaminants.
Radiation Meter	Radiation	During site assessment and as needed.	Background-2m REM/hr: Proceed. 2m REM/hr-10m REM/hr: Proceed under the direction of health physicist.
Noise Dosimeter & Sound Level Meter (SLM)	Noise	As operations require.	Monitor during peak noise levels, 8 hour TWA ≥ 85 decibels requires hearing conservation program.

TABLE 8.1 Environmental and Personal Monitoring/Sampling Requirements (continued)

Instrument	Compounds to detect	Frequency	Comments/action level
Colorimetric Detector Tubes and Pump	Benzene	Daily, prior to and during operations	Concentrations $\geq$ 0.5 ppm: Level C protection. Concentrations $\geq$ 50 ppm: Level B protection.

9.0 TRAINING

9.1 General

The SS or a designated representative will be responsible for informing all personnel performing on-site activities and all visitors of the contents of this plan and ensuring that each person signs the Site Safety and Health Plan Acknowledgement Form on Page ix. By signing the Site Safety and Health Plan Acknowledgement Form, individuals are recognizing the hazards present on-site and the policies and procedures required to minimize exposure to hazards or adverse effects caused by hazards. Documentation of certification of training received will be included in Attachment E-2.

9.1.1 Tailgate Safety Meetings

Daily Tailgate Safety Meetings will be held at the start of each shift to ensure that all personnel understand site conditions and operating procedures, to ensure that personal protective equipment is being used correctly and to address worker health and safety concerns. Each Tailgate Safety Meeting will be documented on the IT Tailgate Safety Meeting Form (see Attachment E-1). Completed forms will be maintained by the Site Supervisor (SS).

9.2 Basic Training

All personnel (including visitors) performing on-site activities must meet training requirements for hazardous site work in accordance with OSHA 29 CFR 1910.120. As noted in 29 CFR 1910.120 (e), all employees and subcontractors who are expected to enter the Exclusion and/or Decontamination Zones will have received a minimum of 40 hours of initial off-site instruction and three days of field experience. Onsite supervisors will have completed at least eight hours of specialized training. However, 29 CFR 1910.120 (e) (9) does provide that employers who can show that an employee's work experience and/or training has resulted in training equivalent to that training required in paragraphs (e) (1) through (4) of Section 1910.120 will be considered as meeting the initial training requirements. Eight hours of refresher training must be completed annually. Documentation of compliance with these training requirements is the responsibility of each employer. IT's subcontractors must provide documentation of training to the SS. This documentation will be maintained in the project files.

9.3 Site Specific Training

Site specific training will be addressed during the daily Tailgate Safety Meetings and during the on-the-job training. Items to be discussed will include names of personnel responsible for health and safety, hazards present at the site, use of personal protective equipment (PPE), safe use of site equipment, and the Site Safety and Health Plan (SSHP). On-the-job

training will be documented on the IT On-The-Job Training Record (OJTR) (see Attachment E-1). The SS will have received IT Excavation Safety training.

9.4 First Aid and CPR

At least one person certified in First Aid and CPR must be present on-site during operations. The American Red Cross Standard First Aid/CPR course or its equivalent will satisfy this requirement.

9.5 Hazard Communication

All personnel performing field activities shall receive hazard communication training. IT personnel, trained in the IT Corp. 8 hour refresher course, have received basic hazard communication training which involves a review of the IT written hazard communication program, material safety data sheets, container labeling and chemical health hazards. Personnel shall be trained on the hazards of chemicals known to be on-site by a review of Section 3.3 and the material safety data sheets in Attachment C.

10.0 MEDICAL SURVEILLANCE

All personnel (including visitors) performing onsite activities must meet appropriate medical surveillance requirements as described in OSHA 29 CFR 1910.120 (f) and ANSI Z-88.2. Documentation of compliance with these medical monitoring requirements and any additional medical monitoring requirements for this site, is the responsibility of each employer.

The written medical opinion from the attending physician required by 29 CFR 1910.120 (f) (7) will be made available upon request to the CO for any site worker.

10.1 Medical Examination

At a minimum the medical surveillance program examination will consist of:

- Medical and occupational history form (detailed questionnaire for new employees, short questionnaire for periodic exams)
- Physical examination
- Complete blood count with differential
- SMAC 23
- Urinalysis (dipstick and microscopic)
- Chest x-ray
- Pulmonary function test (FEV/FVC)
- Audiogram
- Electrocardiogram for persons older than 35 years of age, or if medically indicated
- Drug and alcohol screening
- Visual acuity

The following information is provided to the examining physician:

- Description of employee's duties
- Anticipated exposure types and levels
- Information from previous medical exams
- A copy of 29 CFR 1910.120

All subcontractor personnel who have potential for exposure to hazardous materials shall have successfully completed an examination similar to the aforementioned examination. The cost for subcontractor personnel medical surveillance will be paid by the subcontractor. All physical examinations will be approved by a physician who is Board Qualified in Occupational Medicine by the American Board of Preventive Medicine/Occupational Medicine. The physician shall provide to the Safety and Health Manager (SHM) written

certification of site personnel as fit for duty per 29 CFR 1910.120 and the Site Safety and Health Plan (SSHP).

10.2 Medical Records

Medical and personnel exposure monitoring records will be maintained in accordance with the requirements of 29 CFR 1910.20 and shall be kept for the period of employment plus 30 years. Employee confidentiality is maintained.

11.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

It is essential that IT personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden severe changes in the weather. The following sections outline the general procedures for emergencies. Emergency information will be completed and posted prior to commencing operations.

11.1 Emergency Contacts for Site

Fire:	17 or (804) 422-7456
Ambulance:	17 or (804) 422-7456
Police:	911 or (804) 422-7141
Poison Control Center:	(800) 492-2414

Hospital: Virginia Beach General
Address: First Colonial Road
Emergency Telephone: Post will handle all emergencies
Chemical Trauma Capabilities? Yes (Level II Emergency Room, have handled JP-4 Jet Fuel)

Directions from Site to Hospital:

From east gate turn right onto Shore Drive to Great Neck Road approximately 4 miles, turn left onto First Colonial Road go approximately 2 miles, hospital on left side.

NOTE: All emergencies will be handled by Post and decisions will be made to send anyone to hospital. Maps and directions to the hospital will be posted in the site office, and decontamination area. These maps are provided in Attachment B. Verification of the hospital route and notification of local emergency agencies will be completed by site personnel just prior to commencing operations.

The route to the hospital was verified by _____ on __/__/93. Distance from site to hospital is _____ miles. Approximate driving time is ___ minutes. The fire, police, and hospital were notified of site operations by _____ on __/__/93.

The following individuals have been trained in CPR and First Aid: (NOTE: At least one person certified in First Aid/CPR must be continuously present on-site during site operations).

Bill Simpson _____ Jack Boberg _____

_____ _____

11.1.1 Additional Emergency Numbers

National Response Center	800-424-8802
Center for Disease Control	404-639-3311
U.S. Environmental Protection Agency Region III	215-597-9370
AT&F (Explosives Information)	800-424-9555
Chemtrec	800-424-9300
IT Rapid Response Program Management Office	513-782-4509
CIH - Larry Verdier, IT	513-782-4700
Dr. Greaney - IT Company Doctor	714-535-8221
Contracting Officer - (contact S. Schmidt)	402-291-4260

11.2 Emergency Equipment Available On-Site

Communications Equipment	Location
Public Telephones:	_____
Private Telephones:	_____
Mobile Telephones:	_____
Two-Way Radios:	Four (1-SS, 1-SS0, 1- in the field, and 1-at the decontamination station).
Emergency Alarms/Horns:	On vehicles, and four air horns (1- at the decontamination station, 1- at the site office, -1 in the field, and 1- backup).
Medical Equipment	
First Aid Kits:	Decontamination station
Inspection Date:	__/__/93 By:_____
Oxygen:	Decontamination station
Stretcher/Backboard:	Decontamination station
Eye Wash/Safety Shower Station:	Decontamination station
Fire Fighting Equipment	
Fire Extinguishers:	Company vehicles (10# ABC), decontamination station (25# ABC), operating area (25# ABC), and the command post/break area (10# ABC).

Inspection Date: __/__/93 By: _____

Spill or Leak Equipment

Absorbent Boom/Pads: Small quantities at decontamination station

Dry Absorbent: Small quantities at decontamination station

Other: Rolled plastic, drums

Additional Emergency Equipment

None

11.3 Project Personnel Responsibilities During Emergencies

Site Supervisor (SS)

As the administrator of the project, the SS has primary responsibility for responding to and correcting emergency situations. The SS will:

- Take appropriate measures to protect personnel including: withdraw from the Exclusion Zone, total evacuation and securing of the site, or up-grading or down-grading the level of protective clothing and respiratory protection.

- Take appropriate measures to protect the public and the environment including isolating and securing the site, preventing run-off to surface waters and ending or controlling the emergency to the extent possible.

- Ensure that appropriate Federal, State and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted. Phone numbers are provided in Section 11.1.

- Ensure that appropriate decon treatment or testing for exposed or injured personnel is obtained.

- Determine the cause of the incident and make recommendations to prevent any recurrence.

- Ensure that all required reports have been prepared. Within two (2) working days of any reportable accident, complete, and submit to the CO an Accident Report on ENG Form 3394 in accordance with AR 385-40 (see Attachment G). For IT reporting purposes, IT incident reporting forms will be completed and returned to Regional Health and Safety within 24 hours of the incident (see Attachment H).

Project Personnel

After any emergency operation, all personnel involved with the situation shall meet to discuss the effectiveness of the procedures that were in place at the time and to discuss ways of improving the response procedures for the next possible incident.

11.4 Medical Emergencies

Any person who becomes ill or injured in the Exclusion Zone must be decontaminated to the maximum extent possible, allowing for practices consistent with reasonable life saving methods. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket). First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the SS.

Any person transporting an exposed person to a clinic or hospital for treatment should take the appropriate chemical information and the person directly to the hospital. This information may be included in Table 3.1.

Any vehicle used to transport contaminated personnel, will be cleaned or decontaminated as necessary.

11.5 Fires or Explosions

In the event of a fire greater than incipient stage or explosion, the local fire department should be summoned immediately (Reference the phone listing in Section 11.1). Upon their arrival the SS or designated alternate will advise the fire commander of the location, nature, and identification of hazardous materials on-site.

If it is safe to do so, site personnel may:

- Use fire fighting equipment on-site; or

- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

11.6 Spills or Leaks

In the event of a spill or leak, site personnel will:

- Notify the local fire department and any other necessary authorities if a reportable quantity is released (Reference the phone listing in Section 11.1).
- Locate the source of the spillage and stop the flow if it can be done safely; and
- Begin containment and recovery of the spilled materials.

11.7 Adverse Weather Conditions/Natural Disasters

Adverse weather can take many forms. Thunder and lightning storms, snow storms, hail, freezing rain, and tornados are a few examples. Sudden changes in the weather, extreme weather conditions, and natural disasters can create a number of hazards. Generally, poor working conditions arise, slip, trip and fall hazards exist, and poor working surfaces exist. Natural disasters can create many secondary hazards such as release of hazardous materials to the environment, structure failure and fires.

Routinely monitoring weather conditions and reports may help reduce the impact of severe weather and natural disasters. It may be necessary to halt certain hazardous operations or stop work altogether to allow the situation to pass. The SS or his designate must decide what operations, if any, are safe to perform based on existing conditions and anticipated conditions.

The best protection against most severe weather episodes and natural disasters is to avoid them. This means seeking shelter before the "storm" hits. Sufficient shelter should be identified on-site just prior to beginning operations. Stay away from pipes and electrical equipment should lightning be a threat and watch for damage caused by lightning strikes nearby.

11.8 Evacuation Routes

Evacuation routes have been established by work area locations for this site. All work areas have been provided with designated exit points. Under conditions of extreme emergency, an evacuation should be conducted immediately without regard for equipment. See Attachment B for evacuation routes.

- Evacuation notification will be a continuous blast on an air horn, vehicle horn, or by verbal communication via radio.

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation is not via the decontamination corridor, site personnel should remove contaminated clothing once they are in a location of safety and leave it near the Exclusion Zone or in a safe place.
- Personnel should evacuate to the site office and await instructions at the primary assembly area. In the event that the site office is no longer in a safe zone, meet at the secondary assembly area: _____.
- The SS will conduct a head count and check the sign-in logs to ensure all personnel have been evacuated safely.

12.0 RECORD KEEPING AND DATA MANAGEMENT

Proper record keeping and data management are essential in the implementation of this SSHP. The forms associated with the record keeping and data management requirements must be completed in an accurate, timely fashion and filed with the appropriate entities. It is the responsibility of the SS to ensure that the forms are properly completed. Completed forms will be kept and maintained by IT. These records shall be maintained for a five-year period. Subcontractors will also be responsible for keeping a copy of the forms pertaining to their personnel.

A listing of records to be completed and maintained relative to work at the facility is contained below:

- Training (forms are in Attachment E-1)
  - Respiratory Training Completion Form
  - Tailgate Safety Meeting
  - On-The-Job Training Record (OJTR)

- Medical records
  - Medical Examination
  - Supervisor's Employee Injury Report (Attachment H)

- Monitoring (Attachment F)
  - Real Time Air Monitoring Log
  - Calibration Log
  - Employee notification of results of monitoring for exposure to hazardous substances or harmful physical agents

- Intrusive work forms (Attachment K)
  - Underground/Overhead Utility Checklist
  - Trench/Excavation Notification Worksheet

- Other Forms
  - Vehicle Accident Report (see Attachment H) - Upon occurrence of any accident involving a vehicle, the SS will immediately complete a vehicle accident report form. It is very important to obtain information about involved outside parties. The form must be submitted to the appropriate office within 24 hours. Additional information, e.g., police report, is to be forwarded as it becomes available.

  - General Liability, Property Damage and Loss Report (see Attachment H) - This form is used to record damage or loss of equipment outside of vehicle accidents (theft, accidental breakage, fire). The procedure for completing and submitting this form is the same as for the vehicle accident report.

- OSHA Form 200 - Injury/Illness information from the Supervisor's Employee Injury Report will be logged in an OSHA 200 form within 6 work days from the occurrence of the incident. The OSHA 200 Form will be maintained at the central fixed location of the IT Pittsburgh Remediation Services office, 2790 Mosside Boulevard, Monroeville, PA (Phone No.: 412-372-7701). The SS and SSHO can contact the office for this information. Also, an OSHA 2203 (see Attachment I) poster will be posted in the break area/site office.

In addition, the SS will keep daily logs which will include the following items:

- Date
- Activity description
- Area (site specific) checked
- Employees in a particular area
- Protective clothing being worn by employees
- Protective devices (including monitoring equipment) being used by employees
- Signature and date

ATTACHMENT A

SITE SAFETY AND HEALTH PLAN AMENDMENTS

ATTACHMENT A

SITE SAFETY AND HEALTH PLAN AMENDMENTS

Site Name: _____

Site Safety and Health Plan Ammendment # _____ Date: _____

Type of Amendment: _____

Reason for Amendment: _____

_____

_____

Alternate Safeguard Procedures: _____

_____

_____

_____

Required Changes in PPE: _____

_____

_____

_____

Required Changes in Monitoring: _____

_____

Approvals:

_____
IT Project Manager/Date

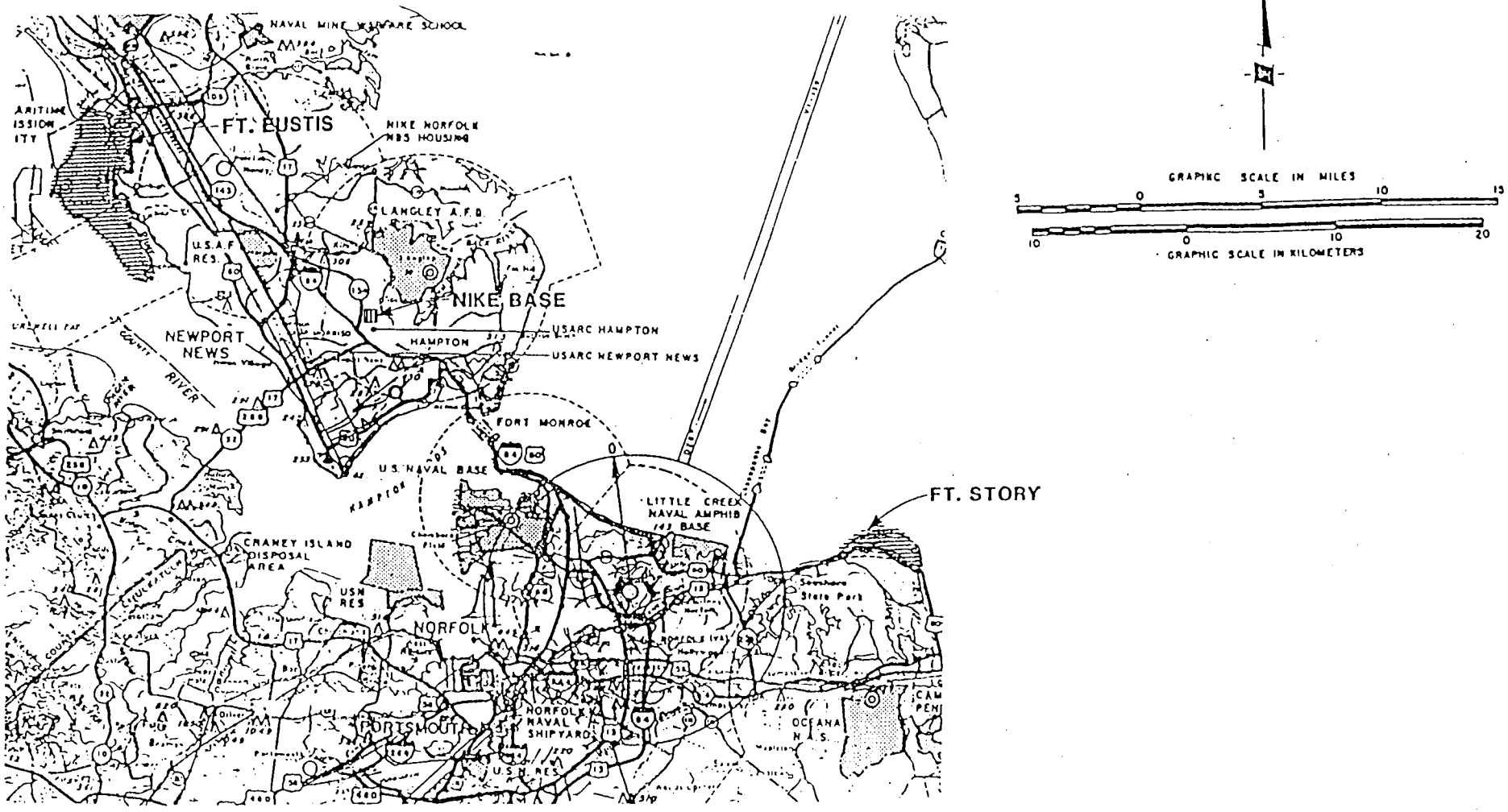
_____
IT Safety & Health Manager/Date

_____
USACE On-Site Representative/Date

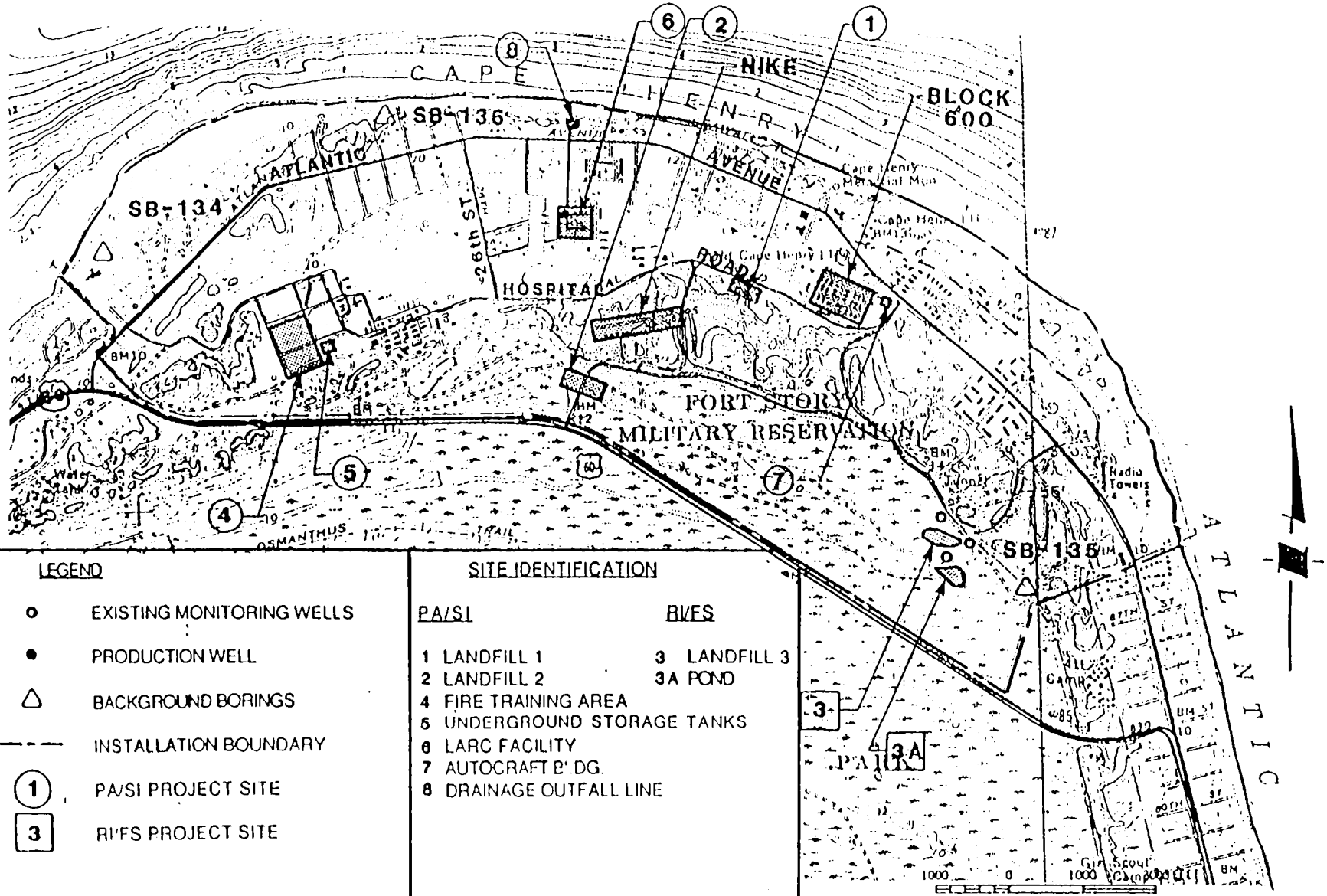
_____
USACE Contracting Officer/Date

ATTACHMENT B

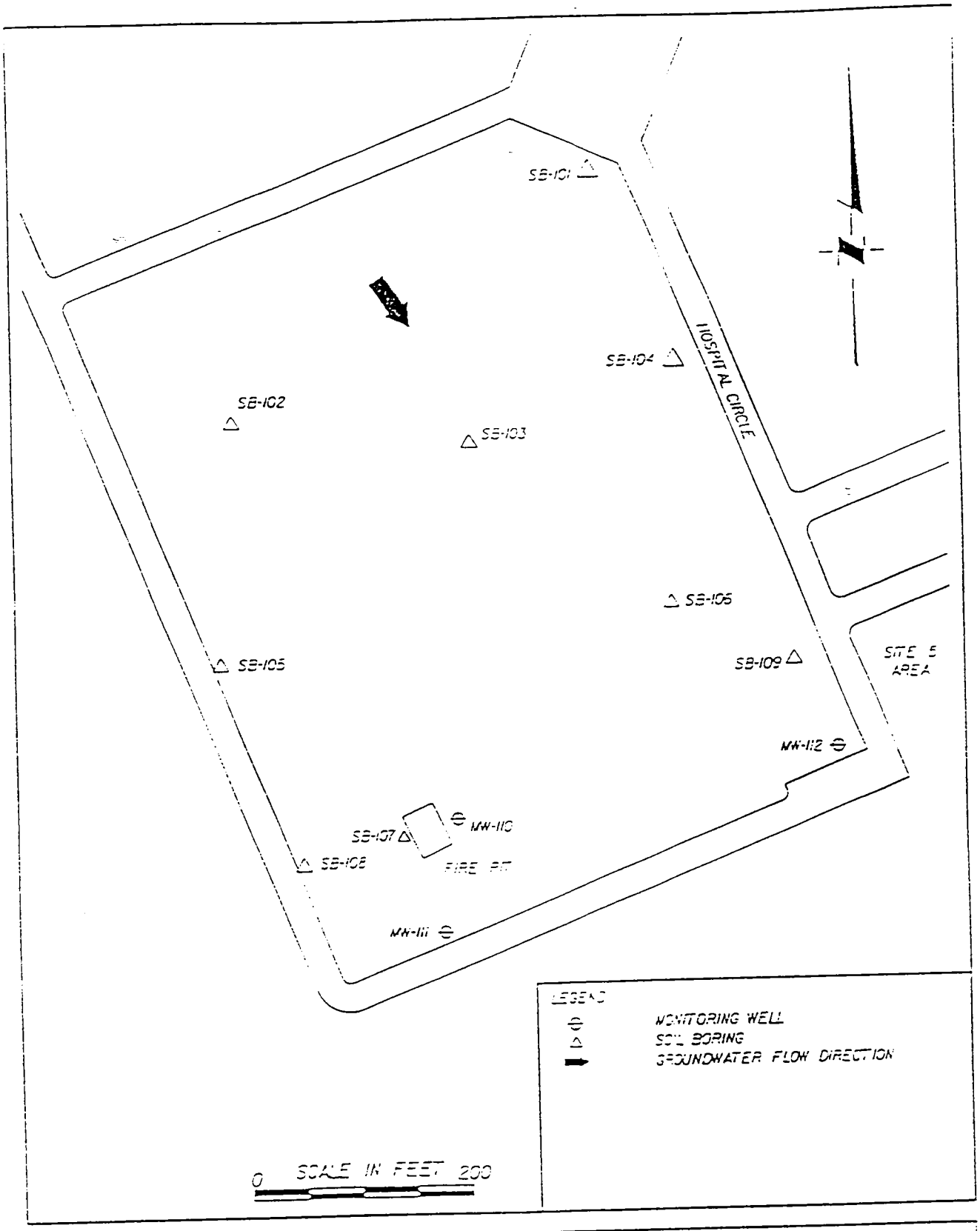
SITE AND HOSPITAL LOCATION MAPS



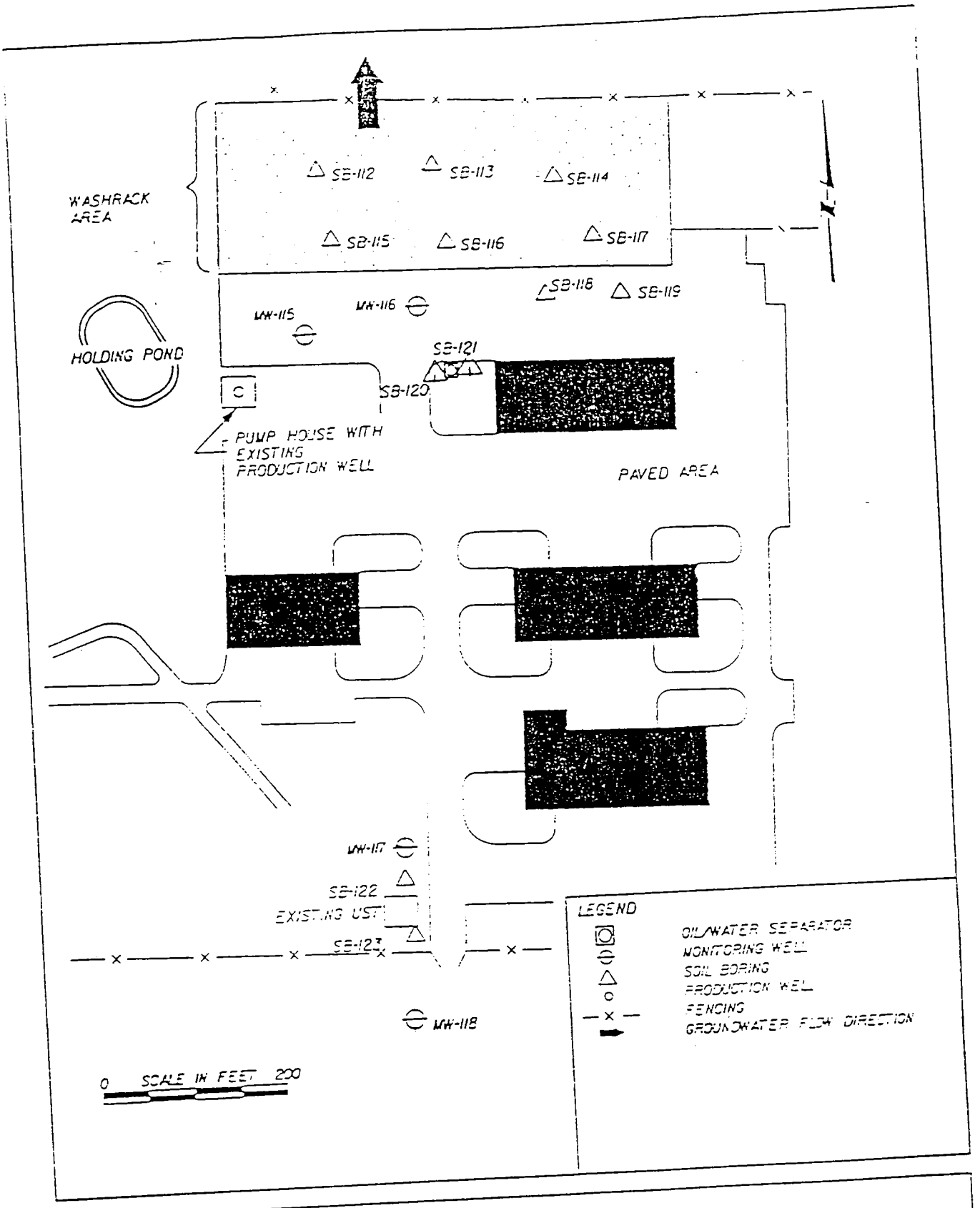
Vicinity Map
Location of USACE Project Installations
Ft. Eustis/Ft. Story



Ft. Story Military Installation
Project Site Locations



Site 4, Firefighter Training Area
Fort Story, VA



Site 6. LARC Maintenance Area
Fort Story, VA

ATTACHMENT C

HAZARDOUS CHEMICAL INFORMATION

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

Section 1. Material Identification

Jet Fuel Description: A petroleum distillate similar to kerosine composed of C_5 to C_{16} aliphatics, monocyclo-paraffins, aromatics, and olefins (for turbine engines only). Aromatics are a lower percentage for jet fuels, but there are a number of jet fuel types with somewhat different compositions and properties.
Other Designations: Jet A, Jet A-1, Jet B, Jet fuel HEF-3, JP-1, JP-4, JP-5, JP-6.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[73] for a suppliers list.
Cautions: *Jet fuel is volatile, combustible, and thus, a dangerous fire hazard.* It is a skin, eye, and respiratory tract irritant. *Ingestion can be harmful, even fatal.*

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

R	1
I	-
S	2
K	2-4*

* Varying flash points

NFPA (a): 2 / 0 / 0 / -
NFPA (b): 3 / 1 / 0 / -

HMIS		HMIS	
H	1	H	1
F	2	F	3
R	0	R	0
PPG†		PPG†	

† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Jet fuel, ca 100%

1989 OSHA PEL	1989-90 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data*
None established	None established	None established	Rat, oral, LD_{50}: 40 mg/kg Rat, inhalation, LC_{50}: 23 ppm/4 hr Rat, skin, LD_{50}: 317 mg/kg

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

Section 3. Physical Data*

Boiling Point: 300 to 550 °F (149 to 288 °C)
Vapor Pressure: 0.1 mm Hg at 20 °C
Viscosity: 1.0 to 2.0 cSt at 72 °F (40 °C)
Relative Density (15 °C/4 °C): 0.79 to 0.84
Water Solubility: Negligible

Appearance and Odor: A clear liquid with a hydrocarbon odor.

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

Section 4. Fire and Explosion Data

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

Extinguishing Media: For large fire, use water spray, fog, or foam. For small fires, use dry chemical or CO_2. Water may be ineffective in fighting fires involving materials with low flash points. Apply in the form of a spray.
Unusual Fire or Explosion Hazards: Jet fuel is volatile and combustible.
Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

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

Section 5. Reactivity Data

Stability/Polymerization: Jet fuels are stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: A violent reaction occurs with fluorine (F_2). Jet fuels are also incompatible with halogens, strong acids, alkalines, and oxidizers.
Conditions to Avoid: Avoid heat, sparks, flame, and build up of static electricity.
Hazardous Products of Decomposition: Thermal oxidative decomposition of jet fuel can produce carbon monoxide from incomplete combustion.

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Section 6. Health Hazard Data

Carcinogenicity: The NTP, IARC, and OSHA do not list jet fuels as a carcinogen.
Summary of Risks: Jet fuel is a moderate skin, eye, and respiratory irritant. Ingestion may be harmful or fatal. The most serious toxic effect following ingestion is aspiration pneumonitis.
Medical Conditions Aggravated by Long-Term Exposure: Individuals with chronic pulmonary disease should not be exposed to jet fuel vapor.
Target Organs: Central nervous system, respiratory tract.
Primary Entry Routes: Inhalation, ingestion.
Acute Effects: Systemic exposure through the respiratory or gastrointestinal (GI) tract may result in increasing levels of central nervous system depression, manifest by a staggering gait, slurred speech, or mental confusion. These symptoms could progress to unconsciousness, coma, and death from respiratory failure. Exposure of lung tissue through aspiration of liquid jet fuel causes an immediate irritant and destructive reaction. The inflammatory lung changes cause a chemical pneumonitis, pulmonary edema (fluid in the lungs), and/or bleeding in the lung tissue. Secondary infection as a result of the injury, and scarring may occur with resultant permanent lung damage. The immediate clinical effects are increasing shortness of breath, coughing, bloody sputum, and chest pain. These symptoms may worsen over the following hours to days. Ingestion causes irritation to the GI tract characterized by vomiting, abdominal pain, and diarrhea. Other organs possibly injured through systemic exposure include parenchyma of the liver, kidney, pancreas, and spleen. Exposure to high mist concentrations may irritate the mucous membrane.
Chronic Effects: Chronic lung dysfunction may result from aspiration into the lungs. Prolonged or repeated skin contact can cause dermatitis.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting*. If the victim is nauseated, position head lower than knees to prevent aspiration. Administer vegetable oil and call a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

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

EPA Designations
RCRA Hazardous Waste (40 CFR 261.33): Not listed
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

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

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear nonsparking shoes (rubber, cord, or sewn leather soles).
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all heat and ignition sources and incompatible materials (Sec. 5). Outside or detached storage is preferred.
Engineering Controls: Avoid vapor inhalation and skin or eye contact. Use with appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Jet fuel's greatest hazard is its fire potential. Train all employees to use fire-extinguishing equipment. Perform fire drill exercises periodically. Take all measures to prevent static electricity: electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. Maintain and test grounding and bonding connections. Do not use drag chains or cables on fueling vehicles. After filling jet fuel storage tanks, wait 30 min before opening hatches to permit the relaxation of any static charges generated during filling or hauling. Empty containers or drums retaining residue (liquid and/or vapor) can be dangerous. Do not expose to heat or ignition sources. All drums should be completely drained, properly bunged, and promptly disposed of per local regulations. Practice good personal hygiene and housekeeping procedures. Take care in handling hoses, cans, and funnels wet with jet fuel. Before touching with bare hands, carefully wipe jet fuel containers. Properly dispose of wet rags per EPA hazardous waste requirements. Avoid contamination of jet fuel with water, rust, scale, dirt, and other petroleum products. Use commercial kits (Hydrokit, Aqua-Glo, or "Clear and Bright") to detect water and dirt, respectively.

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

MSDS Collection References: 1, 73, 84, 103, 126, 132, 133, 136
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

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JET FUELS: JP-4

JPF

Common Synonyms	Watery liquid	Colorless	Fuel oil odor
	Floats on water		

Stop discharge if possible [illegible] quickly
Shut off ignition sources and call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire	FLAMMABLE Extinguish with dry chemical, foam, or carbon dioxide Water may be ineffective on fire Cool exposed containers with water
Exposure	FATAL 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
Water Pollution	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

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
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: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: C_nH_{2n+2}
3.3 IMO/UN Designation: 3.2/1863
3.4 DOT ID No.: 1863
3.5 CAS Registry No.: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to light brown
4.3 Odor: Like fuel oil

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
5.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.
5.3 Treatment of Exposure: ASPIRATION: enforce bed rest; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water
5.4 Threshold Limit Value: 200 ppm
5.5 Short Term Inhalation Limits: 2500 mg/m³ for 60 min.
5.6 Toxicity by Ingestion: Grade 2, LD_{50} = 0.5 to 5 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: 1 ppm
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: −10°F to +30°F C.C.
6.2 Flammable Limits in Air: 1.3%-8.0%
6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
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: Not pertinent
6.7 Ignition Temperature: 464°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

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 500 ppm/*/salmon fingerling/lethal/fresh water
*Time period not specified
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 53%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: 100%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Flammable liquid
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

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: 349-549°F = 176-287°C = 449-560°K
12.4 Freezing Point: < −54°F = < −48°C = <225°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.81 at 20°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): (est.) 1.030
12.12 Latent Heat of Vaporization: 140 Btu/lb = 78 cal/g = 3.3 X 10⁵ J/kg
12.13 Heat of Combustion: −18,540 Btu/lb = −10,300 cal/g = −431.24 X 10⁵ 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

NOTES

JET FUELS: JP-4

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
34	51.740
36	51.670
38	51.600
40	51.530
42	51.460
44	51.390
46	51.320
48	51.260
50	51.190
52	51.120
54	51.050
56	50.980
58	50.910
60	50.840
62	50.770
64	50.700
66	50.630
68	50.560
70	50.490
72	50.420
74	50.350
76	50.280
78	50.220
80	50.150
82	50.080
84	50.010

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.444
10	.449
20	.454
30	.459
40	.464
50	.469
60	.474
70	.479
80	.484
90	.489
100	.494
110	.499
120	.504
130	.509
140	.514
150	.519
160	.524
170	.529
180	.534
190	.539
200	.544
210	.549

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
0	.926
10	.924
20	.921
30	.919
40	.917
50	.915
60	.913
70	.911
80	.909
90	.907
100	.905
110	.903
120	.901
130	.899
140	.897
150	.895
160	.893
170	.891
180	.889
190	.887
200	.885
210	.883

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
−35	2.106
−30	1.994
−25	1.890
−20	1.794
−15	1.705
−10	1.622
−5	1.544
0	1.472
5	1.405
10	1.342
15	1.283
20	1.228
25	1.176
30	1.128
35	1.082
40	1.039
45	.999
50	.961
55	.925
60	.891
65	.859
70	.829
75	.800

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	I
	N
	S
	O
	L
	U
	B
	L
	E

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
0	.319
10	.411
20	.525
30	.663
40	.829
50	1.028
60	1.264
70	1.542
80	1.868
90	2.246
100	2.684
110	3.187
120	3.762
130	4.416
140	5.155
150	5.988
160	6.922
170	7.965
180	9.125
190	10.410
200	11.830
210	13.390

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
	D
	A
	T
	A
	N
	O
	T
	A
	V
	A
	I
	L
	A
	B
	L
	E

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Material Safety Data Sheets Collection:

Sheet No. 470
Diesel Fuel Oil No. 2-D

Issued: 10/81 Revision: A, 11/90

Section 1. Material Identification

Diesel Fuel Oil No. 2-D Description: Diesel fuel is obtained from the middle distillate in petroleum separation; a distillate oil of low sulfur content. It is composed chiefly of unbranched paraffins. Diesel fuel is available in various grades, one of which is synonymous with fuel oil No. 2-D. This diesel fuel oil requires a minimum Cetane No. (efficiency rating for diesel fuel comparable to octane number ratings for gasoline) of 40 (ASTM D613). Used as a fuel for trucks, ships, and other automotive engines; as mosquito control (coating on breeding waters); and for drilling muds.

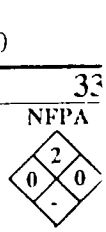
Other Designations: CAS No. 68334-30-5, diesel fuel.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[73] for a suppliers list.

Cautions: Diesel fuel oil No. 2-D is a skin irritant and central nervous depressant with high mist concentrations. It is an environmental hazard and moderate fire risk.

R	1
I	-
S	2
K	2

NFPA



HMIS
H 0
F 2
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupatio ıal Exposure Limits

Diesel fuel oil No. 2-D*

1989 OSHA PEL	1990-91 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data‡
None established	Mineral Oil Mist TWA: 5 mg/m³† STEL: 10 mg/m³	None established	Rat, oral, LD_{50}: 9 g/kg produces gastrointestinal (hypermotility, diarrhea effects

* Diesel fuel No. 2-D tends to be low in aromatics and high in paraffinics. This fuel oil is complex mixture of: 1) >95% paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, 2) sulfur (<0.5%), and 3) benzene (<100 ppm). [A low benzene level reduces carcinogenic risk. Fuel oils can be exempted under the benzene standard (29 CFR 1910.1028)]. Although low in the fuel itself, benzene concentrations are likely to be much higher in processing areas.
† As sampled by nonvapor-collecting method.
‡ Monitor NIOSH, *RTECS* (HZ1800000), for future toxicity data.

Section 3. Physical Data

Boiling Point Range: 340 to 675 °F (171 to 358 °C)
Viscosity: 1.9 to 4.1 centistoke at 104 °F (40 °C)
Specific Gravity: <0.86
Water Solubility: Insoluble

Appearance and Odor: Brown, slightly viscous liquid.

Section 4. Fire and Explosion Data

Flash Point: 125 °F (52 °C) min.	Autoignition Temperature: >500 °F (932 °C)	LEL: 0.6% v/v	UEL: 7.5% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or foam to fight fire. Use a water spray to cool fire exposed containers. Do not use a forced water spray directly on burning oil since this will scatter the fire. Use a smothering technique for extinguishing fire.

Unusual Fire or Explosion Hazards: Diesel fuel oil No. 2-D is a OSHA Class II combustible liquid. Its volatility is similar to that of gas oil. Vapors may travel to a source of ignition and flash back.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways due to pollution and fire or explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Diesel fuel oil No. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: It is incompatible with strong oxidizing agents; heating greatly increases the fire hazard.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of diesel fuel oil No. 2-D can produce various hydrocarbons and hydrocarbon derivatives, and other partial oxidation products such as carbon dioxide, carbon monoxide, and sulfur dioxide.

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Section 6. Health Hazard Data

Carcinogenicity: Although the IARC has not assigned an overall evaluation to diesel fuels as a group, it has evaluated occupational exposures in petroleum refining as an IARC probable human carcinogen (Group 2A). It has evaluated distillate (light) diesel oils as not classifiable as human carcinogens (Group 3).

Summary of Risks: Although diesel fuel's toxicologic effects should resemble kerosine's, they are somewhat more pronounced due to additives such as sulfurized esters. Excessive inhalation of aerosol or mist can cause respiratory tract irritation, headache, dizziness, nausea, vomiting, and loss of coordination, depending on concentration and exposure time. When removed from exposure area, affected persons usually recover completely. If vomiting occurs after ingestion and if oil is aspirated into the lungs, hemorrhaging and pulmonary edema, progressing to renal involvement and chemical pneumonitis, may result. A comparative ratio of oral to aspirated lethal doses may be 1 pt vs. 5 ml. Aspiration may also result in transient CNS depression or excitement. Secondary effects may include hypoxia (insufficient oxygen in body cells), infection, pneumatocele formation, and chronic lung dysfunction. Inhalation may result in euphoria, cardiac dysrhythmias, respiratory arrest, and CNS toxicity. Prolonged or repeated skin contact may irritate hair follicles and block sebaceous glands, producing a rash of acne pimples and spots, usually on arms and legs.

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

Target Organs: Central nervous system, skin, and mucous membranes.

Primary Entry Routes: Inhalation, ingestion.

Acute Effects: Systemic effects from ingestion include gastrointestinal irritation, vomiting, diarrhea, and in severe cases central nervous system depression, progressing to coma or death. Inhalation of aerosols or mists may result in increased rate of respiration, tachycardia (excessively rapid heart beat), and cyanosis (dark purplish discoloration of the skin and mucous membranes caused by deficient blood oxygenation).

Chronic Effects: Repeated contact with the skin causes dermatitis.

FIRST AID

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

Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. If large areas of the body have been exposed or if irritation persists, get medical help immediately. Wash affected area with soap and water.

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

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Contact a physician immediately. Position to avoid aspiration.

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

Note to Physicians: Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk. In cases of severe aspiration pneumonitis, consider monitoring arterial blood gases to ensure adequate ventilation. Observe the patient for 6 hr. If vital signs become abnormal or symptoms develop, obtain a chest x-ray.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. Use a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclamation or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 CFR 1910.120). Diesel fuel oil No. 2-D spills may be environmental hazards. Report large spills.

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

EPA Designations

SARA Hazardous Waste (40 CFR 261.21): Ignitable waste

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

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

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

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

Section 8. Special Protection Data

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

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

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

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

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

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

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

Section 9. Special Precautions and Comments

Storage Requirements: Use and storage conditions should be suitable for a OSHA Class II combustible liquid. Store in closed containers in a well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Use nonsparking tools and explosion-proof electrical equipment. No smoking in storage or use areas.

Engineering Controls: Avoid vapor or mist inhalation and prolonged skin contact. Wear protective rubber gloves and chemical safety glasses where contact with liquid or high mist concentration may occur. Additional suitable protective clothing may be required depending on working conditions. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures. Do not wear oil contaminated clothing. At least weekly laundering of work clothes is recommended. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Fuel oil

DOT Hazard Class: Combustible liquid

No.: NA1993

DOT Label: None

DOT Packaging Exceptions: 173.118a

DOT Packaging Requirements: None

MSDS Collection References: 1, 6, 7, 12, 73, 84, 101, 103, 126, 127, 132, 133, 136, 143, 146

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

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OILS, FUEL: 2-D

OTD

Common Synonyms	Oily liquid	Yellow-brown	Lube or fuel oil odor
Diesel oil, medium	Floats on water		

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam, carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

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

Water Pollution

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

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
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:** Miscellaneous Hydrocarbon Mixtures
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

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Light brown
4.3 **Odor:** Characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield
5.2 **Symptoms Following Exposure:** INGESTION causes nausea, vomiting, and cramping; depression of central nervous system ranging from mild headache to anesthesia, coma, and death; pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.
5.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting. ASPIRATION: enforce bed rest; administer oxygen; seek medical attention. EYES: wash with copious quantity of water. SKIN: remove solvent by wiping and wash with soap and water.
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, LD_{50} = 5-15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Slight smarting of 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 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 125°F C.C.
6.2 **Flammable Limits in Air:** 1.3%-6.0%
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:** 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

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

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 204 mg/l/24 hr/juvenile American shad/TL_m/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Diesel fuel 2-D (ASTM)
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

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

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:** 540—640°F = 282—338°C = 555—611°K
12.4 **Freezing Point:** 0°F = 18°C = 255°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 0.87—0.90 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):** Not pertinent
12.12 **Latent Heat of Vaporization:** Not pertinent
12.13 **Heat of Combustion:** —19,440 Btu/lb = —10,800 cal/g = —452.17 X 10^6 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

NOTES

OILS, FUEL: 2-D

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot (estimate)
50	54.310
52	54.310
54	54.310
56	54.310
58	54.310
60	54.310
62	54.310
64	54.310
66	54.310
68	54.310
70	54.310
72	54.310
74	54.310
76	54.310
78	54.310
80	54.310
82	54.310
84	54.310

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.414
5	.416
10	.419
15	.421
20	.424
25	.426
30	.428
35	.431
40	.433
45	.436
50	.438
55	.440
60	.443
65	.445
70	.448
75	.450
80	.452
85	.455
90	.457
95	.460
100	.462

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
35	.908
40	.908
45	.908
50	.908
55	.908
60	.908
65	.908
70	.908
75	.908
80	.908
85	.908
90	.908
95	.908
100	.908
105	.908
110	.908
115	.908
120	.908
125	.908

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
0	3.773
10	3.397
20	3.071
30	2.788
40	2.541
50	2.324
60	2.134
70	1.965
80	1.815
90	1.681
100	1.561
110	1.454
120	1.358
130	1.270
140	1.191
150	1.120
160	1.054
170	.995
180	.940
190	.890
200	.844
210	.802

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	INSOLUBLE

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
55	.456
60	.474
65	.492
70	.510
75	.529
80	.548
85	.567
90	.587
95	.607
100	.627
105	.647
110	.668
115	.689
120	.711
125	.732
130	.754

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
	NOT PERTINENT

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
	NOT PERTINENT

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Section 1. Material Identification

32

Benzene (C_6H_6) Description: Derived by fractional distillation of coal tar, hydrodealkylation of toluene or pyrolysis of gasoline, catalytic reforming of petroleum, and transalkylation of toluene by disproportionation reaction. Used as a fuel; a chemical reagent; a solvent for a large number of materials such as paints, plastics, rubber, inks, oils, and fats; in manufacturing phenol, ethylbenzene (for styrene monomer), nitrobenzene (for aniline), dodecylbenzene (for detergents), cyclohexane (for nylon), chlorobenzene, diphenyl, benzene hexachloride, maleic anhydride, benzene-sulfonic acid, artificial leather, linoleum, oil cloth, varnishes, and lacquers; for printing and lithography; in dry cleaning; in adhesives and coatings; for extraction and rectification; as a degreasing agent; in the tire industry; and in shoe factories. Benzene has been banned as an ingredient in products intended for household use and is no longer used in pesticides.

Other Designations: CAS No. 0071-43-2, benzol, carbon oil, coal naphtha, cyclohexatriene, mineral naphtha, nitration benzene, phene, phenyl hydride, pyrobenzol.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[73] for a suppliers list.

R 1
I 4
S 2*
K 4
*Skin absorption

NFPA

HMIS
H 3
F 3
R 0
PPG†
† Sec. 8

Cautions: Benzene is a confirmed *human carcinogen* by the IARC. *Chronic low-level exposure may cause cancer (leukemia) and bone marrow damage, with injury to blood-forming tissue.* It is also a dangerous fire hazard when exposed to heat or flame.

Section 2. Ingredients and Occupational Exposure Limits

Benzene, ca 100%*

1989 OSHA PELs
(29 CFR 1910.1000, Table Z-1-A)
8-hr TWA: 1 ppm, 3 mg/m³
15-min STEL: 5 ppm, 15 mg/m³

(29 CFR 1910.1000, Table Z-2)
8-hr TWA: 10 ppm
Acceptable Ceiling Concentration: 25 ppm
Acceptable Maximum Peak: 50 ppm (10 min)†

1989-90 ACGIH
TLV-TWA: 10 ppm, 32 mg/m³

1988 NIOSH RELs
TWA: 0.1 ppm, 0.3 mg/m³
Ceiling: 1 ppm, 3 mg/m³

1985-86 Toxicity Data‡
Man, oral, LD_{Lo}: 50 mg/kg; no toxic effect noted
Man, inhalation, TC_{Lo}: 150 ppm inhaled intermittently over 1 yr in a number of discrete, separate doses affects the blood (other changes) and nutritional and gross metabolism (body temperature increase)
Rabbit, eye: 2 mg administered over 24 hr produces severe irritation

* OSHA 29 CFR 1910.1000, Subpart Z, states that the final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.
† Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift.
‡ See NIOSH, *RTECS* (CY1400000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 176 °F (80 °C)
Melting Point: 42 °F (5.5 °C)
Vapor Pressure: 100 mm Hg at 79 °F (26.1 °C)
Vapor Density (Air = 1): 2.7
Evaporation Rate (Ether = 1): 2.8

Molecular Weight: 78.11
Specific Gravity (15 °C/4 °C): 0.8787
Water Solubility: Slightly (0.180 g/100 g of H_2O at 25 °C)
% Volatile by Volume: 100
Viscosity: 0.6468 mPa at 20 °C

Appearance and Odor: A colorless liquid with a characteristic sweet, aromatic odor. The odor recognition threshold (100% of panel) is approximately 5 ppm (unfatigued) in air. Odor *is not* an adequate warning of hazard.

Section 4. Fire and Explosion Data

Flash Point: 12 °F (-11.1 °C), CC	Autoignition Temperature: 928 °F (498 °C)	LEL: 1.3% v/v	UEL: 7.1% v/v

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish benzene fires. Water may be ineffective as an extinguishing agent since it can scatter and spread the fire. Use water spray to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene is a Class 1B flammable liquid. A concentration exceeding 3250 ppm is considered a potential fire explosion hazard. Benzene vapor is heavier than air and can collect in low lying areas or travel to an ignition source and flash back. Explosive and flammable benzene vapor-air mixtures can easily form at room temperature. Eliminate all ignition sources where benzene is used, handled, or stored.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Structural firefighter's protective clothing provides limited protection. Stay out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Runoff to sewer can create pollution, fire, and explosion hazard.

Section 5. Reactivity Data

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

Chemical Incompatibilities: Benzene explodes on contact with diborane, permanganic acid, bromine pentafluoride, peroxodisulfuric acid, and peroxomonosulfuric acid. It ignites on contact with dioxygen difluoride, dioxygenyl tetrafluoroborate, iodine heptafluoride, and sodium peroxide + water. Benzene forms sensitive, explosive mixture with iodine pentafluoride, ozone, liquid oxygen, silver perchlorate, nitryl perchlorate, nitric acid, and arsenic pentafluoride + potassium methoxide (explodes above 30 °C). A vigorous or incandescent reaction occurs with bromine trifluoride, uranium hexafluoride, and hydrogen + Raney nickel [above 410 °F (210 °C)]. Benzene is incompatible with oxidizing materials.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of benzene can produce toxic gases and vapors such as carbon monoxide.

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Section 6. Health Hazard Data

Carcinogenicity: The ACGIH, OSHA, and IARC list benzene as, respectively, a supected human carcinogen, a cancer hazard, and, based on sufficient human and animal evidence, a human carcinogen (Group 1).
Summary of Risks: Prolonged skin contact or excessive inhalation of benzene vapor may cause headache, weakness, appetite loss, and fatigue. The most important health hazards are cancer (leukemia) and bone marrow damage with injury to blood-forming tissue from chronic low-level exposure. Higher level exposures may irritate the respiratory tract and cause central nervous system (CNS) depression.
Medical Conditions Aggravated by Long-Term Exposure: Exposure may worsen ailments of the heart, lungs, liver, kidneys, blood, and CNS.
Target Organs: Blood, central nervous system, bone marrow, eyes, upper respiratory tract, and skin.
Primary Entry Routes: Inhalation, skin contact.
Acute Effects: Symptoms of acute overexposure include irritation of the eyes, nose, and respiratory tract, breathlessness, euphoria, nausea, drowsiness, headache, dizziness, and intoxication. Severe exposure may lead to convulsions and unconsciousness. Skin contact may cause a drying rash (dermatitis).
Chronic Effects: Long-term chronic exposure may result in many blood disorders ranging from aplastic anemia (an inability to form blood cells) to leukemia.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Immediately rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air. Emergency personnel should protect against inhalation exposure. Provide CPR to support breathing or circulation as necessary. Keep awake and transport to a medical facility.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* since aspiration may be fatal. Call a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: Evaluate chronic exposure with a CBC, peripheral smear, and reticulocyte count for signs of myelotoxicity. Follow up any early indicators of leukemia with a bone marrow biopsy. Urinary phenol conjugates may be used for biological monitoring of recent exposure. Acute management is primarily supportive for CNS depression.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a benzene spill control and countermeasure plan (SCCP).* Notify safety personnel, evacuate all unnecessary personnel, eliminate all heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against vapor inhalation, eye contact, and skin absorption. Absorb as much benzene as possible with an inert, noncombustible material. For large spills, dike far ahead of spill and contain liquid. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of confined spaces such as sewers, watersheds, and waterways because of explosion danger. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Waste No. U019
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 307 (a), 311 (b)(4), 112; and per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Tables Z-1-A and Z-2)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations at least below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all heat and ignition sources and incompatible materials. *Caution! Benzene vapor may form explosive mixtures in air.* To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. When opening or closing benzene containers, use nonsparking tools. Keep fire extinguishers readily available.
Engineering Controls: Because OSHA specifically regulates benzene (29 CFR 1910.1028), educate workers about its potential hazards and dangers. Minimize all possible exposures to carcinogens. If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if absolutely essential. Avoid vapor inhalation and skin and eye contact. Use only with adequate ventilation and appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Designate regulated areas of benzene use (see legend in the box below) and label benzene containers with "DANGER, CONTAINS BENZENE, CANCER HAZARD."
Other Precautions: Provide preplacement and periodic medical examinations with emphasis on a history of blood disease or previous exposure.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Benzene (*benzol*)	**IMO Shipping Name:** Benzene
DOT Hazard Class: Flammable liquid	**IMO Hazard Class:** 3.2
ID No.: UN1114	**ID No.:** UN1114
DOT Label: Flammable liquid	**IMO Label:** Flammable liquid
DOT Packaging Exceptions: 173.118	**IMDG Packaging Group:** II
DOT Packaging Requirements: 173.119	

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE–NO SMOKING
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

MSDS Collection References: 1, 2, 12, 26, 73, 84-94, 100, 101, 103, 109, 124, 126, 127, 132, 134, 136, 138, 139, 143
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Upfal, MD, MPH; **Edited by:** JR Stuart, MS

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IT HAZARDOUS CHEMICAL INVENTORY SHEET

Date _____ Location _____ P.C. _____ Employee Reporting _____ Phone No. _____

Trade Name	Chemical Name	MSDS Yes/No	Manufac./Distrib. and Address	Container Size/Type	Storage Location	Use Location	Est. Yearly * Quantity Used Small, Med., Large

* Liquids

S = < 50 gal. M = 50-500 gal. L = > 500 gal.

Solids

S = < 100 lbs. M = 100-1000 lbs. L = >1000 lbs.

9552-4 (4/86)

DATE: 03/15/90 ACCT: 047344-01
INDEX: 15900720777 CAT NO: A667C212 PO NBR: 031390

AMMONIUM HYDROXIDE
AMMONIUM HYDROXIDE
AMMONIUM HYDROXIDE

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 1336-21-6

SUBSTANCE: **AMMONIUM HYDROXIDE**

TRADE NAMES/SYNONYMS:
AMMONIA AQUEOUS, AMMONIA SOLUTION, AQUA AMMONIA, AMMONIUM HYDROXIDE ([NH4][OH]), AMMONIA WATER, RTSC 4935280, UN 2672; A-669; A-669C; A-669-SI; A-669-S; A-667; A-512; A-470; H5NO; ACC01260

CHEMICAL FAMILY:
INORGANIC BASE

MOLECULAR FORMULA: N-H4-O-H

MOLECULAR WEIGHT: 35.05

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=1 REACTIVITY=0 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=1 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: AMMONIA PERCENT: 28-30

COMPONENT: WATER PERCENT: 70-72

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
AMMONIA, ANHYDROUS:
35 PPM (27 MG/M3) OSHA STEL
25 PPM (18 MG/M3) ACGIH TWA, 35 PPM (27 MG/M3) ACGIH STEL
50 PPM (35 MG/M3) NIOSH RECOMMENDED 5 MINUTE CEILING

500 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY
100 POUNDS SARA SECTION 304 REPORTABLE QUANTITY
100 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

AMMONIUM HYDROXIDE:
1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY

PHYSICAL DATA

DESCRIPTION: COLORLESS LIQUID WITH A SHARP, PUNGENT ODOR.

BOILING POINT: 97 F (36 C) (APPROX) MELTING POINT: -107 F (-77 C)

SPECIFIC GRAVITY: 0.90 (APPROX) VAPOR PRESSURE: 115 MMHG @ 20 C

PH: 11.6 @ 1N SOLN SOLUBILITY IN WATER: SOLUBLE ODOR THRESHOLD: 50 PPM

VAPOR DENSITY: 1.2

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
SLIGHT FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

UPPER EXPLOSIVE LIMIT: 27% (NH3) LOWER EXPLOSIVE LIMIT: 16% (NH3)

AUTOIGNITION TEMP.: 1204 F (651 C) (NH3)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

DATE: 03/15/90 ACCT: 047344-01
INDEX: 15900720777 CAT NO: A6670212 PO NBR: 031390

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
E CONTAINERS FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES H WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK S (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 60).

EXTINGUISH USING AGENT INDICATED. USE FLOODING AMOUNTS OF WATER AS A FOG FROM AS FAR A DISTANCE AS POSSIBLE. USE WATER SPRAY TO ABSORB CORROSIVE VAPORS. AVOID BREATHING CORROSIVE VAPORS; KEEP UPWIND.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
CORROSIVE MATERIAL

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.245
EXCEPTIONS: 49CFR173.244

TOXICITY

AMMONIUM HYDROXIDE:
IRRITATION DATA: 750 UG EYE-RABBIT SEVERE; 44 UG EYE-RABBIT SEVERE; 1 MG/30 SECONDS RINSED EYE-RABBIT SEVERE.
TOXICITY DATA: 5000 PPM INHALATION-HUMAN LCLO; 408 PPM INHALATION-HUMAN TCLO; 43 MG/KG ORAL-HUMAN LDLO; 350 MG/KG ORAL-RAT LD50; 750 MG/KG ORAL-CAT LDLO; 180 MG/KG SUBCUTANEOUS-MOUSE LDLO; 200 MG/KG SUBCUTANEOUS-RABBIT LDLO; 10 MG/KG INTRAVENOUS-RABBIT LDLO; MUTAGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE- INHALATION, SKIN, EYES, INGESTION.
ACUTE TOXICITY LEVEL: TOXIC BY INGESTION.
TARGET EFFECTS: NO DATA AVAILABLE.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH CORNEAL DISEASE OR GLAUCOMA, OR CHRONIC RESPIRATORY DISEASES.

HEALTH EFFECTS AND FIRST AID

INHALATION:
AMMONIUM HYDROXIDE:
CORROSIVE. 500 PPM (NH3) IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- CONCENTRATIONS OF 5 PPM OF AMMONIA VAPOR MAY CAUSE MILD IRRITATION, 9-50 PPM MAY CAUSE NASAL DRYNESS, OLFACTORY FATIGUE, AND MODERATE IRRITATION, AND 150 PPM MAY CAUSE LARYNGEAL SPASM. EXPOSURE TO 500 PPM FOR 30 MINUTES MAY CAUSE CYCLIC HYPERPNEA, INCREASED BLOOD PRESSURE AND PULSE RATE, AND UPPER RESPIRATORY TRACT IRRITATION, SOMETIMES PERSISTING FOR 24 HOURS. 700 PPM MAY CAUSE IMMEDIATE IRRITATION; 1500-10,000 PPM MAY CAUSE DYSPNEA, CONVULSIVE COUGHING, CHEST PAIN, RESPIRATORY SPASM, PINK FROTHY SPUTUM, RAPID ASPHYXIA, AND DELAYED PULMONARY EDEMA WHICH MAY BE FATAL. OTHER EFFECTS MAY INCLUDE SWELLING OF THE LIPS, RESTLESSNESS, RUNNY NOSE, HEADACHE, SALIVATION, NAUSEA, VOMITING, GLOTTAL EDEMA, PHARYNGITIS, TRACHEITIS, AND DIFFICULTY IN SPEAKING. DEATH MAY BE RESULT FROM BRONCHOPNEUMONIA OR ASPHYXIATION DUE TO SPASMS, INFLAMMATION, OR EDEMA OF THE LARYNX. RESIDUAL EFFECTS FROM ACUTE EXPOSURES MAY INCLUDE HOARSENESS, PRODUCTIVE COUGH, DECREASED RESPIRATORY FUNCTION, CHRONIC AIRWAY DYSFUNCTION, ALVEOLAR DISEASE, BRONCHIOLITIS, BRONCHIECTASIS, EMPHYSEMA, AND ANXIETY NEUROSES.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION AND DURATION OF EXPOSURE, REPEATED OR PROLONGED EXPOSURE MAY CAUSE INFLAMMATORY AND ULCERATIVE CHANGES IN THE MOUTH, POSSIBLE BRONCHIAL AND GASTROINTESTINAL DISTURBANCES, AND EFFECTS SIMILAR TO ACUTE EXPOSURE. TOLERANCE TO USUALLY IRRITATING CONCENTRATIONS MAY BE ACQUIRED BY ADAPTATION.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
AMMONIUM HYDROXIDE:
CORROSIVE.
ACUTE EXPOSURE- VAPORS MAY CAUSE MILD IRRITATION. DIRECT CONTACT WITH THE LIQUID OR HIGH VAPOR CONCENTRATIONS (>30,000 PPM AMMONIA) MAY CAUSE SEVERE PAIN, A STINGING SENSATION, SEVERE BURNS AND VESICULATION, AND POSSIBLY BROWNISH STAINS. THE CORRODED AREAS ARE SOFT, GELATINOUS, AND NECROTIC, AND THE TISSUE DESTRUCTION MAY BE DEEP. IF BURNS ARE EXTENSIVE, DEATH MAY OCCUR. RARELY, AMMONIA VAPORS MAY CAUSE URTICARIA.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS OR EFFECTS SIMILAR TO ACUTE EXPOSURE.

DATE: 03/15/90 ACCT: 047344-01
INDEX: 1590072077 7 CAT NO: A667C212 PO NBR: 031390

ALKALINE CORROSIVES:
ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE SEVERE PAIN, BURNS AND POSSIBLY BROWNISH STAINS. THE CORRODED AREAS MAY BE SOFT, GELATINOUS AND NECROTIC AND THE TISSUE DESTRUCTION MAY BE DEEP.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS OR EFFECTS SIMILAR TO ACUTE EXPOSURE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
AMMONIUM HYDROXIDE:
CORROSIVE.
ACUTE EXPOSURE- 1 DROP OF A 9% SOLUTION IN HUMAN EYES CAUSED IMMEDIATE SEVERE PAIN, BLEPHAROSPASM, AND LOSS OF CORNEAL EPITHELIUM DESPITE IRRIGATION. THE FOLLOWING DAY THERE WAS SLIGHT CORNEAL EDEMA AND WRINKLING ON THE POSTERIOR SURFACE. RECOVERY WAS COMPLETE IN 3-4 DAYS. CONTACT WITH THE LIQUID OR HIGH VAPOR CONCENTRATIONS (>2500 PPM AMMONIA) MAY ALSO CAUSE SEVERE IRRITATION, SWELLING OF THE EYELIDS, LACRIMATION, PALPEBRAL EDEMA, INCREASED INTRAOCULAR PRESSURE, OVAL SEMIDILATED FIXED PUPILS, CORNEAL ULCERATION, AND BLINDNESS. POSSIBLY PERMANENT. THE DEGREE OF INJURY DEPENDS ON THE CONCENTRATION AND DURATION OF CONTACT. THERE MAY BE CORNEAL AND AND LENTICULAR OPACIFICATION AND IRITIS, ACCOMPANIED BY HYPOPYON OR HEMORRHAGES AND POSSIBLY EXTENSIVE LOSS OF PIGMENT FROM THE POSTERIOR PIGMENT LAYER OF THE IRIS. CORNEAL ANESTHESIA IS POSSIBLE ALLOWING DAMAGE TO OCCUR BEFORE WARNING DISCOMFORT IS FELT. IN SEVERE BURNS, THE EXTENT OF THE INJURY MAY NOT BE IMMEDIATELY APPARENT. LATE COMPLICATIONS MAY INCLUDE PERSISTENT EDEMA, VASCULARIZATION AND SCARRING OF THE CORNEA, PERMANENT OPACITY, ANGLE CLOSURE, ACUTE-ANGLE GLAUCOMA, STAPHYLOMA, CATARACT, ATROPHY OF THE RETINA AND IRIS, AND SYMPLEPHARON.
CHRONIC EXPOSURE- EFFECTS DEPEND ON CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT MAY RESULT IN CONJUNCTIVITIS OR EFFECTS AS IN ACUTE EXPOSURE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
AMMONIUM HYDROXIDE:
CORROSIVE/TOXIC.
SEE INFORMATION ON ALKALINE CORROSIVES.

ALKALINE CORROSIVES:
ACUTE EXPOSURE- MAY CAUSE IMMEDIATE PAIN, CIRCUMORAL BURNS AND CORROSION OF THE MUCOUS MEMBRANES WHICH AT FIRST TURN WHITE AND SOAPY AND THEN BECOME BROWN, EDEMATOUS AND ULCERATED. THERE MAY BE PROFUSE SALIVATION AND DIFFICULTY OR INABILITY TO SWALLOW OR SPEAK. EVEN WHEN THERE IS NO EVIDENCE OF ORAL BURNS, THE ESOPHAGUS AND STOMACH MAY BE INVOLVED WITH BURNING PAIN, VOMITING AND DIARRHEA. THE VOMITUS MAY BE THICK AND SLIMY WITH MUCOUS, AND LATER CONTAIN BLOOD AND SHREDS OF MUCOSA. EPIGLOTTAL EDEMA MAY RESULT IN RESPIRATORY DISTRESS AND POSSIBLY ASPHYXIA. SHOCK WITH MARKED HYPOTENSION, WEAK AND RAPID PULSE, SHALLOW RESPIRATION, AND CLAMMY SKIN MAY OCCUR. CIRCULATORY COLLAPSE MAY ENSUE, AND IF UNCORRECTED, LEAD TO RENAL FAILURE. IN SEVERE CASES, ESOPHAGEAL OR GASTRIC PERFORATION ARE POSSIBLE AND MAY BE ACCOMPANIED BY MEDIASTINITIS, SUBSTERNAL PAIN, PERITONITIS, ABDOMINAL RIGIDITY, AND FEVER. ESOPHAGEAL, AND POSSIBLY GASTRIC OR PYLORIC STRICTURE, MAY OCCUR WITHIN A FEW WEEKS, BUT MAY BE DELAYED FOR MONTHS OR EVEN YEARS. DEATH MAY RESULT WITHIN A SHORT TIME FROM ASPHYXIA, CIRCULATORY COLLAPSE, OR ASPIRATION OF EVEN MINUTE AMOUNTS. IF DEATH IS DELAYED IT MAY BE DUE TO THE COMPLICATIONS OF PERFORATION, PNEUMONIA, OR THE EFFECTS OF STRICTURE FORMATION.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION, REPEATED INGESTION MAY RESULT IN INFLAMMATORY AND ULCERATIVE EFFECTS ON THE ORAL MUCOUS MEMBRANES AND OTHER EFFECTS AS WITH ACUTE INGESTION.

FIRST AID- DILUTE THE ALKALI BY GIVING WATER OR MILK IMMEDIATELY AND ALLOW VOMITING TO OCCUR. AVOID GASTRIC LAVAGE OR EMETICS. ESOPHAGOSCOPY IS THE ONLY WAY TO EXCLUDE THE POSSIBLITY OF CORROSION IN THE UPPER GASTROINTESTINAL TRACT. IF CORROSION IS SUSPECTED, ESOPHAGOSCOPY SHOULD USUALLY BE PERFORMED WITHIN 24 HOURS (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). MAINTAIN AIRWAY AND TREAT SHOCK. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

AMMONIA AND AMMONIUM HYDROXIDE POISONING:
GIVE FRUIT JUICE OR VINEGAR BY MOUTH OR USE EXTERNALLY (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED PERSONNEL.

DATE: 03/15/90 ACCT: 047244-01
INDEX: 15900720777 CAT NO: A667C212 PO NBR: 031390

REACTIVITY

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
AMMONIUM HYDROXIDE:
ACIDS: VIOLENT, EXOTHERMIC REACTION.
ACROLEIN: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
DIMETHYL SULFATE: VIOLENT REACTION.
FLUORINE: IGNITION AND EXPLOSION.
GOLD: FORMS EXPLOSIVE COMPOUNDS.
IODINE: FORMS AN EXPLOSIVE IODIDE.
MERCURY: FORMS EXPLOSIVE COMPOUND.
METALS AND ALLOYS: CORROSIVE.
NITROMETHANE: FORMS EXPLOSIVE MIXTURE.
OLEUM: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
PROPIOLACTONE (BETA): TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PROPYLENE OXIDE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
SILVER NITRATE + ACETYLENE: FORMS EXPLOSIVE ACETYLIDE.
SILVER NITRATE + SODIUM HYDROXIDE: FORMS SHOCK-SENSITIVE COMPOUND.
SILVER OXIDE: FORMS SHOCK-SENSITIVE SILVER NITRIDE.
SILVER PERMANGANATE: FORMS SHOCK-SENSITIVE MIXTURE.

DECOMPOSITION:
MAY PRODUCE CORROSIVE VAPORS OF AMMONIA AND TOXIC OXIDES OF NITROGEN.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D002.

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

****

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. MAY IGNITE COMBUSTIBLES (WOOD, PAPER, OIL, ETC.).

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SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS

T: 047344-01
NO: A667C212 PO NBR: 031390

TH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO
IA DOCUMENTS OR BY THE U.S. DEPARTMENT OF

MUST BE BASED ON CONTAMINATION LEVELS FOUND
CEED THE WORKING LIMITS OF THE RESPIRATOR AND
I INSTITUTE FOR OCCUPATIONAL SAFETY AND
TH ADMINISTRATION (NIOSH-MSHA).

RESPIRATOR WITH CARTRIDGE(S) PROVIDING
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ATOR.
NG RESPIRATOR WITH CARTRIDGE(S) PROVIDING
MONIA.
FACEPIECE RESPIRATOR (GAS MASK) WITH A
OR BACK-MOUNTED CANISTER PROVIDING PROTECTION

THING APPARATUS.

FACEPIECE RESPIRATOR (GAS MASK) WITH A
OR BACK-MOUNTED CANISTER PROVIDING PROTECTION

TYPE SELF-CONTAINED BREATHING APPARATUS.

IATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

ATUS WITH FULL FACEPIECE OPERATED IN PRESSURE
SSURE MODE.

ULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND
ODE IN COMBINATION WITH AN AUXILIARY
ARATUS OPERATED IN PRESSURE-DEMAND OR OTHER

ROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT
IN CONTACT WITH THIS SUBSTANCE.

ROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS

OR DUST-RESISTANT SAFETY GOGGLES AND A
TH THIS SUBSTANCE.

HA N EMPLOYEE'S EYES AND/OR SKIN MAY BE
MPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN
HE IMMEDIATE WORK AREA FOR EMERGENCY USE.

ER SCIENTIFIC, INC.
REVISION DATE: 10/03/89

TIONAL INFORMATION-
SE ACCURATE AND REPRESENTS THE BEST
TO US. HOWEVER, WE MAKE NO WARRANTY OF
RANTY, EXPRESS OR IMPLIED, WITH RESPECT TO
NO LIABILITY RESULTING FROM ITS USE. USERS
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MATERIAL.
ER SPRAY
VAPORS.

DATE: 03/14/90 ACCT: 047344-01
INDEX: 15900726777 CAT NO: SA541 PO NBR: 031390

COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS, KEEP UPWIND.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
CORROSIVE MATERIAL

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.263
EXCEPTIONS: 49CFR173.244

TOXICITY

HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
IRRITATION DATA:
ANHYDROUS: 100 MG RINSED EYE-RABBIT MILD.
TOXICITY DATA:
HYDROGEN CHLORIDE (ANHYDROUS GAS): 4701 PPM/30 MINUTES INHALATION-RAT LC50; 2644 PPM/30 MINUTES INHALATION-MOUSE LC50.
MONOHYDRATE: NO DATA AVAILABLE.
DIHYDRATE: NO DATA AVAILABLE.
TRIHYDRATE: NO DATA AVAILABLE.
HEXAHYDRATE: NO DATA AVAILABLE.
HYDROGEN CHLORIDE (AEROSOL): 5666 PPM/30 MINUTES INHALATION-RAT LC50; 2142 PPM/30 MINUTES INHALATION-MOUSE LC50.
HYDROCHLORIC ACID: 1300 PPM/30 MINUTES INHALATION-HUMAN LCLO, 3000 PPM/5 MINUTES INHALATION-HUMAN LCLO, 81 MG/KG UNREPORTED MAN LDLO, 3124 PPM/1 HOUR INHALATION-RAT LC50, 1108 PPM/1 HOUR INHALATION-MOUSE LC50, 1449 MG/KG INTRAPERITONEAL-MOUSE LD50, 900 MG/KG ORAL-RABBIT LD50, 4416 PPM/30 MINUTES INHALATION-RABBIT LCLO, 4416 PPM/30 MINUTES INHALATION-GUINEA PIG LCLO, 1000 MG/M3/2 HOURS INHALATION-MAMMAL LCLO, MUTAGENIC DATA (RTECS), REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE-INHALATION, SKIN, EYE AND INGESTION.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION.
TARGET EFFECTS: NO DATA AVAILABLE.

HEALTH EFFECTS AND FIRST AID

INHALATION:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE. 100 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- INHALATION OF GAS OR FUMES AT LEVELS OF 5-35 PPM MAY CAUSE IRRITATION AND BURNING OF THE THROAT, COUGHING AND CHOKING; 50-100 PPM MAY BE BARELY TOLERABLE FOR 1 HOUR. HIGH LEVELS MAY CAUSE INFLAMMATION AND OCCASIONALLY ULCERATION OF THE NOSE, THROAT OR LARYNX, BRONCHITIS, PNEUMONIA, PALPITATIONS AND HEADACHE. HIGHER CONCENTRATIONS MAY CAUSE NECROSIS OF THE TRACHEAL AND BRONCHIAL EPITHELIUM, NASOSEPTAL PERFORATION, ATELECTASIS, EMPHYSEMA, DAMAGE TO PULMONARY BLOOD VESSELS AND LESIONS OF THE LIVER AND OTHER ORGANS. DEATH MAY BE DUE TO LARYNGEAL SPASM, BRONCHOPNEUMONIA OR PULMONARY EDEMA. 1300-2000 PPM MAY BE DANGEROUS, EVEN ON BRIEF EXPOSURES. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE EROSION AND DISCOLORATION OF EXPOSED TEETH, CHRONIC BRONCHITIS AND GASTRITIS.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE.
ACUTE EXPOSURE- CONTACT MAY CAUSE SEVERE IRRITATION, INFLAMMATION, ULCERATION, NECROSIS AND CHEMICAL BURNS. SHOCK SYMPTOMS MAY DEVELOP INCLUDING RAPID PULSE, SWEATING AND COLLAPSE. PHOTOSENSITIZATION REACTIONS MAY OCCUR IN PERSONS PREVIOUSLY EXPOSED. CONTACT WITH A COMPRESSED GAS MAY CAUSE FROSTBITE.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH VAPORS OR DILUTE SOLUTIONS MAY CAUSE DERMATITIS. PHOTOSENSITIZATION MAY OCCUR.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE.

DATE: 03/14/90 ACCT: 047344-01
INDEX: 1800072877 7 CAT NO: 8A571 PO NBR: 031390

ACUTE EXPOSURE- CONTACT MAY CAUSE SEVERE IRRITATION, CONJUNCTIVITIS, CORNEAL NECROSIS AND BURNS WITH IMPAIRMENT OR PERMANENT LOSS OF VISION. A DROP OF HYDROCHLORIC ACID SPLASHED IN THE EYE AND IMMEDIATELY WASHED OUT HAS PRODUCED A WHITE COAGULATION OF THE CORNEAL AND CONJUNCTIVAL EPITHELIUM. ANIMALS EXPOSED TO VAPOR CONCENTRATIONS OF 1350 PPM FOR ONE AND A HALF HOURS SHOWED CLOUDING OF THE CORNEA AND 300 PPM FOR 5 HOURS SHOWED SLIGHT EROSION OF THE CORNEAL EPITHELIUM. CONTACT WITH A COMPRESSED GAS MAY CAUSE FROSTBITE.
CHRONIC EXPOSURE- ANIMALS EXPOSED TO VAPOR AT 100 PPM FOR 6 HOURS DAILY FOR 50 DAYS SHOWED ONLY SLIGHT UNREST AND IRRITATION OF THE EYES, BUT NO OCULAR INJURY. EFFECTS ARE DEPENDENT UPON CONCENTRATION AND DURATION OF EXPOSURE. CONJUNCTIVITIS OR EFFECTS SIMILAR TO THOSE FOR ACUTE EXPOSURE MAY OCCUR.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE.
ACUTE EXPOSURE- INGESTION OF THE ACID MAY CAUSE BURNS OF THE MOUTH, THROAT, ESOPHAGUS AND STOMACH WITH CONSEQUENT PAIN, UNEASINESS, NAUSEA, SALIVATION, VOMITING, DIARRHEA, CHILLS, SHOCK AND INTENSE THIRST. NEPHRITIS, FEVER AND PERFORATION OF THE INTESTINAL TRACT, AND CIRCULATORY COLLAPSE MAY OCCUR. DEATH MAY BE DUE TO ESOPHAGEAL OR GASTRIC NECROSIS.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

FIRST AID- DO NOT USE GASTRIC LAVAGE OR EMESIS. DILUTE THE ACID IMMEDIATELY BY DRINKING LARGE QUANTITIES OF WATER OR MILK. IF VOMITING PERSISTS, ADMINISTER FLUIDS REPEATEDLY. INGESTED ACID MUST BE DILUTED APPROXIMATELY 100 FOLD TO RENDER IT HARMLESS TO TISSUES. MAINTAIN AIRWAY AND TREAT SHOCK. (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
REACTS EXOTHERMICALLY WITH WATER OR STEAM TO PRODUCE TOXIC AND CORROSIVE FUMES.

CONTACT WITH COMMON METALS PRODUCES HYDROGEN WHICH MAY FORM EXPLOSIVE MIXTURES WITH AIR.

INCOMPATIBILITIES:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
ACETIC ANHYDRIDE: VIOLENT REACTION.
ALCOHOLIC HYDROGEN CYANIDE: EXPLOSIVE REACTION.
ALUMINUM: EXPLOSION.
ALUMINUM-TITANIUM ALLOYS: IGNITES OR INCANDESCES WHEN HEATED.
2-AMINOETHANOL: VIOLENT REACTION.
AMMONIUM HYDROXIDE: VIOLENT REACTION.
BASES: VIOLENT REACTION.
BRASS: CORRODES.
BRONZE: CORRODES.
CALCIUM CARBIDE: REACTS WITH INCANDESCENCE.
CALCIUM HYPOCHLORITE: IGNITION.
CESIUM ACETYLIDE: IGNITES ON CONTACT.
CHLORINE + DINITROANILINES: VIGOROUS REACTION WITH RELEASE OF FLAMMABLE HYDROGEN GAS FUMES.
CHLOROSULFONIC ACID: VIOLENT REACTION.
1,1-DIFLUOROETHYLENE: EXTREMELY EXOTHERMIC DECOMPOSITION REACTION.
DOWICIL 100: DECOMPOSES.
ETHYLENE DIAMINE: VIOLENT REACTION.
ETHYLENE IMINE: VIOLENT REACTION.
FLUORINE: IGNITES ON CONTACT.
HEXALITHIUM DISILICIDE: INCANDESCES.
IRON: CORRODES WITH EVOLUTION OF FLAMMABLE HYDROGEN GAS.
MAGNESIUM BORIDE: PRODUCES A SPONTANEOUSLY FLAMMABLE GAS.
MERCURIC SULFATE: VIOLENT REACTION AT 125 C.
METAL ACETYLIDES: VIOLENT REACTION.
METALS: SEVERE CORROSION WITH EVOLUTION OF FLAMMABLE HYDROGEN GAS.
OLEUM: VIOLENT REACTION.
OXIDIZERS (STRONG): VIOLENT REACTION.
OXYGEN + PLATINUM: IGNITES ON CONTACT.
PERCHLORIC ACID: VIOLENT REACTION.
PLASTICS, RUBBER, COATINGS: ATTACKS.
POTASSIUM PERMANGANATE: EXPLOSION HAZARD.
BETA-PROPIOLACTONE: VIOLENT REACTION.
PROPYLENE OXIDE: VIOLENT REACTION.
RUBIDIUM ACETYLIDE: IGNITES ON CONTACT.
SILICA (GEL): INCOMPATIBLE.
SODIUM: VIGOROUS OR EXPLOSIVE REACTION.

SULFURIC ACID: EXPLOSIVE REACTION WITH RELEASE OF TOXIC HYDROGEN CHLORIDE GAS.
TETRASELENIUM TETRANITRIDE: EXPLODES ON CONTACT.
VINYL ACETATE: VIOLENT REACTION.

DECOMPOSITION:
T MAL DECOMPOSITION MAY RELEASE CORROSIVE HYDROGEN CHLORIDE.

P /MERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

##STORAGE##

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

PROTECT AGAINST PHYSICAL DAMAGE. STORE IN COOL, WELL-VENTILATED PLACE, SEPARATED FROM ALL OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

##

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. MAY IGNITE COMBUSTIBLES (WOOD, PAPER, OIL, ETC.).

##

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
COVER WITH SODA ASH. SCOOP UP AND PLACE IN A SUITABLE CONTAINER.

REPORTABLE QUANTITY (RQ): 5000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES T T A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS BTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION SYSTEM TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

HYDROGEN CHLORIDE (HYDROCHLORIC ACID):

50 PPM- ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH CARTRIDGE(S) PROVIDING PROTECTION AGAINST HYDROCHLORIC ACID.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH CARTRIDGE(S) PROVIDING PROTECTION AGAINST HYDROCHLORIC ACID.

100 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ACID GAS CANISTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

DATE: 03/14/90 ACCT: 047344-01
INDEX: 1890072877 CAT NO: SA541 PO NBR: 031390

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 07/09/85 REVISION DATE: 09/06/89

-ADDITIONAL INFORMATION-

THIS INFORMATION IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

ATTACHMENT D

HEAT STRESS

IT CORPORATION

STANDARD PROCEDURE

PROCEDURE NO. ITC PRO 9533.1

DATE February 23, 1987

SUPERSEDES --------

APPROVED DRSmith

David R. Smith

SUBJECT:

WORKING IN HOT ENVIRONMENTS

I. Purpose

To establish guidelines to protect all employees from the effects of heat stress (hyperthermia) when working in hot environments.

II. References

A. Threshold Limit Values and Biological Exposure Indices for 1985-1986, American Conference of Governmental Industrial Hygienists.

B. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

C. Criteria for a Recommended Standard, Occupational Exposure to Hot Environments, Revised Criteria 1986, U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

III. Attachments

1. Recommended Heat-Stress Guidelines for Unacclimated Workers in Hot Environments.

2. Recommended Heat-Stress Guidelines for Acclimated Workers in Hot Environments.

3. Assessment of Employee Workload (kcal/h) in Hot Environments.

4. Employee Physiological Monitoring Record for Heat Stress (Guideline).

IV. Discussion

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal injury, increased accident probability, etc. to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment puts a worker at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at sites, regular monitoring and other preventive precautions are vital.

Note: Chemical protective clothing is defined as, but not limited to:
Polyethylene coated Tyvek;
Saranex coated Tyvek;
Medium weight polyvinylchloride (PVC);
Sigel suits (heavyweight PVC); and
Fully encapsulating suits.

V. Assignment of Responsibilities

A. H&S Coordinator

The H&S Coordinator will be responsible for initial on-site coordination of the heat stress policy. He/she shall establish work/rest regimens from the Wet Bulb Globe Thermometer (WBGT) readings and conduct physiological monitoring when on site.

B. Project/Job Manager

The Project/Job Manager will be responsible for field implementation of the heat stress policy. This includes assurance that all personnel on-site comply with the policy. He/she shall be responsible for establishing and monitoring safe work practices. He/she will ensure that all personnel potentially exposed to heat have proper training and that on-site supervision implements the program in his/her absence.

C. Project Supervisor

The Project Supervisor will be responsible for ensuring that work crews comply with all site requirements, including the heat stress policy. In the absence of the H&S Coordinator, he/she shall also be responsible for physiological monitoring as outlined in Section VI below and Guideline Attachment 1 to this procedure. Team members shall also observe their fellow workers for signs of heat stress.

D. Team Member

All Team Members will be responsible for understanding and complying with all site requirements, including the heat stress policy.

VI. Procedures

A. Recommended Guidelines

1. Note that the following guidelines discussed in this section (VI.A.) are only intended to be used as a means for initial establishment of a work-rest regimen. It will be the

responsibility of a Health and Safety Coordinator to evaluate the conditions at a specific operation and make final determinations of the work-rest regimen. Physiological monitoring, as discussed in the following section, will be used to establish more stringent regimens.

2. Unacclimatized Workers - The total heat exposure to unacclimatized workers not wearing protective clothing shall not exceed the guidelines given in Attachment 1. Note that it generally takes an employee seven to ten days to become acclimated to heat.

3. Acclimatized Workers - The total heat exposure to acclimatized healthy workers not wearing protective clothing shall not exceed the guidelines given in Attachment 2.

4. The guidelines shown in Attachments 1. and 2. are for the worker not wearing chemical protective clothing. If the worker is wearing chemical protective clothing, the guidelines in Attachments 1 and 2 should be changed by 4°F. In other words, add 4°F to the WBGT reading and use this adjusted WBGT in Attachments 1 and 2.

5. The metabolic heat rate to use in Attachments 1 and 2 shall be estimated using Attachment 3.

B. Physiological Monitoring

1. For operations at which workers are wearing chemical protective clothing, physiological monitoring is necessary when the ambient temperature exceeds 78°F (25.5°C).

2. After the initial work-rest regimen is established, as discussed in Section A, it is necessary to perform physiological monitoring to determine if the established work-rest regimen should be adjusted. The following guidelines will be used to adjust the regimen and should be recorded on a form similar to the guideline attachment 1 to this procedure.

   a. Baseline Information

      Determine a baseline heart rate and oral temperature for each employee prior to on-site activities by counting the radial pulse and using a clinical thermometer to measure oral temperature.

   b. Increasing Work Rate

      (1) If a worker's heart rate and oral temperature do not increase, or only increase slightly (10% or less for the heart rate and 0.5% or less for the oral temperature) from the baseline readings after the first work cycle, the work period (according to the established work-rest regimen) can be increased by 20%.

(2) The worker shall be monitored closely after the next work cycle period and if there are still no significant increases in heart rate and oral temperature, the work period can be increased by an additional 10% and the rest period remains the same.

(3) Increases in the work period can be made throughout the shift if there are no significant increases in the physiological monitoring indices.

(4) Note that the increases to the work period are made based on the work-rest regimen established from WBGT readings. These WBGT readings will change throughout the day as the temperature rises or falls.

c. Decreasing Work Rate

(1) Pulse

(a) Count the radial pulse as early as possible in the rest period.

(b) If a worker's heart rate exceeds 110 beats per minute immediately after a work period, shorten the next work cycle by 30% and keep the rest period the same.

(c) If the heart rate still exceeds the 110 beats per minute after the next work period, shorten the following work cycle by 30%.

(d) Continue to shorten the employee's work cycle until the heart beat is below 110 beats per minute.

(2) Temperature

(a) Use a clinical thermometer or similar device to measure the ora temperature at the end of a work period (before drinking).

(b) If the oral temperature exceeds 99.6°F (37.6°), shorten the next work cycle by 30% without changing the rest period.

(c) If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the following work cycle by 30%.

(d) Do not permit a worker to return to a work area when the oral temperature exceeds 100.6°F (38.1°C).

C. Prevention

1. Establish a work-rest regimen according to the guidelines given in Section A and B of this policy.

2. Adequate liquids must be provided to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

   Replacement fluids can be a 0.1% salt water solution, a commercial mix, such as Gatorade or Quik Kick, or a combination of these with fresh water. Employees should be encouraged to salt their foods more heavily.

   The replacement fluid temperature should be kept cool.

3. Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

4. All breaks are to be taken in a cool, shaded rest area (77°F is best).

5. Employees shall remove chemical protective garments during rest periods.

6. Employees shall not be assigned other tasks during rest periods.

7. All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress.

8. Employees shall be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.

D. Training

Those personnel (including contractor employees) potentially exposed to heat stress conditions shall have the following training:

1. Employees

   a. Sources of heat stress, influence of protective clothing, and importance of acclimatization;

   b. How the body handles heat;

c. Heat related illnesses;

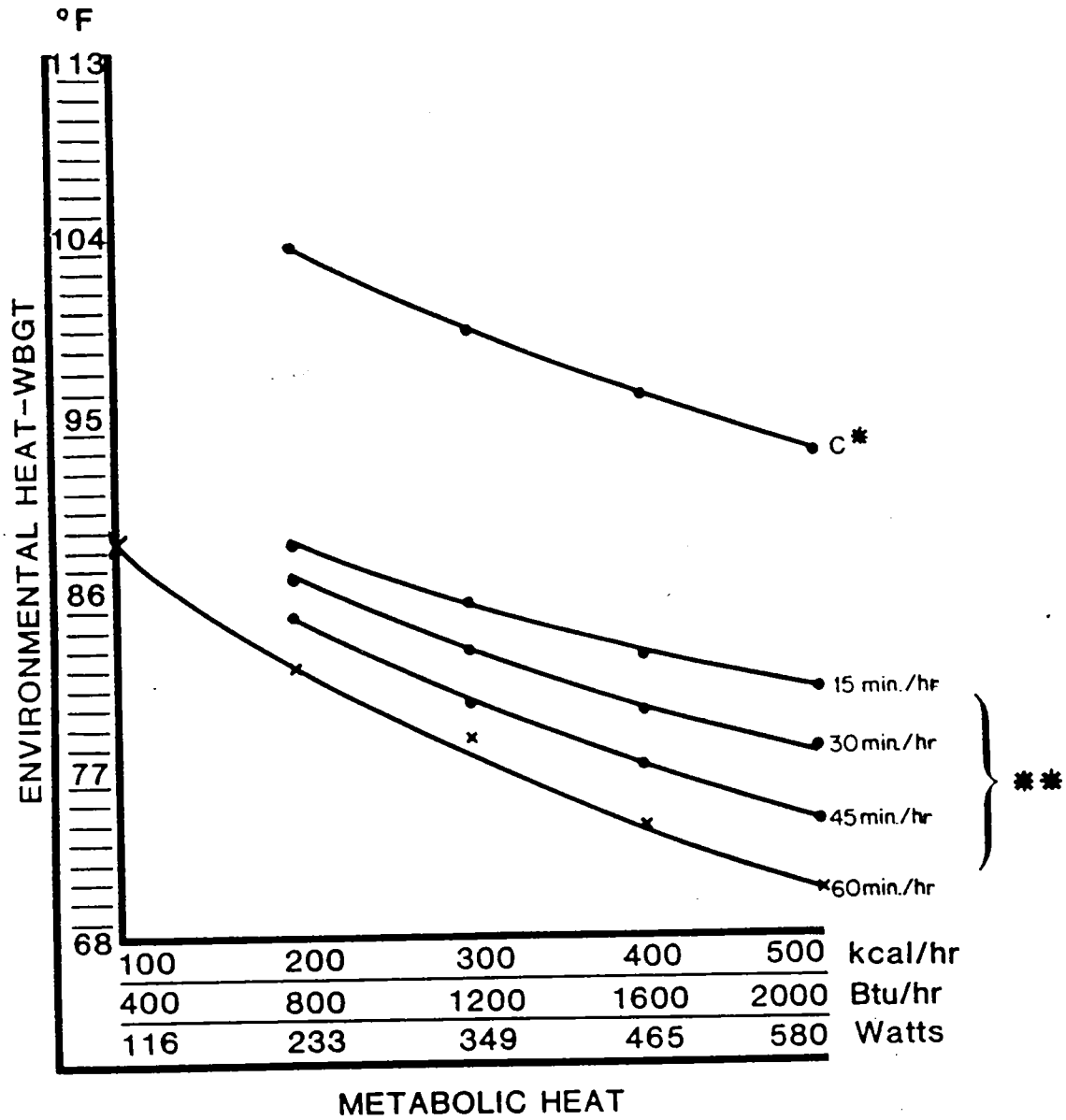
d. Preventative/Corrective measures; and

e. First Aid procedures.

2. IT Supervisors

a. Measurement methods and calculations of WBGT and physiological monitoring.

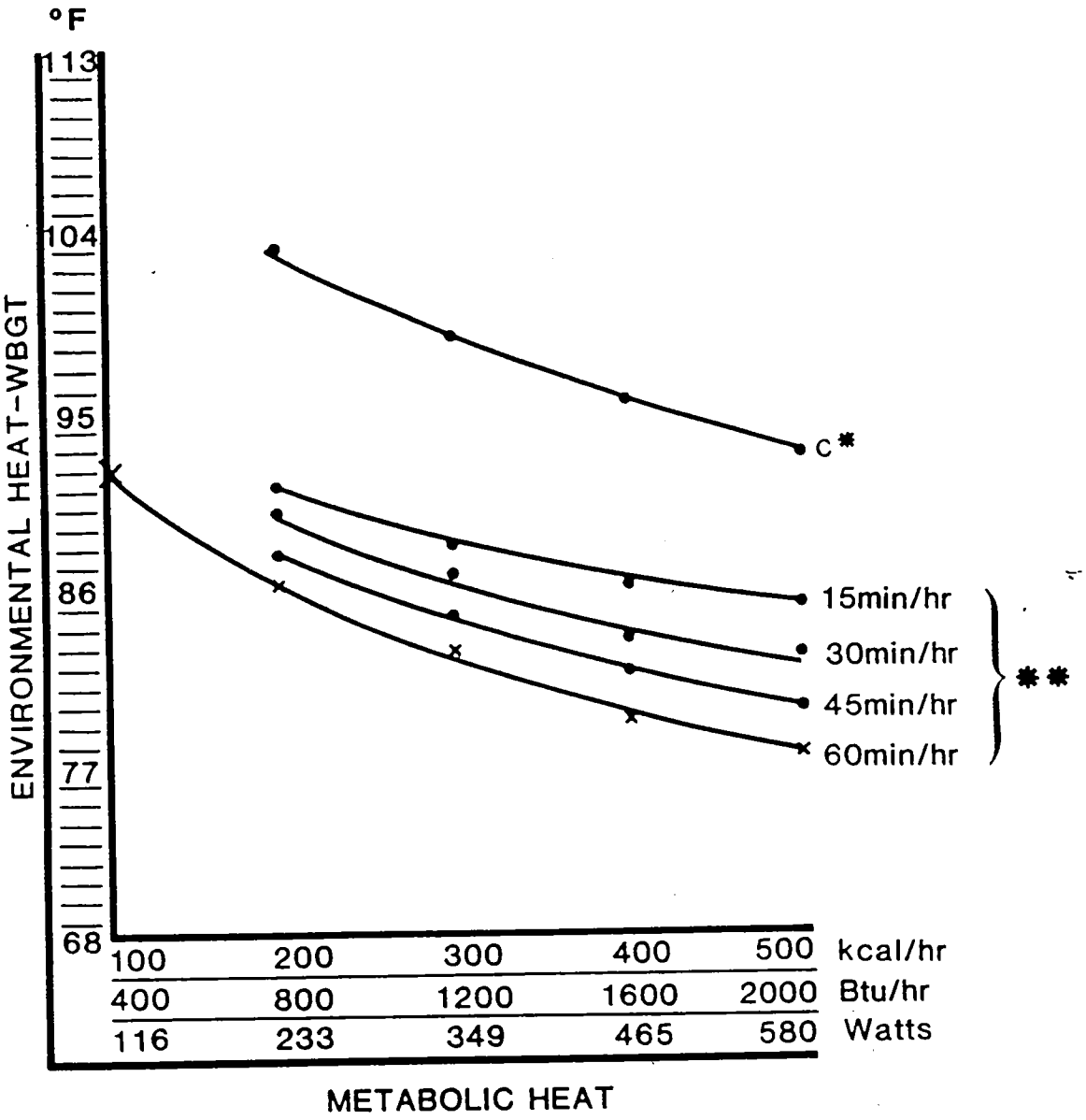
9533-1



Recommended Heat Stress Guidelines for Unacclimated Workers in Hot Environments

* C= Ceiling Limit – No work should be performed without body cooling provided

** Work–Rest Regimen – Minutes worked per hour



Recommended Heat Stress Guidelines for Acclimated Workers in Hot Environments

* C= Ceiling Limit – No work should be performed without body cooling provided

** Work-Rest Regimen = Minutes worked per hour

ASSESMENT OF EMPLOYEE WORK LOAD IN HOT ENVIRONMENTS

A. BODY POSITION AND MOVEMENT	kcal/min
Sitting	0.3
Standing	0.6
Walking	2.0–23.0
Walking uphill	add 0.8 per meter rise

B. TYPE OF WORK	Average kcal/min	Range kcal/min
Hand work		
Light	0.4	0.2–1.2
Heavy	0.9	
Work One Arm		
Light	1.0	0.7–2.5
Heavy	1.8	
Work Both Arms		
Light	1.5	1.0–3.5
Heavy	2.5	
Work Whole Body		
Light	3.5	2.5–9.0
Moderate	5.0	
Heavy	7.0	
Very Heavy	9.0	

C. BASAL METABOLISM	1.0

D. SAMPLE CALCULATION	Average kcal/min
Assembling work with heavy hand tools	
1. Standing	0.6
2. Two-arm work	3.5
3. Basal Metabolism	1.0
TOTAL	5.1 kcal/min x 60=306 kcal/hr

EMPLOYEE PHYSIOLOGICAL MONITORING RECORD FOR HEAT STRESS

Attachment 4 (Guideline)
ITC Pro 9533.1

Employee Name _____ Date _____ Employee SS# _____
Division _____ Start Time _____ Location _____
P.C.# _____ Stop Time _____ Job Number _____
Health & Safety Coordinator _____ Supervisor _____

TEMPERATURES

A. INITIAL READING
1. Ambient Air Temperature _____
2. Baseline Oral Temperature _____
3. WBGT _____

B. AFTER FIRST WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

C. AFTER SECOND WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

D. AFTER THIRD WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

E. AFTER FOURTH WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

F. AFTER FIFTH WORK PERIOD
1. Ambient Air Temperature _____
2. Oral Temperature _____
3. WBGT _____

HEART RATE

A. INITIAL READING
1. Baseline Heart Rate _____ B/min

B. AFTER FIRST WORK PERIOD
1. Heart Rate _____ B/min

C. AFTER SECOND WORK PERIOD
1. Heart Rate _____ B/min

D. AFTER THIRD WORK PERIOD
1. Heart Rate _____ B/min

E. AFTER FOURTH WORK PERIOD
1. Heart Rate _____ B/min

F. AFTER FIFTH WORK PERIOD
1. Heart Rate _____ B/min

This completed form should be retained in project file

B/min=Beats/ per minute

ATTACHMENT E-1

SAFETY-TRAINING MEETING RECORDS

TAILGATE SAFETY MEETING

Division/Subsidiary _____ Facility _____

Date _____ Time _____ Job Number _____

Customer _____ Address: _____

Specific Location _____

Type of Work _____

Chemicals Used _____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards _____

Physical Hazards _____

Emergency Procedures _____

ital / Clinic _____ Phone ( ) _____ Paramedic Phone ( ) _____

Hospital Address _____

Special Equipment _____

Other _____

ATTENDEES

NAME PRINTED	SIGNATURE

M ting conducted by:

_____ NAME PRINTED

_____ SIGNATURE

Supervisor _____ Manager _____

36-8-85

INTERNATIONAL TECHNOLOGY CORPORATION

ON-THE-JOB TRAINING RECORD (OJTR)

TRAINEE _____ DIVISION _____

S.S.# _____ - _____ - _____ LOCATION _____

Date: ____/____/____ Hrs. Training _____ Instructor _____
Mo. Day Year

SUBJECT: _____

KEY POINTS: _____

PERFORMANCE EVALUATION: _____

Instructing Supervisor Signature

Trainee Signature

ITC FORM 48514-1 (5/87)

INTERNATIONAL TECHNOLOGY CORPORATION

RESPIRATOR TRAINING COMPLETION FORM

FIT TEST PROTOCOL:

☐ Standard
☐ Other (specify) _____

DIVISION _____ **LOCATION** _____

FIT TEST CONDUCTED BY: _____ **DATE** _____

Initial only the appropriate blocks

NAME _____ (Please print)

SIG. _____

S.S.# _____

	SCBA Brand: Model: Size: S M L XL	*AIRLINE PRESSURE DEMAND* Brand: Model: Size: S M L XL	*AIR PURIFYING FULL FACE* Brand: Model: Size: S M L XL	*AIR PURIFYING HALF MASK* Brand: Model: Size: S M L XL	*PAPR* Brand: Model: Size: S M L XL	*OTHER* Brand: Model: Size: S M L XL
1. I understand why respiratory protection is needed and where and when it should be used.						
2. I know how to use this respirator properly.						
3. I know how to clean and inspect this respirator.						
4. I understand the limitations and restrictions of the respirators I will be using.						
5. I wore this respiratory equipment in normal air and checked the facepiece fit.						
6. I wore this respiratory equipment in a test atmosphere generated by smoke or other means.						
7. I understand that a good gas-tight face seal cannot be achieved with obstruction such as facial hair or glasses (with fullface mask).						

ITC FORM 9561-1 (9/91)

ATTACHMENT E-2

PERSONNEL TRAINING CERTIFICATION

SUBCONTRACTOR CERTIFICATION

I, _____ as an agent of _____, do hereby certify that the following employees have successfully completed a 40-hour training course (and, as necessary, annual refresher course), which complies with the provisions of 29 CFR 1910.120, and respiratory protection training which complies with 29 CFR 1910.134. Each employee has also successfully completed a medical examination which complies with the above regulations.

Individual copies of certification of successful completion of the required training and medical examination are attached for each employee.

Signature	Date

Subcontractor Employee Name:	Subcontractor Employee Name:

PERSONNEL TRAINING/MEDICAL LOG*								
Name	Representing	Medical exam date	40 Hr date	8 Hr Refresher date	8 Hr Supervisor date	SSHP date	First Aid/ CPR date	Other:

*Include copies of all training certificates in this Attachment.

ATTACHMENT F

AIR MONITORING/SAMPLING FORMS

INTERNATIONAL TECHNOLOGY CORPORATION

CALIBRATION LOG

Project Name _____

By _____

Project No. _____

Page _____ of _____

Date/Time	Instrument	STD	STD CONC ppm	Meter Reading	Comments

688-1-89

INTERNATIONAL TECHNOLOGY CORPORATION

REAL TIME AIR MONITORING LOG

PROJECT NAME _____ LOCATION _____ PROJECT NO. _____

Date	Analyst	Time	Instrument (Mfg/Model/ Serial No.)	Calibration Date & Cpd.	Compound Measured	Span Set or Sens. Cal.	Conc. (Units)	Location/Activity/Comments

IT Employee Notification
Of Results of Monitoring for Exposure
To Hazardous Substances or Harmful Physical Agents

This form is to provide you with information on results of monitoring for your exposure to toxic substances (chemicals) or physical agents (noise, radiation, etc.).

Please read this form and the results shown, then acknowledge by signing and dating in the spaces provided below. Give the completed form to your supervisor for his/her signature. The supervisor will return the signed form to the Health and Safety Department and a copy will then be provided to you. Please call the Health and Safety Coordinator named below if there are any questions.

Health & Safety Coordinator _____ Phone No. _____

Employee Signature _____ Date _____

To be completed by IT Health and Safety Coordinator:

Employee Name _____ SSAN _____

Division _____ PC No. _____ Location _____

Job Title _____ Sampling Location _____

Job Supervisor _____ Date Monitored _____

IT Job No. _____

Contaminant/Physical Agent Monitored	IT Results	OSHA or IT PEL Limits
1.		
2.		
3.		
4.		

Protective Equipment Used: (Describe specifically)

_____

_____

Explanation of Sampling Results or Comments by Health & Safety

_____

_____

_____

If Sampling Results are in excess of OSHA or IT Permissible Exposure Limits then Corrective Action to reduce any future exposures is as follows: _____

_____

Distribution:

Employee's Corporate Medical File
Employee
Employee's Supervisor
Employee's Profit Center Manager
Regional Health & Safety

ITC Form 9550.1-1B (11/86)

ATTACHMENT G

ENG FORM 3394 - ACCIDENT REPORT

(For Safety Staff only)	REPORT NO	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT (For Use of this Form See Attached Instructions and USACE Suppl to AR 385-40)	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

1 ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2 PERSONAL DATA

a. NAME (Last,First,MI)	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER ___ ___ ___ / ___ ___ ___ ___ ___ ___	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER (Specify)

3 GENERAL INFORMATION

a. DATE OF ACCIDENT (month/day/year)	b. TIME OF ACCIDENT (Military time))	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME (2) SUBCONTRACTOR
/ /			

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER (Specify)	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER (Specify)	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER (Specify)

4 CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see instructions)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

INJURY / ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see instructions)*

SEVERITY OF ILLNESS / INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE) #	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE) #
PRIMARY		TYPE	
SECONDARY		SOURCE	
f. NATURE OF ILLNESS / INJURY			

6 PUBLIC FATALITY *(Fill in line and corresponding code number in box - see instructions)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7 MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE ☐ TRUCK ☐ OTHER (Specify)	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER (Specify)	(1) FRONT SEAT			
		(2) REAR SEAT			

8 PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9 VESSEL / FLOATING PLANT ACCIDENT *(Fill in line and corresponding code number in box from list - see instructions)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11 CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a *(Explain YES answers in item 13)*	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
ISPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident?	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12 TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	/ / *(Month) (Day) (Year)*

13 FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14 ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING *(Month/Day/Year)* / /	b. ANTICIPATED COMPLETION *(Month/Day/Year)* / /

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL
CORPS _____	___ / ___ / ___		
CONTRACTOR _____	___ / ___ / ___		

16. MANAGEMENT REVIEW *(1st)*.

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17 MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18 SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19 COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

GENERAL. Complete a separate report for each person who was *injured, caused, or contributed* to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the descretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

INSTRUCTIONS FOR SECTION 1 — ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable.)*

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY ILLNESS/FATALITY — Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY ILLNESS/FATALITY — Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).

(2) VOID SPACE — Make no entry.

(3) VEHICLE INVOLVED — Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) VOID SPACE — Make no entry.

INSTRUCTIONS FOR SECTION 2 — PERSONAL DATA

a. NAME — (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE — Enter age.

c. SEX — Mark appropriate box.

d. SOCIAL SECURITY NUMBER — (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE — (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Examples: O-6; E-7; WG-8; WS-12; GS-11; etc.

f. JOB SERIES/TITLE — For *government civilian employees* enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For *contractor employees* enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc.,

g. DUTY STATUS — Mark the appropriate box.

(1) ON DUTY — Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) OFF DUTY - Person was not on official business at time of accident

h. EMPLOYMENT STATUS — (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

a. DATE OF ACCIDENT — Enter the month, day, and year of accident.

b. TIME OF ACCIDENT — Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT — Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME

(1) PRIME — Enter the exact name (title of firm) of the prime contractor.

(2) SUBCONTRACTOR — Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER — Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT — Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) — Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 — CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY — Select the *most appropriate* construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION	14. ELECTRICAL
2. SITE PREPARATION	15. SCAFFOLDING/ACCESS
3. EXCAVATION TRENCHING	16. MECHANICAL
4. GRADING (EARTHWORK)	17. PAINTING
5. PIPING/UTILITIES	18. EQUIPMENT MAINTENANCE
6. FOUNDATION	19. TUNNELING
7. FORMING	20. WAREHOUSING/STORAGE
8. CONCRETE PLACEMENT	21. PAVING
9. STEEL ERECTION	22. FENCING
10. ROOFING	23. SIGNING
11. FRAMING	24. LANDSCAPING/IRRIGATION
12. MASONRY	25. INSULATION
13. CARPENTRY	26. DEMOLITION

b. TYPE OF CONSTRUCTION EQUIPMENT — Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER
2. DRAGLINE
3. CRANE (ON VESSEL/BARGE)
4. CRANE (TRACKED)
5. CRANE (RUBBER TIRE)
6. CRANE (VEHICLE MOUNTED)
7. CRANE (TOWER)
8. SHOVEL
9. SCRAPER
10. PUMP TRUCK (CONCRETE)
11. TRUCK (CONCRETE/TRANSIT MIXER)
12. DUMP TRUCK (HIGHWAY)
13. DUMP TRUCK (OFF HIGHWAY)
14. TRUCK (OTHER)
15. FORKLIFT
16. BACKHOE
17. FRONT-END LOADER
18. PILE DRIVER
19. TRACTOR (UTILITY)
20. MANLIFT
21. DOZER
22. DRILL RIG
23. COMPACTOR/VIBRATORY ROLLER
24. OTHER

INSTRUCTIONS FOR SECTION 5 — INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI NO INJURY
FAT FATALITY
PTL PERMANENT TOTAL DISABILITY
PPR PERMANENT PARTIAL DISABILITY
LWD LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA RECORDABLE FIRST AID CASE
NRI NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST — Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED — Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY — Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED — Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN.
	TC	CONTUSION, BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY — OTHER (EXCEPT DISEASE, ILLNESS)

** A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which doses not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE PARASITIC — OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/ oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle..
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the *most* appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating—powered
3. Boating—unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION—Mark appropriate box.

c. SEAT BELT—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8—PROPERTY/ MATERIAL INVOLVED

a. NAME OF ITEM—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP—Enter ownership for each item listed. (Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE*)

c. $ AMOUNT OF DAMAGE—Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9 — VESSEL/ FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT — Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/ floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL, BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP — Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEPT DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10 — ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT — Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11 — CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN — Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE — Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION — Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES — Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES — Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS — Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS — Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS — Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.,), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) OFFICE FACTORS — Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS — Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc?

(11) PERSONAL PROTECTIVE EQUIPMENT — Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL — Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS — Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *If one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12 — TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? — For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING — Mark the appropriate box that best indicates the type of training, (classroom or on-the-job) that the injured person received before the accident happened.

c. DATE OF MOST RECENT TRAINING — Enter the month, day, and year of the last *formal* training completed that covered the activity-task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13—CAUSES

a. DIRECT CAUSES—The direct cause is that single factor which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

a. BEGIN DATE—Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE—Enter the date when the corrective action(s) identified in Section 14 will be completed.

c. TITLE AND SIGNATURE—Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d. 15.e and 15.f below. the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED—Enter the month. day. and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME—For GOVERNMENT employee accidents enter the USACE organization name (Division. Branch. Section. etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. OFFICE SYMBOL—Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc, are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

ATTACHMENT H

IT ACCIDENT/INJURY REPORT

AUTHORIZATION FOR TREATMENT
OCCUPATIONAL INJURY/ILLNESS

Location _____ IT Division _____ PC No. _____ Project No. _____

Date of Incident/Exam _____ ° Injury ° Illness

Employee Name _____ Employee SS No. _____

Job Title _____ Location/Site Address _____

_____

TO THE TREATING PHYSICIAN:

- ***Light Duty Work***
  It is the policy of IT Corporation to provide light duty work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact the manager/supervisor listed below, before releasing the employee, so that a light duty assignment may be arranged.

  Manager/Supervisor _____ Phone (____) _____

- ***Medically Unable to Return to Work***
  It is the policy of IT Corporation to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other benefits available to them. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting our Medical Director with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

  IT Medical Director: Peter P. Greaney, M.D. Office: (714) 535-8221 FAX: (714) 535-3157

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Send your reports and bills to:

1. If first-aid only _____
2. If medical treatment provided _____

IT Authorization Signature _____ _____

Date _____ Phone No. (____)_____

Doctor, please provide:

Medical Diagnosis _____

_____

Treatment Provided _____

_____

Recommended Work Limitation/Restriction _____

_____

Return Visit Needed • Yes • No First Aid Only • Yes • No When _____

_____ _____

Name Printed Signature

FORM HS105A

INTERNATIONAL TECHNOLOGY CORPORATION

SUPERVISOR'S EMPLOYEE INJURY REPORT

This is an official document to be initiated by the employee's supervisor. Please answer all questions completely. This report must be forwarded to the employee's Regional Health and Safety office within 24 hours of the injury.

Injured's Name _____ Sex ____ S.S. No. _____ Birthdate _____

Home Address _____ City _____ State _____ Zip _____ Phone _____

Job title _____ Employee's P.C. _____ Hire date _____ Hourly wage _____

SUPERVISOR

Date of incident _____ Time _____ Time reported _____ To whom? _____

Client name _____ Client address _____ Time shift began _____

Exact location of incident _____ Did employee leave work? ☐ No ☐ Yes When _____

Has employee returned to work? ☐ No ☐ Yes When _____ Did employee miss a regularly scheduled shift? ☐ No ☐ Yes

Doctor/Hospital name _____ Address _____

Witness name(s) _____ Statements attached? ☐ No ☐ Yes

Nature of injury _____ Exact body part _____

Medical attention: ☐ None ☐ First aid on site ☐ Doctor's office ☐ Hospital ER ☐ Hospitalized

Job assignment at time of incident _____ Job: _____ Phase: _____ Task: _____ Subtask: _____

Describe incident _____

What unsafe physical condition or unsafe act caused the incident? _____

What corrective action has been taken to prevent recurrence? _____

Supervisor/Foreman _____ (Print) _____ Signature _____ Date

MANAGER

Comments on incident and corrective action _____

Manager's name _____ (Print) _____ Signature _____ Date

HEALTH AND SAFETY

Concur with action taken? ☐ No ☐ Yes Remarks _____

OSHA Classification:

☐ Incident only ☐ First aid ☐ No lost workdays ☐ Lost workdays ☐ Restricted activity ☐ Fatality

Days away from work _____ Days restricted work _____ Total days charged _____

☐ State jurisdiction ☐ Federal L&H ☐ Date ER submitted _____ Which claims office _____

Coding: A. Injury type or illness _____ B. Injured body parts _____ C. Activity at time of accident _____ D. Injury cause code _____

E. Agent code _____ F. Safety rule violated code _____ G. Accident prevention code _____

Name _____ (Print) _____ Signature _____ Date

ITC FORM HS020A (5/31/91)

White: Corporate Health and Safety Yellow: Regional Health and Safety Pink: Profit/Cost Center

SCA-3-85

IT CORPORATION WORKERS COMPENSATION ACCIDENT CODING

A. TYPE OF INJURY OR ILLNESS

10 Laceration
12 Puncture
14 Contusion
Abrasion
Crushing Injury
20 Foreign Body
22 Burn-Thermal
24 Burn-Chemical
26 Fracture
28 Amputation
30 Hernia/Inguinal
31 Hernia/Other
32 Strain
34 Sprain
36 Dislocation
38 Heat Exhaustion/Heat Stress
40 Drowning
42 Asphyxiation
44 Systemic Poisoning
46 Dermatitis
48 Inflammation/Irritation
49 Pneumoconiosis
50 Respiratory Condition Due to Toxic Agents
51 Radiation
52 Heart Disease
54 Liver Damage
56 Kidney Damage
58 Mental Stress/Psychiatric
60 Repeated Trauma
62 Hearing Loss
64 Cancer
66 Other Occupational Disease
68 Fatality
70 Infectious Respiratory Disease
72 Miscellaneous-Not Otherwise Coded
74 Not Work Related

NJURED BODY PARTS

10 Head
12 Face
14 Ear
16 Eye
17 Nose
18 Teeth/Mouth
20 Neck
22 Shoulder
24 Chest
26 Abdomen
28 Upper Arm
30 Elbow
32 Lower Arm
34 Wrist
36 Hand
38 Thumb
40 Fingers
42 Back/Spine
44 Hip/Pelvis
46 Thigh
48 Knee
50 Lower Leg
52 Ankle
54 Heel
56 Metatarsal
58 Toes
60 Lungs
62 Heart
63 Liver
64 Other Internal Organs
66 Psyche
68 Not Otherwise Coded

CTIVITY AT TIME OF ACCIDENT

Driving
14 Operating Heavy Equipment
16 Hot Work
18 Hydroblasting
19 Washing
20 Cutting
22 Lifting Or Manual Carrying
24 Walking
26 Running
28 Jumping
30 Hammering
32 Sampling
34 Loading/Unloading Vacuum Trucks
36 Pulling Vacuum Hoses
38 Climbing
40 Shoveling
41 Sweeping
42 Pulling
44 Pushing
46 Opening Or Closing
48 Reaching Or Stretching
50 Standing, Observing Or Inspecting
52 Piling Or Stacking
54 Maintenance
56 Training
58 Chemical Packaging
60 Laboratory Analysis
62 Washing Glassware
64 Tank Cleaning
66 Asbestos Removal
68 Nuclear Decontamination
70 Drilling
72 Pond Maintenance
74 Using Hand Tools
76 Not Otherwise Classified

D. INJURY CAUSE CODE

STRUCK BY

01 Falling Object
02 Flying Object
03 Swinging Object
04 Tipping, Sliding Or Rolling Object
05 Motor Vehicle
06 Altercation
07 All Other Moving Objects

STRAIN OR OVEREXERTION

10 Lifting (Back)
11 Lifting (Other Than Back)
12 Pulling Or Pushing
13 Reaching, Twisting Or Over Extending
14 Cumulative Trauma

FALL FROM ELEVATION

20 Manway Opening
21 Ladder Or Scaffold
22 Machinery Or Stationary Equipment
23 Piled Materials
24 Stairs
25 Heavy Equipment
26 Vacuum Trucks
27 Other Trucks

FALL FROM SAME LEVEL

30 Slip
31 Trip

STRUCK AGAINST

40 Moving Object
41 Stationary Object
42 Sharp Object

CAUGHT IN, UNDER OR BETWEEN

50 Running Or Meshing Objects
51 Point Of Operation (Machinery Or Equipment)
52 Other Than Point Of Operation
53 Moving And Stationary Objects
54 Two Moving Objects

EXPOSURE TO

60 Cold
61 Heat
62 Electric Current
63 Chemicals
64 Radiation
65 Noise
66 Dust
68 Poison Oak/Ivy

MISCELLANEOUS

70 Inhalation
71 Ingestion
72 Absorption
73 Job Stress
74 Insect Or Animal Bites

E. AGENT CODE

10 Grading/Compacting Equipment
11 Excavating/Drilling Equipment
12 Crane
14 Vacuum Truck
16 End Dump Truck
18 Automobile
19 All Other Motor Vehicles
20 Hand Tools
22 Power Tools
24 Laboratory Glassware
26 Laboratory Equipment
28 Sampling Equipment
30 Hoses
32 Hydroblaster
34 High Pressure Washing
36 Hand Truck
38 Ladder
40 Scaffold
42 Stairs
44 Slippery Surface
45 Ice Or Snow
46 Uneven Surface
48 Hot Liquid/Gases
50 Toxic Material
52 Oxygen Deficient Atmosphere
54 Flammable Materials
56 Electric Current
58 Radiation
60 Door
62 Compressed Gas
64 Gas Cylinder
66 Respirator/Breathing Apparatus
68 Protective Clothing
70 Other Clothing/Jewelry
72 Mobile Treatment Equipment
73 Fixed Treatment Facility

F. SAFETY RULE VIOLATED CODE

01 IT Safety Rule
02 Client Safety Rule
03 Compressed Air
05 Wire Rope, Clips And Slings
06 Locking Out Equipment
07 Piling And Blocking Of Materials
08 High Voltage Rules
09 Eye And Face Protection
10 Portable Ladders
11 Underground Construction
12 Cold Weather Hazards
13 Loading/Unloading
14 Hand Tools
15 Cleaning And Repair To Tools
16 Protective Clothing And Apparel
17 Flammable And Combustible Liquids
18 Job Procedure
19 Portable Electrical Tools
21 Flammable Gases
22 Fall Protection
23 Grinding Wheel
24 Machine Guarding
25 Scaffolding
26 Handling Materials
27 Horse Play And Fighting
28 Housekeeping
29 Unauthorized Walkways
30 Welding Equipment
31 Machine Operations
32 Hand Tools
35 Crane Rules
37 Acids And Caustics
38 Tripping And Slipping Hazards
42 Respirator Protection
43 Hearing Protection
44 Confined Space
45 Late Report of Minor Accident
46 Temporary Cords And Lamps
47 Improper Operation Of Equipment
48 Hydroblast
50 Motor Vehicle
51 Driving Under the Influence (DUI)
52 Fork Lifts
54 Air Compressors And Receivers
60 No Safety Rule Violation
62 Did Not Review Job With Health and Safety

G. ACCIDENT PREVENTION COD

02 Install Guards Or Safety Device
04 Install Warning System
06 Store Flammables And Combustibles In Approved Manner
08 Block Or Secure Material On Machinery Against Unexpected Movement
10 Additional Housekeeping Needed
12 Remove Protruding Objects
14 Maintain Necessary Clearance
16 Control Or Remove Atmospheric Conditions
18 Maintain Proper Piling of Storage
20 Install Additional Illumination
22 Personal Protective Equipment
24 Review Project with Health & Safety

INSTRUCTION/RE-INSTRUCTION ON:

50 Use Of Equipment
52 Proper Operation Or Working Speed
54 Use Of Warning Devices
56 Proper Use Of Safety Devices
58 Use Of Tools In Good Repair
60 Proper Lifting Practices
62 De-Energizing Equipment Before Adjusting Or Repairing
64 Stay Off Moving Equipment
66 Horse Play
68 Wearing Of Personal Protective Equipment
70 Proper Chemical Handling Procedure
72 Safety Work Rules
74 IT Training Class

INTERNATIONAL TECHNOLOGY CORPORATION

VEHICLE ACCIDENT REPORT

IT Vehicle

DRIVER _____ ACCIDENT DATE _____ DRIVERS LICENSE _____ STATE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

WORK PHONE ( ) _____ SS# _____ PC # _____

VEHICLE # _____ YEAR _____ MAKE _____ MODEL _____ PLATE # _____

STATE _____ VEHICLE OWNER: ☐ ITC ☐ LEASED/RENTED ☐ PRIVATE VEHICLE

IF NOT ITC OWNED: OWNER _____ ADDRESS _____

_____ PHONE _____

VEHICLE DAMAGE _____ EST. REPAIR COST _____ _____

Other Vehicle(s)

Use separate sheet if more than one

DRIVER _____ DRIVERS LICENSE _____ STATE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE ( ) _____ SS# _____

OWNERS NAME (CHECK IF SAME AS DRIVER ☐) _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

INSURANCE COMPANY _____ POLICY # _____

AGENTS NAME _____ ADDRESS _____ PHONE # _____

VEHICLE: YEAR _____ MAKE _____ MODEL _____ PLATE # _____ STATE _____

VEHICLE DAMAGE _____

PASSENGERS ☐ YES (List on reverse) ☐ NO INJURIES ☐ YES (List names & address on reverse) ☐ NO

Accident Description

DATE _____ TIME _____

LOCATION _____

DESCRIPTION _____

_____

_____

_____

_____

WITNESS _____ ADDRESS _____

_____ PHONE # _____

POLICE OFFICER'S NAME _____ DEPT. _____

EMPLOYEE _____ DATE _____
PRINT SIGNATURE

MANAGER _____ _____ _____
PRINT NAME SIGNATURE DATE

ITC FORM HS020B (5/31/91)

USE BACK SIDE IF NECESSARY

INTERNATIONAL
TECHNOLOGY
CORPORATION

FOR ADMINISTRATION USE ONLY

Date Claim Submitted _____

Agent _____

GENERAL LIABILITY, PROPERTY DAMAGE, AND LOSS REPORT

DIVISION/SUBSIDIARY _____ CENTER NO. _____ DATE / /

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION OF DAMAGE OR LOSS: _____

IDENTIFICATION OF DAMAGED OR LOST PROPERTY: _____

LOCATION OF DAMAGED OR LOST PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGED OR LOST PROPERTY: Date / / Time _____ AM PM

OWNER OF DAMAGE OR LOST PROPEPERTY:
Name _____ Phone No. _____
Address _____ City _____
Employer _____

INJURED PARTIES (Complete also a Supervisors Employee Injury Report if an IT Employee):
1. Name _____ Phone No. _____
   Address _____ City _____
   Employer's Name & Address _____
2. Name _____ Phone No. _____
   Address _____ City _____
   Employer's Name & Address _____

WITNESSES:
1. Name _____ Phone No. _____
   Address _____ City _____
   Employer's Name & Address _____
2. Name _____ Phone No. _____
   Address _____ City _____
   Employer's Name & Address _____

WERE PICTURES TAKEN ☐ YES ☐ NO

WERE POLICE NOTIFIED ☐ YES ☐ NO DEPT. _____

EMPLOYEE _____ _____ Date / /
Print Name Signature

MANAGER _____ _____ Date / /
Print Name Signature

ITC FORM HS020C (5/31/91) USE BACK SIDE IF NECESSARY

INTERNATIONAL TECHNOLOGY CORPORATION

MUST BE COMPLETED WITHIN 72 HOURS

ACCIDENT/INJURY INVESTIGATION

Date _____ Profit/Cost Center _____ Date of Accident/Injury _____
Employee Name _____
Supervisor Name _____
Job Number/Name _____ / _____
Location of Accident/Injury _____

- Accident/Injury Classification

Injury
- ☐ Near Miss
- ☐ First Aid
- ☐ OSHA Recordable
- ☐ Lost Workday

Vehicle
- ☐ Chargeable
- ☐ Non-Chargeable
- ☐ Not at Fault

DOT
- ☐ DOT Vehicle
- ☐ DOT Reportable

General Liability ☐

- Description (Provide facts, describe how incident occurred, provide diagram (on back) or photos)

_____
_____
_____

- Analysis 1 (What unsafe acts or conditions contributed to the incident?)

_____
_____
_____

- Analysis 2 (What systematic or management deficiencies contributed to incident?)

_____
_____
_____

- Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____
_____
_____

- Witnesses (Attach statements or indicate why unavailable)

_____
_____
_____

Investigated By _____ _____ _____
Print Name Signature Date

Manager _____ _____ _____
Print Name Signature Date

(Attach Additional pages if needed)
ITC Form HS020E 1/28/92

ATTACHMENT I

OSHA POSTER 2203

Race, Color, National Origin, Sex:
In addition to the protection of Title VII of the Civil Rights Act of 1964, Title VI of the Civil Rights Act prohibits discrimination on the basis of race, color or national origin in programs or activities

If you believe you have been discriminated against in a program of any institution which receives Federal assistance, you should contact immediately the Federal agency providing such assistance.

1/90

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Provisions of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discriminatory action.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

There are also provisions for criminal penalties. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of up to $250,000 (or $500,000 if the employer is a corporation), or by imprisonment for up to six months, or both. A second conviction of an employer doubles the possible term of imprisonment.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

OSHA has published Safety and Health Program Management Guidelines to assist employers in establishing or perfecting programs to prevent or control employee exposure to workplace hazards. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free assistance in identifying and correcting hazards and in improving safety and health management is available to employers, without citation or penalty, through OSHA-supported programs in each State. These programs are usually administered by the State Labor or Health department or a State university.

Posting Instructions

Employers in States operating OSHA approved State Plans should obtain and post the State's equivalent poster.

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or facsimile) in a conspicuous place where notices to employees are customarily posted.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta	(404) 347-3573
Boston	(617) 565-7164
Chicago	(312) 353-2220
Dallas	(214) 767-4731
Denver	(303) 844-3061
Kansas	(816) 426-5861
New York	(212) 337-2325
Philadelphia	(215) 596-1201
San Francisco	(415) 995-5672
Seattle	(206) 442-5930

Elizabeth Dole

Elizabeth Dole, Secretary of Labor

Washington, D.C.
1989 (Revised)
OSHA 2203

U.S. Department of Labor

Occupational Safety and Health Administration

ATTACHMENT J

IT POLICIES AND PROCEDURES HS001-999 TABLE OF CONTENTS

TABLE OF CONTENTS CROSS REFERENCE
ITC POLICIES AND PROCEDURES HS001-999

OLD ITC PRO. NO.	NEW ITC PRO. NO.	PROCEDURE NAME	DATE OF ISSUE
9000	HS001	Safety Policy (Revision 1)	10/26/92
-	HS002	Safety: Policy for International Operations	5/31/91
9010.21	HS010	Employee Safety and Health Work Rules	
9591.1	HS011	Contractor Safety and Health Rules	
9010.1-.2	HS012	Chemical Hygiene Plan (Locator Reference)	1/16/91
-	HS013	Health and Safety Procedure Variance	6/8/90
-	HS018	Safety Councils (Revision 1)	1/14/92
-	HS019	Injury and Illness Prevention Program, (Revision 3)	5/15/92
9020.1	HS020	Accident Prevention Program: Reporting, Investigation, and Review (Revision 3)	11/13/91
9020.2	HS021	Accident Prevention Program: Management Safety Reviews (Revision 3)	1/14/92
9021.1	HS022	Accident Prevention Program: Review of New Proposals, Projects, Operations, Construction, and Jobs by Health and Safety	9/9/91
-	HS040	Stop Work Authority	5/31/91
-	HS041	Embryo-Fetus Protection Program	6/27/91
9030.1	HS050	Training Requirements	
9540.1	HS051	Tailgate Safety Meetings	
-	HS052	Health and Safety Plans	7/8/91
9552	HS060	Hazard Communication Program	
9300.1	HS080	Insurance Claims	
9210.1	HS090	OSHA Regulatory Inspections	
9220.1	HS091	Serious Injury and Fatality Reporting Requirements	
0.2	HS092	Occupational Injury and Illness Recordkeeping	

TABLE OF CONTENTS CROSS REFERENCE
ITC POLICIES AND PROCEDURES HS001-999
(Continued)

OLD ITC PRO. NO.	NEW ITC PRO. NO.	PROCEDURE NAME	DATE OF ISSUE
9410.1-.6	HS100	Medical Policies and Procedures	10/26/92
-	HS101	Drug and Alcohol Testing (Revision 1)	11/12/91
9420.1	HS102	Management of Employee Exposure and Medical Records	10/26/92
9550.1	HS104	Employee Notification of Industrial Hygiene Monitoring Results	
9462	HS105	Occupational Injury/Illness Procedures (Revision 1)	10/26/92
9464.1	HS106	First Aid Kits	
9531.1	HS300	Confined Spaces, Industrial	
9531.2	HS301	Confined Spaces, Marine	
9531.3	HS302	Confined Spaces, Leaded Product	
2.1	HS303	Hydroblasting	
9632.2	HS304	Compressed Gas	
9532.3	HS305	Pressurized Systems	
9532.8	HS306	Handling Known Compressed Gas Cylinders	
9532.9	HS307	Excavation and Trenching	6/8/90
9532.11	HS308	Scaffolding	
9532.7	HS309	Underground Storage Tank Removal	
9532.10	HS310	Hazardous Waste Operations at Uncontrolled Waste Sites	
9532.5	HS311	Emergency Response Operations	
9632.13	HS312	Hazardous Waste Operations at TSD Facilities	
9532.6	HS313	TSD Facilities - Minimum Staffing Requirements	
9571	HS314	Hot Work in Hazardous Locations	

TABLE OF CONTENTS CROSS REFERENCE
ITC POLICIES AND PROCEDURES HS001-999
(Continued)

OLD ITC PRO. NO.	NEW ITC PRO. NO.	PROCEDURE NAME	DATE OF ISSUE
9533.1	HS400	Working in Hot Environments	
9533.2	HS401	Cold Stress	
9650	HS402	Hearing Conservation Program	
9551.1	HS500	Handling of PCBs	
9551.5	HS501	Handling of PCBs in the Laboratory	
9551.7	HS502	PCB Containment and Spill Prevention Requirements for Transport Vehicles	
9551.9	HS503	Handling of Dioxin and Furan Contaminated Materials	
9551.10	HS504	Handling of Dioxin in the Laboratory	
9551.2	HS505	Handling of Inorganic Lead, Inorganic Lead Compounds, and Organic Lead Soaps	
9551.3	HS506	Handling of Inorganic Arsenic	
9551.8	HS507	Handling of Dibromochloropropane (DBCP)	
9551.6	HS508	Handling of Beryllium and Beryllium Contaminated Materials	
9551.4	HS509	Handling, Removal and Disposal of Asbestos and Asbestos Contaminated Materials	
9551.12	HS510	Asbestos Work in Schools	
9551.11	HS511	Handling of Benzene and Benzene Contaminated Materials	
9532.12	HS512	Handling of Blood or Other Potentially Infectious Material (Revision 2)	6/10/92
9621	HS513	Handling Radioactive Materials	
9560	HS600	Personal Protective Equipment	
61	HS601	Respiratory Protective Program	
9[illegible].1	HS602	Eye Protection - Prescription Safety Glasses	

TABLE OF CONTENTS CROSS REFERENCE
ITC POLICIES AND PROCEDURES HS001-999
(Continued)

OLD ITC PRO. NO.	NEW ITC PRO. NO.	PROCEDURE NAME	DATE OF ISSUE
9521.1-3	HS603	Maintenance of Survey Equipment	
9572.2	HS604	Use and Maintenance of Portable Electical Equipment	
9622	HS605	Electron Capture Detectors	
9623	HS606	Soil Density Gauges	
9582.1-.2, 9612	HS800	Motor Vehicle Operation: General Requirements (Revision 2)	05/14/92
9611, 9613-9617	HS810	Commercial Motor Vehicle Operation and Maintenance (Revision 3)	10/28/92
9581	HS820	Forklift Operation	
9562	HS821	Breathing Air Cylinder Trailer	
9585	HS822	Mobil Crane Inspection	

ATTACHMENT K

INTRUSIVE WORK CHECKLISTS

INTERNATIONAL TECHNOLOGY CORPORATION

UNDERGROUND/OVERHEAD UTILITY CHECKLIST

ject Name/Number _____ Date _____

Location _____

Prepared By _____ Project Manager _____

This checklist must be completed for any intrusive subsurface work such as excavating or drilling. It records the fact that all underground and overhead structures and utilities in the work area are identified and located. The Project Manager shall request utility markouts before the start of field operations to allow the client and utility companies time to complete them. If complete information is not available, a magnetometer survey shall be performed to locate obstacles prior to excavating or drilling.

Procedure

A diagram of the project area depicting the proposed location of excavation or drilling sites must be attached to this form. The diagram must clearly indicate the areas checked for underground structures/utilities, and overhead power lines. This form and the diagram must be signed by the Project Manager, the IT Field Supervisor, and the client representative.

Checklist

Type of Structure	Present	Not Present	Method of Markout
Electric Power Line			
Natural Gas Line			
Telephone Line			
Water Line			
Product Line			
Steam Line			
Sewer Line			
Drain Line			
Underground Tank			
Overhead Power Line			
Overhead Product Line			
Septic Tank/Drain			

Client Representative _____ Date _____

IT Project Manager _____ Date _____

IT Field Supervisor _____ Date _____

INTERNATIONAL TECHNOLOGY CORPORATION

TRENCH/EXCAVATION NOTIFICATION WORKSHEET

Project Number _____ Project Name _____

Customer's Name: _____

Specific Jobsite Location: _____

Nearest Major Cross Street: _____

City: _____ County: _____

Name and Title of Site Supervisor: _____

Starting Date: _____ Estimated Completion Date: _____

High Voltage Lines in Proximity: YES_____ NO_____ How Near_____

Depth Range (ft): ___ ___ Width Range(ft): ___ ___ Length(ft): _____
min max min max

Project Description: _____

_____

Anticipated Soil Condition: Hard Compact___ Unstable___ Running___

Ground Protection Method: Shoring_____ Sloping____
Trench Shield_____ Alternate_____

ALL METHODS MUST MEET ACCEPTED ENGINEERING REQUIREMENTS.
PLANS MUST BE KEPT ON-SITE.

Describe Chemical Hazards at Site: _____

_____

Subcontractor's Name: _____

Equipment to be Used: _____

Design Engineer: _____ Project Supervisor: _____

Phone: ( ) _____

==========

Health & Safety Use Only

IT Permit Number: _____ Date Issued: _____ Expires: _____

Issued By: _____

CAL/OSHA Notification: Date: _____ By: _____

District Office: _____ Contact: _____

Form HS307.1

ATTACHMENT L

SUBCONTRACTOR HASP

Health and Safety Plan for the Bioremediation of petroleum contaminated soil at the LARC Parking Area at Fort Story, Virginia Beach, VA.

The following individuals have read and approved the attached Health and Safety Plan.

TITLE: IT Corporation, Project Manager
NAME: Tom Mathison
SIGNATURE: _____

TITLE: Corp of Engineers, Technical Manager
NAME: Jeff Hubbard
SIGNATURE: _____

TITLE: IRP Manager
NAME: Joan Vandervort
SIGNATURE: _____

INTRODUCTION

OSHA requires in 29 CFR 1910.120 a written safety and health program for employees involved in operations where hazards or toxic chemicals may be involved. The purpose of the safety and health program is to identify, evaluate, and control safety and health hazards, and to provide for emergency response for hazardous operations. This written program shall incorporate the following:

I. ORGANIZATIONAL STRUCTURE 1

II. COMPREHENSIVE WORK PLAN 4

III. SITE SPECIFIC SAFETY AND HEALTH PLAN 5

IV. SAFETY AND HEALTH TRAINING PROGRAM 15

V. MEDICAL SURVEILLANCE PROGRAM 16

VI. STANDARD OPERATING PROCEDURES FOR SAFETY AND HEALTH 18

APPENDICES

APPENDIX A JOB RISK ANALYSIS

APPENDIX B PERSONAL PROTECTIVE EQUIPMENT (PPE)

APPENDIX C MATERIAL SAFETY DATA SHEETS

This Safety and Health Program must be available for inspection at any time by: **Fort Story Army Base.**

SAFETY AND HEALTH PLAN

COMPANY NAME: SOLUTIONS ENVIRONMENTAL ASSOCIATES, INC.

ADDRESS 814-B GREENBRIER CIRCLE, CHESAPEAKE, VIRGINIA 23220

LOCATION OF SITE: FORT STORY, VIRGINIA BEACH, VIRGINIA

NOTE: The following safety and health plan has been designed to partially fulfill the requirements of the OSHA standard for hazardous operations and emergency response, 29 CFR 1910.120, which requires a safety and health program for employees involved in hazardous waste projects. The specific application of the Plan is for **bioremediation of petroleum contaminated soil at the LARC Parking Area.** As the plan is generic in nature, it must be adapted for each specific site. This plan is not intended to take the place of 29 CFR 1910.120 or any other OSHA standards, which should be carefully read and followed.

I. ORGANIZATIONAL STRUCTURE

The purpose of the organizational structure is to establish a direct chain of command at the site and to specify the overall responsibilities of supervisors and employees.

Albert C. Davis, Jr. (attached resume)

Title: General Site Supervisor

Responsibilities: Duties include the supervision of all site activities. He is also responsible for the overall performance and compliance with applicable regulations and procedural guidelines as specified in this Safety and Health plan. He will be responsible for the performance of all personnel at the site.

Training

40 hour OSHA Training
Supervisor Training

Claude Thompson (attached resume)

Title: Health and Safety Manager

Responsibilities: He shall have responsibility and authority to develop and implement the Site Safety and Health Plan and verify compliance. The Health and Safety Manager is responsible for coordinating and supervising technical and field activities at the site. He will document all work progress and will be responsible for supervising technical and field activities at the site. He willdocument all work progress and will be responsible for execution of the work plan and completion of the Project Logbook. This individual is responsible for controlling access to the site, and ensuring that all work activities are carried out in accordance with the Safety and Health Plan. Duties include the conduction of air monitoring with direct reading instrumentation on-site entry to determine potential hazards. All readings shall be recorded in the Project Logbook. He will be responsible for calibration of all air monitoring equipment. He shall also be responsible for performing a daily check of fire extinguishers, rescue equipment, etc, and so noting in the Project Logbook.

Training

40 hour OSHA Training
Supervisor Training

RESUME

Albert C. Davis, Jr., P.E.

Education

B.S. ,Mechanical Engineering, Louisiana State University, 1970

Licenses/Memberships

Registered Professional Engineer in:

Virginia North Carolina Maryland
Delaware South Carolina Pennsylvania
Nebraska

Member, National Society of Professional Engineers
Member, American Society of Mechanical Engineers
Member, Hazardous Materials Control Research Institute

Relevant Experience

President and owner of Davis Engineering Associates, P.C., has over 20 years experience in the engineering profession and is a Registered Professional Engineer in seven states. Extensive industrial and environmental experience in both the government and private sectors. Involved in design and implementation of numerous projects including Naval Nuclear power systems, chemical process plant design and construction, material handling systems, industrial plant renovation and construction, as well as design and regulatory assistance for a number of hazardous material storage and processing plants. Involved in the design and retrofitting of pollution control systems, solvent recycling systems, industrial wastewater treatment systems, and biological inoculation system.

RESUME

Claude R. Thompson, P.E.

Education

B.S. ,U.S. Coast Guard Academy

Massachusetts Institute of Technology, Naval Engineering

Oklahoma State University, Chemical Engineering

Memberships

Member, Society of Naval Architects and Marine Engineering

Member, Society of Sigma Xi

Member, Member, Propeller Club of Norfolk

Member, Hampton Roads Foreign Commerce Club

Relevant Experience

Captain of the port as a Coast Guard officer. Extensive knowledge of construction codes, marine transportation regulations, code making organizations, and government agencies at the Federal, State and local levels. Experienced in emergency response to marine incidents involving pollution and supply hazards. Served as Project Manager for the conceptual design of a 15-million-ton-per-year coal terminal project located in Portsmouth, Va. This included analyzing marine operations of the terminal; conceptual layout of rail lines; and coordination with all regulatory agencies; as well as evaluation of environmental problems. During the last 2 years, has developed a network of contacts, was instrumental in the initial pursuit of information, and research related to bioremediation and carbon filter remediation. Collaborates with group for bids, new projects and new technical review.

II. COMPREHENSIVE WORK PLAN

The purpose of the comprehensive work plan is to address the tasks and objectives of the site operations and the logistics and resources required to reach those tasks and objectives.

A. Anticipated normal operating procedures and clean-up activities (see Site Specific Safety and Health Plan)

B. Work tasks, objectives and methods for accomplishing those tasks and objectives (see Site Specific Safety and Heath Plan)

C. Personnel requirements (see Site Specific Safety and Health Plan)

D. Implementation of training

Solutions Environmental Associates, Inc. is responsible for implementation of training. For more information, see Section IV., Safety and Health Training.

E. Implementation of informational programs

Solutions Environmental Associates, Inc. shall inform it's employees and subcontractors of the nature, level and degree of exposure, and safety hazards associated with the field operations. This shall be documented by a memo or sign-off sheet which is signed both by an representative of **Solutions Environmental Associates, Inc.** and the supervisor responsible for on-site operations of the subcontractor(s). (See page 14)

F. Implementation of the medical surveillance program

Solutions Environmental Associates, Inc. is responsible for implementing the medical surveillance program. For more information, see Section V., Medical Surveillance Program.

SITE - SPECIFIC SAFETY AND HEALTH PLAN

This Site Safety and Health Plan will be submitted to **Joan Vandervort, IRP Manager, Fort Story Army Base,** prior to the job, and shall be kept on site at all times.

A. SITE DESCRIPTION

DATE (APP. DURATION): April 15, 1993 (45 days)

LOCATION: LARC Parking Area, Fort Story, Virginia Beach, VA

HAZARDS: Potential volatile compounds from petroleum products.

AREA AFFECTED: Surrounding area of LARC Parking Area

SURROUNDING POPULATION: Military personnel

TOPOGRAPHY: Moderately Flat

ACCESS: No obstacles

PREVAILING WIND DIRECTION: To be determined on-site prior to work proceeding

B. PROJECT OBJECTIVES\WORK PROCEDURES

The Site Supervisor, **Al Davis, or his designated representative** will oversee all field operations to ensure strict compliance to the Site Safety Plan.

1. GENERAL

Approximately (16,000) sixteen thousand yds^3 of petroleum contaminated soil will be bioremediated on site.

2. SAFETY OVERVIEW

The primary hazard of this operation may be the possible volatilization of the petroleum contamination. The type of petroleum contamination appears to be motor oil and diesel oil. The bioremediation will mobilize, recover and consume the material. The is no evidence that benzene would be produced during the operation, however, a FID will be used to monitor volatiles.

3. OPERATIONS PLAN

A. Work Plan

A total of five personnel will conduct the site work for the bioremediation activities.

The operation will be conducted, on the site location that has been described as the LARC Parking Area.

The area will have initial work that will entail digging several test pits, to get an initial soil profile, and to identify the "heaviest" contaminated areas. Several wells will be installed, with at least one well located in the center of the area to use as the groundwater recovery well/wells. Geological work will be done to determine the area of influence and the proper location of the recovery well/wells. Pump tests will be performed to determine the pumping rate that will have to be maintained to produce hydraulic isolation.

The site work will commence after all the preliminary work has been completed. A random grid will be created by marking the fence and identifying the grid markings on the area. The random samples will be selected, and sent to the lab. The soil will be handled by a backhoe and bulldozer to expose any areas that are particularly high in contamination. This soil will be brought to the surface to better physically handle and inoculate the soil. The general operations of the site work will include the physical handling of the soil by use of a backhoe and bulldozer, spraying of the inoculation, recirculating the inoculated groundwater, separating the petroleum phased material from the groundwater and reapplying the inoculated groundwater.

The water will need pH adjustment, nutrient addition and aeration during the operation. The chemicals for pH adjustment will include Ammonium Hydroxide, and or HCL, depending on the ph adjustment requirements. The handling of these materials will be done by trained personnel with proper protective clothing. The MSDS information is included. The storage of the chemicals will be

according to proper storage recommendations on the MSDS. The nutrients that will be used on the site will be mixed by the company that will spray the nutrients. The equipment that will be used for spraying the nutrients will be equipment that is commonly used for this type of application of chemicals. The chemical constituents of the nutrients are ammonia and phosphate. The MSDS for these constituents are also included.

During the process, there will be petroleum products that will be recovered, as mentioned before. Due to the apparent nature of the contamination, it is expected that this material will not be flammable in nature. The "oil" will be separated from the groundwater, and disposed of by an oil recycling company. The material will be stored according to proper storage requirements based on the flammability of the material.

All electrical equipment will be installed according to code with all safety requirements (i.e. grounding, proper protection of electrical connections, properly rated wiring and extension cords where needed) installed and maintained according to OSHA requirements.

B. Personal Protective Equipment

The project manager will ensure that all personnel are properly protected for all project activities. Protective clothing will be used when pH adjustment is being done on the site. The protective clothing will be level C.

The Health and Safety Manager will be in level "C" while supervising the pH adjustment activities, in case of an emergency. In the event the Health and Safety Manager is required to enter the hot zone, he will be properly equipped to respond.

All hand tools will be of spark proof alloy construction. All electrical devices are UL approved.

C. On-site Control

Claude Thompson, the Health and Safety Manager or his designated representative has been named to coordinate safety and health, access control, and security on site.

The on-site Con mand Posts have been established at **the site trailer.**

The staging area has been established at the entrance to the work area.

While recognizing that wind directions will vary, the prevailing wind direction is to be determined at the site which will shall be taken into consideration in the planning of evacuation routes, spill control, etc.

Parking will be at designated locations.

A first aid kit is located at the command post.

The nearest medical facility is **Virginia Beach General Hospital** which is located approximately 5 miles

from the site on First Colonial Road.

Local ambulance service is available at the telephone number listed on the emergency telephone list which will be posted at the telephone in the command post.

Emergency telephone numbers are also posted at the entrance to the site and are accessible through a government telephone only.

All site employees of **Solutions Environmental Associates, Inc.** have been trained in Emergency Response. (see I-2, below)

D. SITE MAP

The site supervisor, **Albert Davis,** will be responsible for preparing a **Site Map** which will indicate the locations of the following items. Symbols or numbers may be used to indicate locations. The locations of some items, such as the staging area, will be determined after consultation with **Ms. Joan Vandervort, IRP Manager, from Fort Story.**

1. Command Post
2. Location of telephone and posted telephone numbers
3. Fire extinguishers
4. Site orientation (north)
5. Work Zone
6. Barricade locations
7. Staging area
8. Spill containment equipment
9. Personal protective equipment
10. First aid kit
11. Rescue equipment
12. Power, utility and sewer lines (differentiating overhead power lines)

E. RISK ANALYSIS

A safety and health risk or hazard analysis shall be performed for each site task and operation, as it is not possible to foresee every site task and operation for the site. (See Appendix A) NOTE: All employee training, medical examinations, and licenses, etc. MUST be obtained prior to starting work at the site.

F. EMERGENCY PROCEDURES

The following standard emergency procedures will be used by on site personnel. The Site Safety Officer shall be notified of any on site emergencies and be responsible for ensuring that the appropriate procedures are followed. All on site employees are responsible for reporting to the Command Post in the event of an emergency, unless the Command Post becomes involved in the emergency, in which case all personnel shall report to **Alternate Command Post** (see site map). The Health and Safety Manager shall contact Ms. Vandervort who shall enter the site, and they shall

specifically designate an on site employee to inform **Fort Story** of any situations.

The following emergency procedures shall be discussed daily at Safety Meetings held in the site trailer, and so noted in the Project Logbook. In tailoring these procedures to an individual site, the topography, layout, weather, wind direction, availability of fire, ambulance, and other authorities, and existing disaster and fire plans, shall be considered.

1. Personnel Injury in the Bioremediation Area: Upon notification of an injury in the bioremediation area, the external alarm will be pulled and the emergency number 911, will be dialed. The designated emergency signal **aerosol horn one 3 second blast** will be sounded. All site personnel shall assemble at the command post, with the Health and Safety Manager, **Claude Thompson**, assuming control at the location of injury. If the Health and Safety Manager is not available, the next-in-command will assume his responsibilities. The Health and Safety Manager, who shall be certified in First Aid/CPR, shall survey the situation to determine what action should be taken next.

Hand signals, such as clutching the throat to indicate severe breathing restrictions, will be utilized as visual indicators in the event of operational complications.

The Health and Safety Manager will remain with the victim and the next-in-command shall telephone for emergency ambulance services as is listed on the emergency telephone list. The victim shall only be moved by site personnel if, in the opinion of the Health and Safety Manager, he is in greater risk for further injury than might be caused by not being moved.

2. Fire/Explosion: Upon notification of a fire/explosion or medical emergency in the bioremediation area, the Health and Safety Manager, **Claude Thompson,** will activate the emergency fire alarm and dial 911. In addition, the emergency **aerosol horn will be sounded with four 3 second blasts.** If the command post area is involved in the fire/explosion, personnel will assemble at the alternate location. If the Health and Safety Manager is not available, the next-in-command will assume his responsibilities.

3. Observance of Unanticipated Hazardous Materials: In the event unanticipated hazardous materials or conditions are observed, or symptoms of eye, nose, or throat irritation, or other distress are experienced by on site personnel, the first step shall be to contact the Health and Safety Manager. He shall determine if immediate medical attention is required. Personnel should also be aware of the possibility of heat stress on very hot days, and should protect themselves by drinking adequate amounts of liquids, and seeking a cooler location if lightheadedness, dizziness, nausea, accelerated heart rate, or other symptoms of heat stress occur.

4. Personal Protective Equipment Failure: If any site worker experiences a failure or alteration of protective equipment, he shall immediately leave any Work Zone which present a hazard, informing co-workers of his actions if applicable. The Health and Safety Manager shall be contacted and re-entry into the Work Zone shall not be permitted until the equipment has been repaired or replaced.

5. Other Equipment Failure: If any other equipment on site fails to operate properly, the Health and Safety Manager shall be notified and they shall determine the effect of this failure on continuing operations at the site. If the failure affects the safety of personnel or prevents completion of work tasks, all personnel shall leave the Work Zone until the situation is evaluated and appropriate actions taken.

6. Emergency Escape/Access Routes: The following emergency escape routes are designated for use in those situations where egress from the Work Zone cannot occur through normal routes. The alternate escape route will be through the parking area at the rear of the maintenance building. (See site map).

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

a. The conditions causing the emergency have been corrected.
b. The hazards have been re-assessed.
c. The Site Safety and Health Plan has been reviewed.
d. Site Personnel have been briefed on any changes in the Site Safety and Health Plan.

G. PERSONAL AND ENVIRONMENTAL MONITORING

The following environmental monitoring instruments shall be used on site continuously during the repackaging procedures.

FID Detector

The Health and Safety Manager shall conduct air monitoring with direct reading instrumentation on initial entry to determine VOA concentrations. Readings shall be taken in the operating area, at the nearest point to the active site work. These readings shall be repeated on a daily basis during site work, and recorded in the Project Logbook. Monitoring shall be continuous while repackaging is on-going. All values shall be reported to **Ms. Vandervort, IRP Manager, Fort Story.**

Direct-reading instrumentation shall be calibrated by the Health and Safety manager before and after use according to the manufacturer's instructions, and so noted in the Project Logbook.

H. EMPLOYEE TRAINING

1. Employees of Solutions Environmental Associates, Inc. working on bioremediation at **Fort Story** will receive a minimum of 40 hours off-site training, and a minimum of 3 days of supervised field experience, including emergency response training. Supervisors will receive an additional 8 hours of training on safety and health program management. (See Section I, Organizational Structure).

2. Training certificates are current and copies are attached hereto and will be available on site for inspection in the Project Logbook.

3. See Section IV, Safety and Health Training Program, for more information.

I. DECONTAMINATION

Extensive decontamination procedures are not expected to be necessary. If a spill or splash of a low-hazard material results in contact with the skin, the person should immediately shower or rinse the liquid off the skin using water available at the site, as shown on the site map, and thoroughly shower as soon as reasonably possible thereafter. If the liquid contacts a disposable garment, it should be immediately removed and replaced with a clean suit. Clothing which is contaminated with unknown chemicals shall be disposed of on-site in appropriate containers.

If a spill or splash of a more hazardous material results in skin contact, the person should immediately proceed to a safety shower and thoroughly shower, removing the clothes, then seek medical attention if necessary.

Eye contact shall be minimized by the use of chemical full face respirators where necessary. In the event eye contact does occur, the eye(s) shall be thoroughly rinsed for at least 15 minutes with an emergency eye wash solution located on site. Following rinsing, medical attention shall be sought. (Location of eye wash station shall be noted on Site Map.)

At the end of each day, all disposable PPE will be removed and placed into a drum for subsequent disposal.

All contaminated tools and equipment will be manually wiped clean avoiding solvents and water. The contaminated rags will be placed with the disposable PPE for future disposal.

J. ON SITE EQUIPMENT

The following is a list of equipment which will be available at all the site at all times.

Quantity Provided	Description and minimum quantities
	fire extinguishers, A:B:C dry powder type, (adequate to provide proper coverage, see section VI, A-2 below)
	first aid kits, (1, industrial type 1, burn kit)
	Personal protective equipment
	Full face air purifying respirator model replacement cartridges, (1 per reap. per day, min)
	hard hats, (1 for each site employee, min)
	safety glasses, (1 set for each site employee, min)
	chemical splash goggles, (1 set for each employee, min)

IV. SAFETY AND HEALTH TRAINING PROGRAM

All employees and their supervisors shall have received training before they are permitted to engage in bioremediation operations, and they shall have received annual review training.

1. Elements to be covered at the site shall include:

   a. Names of personnel and alternates responsible for site safety and health,
   b. Safety, health and other hazards present on the site,
   c. Use of personal protective equipment (PPE),
   d. Work practices to minimize risks from hazards,
   e. Medical surveillance requirements, including recognition of signs and symptoms of overexposure,
   f. Site safety and health plan.

2. General site workers shall receive a minimum of 40 hours of off site instruction, and a minimum of 3 days actual field: experience under the direct supervision of a trained, experienced supervisor. (Workers on site only occasionally for a specific, limited task shall receive a minimum of 24 hours of off site instruction, and 1 day actual field experience under the direct supervision of a trained, experienced supervisor.) In addition to the initial training supervisors shall received at least 8 hours of specialized training on such topics as the employer's safety and health training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques. All personnel shall receive an annual 8 hour refresher course.

3. Training certificates shall be current, and copies are attached hereto, and shall also be available on site, for inspection, in the project logbook.

4. Employees shall also receive training in the use of fire extinguishers (including hands on experience), confined space entry procedures including emergency extraction procedures, respirator protection, hot work permits, sloping/shoring, and emergency procedures. Such training need not be separately provided if inclusion in the 40 hour training course can be verified.

5. An adequate number of employees shall be certified in first aid/CPR so that there will always be at least one person so trained on site at all times that operations are conducted.

V. MEDICAL SURVEILLANCE PROGRAM (AS PER REQUIREMENTS OF OSHA)

The objectives of a medical surveillance program are as follows:

a. to establish a baseline physical examination status of health to which future medical changes can be compared,

b. to identify and analyze illness or conditions that may be aggravated by exposure to hazardous materials, physical stresses, job activities, or combinations of the above,

c. to allow for recognition of any abnormalities at the earliest reasonable opportunity so that corrective measures can be implemented.

Medical surveillance is required by OSHA for all employees (a) who are or may be exposed to hazardous materials at or above the Permissible Exposure Limits (PEL) enforced by OSHA, (b) who are injured due to overexposure to hazardous substances, and (c) who may be assigned the use of a respirator. Medical examinations must be provided prior to assignment and at least annually thereafter, or as soon as possible upon notification by an employee that injury has occurred, and upon termination if < 6 months has elapsed since last examination.

Therefore, prior to work operations, all employees of **Solutions Environmental Associates, Inc.** shall have successfully completed a preplacement or annual update medical examination with special emphasis on symptoms related to the handling of hazardous substance and to fitness for duty (including the ability to wear any required PPE under work site conditions), including a complete medical and occupational history, physical examination, pulmonary function testing, and any other tests the physician deems appropriate.

All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, without cost to the employee, at a reasonable time and place.

The examining physician shall be provided with the following:

a. description of the employee's duties as they relate the potential exposures,

b. anticipated exposure levels,

c. description of the personal protective equipment to be used,

d. information from previous medical examinations which may be pertinent.

Each employee shall be provided with a copy of a written opinion from the examining physician containing the following:

a. results of the medical examination and tests,

b. physician's opinion as to whether the employee has any detected medical condition that would place the employee at increased health risk, given the anticipated exposures at the subject site,

c. physician's recommended limitations, if any, concerning the employees's assigned work, and

d. statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions that require further examination or treatment.

Copies of the physician's opinions as to the fitness for duty of employees is kept on file at Solutions' office and shall be submitted to **Ms. Vandervort, IRP Manager, Fort Story** upon request. The physician's opinions shall <u>not</u> reveal any specific diagnoses or findings.

VI. STANDARD OPERATION PROCEDURES FOR SAFETY AND HEALTH

A. Potential Safety Hazards at Site

1. Equipment failure: All equipment shall be inspected and tested before use. All equipment shall be maintained in accordance with manufacturer's specifications. Malfunctioning equipment shall be tagged and locked out until repairs can be made.
2. Fire: Open fires, tobacco smoking, and any other uncontrolled ignition sources are prohibited on site. As appropriate, equipment shall have spark arresters, and nonsparking tools will be used. An A:B:C: (dry powder) fire extinguisher shall be located on each piece of equipment. The equivalent of at least 2A fire extinguishing capacity shall be provided for each 1500 square feet, with a maximum travel distance of 50 feet to each fire extinguisher. Location of the fire extinguishers shall be indicated on the Site Map. The Health and Safety Manager shall make a daily check of the presence and the condition of each fire extinguisher, and so note in the Project Logbook. Electrical equipment shall be rated for Class I flammable atmospheres. Location of nearest 24-hour telephone, and telephone numbers for fire/police shall be posted at the Command Post on a waterproof display board or other manner which protects from weathering.

3. Slips, trips and falls: Attempts shall be made to minimize the potential by providing clear footing and adequate illumination. A minimum illumination of 5 - 30 footcandles based on activities will be provided.

4. Skin or eye contact with chemicals: Use of appropriate impermeable gloves and coveralls, and splash-protective goggles or other protective equipment as needed.

5. Inhalation of organic vapors: Use of direct-reading instrumentation to determine airborne concentrations, periodic personnel monitoring where indicated. Use of appropriate respiratory protection if vapor concentrations exceed PEL or TLV levels.

6. Chemical spill: Appropriate spill absorbent materials for cleaning up a small to moderate spills shall be available on site.

7. Personal injury: An adequate number of employees shall be certified in first aid/CPR so that there will always be at least one person so trained on site at all times that operations are conducted.

8. Backup safety equipment (personal protective equipment, rescue equipment, etc.) must be available and in good operating conditions at all times that operations are conducted.

9. All cylinders of compressed gas must be adequately chained or secured to a cart at all times.

B. Personal Protective Equipment

The physician conducting the pre-employment physical exam shall be informed of the level of personal protective equipment, and shall certify that site workers are capable of performing job tasks while using the personal protective equipment. Employees who may be required to wear respirators shall be fit tested prior to use.

C. General Safe Work Practices

1. Daily Safety Meeting

There will be a daily Safety Meeting, to be attended by all site employees and **Ms Vandervort, IRP Manager, Fort Story.** Brief minutes shall be noted in the Project Logbook. The initial Safety Meeting (held prior to any work operations) on site will focus on location of power lines, sewers, buildings, buried utilities including water, electric, gas, sewer, etc., overhead utilities, or other relevant information as needed. The Site Map will be explained to all personnel.

2. Eating, Drinking and Smoking

Eating, drinking, chewing gum or tobacco or application of cosmetics is prohibited with the Work Zone. Smoking will not be allowed anywhere on site.

3. Equipment Grounding

As appropriate, equipment shall be bonded and grounded. Non-sparking tools shall be used. Flammable liquids shall not be transferred without bonding and grounding.

D. Stop Work Orders

In the event work is performed contrary to the provisions of the specification and/or approved work plans or to the conditions of any applicable permit or certificate, or if, upon inspection, it is determined that continuation of authorized work is likely to endanger any person or public and/or private property, then the work shall be stopped by notice in writing served by **Ms. Vandervort, IRP Manager, Fort Story** or another authorized representative.

E. Recordkeeping

Recordkeeping shall be consistent with all applicable OSHA regulations. The following records shall be maintained by the Site Safety Officer, with copies forwarded to **Ms. Vandervort, IRP Manager, Fort Story** as requested:

1. safety inspection reports
2. personnel monitoring results
3. incident reports
4. OSHA logs
5. visitors, their affiliation and purpose
6. relevant telephone conversations
7. sampling activities
8. chain-of-custody forms
9. work progress
10. daily work activities and condition
11. disciplinary actions related to health, safety, or environmental conditions
12. employee training records
13. employee medical examination reports
14. employee respirator fit testing results
15. manifests, transportation plans, etc., for transport of wastes off site

chemical splash goggles, (1 set for each employee, min)

Manuals will be on the site for all instrumentation and equipment.

All site personnel will read the Safety and Health Plan and be familiar with its provisions prior to starting work at the site.

TITLE: SITE SUPERVISOR
NAME: ALBERT C. DAVIS, JR.
SIGNATURE: _____

TITLE: HEALTH AND SAFETY MANAGER
NAME: CLAUDE THOMPSON
SIGNATURE: _____

APPENDIX A- JOB RISK ANALYSIS

JOB RISK ANALYSIS

Job Task	**Potential Hazard**	**Controls**
Site Preparation		
Bioremediation Activities	Exposure to Caustic/Acid for pH Adjustment	Mimimization of exposure
Closeout of Site Work		

APPENDIX B- PERSONAL PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT

Level C Protective Clothing

- Air Purifying Full Face respirator
- Chemical resistant clothing can include one piece or two piece suit (i.e. chemical resistant overalls)
- Chemical resistant outer gloves
- Safety shoes (steel toe), with boot covers
- Hard hat

APPENDIX C- MATERIAL SAFETY DATA SHEETS

DATE: 03/15/90 ACCT: 047344-01
INDEX: 15900720777 CAT NO: A667C212 PO NBR: 031390

AMMONIUM HYDROXIDE
AMMONIUM HYDROXIDE
AMMONIUM HYDROXIDE

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 1336-21-6

SUBSTANCE: **AMMONIUM HYDROXIDE**

TRADE NAMES/SYNONYMS:
AMMONIA AQUEOUS, AMMONIA SOLUTION, AQUA AMMONIA,
AMMONIUM HYDROXIDE ((NH4)(OH)), AMMONIA WATER, RTSC 4935280, UN 2672, A-669,
A-669C, A-669-SI, A-669-S, A-667, A-512, A-470, HSNO, ACC01260

CHEMICAL FAMILY:
INORGANIC BASE

MOLECULAR FORMULA: N-H4-O-H

MOLECULAR WEIGHT: 35.05

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=1 REACTIVITY=0 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=1 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: AMMONIA PERCENT: 28-30

COMPONENT: WATER PERCENT: 70-72

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
AMMONIA, ANHYDROUS:
35 PPM (27 MG/M3) OSHA STEL
25 PPM (18 MG/M3) ACGIH TWA, 35 PPM (27 MG/M3) ACGIH STEL
50 PPM (35 MG/M3) NIOSH RECOMMENDED 5 MINUTE CEILING

500 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY
100 POUNDS SARA SECTION 304 REPORTABLE QUANTITY
100 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

AMMONIUM HYDROXIDE:
1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY

PHYSICAL DATA

DESCRIPTION: COLORLESS LIQUID WITH A SHARP, PUNGENT ODOR.

BOILING POINT: 97 F (36 C) (APPROX) MELTING POINT: -107 F (-77 C)

SPECIFIC GRAVITY: 0.90 (APPROX) VAPOR PRESSURE: 115 MMHG @ 20 C

PH: 11.6 @ 1N SOLN SOLUBILITY IN WATER: SOLUBLE ODOR THRESHOLD: 50 PPM

VAPOR DENSITY: 1.2

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
SLIGHT FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

UPPER EXPLOSIVE LIMIT: 27% (NH3) LOWER EXPLOSIVE LIMIT: 16% (NH3)

AUTOIGNITION TEMP.: 1204 F (651 C) (NH3)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

DATE: 03/15/90 ACCT: 047344-01
INDEX: 15900720777 CAT NO: A667C212 PO NBR: 031390

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES
H WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK
S (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 60).

EXTINGUISH USING AGENT INDICATED. USE FLOODING AMOUNTS OF WATER AS A FOG FROM
AS FAR A DISTANCE AS POSSIBLE. USE WATER SPRAY TO ABSORB CORROSIVE VAPORS.
AVOID BREATHING CORROSIVE VAPORS, KEEP UPWIND.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
CORROSIVE MATERIAL

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.245
EXCEPTIONS: 49CFR173.244

TOXICITY

AMMONIUM HYDROXIDE:
IRRITATION DATA: 750 UG EYE-RABBIT SEVERE, 44 UG EYE-RABBIT SEVERE;
1 MG/30 SECONDS RINSED EYE-RABBIT SEVERE.
TOXICITY DATA: 5000 PPM INHALATION-HUMAN LCLO; 408 PPM INHALATION-HUMAN
TCLO; 43 MG/KG ORAL-HUMAN LDLO; 350 MG/KG ORAL-RAT LD50; 750 MG/KG
ORAL-CAT LDLO; 150 MG/KG SUBCUTANEOUS-MOUSE LDLO; 200 MG/KG
SUBCUTANEOUS-RABBIT LDLO; 10 MG/KG INTRAVENOUS-RABBIT LDLO;
MUTAGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE- INHALATION, SKIN, EYES, INGESTION.
ACUTE TOXICITY LEVEL: TOXIC BY INGESTION.
TARGET EFFECTS: NO DATA AVAILABLE.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH CORNEAL DISEASE OR GLAUCOMA,
OR CHRONIC RESPIRATORY DISEASES.

HEALTH EFFECTS AND FIRST AID

INHALATION:
AMMONIUM HYDROXIDE:
CORROSIVE. 500 PPM (NH3) IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- CONCENTRATIONS OF 5 PPM OF AMMONIA VAPOR MAY CAUSE MILD
IRRITATION, 9-50 PPM MAY CAUSE NASAL DRYNESS, OLFACTORY FATIGUE, AND
MODERATE IRRITATION, AND 150 PPM MAY CAUSE LARYNGEAL SPASM. EXPOSURE
TO 500 PPM FOR 30 MINUTES MAY CAUSE CYCLIC HYPERPNEA, INCREASED BLOOD
PRESSURE AND PULSE RATE, AND UPPER RESPIRATORY TRACT IRRITATION, SOMETIMES
PERSISTING FOR 24 HOURS. 700 PPM MAY CAUSE IMMEDIATE IRRITATION;
1500-10,000 PPM MAY CAUSE DYSPNEA, CONVULSIVE COUGHING, CHEST PAIN,
RESPIRATORY SPASM, PINK FROTHY SPUTUM, RAPID ASPHYXIA, AND DELAYED
PULMONARY EDEMA WHICH MAY BE FATAL. OTHER EFFECTS MAY INCLUDE SWELLING
OF THE LIPS, RESTLESSNESS, RUNNY NOSE, [illegible] SALIVATION, NAUSEA,
VOMITING, GLOTTAL EDEMA, PHARYNGITIS, TRACHEITIS, AND DIFFICULTY IN
SPEAKING. DEATH MAY BE RESULT FROM BRONCHOPNEUMONIA OR ASPHYXIATION DUE TO
SPASMS, INFLAMMATION, OR EDEMA OF THE LARYNX. RESIDUAL EFFECTS FROM
ACUTE EXPOSURES MAY INCLUDE HOARSENESS, PRODUCTIVE COUGH, DECREASED
RESPIRATORY FUNCTION, CHRONIC AIRWAY DYSFUNCTION, ALVEOLAR DISEASE,
BRONCHIOLITIS, BRONCHIECTASIS, EMPHYSEMA, AND ANXIETY NEUROSES.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION AND DURATION OF EXPOSURE,
REPEATED OR PROLONGED EXPOSURE MAY CAUSE INFLAMMATORY AND ULCERATIVE
CHANGES IN THE MOUTH, POSSIBLE BRONCHIAL AND GASTROINTESTINAL
DISTURBANCES, AND EFFECTS SIMILAR TO ACUTE EXPOSURE. TOLERANCE TO
USUALLY IRRITATING CONCENTRATIONS MAY BE ACQUIRED BY ADAPTATION.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING
HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD
PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND
AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN
SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION
IMMEDIATELY.

SKIN CONTACT:
AMMONIUM HYDROXIDE:
CORROSIVE.
ACUTE EXPOSURE- VAPORS MAY CAUSE MILD IRRITATION. DIRECT CONTACT WITH THE
LIQUID OR HIGH VAPOR CONCENTRATIONS (>30,000 PPM AMMONIA) MAY CAUSE SEVERE
PAIN, A STINGING SENSATION, SEVERE BURNS AND VESICULATION, AND POSSIBLY
BROWNISH STAINS. THE CORRODED AREAS ARE SOFT, GELATINOUS, AND NECROTIC.
AND THE TISSUE DESTRUCTION MAY BE DEEP. IF BURNS ARE EXTENSIVE, DEATH
MAY OCCUR. RARELY, AMMONIA VAPORS MAY CAUSE URTICARIA.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF
EXPOSURE. REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS OR EFFECTS
SIMILAR TO ACUTE EXPOSURE.

DATE: 03/15/90 ACCT: 047344-01
INDEX: 13900720777 CAT NO: A667C212 PO NBR: 031390

ALKALINE CORROSIVES:
ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE SEVERE PAIN, BURNS AND POSSIBLY BROWNISH STAINS. THE CORRODED AREAS MAY BE SOFT, GELATINOUS AND NECROTIC AND THE TISSUE DESTRUCTION MAY BE DEEP.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS OR EFFECTS SIMILAR TO ACUTE EXPOSURE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
AMMONIUM HYDROXIDE:
CORROSIVE.
ACUTE EXPOSURE- 1 DROP OF A 9% SOLUTION IN HUMAN EYES CAUSED IMMEDIATE SEVERE PAIN, BLEPHAROSPASM, AND LOSS OF CORNEAL EPITHELIUM DESPITE IRRIGATION. THE FOLLOWING DAY THERE WAS SLIGHT CORNEAL EDEMA AND WRINKLING ON THE POSTERIOR SURFACE. RECOVERY WAS COMPLETE IN 3-4 DAYS. CONTACT WITH THE LIQUID OR HIGH VAPOR CONCENTRATIONS (>2500 PPM AMMONIA) MAY ALSO CAUSE SEVERE IRRITATION, SWELLING OF THE EYELIDS, LACRIMATION, PALPEBRAL EDEMA, INCREASED INTRAOCULAR PRESSURE, OVAL SEMIDILATED FIXED PUPILS, CORNEAL ULCERATION, AND BLINDNESS, POSSIBLY PERMANENT. THE DEGREE OF INJURY DEPENDS ON THE CONCENTRATION AND DURATION OF CONTACT. THERE MAY BE CORNEAL AND ANTERIOR LENTICULAR OPACIFICATION AND IRITIS, ACCOMPANIED BY HYPOPYON OR HEMORRHAGE AND POSSIBLY EXTENSIVE LOSS OF PIGMENT FROM THE POSTERIOR PIGMENT LAYER OF THE IRIS. CORNEAL ANESTHESIA IS POSSIBLE ALLOWING DAMAGE TO OCCUR BEFORE WARNING DISCOMFORT IS FELT. IN SEVERE BURNS, THE EXTENT OF THE INJURY MAY NOT BE IMMEDIATELY APPARENT. LATE COMPLICATIONS MAY INCLUDE PERSISTENT EDEMA, VASCULARIZATION AND SCARRING OF THE CORNEA, PERMANENT OPACITY, ANGLE CLOSURE, ACUTE-ANGLE GLAUCOMA, STAPHYLOMA, CATARACT, ATROPHY OF THE RETINA AND IRIS, AND SYMPLEPHARON.
CHRONIC EXPOSURE- EFFECTS DEPEND ON CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT MAY RESULT IN CONJUNCTIVITIS OR EFFECTS AS IN ACUTE EXPOSURE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
AMMONIUM HYDROXIDE:
CORROSIVE/TOXIC.
SEE INFORMATION ON ALKALINE CORROSIVES.

ALKALINE CORROSIVES:
ACUTE EXPOSURE- MAY CAUSE IMMEDIATE PAIN, CIRCUMORAL BURNS AND CORROSION OF THE MUCOUS MEMBRANES WHICH AT FIRST TURN WHITE AND SOAPY AND THEN BECOME BROWN, EDEMATOUS AND ULCERATED. THERE MAY BE PROFUSE SALIVATION AND DIFFICULTY OR INABILITY TO SWALLOW OR SPEAK. EVEN WHEN THERE IS NO EVIDENCE OF ORAL BURNS, THE ESOPHAGUS AND STOMACH MAY BE INVOLVED WITH BURNING PAIN, VOMITING AND DIARRHEA. THE VOMITUS MAY BE THICK AND SLIMY WITH MUCOUS, AND LATER CONTAIN BLOOD AND SHREDS OF MUCOSA. EPIGLOTTAL EDEMA MAY RESULT IN RESPIRATORY DISTRESS AND POSSIBLY ASPHYXIA. SHOCK WITH MARKED HYPOTENSION, WEAK AND RAPID PULSE, SHALLOW RESPIRATION, AND CLAMMY SKIN MAY OCCUR. CIRCULATORY COLLAPSE MAY ENSUE, AND IF UNCORRECTED, LEAD TO RENAL FAILURE. IN SEVERE CASES, ESOPHAGEAL OR GASTRIC PERFORATION ARE POSSIBLE AND MAY BE ACCOMPANIED BY MEDIASTINITIS, SUBSTERNAL PAIN, PERITONITIS, ABDOMINAL RIGIDITY, AND FEVER. ESOPHAGEAL, AND POSSIBLY GASTRIC OR PYLORIC STRICTURE, MAY OCCUR WITHIN A FEW WEEKS, BUT MAY BE DELAYED FOR MONTHS OR EVEN YEARS. DEATH MAY RESULT WITHIN A SHORT TIME FROM ASPHYXIA, CIRCULATORY COLLAPSE, OR ASPIRATION OF EVEN MINUTE AMOUNTS. IF DEATH IS DELAYED IT MAY BE DUE TO THE COMPLICATIONS OF PERFORATION, PNEUMONIA, OR THE EFFECTS OF STRICTURE FORMATION.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION, REPEATED INGESTION MAY RESULT IN INFLAMMATORY AND ULCERATIVE EFFECTS ON THE ORAL MUCOUS MEMBRANES AND OTHER EFFECTS AS WITH ACUTE INGESTION.

FIRST AID- DILUTE THE ALKALI BY GIVING WATER OR MILK IMMEDIATELY AND ALLOW VOMITING TO OCCUR. AVOID GASTRIC LAVAGE OR EMETICS. ESOPHAGOSCOPY IS THE ONLY WAY TO EXCLUDE THE POSSIBLITY OF CORROSION IN THE UPPER GASTROINTESTINAL TRACT. IF CORROSION IS SUSPECTED, ESOPHAGOSCOPY SHOULD USUALLY BE PERFORMED WITHIN 24 HOURS (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). MAINTAIN AIRWAY AND TREAT SHOCK. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

AMMONIA AND AMMONIUM HYDROXIDE POISONING:
GIVE FRUIT JUICE OR VINEGAR BY MOUTH OR USE EXTERNALLY (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED PERSONNEL.

DATE: 03/15/90 ACCT: 047244-01 PO NBR: 031390
INDEX: 1590072077 CAT NO: A667C212

REACTIVITY

CTIVITY:
BLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
AMMONIUM HYDROXIDE:
ACIDS: VIOLENT, EXOTHERMIC REACTION.
ACROLEIN: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
DIMETHYL SULFATE: VIOLENT REACTION.
FLUORINE: IGNITION AND EXPLOSION.
GOLD: FORMS EXPLOSIVE COMPOUNDS.
IODINE: FORMS AN EXPLOSIVE IODIDE.
MERCURY: FORMS EXPLOSIVE COMPOUND.
METALS AND ALLOYS: CORROSIVE.
NITROMETHANE: FORMS EXPLOSIVE MIXTURE.
OLEUM: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
PROPIOLACTONE (BETA): TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PROPYLENE OXIDE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
SILVER NITRATE + ACETYLENE: FORMS EXPLOSIVE ACETYLIDE.
SILVER NITRATE + SODIUM HYDROXIDE: FORMS SHOCK-SENSITIVE COMPOUND.
SILVER OXIDE: FORMS SHOCK-SENSITIVE SILVER NITRIDE.
SILVER PERMANGANATE: FORMS SHOCK-SENSITIVE MIXTURE.

DECOMPOSITION:
MAY PRODUCE CORROSIVE VAPORS OF AMMONIA AND TOXIC OXIDES OF NITROGEN.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

SPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D002.

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

==========

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. MAY IGNITE COMBUSTIBLES (WOOD, PAPER, OIL, ETC.).

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SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS

T: 047344-01
NO: A667C212 PO NBR: 031390

TH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO
IA DOCUMENTS OR BY THE U.S. DEPARTMENT OF

MUST BE BASED ON CONTAMINATION LEVELS FOUND
CEFR THE WORKING LIMITS OF THE RESPIRATOR AND
I(INSTITUTE FOR OCCUPATIONAL SAFETY AND
(TH ADMINISTRATION (NIOSH-MSHA).

RESPIRATOR WITH CARTRIDGE(S) PROVIDING
MONIA.

ATOR.
NG RESPIRATOR WITH CARTRIDGE(S) PROVIDING
MONIA.
FACEPIECE RESPIRATOR (GAS MASK) WITH A
OR BACK-MOUNTED CANISTER PROVIDING PROTECTION

THING APPARATUS.

FACEPIECE RESPIRATOR (GAS MASK) WITH A
OR BACK-MOUNTED CANISTER PROVIDING PROTECTION

TYPE SELF-CONTAINED BREATHING APPARATUS.

IATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

ATUS WITH FULL FACEPIECE OPERATED IN PRESSURE
SSURE MODE.

ULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND
ODE IN COMBINATION WITH AN AUXILIARY
ARATUS OPERATED IN PRESSURE-DEMAND OR OTHER

ROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT
IN CONTACT WITH THIS SUBSTANCE.

ROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS

OR DUST-RESISTANT SAFETY GOGGLES AND A
TH THIS SUBSTANCE.

HA N EMPLOYEE'S EYES AND/OR SKIN MAY BE
MPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN
HE IMMEDIATE WORK AREA FOR EMERGENCY USE.

ER SCIENTIFIC, INC.
+ REVISION DATE: 10/03/89

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DATE: 03/14/90 ACCT: 047344-01
INDEX: 15900728777 CAT NO: 8A541 PO NBR: 031390

COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS, KEEP UPWIND.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
CORROSIVE MATERIAL

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.263
EXCEPTIONS: 49CFR173.244

TOXICITY

HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
IRRITATION DATA:
ANHYDROUS: 100 MG RINSED EYE-RABBIT MILD.
TOXICITY DATA:
HYDROGEN CHLORIDE (ANHYDROUS GAS): 4701 PPM/30 MINUTES INHALATION-RAT LC50; 2644 PPM/30 MINUTES INHALATION-MOUSE LC50.
MONOHYDRATE: NO DATA AVAILABLE.
DIHYDRATE: NO DATA AVAILABLE.
TRIHYDRATE: NO DATA AVAILABLE.
HEXAHYDRATE: NO DATA AVAILABLE.
HYDROGEN CHLORIDE (AEROSOL): 5666 PPM/30 MINUTES INHALATION-RAT LC50; 2142 PPM/30 MINUTES INHALATION-MOUSE LC50.
HYDROCHLORIC ACID: 1108 PPM/30 MINUTES INHALATION-HUMAN LCLO; 3000 PPM/5 MINUTES INHALATION-HUMAN LCLO; 81 MG/KG UNREPORTED MAN LDLO; 3124 PPM/1 HOUR INHALATION-RAT LC50; 1108 PPM/1 HOUR INHALATION-MOUSE LC50; 1449 MG/KG INTRAPERITONEAL-MOUSE LD50; 900 MG/KG ORAL-RABBIT LD50; 4715 PPM/30 MINUTES INHALATION-RABBIT LCLO; 4416 PPM/30 MINUTES INHALATION-GUINEA PIG LCLO; 1000 MG/M3/2 HOURS INHALATION-MAMMAL LCLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE-INHALATION, SKIN, EYE AND INGESTION.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION.
TARGET EFFECTS: NO DATA AVAILABLE.

HEALTH EFFECTS AND FIRST AID

INHALATION:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE. 100 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- INHALATION OF GAS OR FUMES AT LEVELS OF 5-35 PPM MAY CAUSE IRRITATION AND BURNING OF THE THROAT, COUGHING AND CHOKING; 50-100 PPM MAY BE BARELY TOLERABLE FOR 1 HOUR. HIGH LEVELS MAY CAUSE INFLAMMATION AND, OCCASIONALLY ULCERATION OF THE NOSE, THROAT OR LARYNX, BRONCHITIS, PNEUMONIA, PALPITATIONS AND HEADACHE. HIGHER CONCENTRATIONS MAY CAUSE NECROSIS OF THE TRACHEAL AND BRONCHIAL EPITHELIUM, NASOSEPTAL PERFORATION, ATELECTASIS, EMPHYSEMA, DAMAGE TO PULMONARY BLOOD VESSELS AND LESIONS OF THE LIVER AND OTHER ORGANS. DEATH MAY BE DUE TO LARYNGEAL SPASM, BRONCHOPNEUMONIA OR PULMONARY EDEMA. 1300-2000 PPM MAY BE DANGEROUS, EVEN ON BRIEF EXPOSURES. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE EROSION AND DISCOLORATION OF EXPOSED TEETH. CHRONIC BRONCHITIS AND GASTRITIS.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE.
ACUTE EXPOSURE- CONTACT MAY CAUSE SEVERE IRRITATION, INFLAMMATION, ULCERATION, NECROSIS AND CHEMICAL BURNS. SHOCK SYMPTOMS MAY DEVELOP INCLUDING RAPID PULSE, SWEATING AND COLLAPSE. PHOTOSENSITIZATION REACTIONS MAY OCCUR IN PERSONS PREVIOUSLY EXPOSED. CONTACT WITH A COMPRESSED GAS MAY CAUSE FROSTBITE.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH VAPORS OR DILUTE SOLUTIONS MAY CAUSE DERMATITIS. PHOTOSENSITIZATION MAY OCCUR.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING, BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE.

DATE: 03/14/90 ACCT: 047344-01
INDEX: 1890072077 CAT NO: 8A571 PO NBR: 031390

ACUTE EXPOSURE- CONTACT MAY CAUSE SEVERE IRRITATION, CONJUNCTIVITIS, CORNEAL NECROSIS AND BURNS WITH IMPAIRMENT OR PERMANENT LOSS OF VISION. A DROP OF HYDROCHLORIC ACID SPLASHED IN THE EYE AND IMMEDIATELY WASHED OUT HAS PRODUCED A WHITE COAGULATION OF THE CORNEAL AND CONJUNCTIVAL EPITHELIUM. ANIMALS EXPOSED TO VAPOR CONCENTRATIONS OF 1350 PPM FOR ONE AND A HALF HOURS SHOWED CLOUDING OF THE CORNEA AND 300 PPM FOR 6 HOURS SHOWED SLIGHT EROSION OF THE CORNEAL EPITHELIUM. CONTACT WITH A COMPRESSED GAS MAY CAUSE FROSTBITE.
CHRONIC EXPOSURE- ANIMALS EXPOSED TO VAPOR AT 100 PPM FOR 6 HOURS DAILY FOR 50 DAYS SHOWED ONLY SLIGHT UNREST AND IRRITATION OF THE EYES, BUT NO OCULAR INJURY. EFFECTS ARE DEPENDENT UPON CONCENTRATION AND DURATION OF EXPOSURE. CONJUNCTIVITIS OR EFFECTS SIMILAR TO THOSE FOR ACUTE EXPOSURE MAY OCCUR.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
CORROSIVE.
ACUTE EXPOSURE- INGESTION OF THE ACID MAY CAUSE BURNS OF THE MOUTH, THROAT, ESOPHAGUS AND STOMACH WITH CONSEQUENT PAIN, UNEASINESS, NAUSEA, SALIVATION, VOMITING, DIARRHEA, CHILLS, SHOCK AND INTENSE THIRST. NEPHRITIS, FEVER AND PERFORATION OF THE INTESTINAL TRACT, AND CIRCULATORY COLLAPSE MAY OCCUR. DEATH MAY BE DUE TO ESOPHAGEAL OR GASTRIC NECROSIS.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

FIRST AID- DO NOT USE GASTRIC LAVAGE OR EMESIS. DILUTE THE ACID IMMEDIATELY BY DRINKING LARGE QUANTITIES OF WATER OR MILK. IF VOMITING PERSISTS, ADMINISTER FLUIDS REPEATEDLY. INGESTED ACID MUST BE DILUTED APPROXIMATELY 100 FOLD TO RENDER IT HARMLESS TO TISSUES. MAINTAIN AIRWAY AND TREAT SHOCK. (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
REACTS EXOTHERMICALLY WITH WATER OR STEAM TO PRODUCE TOXIC AND CORROSIVE FUMES.

CONTACT WITH COMMON METALS PRODUCES HYDROGEN WHICH MAY FORM EXPLOSIVE MIXTURES WITH AIR.

INCOMPATIBILITIES:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
ACETIC ANHYDRIDE: VIOLENT REACTION.
ALCOHOLIC HYDROGEN CYANIDE: EXPLOSIVE REACTION.
ALUMINUM: EXPLOSION.
ALUMINUM-TITANIUM ALLOYS: IGNITES OR INCANDESCES WHEN HEATED.
2-AMINOETHANOL: VIOLENT REACTION.
AMMONIUM HYDROXIDE: VIOLENT REACTION.
BASES: VIOLENT REACTION.
BRASS: CORRODES.
BRONZE: CORRODES.
CALCIUM CARBIDE: REACTS WITH INCANDESCENCE.
CALCIUM HYPOCHLORITE: IGNITION.
CESIUM ACETYLIDE: IGNITES ON CONTACT.
CHLORINE + DINITROANILINES: VIGOROUS REACTION WITH RELEASE OF FLAMMABLE HYDROGEN GAS FUMES.
CHLOROSULFONIC ACID: VIOLENT REACTION.
1,1-DIFLUOROETHYLENE: EXTREMELY EXOTHERMIC DECOMPOSITION REACTION.
DOWICIL 100: DECOMPOSES.
ETHYLENE DIAMINE: VIOLENT REACTION.
ETHYLENE IMINE: VIOLENT REACTION.
FLUORINE: IGNITES ON CONTACT.
HEXALITHIUM DISILICIDE: INCANDESCES.
IRON: CORRODES WITH EVOLUTION OF FLAMMABLE HYDROGEN GAS.
MAGNESIUM NITRIDE: PRODUCES A SPONTANEOUSLY FLAMMABLE GAS.
MERCURIC SULFATE: VIOLENT REACTION AT 125 C.
METAL ACETYLIDES: VIOLENT REACTION.
METALS: SEVERE CORROSION WITH EVOLUTION OF FLAMMABLE HYDROGEN GAS.
OLEUM: VIOLENT REACTION.
OXIDIZERS (STRONG): VIOLENT REACTION.
OXYGEN + PLATINUM: IGNITES ON CONTACT.
PERCHLORIC ACID: VIOLENT REACTION.
PLASTICS, RUBBER, COATINGS: ATTACKS.
POTASSIUM PERMANGANATE: EXPLOSION HAZARD.
BETA-PROPIOLACTONE: VIOLENT REACTION.
PROPYLENE OXIDE: VIOLENT REACTION.
RUBIDIUM ACETYLIDE: IGNITES ON CONTACT.
SILICA (GEL): INCOMPATIBLE.
SODIUM: VIGOROUS OR EXPLOSIVE REACTION.

DATE: 03/14/90 ACCT: 047344-01
INDEX: 15900720777 CAT NO: 8A541 PO NBR: 031390

SULFURIC ACID: EXPLOSIVE REACTION WITH RELEASE OF TOXIC HYDROGEN CHLORIDE GAS.
TETRASELENIUM TETRANITRIDE: EXPLODES ON CONTACT.
VINYL ACETATE: VIOLENT REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION MAY RELEASE CORROSIVE HYDROGEN CHLORIDE.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

##STORAGE##

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

PROTECT AGAINST PHYSICAL DAMAGE. STORE IN COOL, WELL-VENTILATED PLACE, SEPARATED FROM ALL OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

##

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. FLAMMABLE. POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. MAY IGNITE COMBUSTIBLES (WOOD, PAPER, OIL, ETC.).

##

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
COVER WITH SODA ASH, SCOOP UP AND PLACE IN A SUITABLE CONTAINER.

REPORTABLE QUANTITY (RQ): 5000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES [illegible]T A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS [illegible]STANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE [illegible] THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION SYSTEM TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

HYDROGEN CHLORIDE (HYDROCHLORIC ACID):

50 PPM- ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH CARTRIDGE(S) PROVIDING PROTECTION AGAINST HYDROCHLORIC ACID.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH CARTRIDGE(S) PROVIDING PROTECTION AGAINST HYDROCHLORIC ACID.

100 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ACID GAS CANISTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

DATE: 03/14/90 ACCT: 047244-01
INDEX: 15900728777 CAT NO: SA541 PO NBR: 031390

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 07/09/85 REVISION DATE: 09/06/89

-ADDITIONAL INFORMATION-

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SOLUTIONS
Environmental Associates, Inc.

April 9, 1993

Mr. Tom Mathison
IT International Technology Corp.
William Penn Plaza
2790 Mosside Boulevard
Monroeville, PA 15146-2792

SUBJECT: Comments for Fort Story Work Plan

Dear Mr. Mathison,

Solutions Environmental Associates, Inc. (SEA) is responding to the comments from the Corp of Engineers regarding our preliminary Work Plan. Our responses are recapped in order as the comments were presented.

Sheet # Section or Page	CMT #	Response
CSAP App. A	24	Appendix A has been added
CSAP Apps B/C	25	Appendices have been updated
Solutions' Encl-App B	26	Appendices have been updated
Solutions Pro. Plan Sect 1.2	27	Appendices have been updated
Solutions Bio Plan Sect 2.4	28	Wording has been amended
Sol. Bio Plan Sect 2.6,2.72 & 2.10	29	Work Plan discusses issue
General	30	Work Plan specifies placement in section in Section 1.1
Sol. Bio Plan Sect 3.2	31	According to recent information, the acceptance of results by the State of VA is what is required
Sol. Bio Plan Sect. 4.0	32	Wording has been added
Sol. Bio Plan Sect 5.2	33	Wording has been added

814-B Greenbrier Circle, Chesapeake, Virginia 23320
(804) 420-0467

SOLUTIONS
Environmental Associates, Inc.

Sheet # Section or Page	CMT #	Response
Solutions Enclosure Bio. Plan	34	Enclosures have been updated
	35	Stricken
General	36	Solutions will provide a detailed plan of piping that will remain on site subsurface
General	37	Section 6.0 first paragraph contains wording
General	38	Detailed drawings of the "system" will be provided after the Preliminary Site Work is completed. It is understood that part of the activities of the site closure will be removing all above grade projections.
2.4	10	Knowing the characteristics of the soil and groundwater before treatment is important to our company. We realize that groundwater treatment is not included, however, we want to have defensible results for initial possible contamination in the groundwater before and after our activities at the site.
5.1	11	The system is capable of removing the VOCs present, however the source of contamination is approximately 600 feet from the remediation site. Additionally, the concentrations of the compounds that are potentially listed compounds are 38-50 times lower in concentration than the action levels for hazardous wastes.

If there are any further questions or comments, please contact us at (804) 420-0467.

Sincerely,

Dorothy S. Small
President

814-B Greenbrier Circle, Chesapeake, Virginia 23320
(804) 420-0467

List of Enclosures

1. General Location Map
2. Detailed Site Plan
3. Bioremediation Schematic
4. Bioremediation System Cross Section

WORK PLAN
FOR
BIOLOGICAL REMEDIATION
LARC MAINTENANCE AREA
FORT STORY
VIRGINIA BEACH, VIRGINIA

Prepared For:

INTERNATIONAL TECHNOLOGY CORPORATION
MONROEVILLE, PA

Prepared By:

SOLUTIONS ENVIRONMENTAL ASSOCIATES, INC.
CHESAPEAKE, VIRGINIA

APRIL 9, 1993

TABLE OF CONTENTS

1.0 INTRODUCTION
- 1.1 Background
- 1.2 Site Description

2.0 INVESTIGATIVE METHODS
- 2.1 Utility/Piping Clearance
- 2.2 Permitting
- 2.3 Drilling Procedures
- 2.4 Monitoring Well Installation
- 2.5 Fluid Level Measurements
- 2.6 Well Development Procedures
- 2.7 Sample Collection
- 2.8 Sample Handling and Transportation
- 2.9 Sample Documentation in the Field
- 2.10 Decontamination Procedures
- 2.11 Aquifer Characteristics

3.0 ANALYSIS OF SOIL AND GROUNDWATER
- 3.1 Laboratory Analysis
- 3.2 Laboratory Quality Assurance/Quality Control(QA/QC)

4.0 CONTAMINATED MATERIALS HANDLING

5.0 BIOREMEDIATION

ENCLOSURES
- 1 General Location Map
- 2 Detailed Site Plan
- 3 Bioremediation Schematic
- 4 Bioremediation System Cross-Section

1.0 INTRODUCTION

1.1 Background

The soil and possibly the groundwater at the LARC parking area at Fort Story has been impacted by hydrocarbon materials resulting from maintenance activities conducted in the area. The site was characterized in the Preliminary Site Characterization of Fort Story by JMM. The remedial approach that has been proposed for this site is based upon the results of the Site Characterization and the soil type.

From the site information and the site visit, the site has been contaminated with diesel fuel, motor oil and some other petroleum products that primarily has a residual of semivolatile compounds. This is based on the analytical results presented. The Total Petroleum Hydrocarbon concentration ranges from 11,200 ppm at MW-115 at depth of 1.5 feet, to 28 ppm at SB-112 at 8 feet. The analytical results indicate 0.02 ppm of Ethylbenzene, 0.01 ppm of tetrachloroethane, 0.07 ppm of m&p xylene and 0.05 ppm of o xylene at MW-115 at 1.5 feet. All other samples do not contain any volatiles in the treatment area. Analysis of the soils also included pesticides/PCBs with a result of 0.011 ppm of p',p'DDD at MW-115 at 1.5 feet and ranges of similar concentrations of p',p'DDD, p',p'DDE and p',p'DDT at surface at SB-113. BNAs were performed, with non-detectable results in the treatment area. Metals analysis was also performed as total metals. There were results at SB-116 and SB-117 at surface of lead and zinc that are indicative of the site use. It is understood that the TCLP lead results are below the action level.

Approximately 1,000 yds^3 will be removed from the Fire Fighting Area and located at the west end of the remediation area at the LARC Parking Area. The soil will be staged on plastic until remediation activities begin.

1.2 Site Description

The site is rectangular in shape, approximately 200' wide by 500' long, containing approximately 15,000 yd^3 of contaminated materials. The soil type is characterized as medium grained sand. The depth to groundwater varies from 5 to 7.5 feet below the ground surface.

In review of the Site Assessment Plan done by JMM, several groundwater monitoring wells were found to be located in the immediate vicinity of the LARC parking site. The locations of the prior soil boring locations and monitoring wells described above are shown on Enclosure 2.

2.0 INVESTIGATIVE METHODS

A limited subsurface investigation will be performed to evaluate the horizontal and vertical extent of the contaminated soil. Our investigation will include a review of the Site Assessment, site work which will include excavating pits or trenches to view the soil profile, drilling/installing groundwater monitoring wells, drilling and installing at least one product recovery well, and collecting soil and groundwater samples for chemical analysis. Aquifer characterization tests (i.e., drawdown and recovery) will also be performed to evaluate site hydrogeologic conditions. The following sections describe the investigative methods to be employed.

2.1 Utility/Piping Clearance

Prior to subsurface investigation activities, a utility check must be performed to identify nearby underground utility lines and/or pipelines. Solutions will supply maps indicating proposed excavation and drilling locations. Coordination of the utility check for these locations will be the responsibility of the Fort Story point of contact.

2.2 Permitting

A permit may need to be obtained from the Virginia Water Control Board prior to inoculation of the soil at the site with active biological materials. Solutions can assist with the initial permitting activities, however, it is the responsibility of the land owner to obtain these permits.

2.3 Drilling Procedures

Soil borings will be advanced in the LARC parking area on a random grid sampling plan. These proposed soil boring locations will be determined based on the suspected groundwater flow direction being south-southeast. The final locations may change due to additional information obtained from field sampling. The soil borings will be advanced by a hand auger or by a truck-mounted drill rig using 6 1/4 inch inside diameter hollow-stem augers. If warranted, a hand auger may be initially advanced to check for subsurface utilities or piping. Soil cuttings obtained during drilling activities will be staged on site for remediation.

The split-spoon samples will be collected at continuous intervals until the final depth of the boring. Two - foot length split-spoon samplers will be used to increase the likelihood that a sufficient quantity of each sample is retained for laboratory analysis.

The soil samples will be visually classified by Solution's on-site geologist and properly recorded. The description will include, but not limited to, the following:

- Principal constituent type
- Color
- Minor constituent, if present, and approximate proportion
- Plasticity for cohesive soils
- Relative density of noncohesive and cohesive soils: loose, dense, very dense; very soft, soft, medium stiff
- Moisture content: dry, damp, moist, wet

It is anticipated that drilling operations will be performed using Level D personal protective clothing. Continuous air monitoring will be conducted with a photoionization detector (PID) or a flame ionization detector (FID) during drilling activities. If, however, volatile organic vapor concentrations exceed 2.5 parts per million (ppm), in the breathing zone around the borehole being drilled, Level C personal protective equipment may be required.

2.4 Monitoring Well Installation

Several of the soil borings will be converted into, two-inch diameter PVC shallow groundwater monitor wells. The monitoring wells will be used to provide data to evaluate the horizontal and vertical extent of petroleum hydrocarbons in the groundwater. In addition, at least one soil boring will be converted into a six-inch diameter Schedule 80 PVC product recovery well. Prior to installing the recovery well, 8 - 1/4 inch diameter hollow-stem augers will be used to over-drill the boreholes to a sufficient diameter for installation. The recovery well will be installed in the area estimated to be the center of the contaminated soil to be remediated. More than one recovery well may be required. If more than one well is necessary, the associated costs are included in the bid pricing.

2.5 Fluid Level Measurements

Fluid level measurements will be obtained from all newly installed monitoring wells and selected existing groundwater monitoring wells presently located in the vicinity of the LARC parking area. The depth to water or free-phase product will be measured using an oil/water interface probe capable of detecting product layers as thin as 0.01 feet. Depths will be measured to the nearest 0.01 foot. The interface probe will be decontaminated between readings with an Alconox solution and distilled water.

2.6 Well Development Procedures

Following well construction and curing of the grout seal, each newly-installed well will be developed to remove fine-grained materials that may have entered the well during construction. Well development groundwater will be containerized in portable tanks and staged on site. The water will be tested and released or treated by bioremedation on site, tested and released.

2.7 Sample Collection

Soil and groundwater samples will be collected for chemical analysis. The following sections describe soil and groundwater sampling activities.

2.7.1 Soil Sampling

In order to estimate the extent of potentially contaminated soils, soil grab samples from each borehole will be collected and submitted for TPH analysis. The soil samples will be collected from between 2.0 to 4.0 feet below ground surface and a second soil sample will be collected from between the groundwater table to 4.0 feet below ground surface. Collection of these samples will be determined by the Solutions project manager and/or field geologist. The samples will be collected via split-spoon sampling as discussed in Section 2.1 or a hand auger as discussed in Section 2.3.

Each soil sample will be placed into a laboratory prepared container, stored on ice in a cooler, and delivered to the contract laboratory for analysis. Appropriate Chain-of-Custody (COC) documentation will accompany the samples to the laboratory.

2.7.2 Groundwater Sampling

Groundwater samples will be collected from the groundwater monitoring wells, and six-inch recovery well to evaluate the horizontal and vertical extent of potentially contaminated groundwater. The groundwater samples will be analyzed for TPH by 418.1, BTEX, pH field chloride, phosphate, ammonia, nitrate and total lead. Monitoring wells will be allowed to stabilize for at least a 24-hour period prior to sampling. The following paragraphs discuss the methods to be employed for sampling activities.

Prior to performing groundwater sampling, static fluid level measurements will be obtained using a water level probe. The depth to groundwater and the thickness of floating product, if present, will be determined in the well at the time of measurement. The water level will be measured to the nearest 0.01 foot from the top of the PVC well casing. The total depth of each well will also be measured to the nearest 0.01 foot using a weighted measuring tape. The water levels and well depth measurements will be used to calculate the volume of water in each well and the minimum volume of water that must be purged prior to sampling. All downhole equipment will be decontaminated with alconox detergent and distilled water.

A minimum of three well volumes will be purged from the wells prior to sampling. If the well is pumped or bailed dry, purging will be considered to be complete and an appropriate note will be recorded in the field log. Purged water will be stored on site for later reuse. The decontaminated water and the groundwater will also be stored for later reuse. The decon water and the groundwater will be tested and released or bioremediated, tested and released.

During purging activities, three measurements of pH, specific conductance, and temperature will be obtained and recorded in the field log.

Groundwater samples will be collected from the wells using dedicated disposable polyethylene bailers or clean bailers and immediately placed into appropriate, laboratory-prepared sample containers. Samples that are to be analyzed for volatile organic compounds (VOC's) will be collected by slowly pouring water from the bailer into a 40 ml vial. Each vial will be completely filled to prevent volatilization, and preserved with HCL and put on ice.

2.8 Sample Handling and Transportation

The subcontracted laboratory will deliver new, clean, contaminant-free polyethylene and glass sample containers with preservatives, labels, and COC documents.

2.9 Sample Documentation in the Field

Three kinds of documentation will be used in tracking and shipping analytical samples:

- Field log book
- Sample labels
- Chain-of-Custody records

At a minimum, the label for each sample bottle will contain the following information:

- Site name
- Sample number
- Date and time of collection
- Sampler's initials
- Sample preservation and preservative used, and
- General types of analysis to be conducted.

The sample information, as well as the analysis to be performed on the sample, will be entered in the field log book for each sampling point. Any errors in the field log will not be erased; instead a single line will be drawn through the error and initialed by the person completing the log.

Additionally, the following items will be entered:

- Dates and times of entry
- Sample depth and number
- Names of field personnel on site
- Names of visitors on site
- Field conditions
- Description of activities
- Sampling remarks and observations
- QA/QC samples collected
- List of photographs taken, and
- Sketch of site conditions

Sample numbers will be designated by site code name ("LARC"), matrix ("S" for soil and "W" for groundwater), borehole number, and sample number taken from a particular borehole (Example: LARC-S-1-01 would represent the first soil sample collected from soil boring number 1). For duplicate samples an arbitrary sample number will be chosen.

Custody of the samples will be maintained by Solutions personnel from the time of sampling until the time they are forwarded to the analytical laboratory. A sample is considered to be in an individual's possession if:

- It is the sampler's possession or it is in the sampler's view after being in his/her possession;
- It was in the sampler's possession and then locked or sealed to prevent tampering; or,
- It is in a secure area.

The sample COC is documented using COC records. The COC record will be used to record the custody of samples at all times. The following information shall be entered on the COC record:

- Project name;
- Signature of sampler;
- Solutions sample number, date, and time of collection, grab or composite sample designation, and a brief description of the type of sample location;
- Signatures of individuals involved in sample transfer;
- Sample matrix; and,
- The tracking number or laboratory number

Solutions field personnel will complete a COC record, in ink, to accompany each cooler forwarded from the site to the laboratory. Any errors on the COC records will not be erased; instead, a line will be drawn through the error and initialed by the person completing the form. The original copy will be placed in a sealable bag and put inside the appropriate cooler, secured to the cooler's lid.

If the sample cooler is to be shipped by commercial air carrier, the cooler must be secured with custody seals so that the seals would be broken if the cooler is opened. The commercial carrier is not required to sign the COC record as long as the custody seals remain intact and the COC records stays in the cooler. The only other documentation required is the completed airbill.

If the sample shipment is hand delivered to the laboratory by Solutions or retrieved by laboratory personnel at the site, then the custody seals are not necessary. The laboratory sample custodian, or his/her designer accepting the sample shipment, whether it is from the air carrier to Solutions, signs and dates the COC record upon sample receipt. The original COC record will be returned with the final data report. The laboratory will be responsible for maintaining internal log books and records that provide a custody record during sample preparation and analysis.

2.10 Decontamination Procedures

Drilling and well development equipment (i.e., augers, drill rods, pump, hoses) will be decontaminated before initial use and after each boring by steam cleaning to reduce the possibility of cross-contamination occurring between borings. For the split-spoon samplers, the spoons will be decontaminated between samples either by steam cleaning or by washing with a non-phosphate soap (Alconox) and rinsing with distilled water. A temporary decontamination area/pad will be provided by the drilling subcontractor and will be designated by Solutions site geologist or project manager on the property near a potable water source.

2.11 Aquifer Characteristics

Aquifer characterization tests will be performed to evaluate the hydrologic characteristics of the shallow water-bearing zone. The following sections discuss the various test methods to be employed.

2.11.1 Groundwater Elevation Data

At the completion of well drilling, installation, and well development, the depths to water (or floating product if detected) will be measured in site wells using a water level probe. Groundwater elevations will be calculated from data by subtracting the groundwater measurements from surveyed, top-of-casing reference elevations. Survey elevation data for the wells will be obtained using standard survey procedures. All vertical elevations will be surveyed from the nearest permanent benchmark by a registered surveyor. Data generated from the measurements will be contoured to assist in determining groundwater flow direction.

Monitoring wells that are detected to have free product will be individually evaluated whether they will be used to determine groundwater flow direction. This evaluation will be dependent upon conditions such as product thickness, geology, etc.

2.11.2 Well-Head Tests

The well-head tests will be a standard variation of the falling-head of rising-head slug test. In these tests, a solid slug of known dimensions is introduced below the water table or withdrawn quickly to induce a disturbance in the water column. It is anticipated that tests will be performed at two different well locations. Monitoring wells with measurable free product will not be considered for the well-head tests. Water level data will be collected using Data Loggers and pressure transducers. Additionally, water level measurements will also be recorded using an electric measuring tape in order to compare test results. All downhole equipment will be decontaminated using the same procedures as described in Section 2.12.

Data from the well-head tests will be analyzed according to standard methods, as appropriate to the test conditions and probably including: Hvorslev (1951); Bouwer and Rice (1967); Cooper, et al. (1967); or similar studies. The aquifer parameters calculated from the well-head tests will include hydraulic conductivity and transmissivity. Estimated values for hydraulic conductivity will be associated with the probable thickness of the shallow saturated layer to approximate a value of transmissivity for the shallow zone.

2.11.3 Aquifer Drawdown and Recovery Tests

2.11.3.1 Recovery Well Installation

To assist with the biological remediation and provide hydraulic isolation, at least one six-inch monitoring well will be installed at the site to serve as a recovery well. The location of the six-inch well will be determined upon field observations. The well will be installed within the suspected area of the contaminated soil. Construction methods and materials will be similar to those used for the two-inch monitoring wells. After installation, the recovery well will be thoroughly developed to remove sediments from the well and to improve the hydraulic connection of the well with the surrounding aquifer.

2.11.3.2 Pump Installation

An electric submersible pump will be temporarily installed in the recovery well by the drilling subcontractor. Depending upon the depths of the recovery well and the size of the pump used, the pump will be suspended within the recovery well using either a nylon rope or a steel cable. Upon installation, the pump will be suspended six-inches to one-foot above the bottom of the recovery well.

Either a solid PVC pipe or a flexible hose may be used as the discharge line from the pump to the top of the well. As the pump is lowered into the recovery well, the electric cable, discharge line, and the suspension cable will be taped together with duct tape at periodic intervals to allow maximum clearance within the recovery well.

Upon reaching the top of the well, the discharge line will be attached to a flow meter with a totalizing meter of appropriate accuracy and capacity. The discharge line will then proceed through a valve. The valve will be used to regulate the discharge rates of the pump. After the valve, the discharge line will be extended to a container that is suitable for fluid storage.

2.11.3.3 Step-Drawdown Test

After the pump and associated equipment is installed, fluid level measurements will be obtained from the recovery well and the two-inch monitoring wells located at the site.

Fluid levels for each step of the test will be recorded by the hydrologic monitor from the pressure transducer.

If a significant amount of free product is present (0.05 ft. or greater) the fluid level measurements will be obtained using an interface probe. These manually obtained measurements will also be obtained on a logarithmic scale.

Decisions as to when the flow rates should be increased to the next step will be based on the drawdown observed in the recovery well. Efforts will be made to over pump the recovery well so the maximum discharge rate may be determined.

After each step is completed, fluid level measurements from the nearest two-inch monitoring wells will be recorded. If drawdown influences are observed in these monitoring wells, additional measurements will be obtained from monitoring wells further away from the recovery well. This procedure is intended to determine what influences, if any, may be observed in the monitoring wells during the 8-hour aquifer test.

Once the various steps have been completed for the step-drawdown test, the flow rate of the pump will be adjusted with the gate valve to the discharge rate which will be used for the 8-hour aquifer test. The pump will then be shut down by terminating the power supplied to the pump. The recovery of the water levels inside the recovery well will be measured on a logarithmic scale, similar to the scale used for the drawdown phase of the test. Fluid levels within the recovery well and the monitoring wells will be allowed to return to static before starting the 8-hour aquifer test.

2.11.3.4 8-Hour Aquifer Test

The 8-hour aquifer test will be an aquifer test in which a constant discharge rate will be maintained for an 8-hour interval. Fluid level measurements in the recovery well and all of the two-inch monitoring wells at the facility will be observed.

Prior to starting the test, fluid level measurements will be obtained from all wells. A maximum of four pressure transducers will be installed within three of the two-inch monitoring wells and the recovery well. Selection of the two-inch monitoring wells will be based on site specific conditions. Such conditions may be the presence of free product, distance to the recovery well, and traffic patterns in the area.

In addition to the fluid level data recorded from the four wells, fluid level data will also be obtained from the remaining monitoring wells using an interface probe. These measurements will be recorded every 30 minutes. If no influence is observed within these monitoring wells, the frequency may be reduced to an hourly interval.

Flow rates will be recorded periodically. Site personnel will record flow rates frequently during the initial portion of the test. If flow rates are remaining fairly stable, they will not require as frequent checks. If flow rates fluctuate more than 0.25 gpm from the desired flow rate, the gate valve will be used to adjust the flowrate accordingly. Data obtained from the flowmeter will be used to determine the total volume of fluids discharged and the average flow rate for the test.

If a pressure transducer is being used in the recovery well, an interface probe will be used to periodically measure the product thickness that may be present. These measurements will be obtained on an hourly schedule.

2.11.3.5 Recovery Test

At the conclusion of the drawdown phase of the aquifer test, the pump will be shut down and the fluid levels permitted to recover. Of the two-inch monitoring wells, only those monitoring wells that had a measurable drawdown need to be monitored during the recovery test. The recovery test will be terminated after the fluid levels in the recovery well have returned to 90% of the original level. The pump and other downhole equipment will not be removed from the recovery well until the recovery test is concluded.

2.11.3.6 Data Elevation

Fluid levels obtained prior to the initiation and the termination of the 8-hour aquifer test will be used to develop potentiometric surface maps to illustrate the influence of the recovery well. Information obtained from the aquifer test will be used to determine the specific capacity and efficiency of the recovery well. In addition, aquifer conditions permitting, the following properties of the aquifer that may be determined.

- Hydraulic conductivity
- Storage coefficient
- Transmissivity
- Rate of groundwater migration

3.0 ANALYSIS OF SOIL AND GROUNDWATER

All samples will be analyzed for required parameters using seven-day laboratory turnaround. The following sections discuss the methodology to be employed for laboratory analysis.

3.1 Laboratory Analysis

3.1.1 Soils

The soil samples will be analyzed for the total petroleum hydrocarbons by 8015. Specific method numbers for the required analysis are listed in Table 1 and the analytical methods are described in the reference listed below:

-Total Petroleum Hydrocarbons (TPH) - Test Methods for Evaluating Solid Waste SW-846, 3rd Edition, November 1986.
-Total Petroleum Hydrocarbons (TPH) - EPA Method 418.1 modified for soil.

3.1.2 Groundwater

The groundwater samples will be analyzed for the following parameters: purgeable aromatics. Specific method numbers for the required analysis are listed in Table 3 and the analytical methods are described in the references listed below:

-Volative Organics - Test Methods for Evaluating Solid Waste SW-846, 3rd Edition, November 1986.
-Total Petroleum Hydrocarbons - EPA Method 418.1.

-Metal Analysis - EPA Method 200 Series.

3.2 Laboratory Quality Assurance/Quality Control (QA/QC)

The laboratory QA/QC Plan is attached with the Work Plan. All sampling containers, preservation, holding times, and analytical methods are according to the strictest EPA guidelines. The laboratory contracted for the initial work and the process work will be Solutions Laboratories, Inc. The laboratory has extensive experience in this type of work. The laboratory is approved by the Virginia State Water Control Board, for reporting to their agency for VPDES permit work as well as other analytical work commonly reported to the UST department of the State Water Control Board. The Certificate number is VA000017.

4.0 CONTAMINATED MATERIALS HANDLING

Quantities of solids and liquids may be generated as a result of drilling operations and decontamination procedures. This section defines the procedures to be used to control the handling, packaging, and transporting of contaminated materials. The following paragraphs address the potential sources and protocols for containerization and handling of contaminated waste.

There are five sources that may potentially generate contaminated materials, including: drilling, decontamination, well development, purging activities, and aquifer pump testing.

Initial containment of the materials will be accomplished using a plastic sheeting. During drilling, cuttings will be placed on plastic for temporary storage. For decontamination fluids, a temporary decontamination area will be constructed. The decontamination area will be constructed so that fluids will be collected for re-use at the site. All cuttings and decontamination fluids will be remediated at the site. The water and soil will be tested and released or bioremediated, tested and released.

5.0 BIOREMEDIATION

5.1 General Information

Our remediation program starts with hydraulic isolation of the groundwater under the site by pumping sufficient water to produce a cove of depression. Remediation liquids applied to the site will migrate to the depressed groundwater and be pumped out of the ground through an oil-water separator. The oil will be removed for disposal. The water will be used as a vehicle to put micro-organisms and inoculant into the contaminated soil. Water will be put into holding tanks for pH adjustment, aeration, nutrient enrichment and micro-organism enrichment by EPA approved micro-organisms. From the holding tanks, the water will be placed back into the site for another cycle of capturing, consuming and moving contaminants towards the cone of depression. This cycle of moving enriched water through the site is a continuous process of consuming and moving soil contaminants.

An equally important part of the program is physically moving the contaminated soils to "break up" pockets of contamination and to search for big areas of heavy contamination. These areas of soil contamination will be analyzed and given specialized treatment. Such treatment will be a combination of physical movement and specifically developed inoculant. Each individual area of contamination receives its special recipe for "clean up".

5.2 Site Work

The site will be excavated in trenches accessing the highest concentrations of contamination that can be identified during the preliminary site preparation. The approach will be to expose those areas by trenching, and then inoculate the trenched areas with an EPA approved inoculation. The trenches will possibly be open during the entire period of remediation. The exact inoculant that will be used will be

determined during the initial TPH characterization during the preliminary site work. The inoculation for the LARC parking area may consist of a different inoculation than that used for the firefighting soil. If the inoculant is determined to be different, the soil will be brought into the treatment area, but segregated, such that the soil can be physically applied separately.

5.3 Inoculation

The biological inoculation consists of a liquid solution, that contains a high cell count of EPA approved bacteria, that have been given ideal conditions in order to deliver a "activated" biological solution that is prepared to consume the TPH of concern.

5.4 Selection of Inoculation

The selection of the micro-organisms is based on the chromatographic characteristics of the contamination. In many cases, the inoculation is a combination of several EPA approved bacterial groups. The mixture is based on formulated on the historical experience of our work with a wide variety of contaminants, the TPH characteristics, and the abilities of different types of bacteria that consume certain type of TPH compounds. It has been known for years that certain types of micro-organisms consume certain compounds that are contained in different products, for example diesel fuel. See Enclosures 3 and 4.

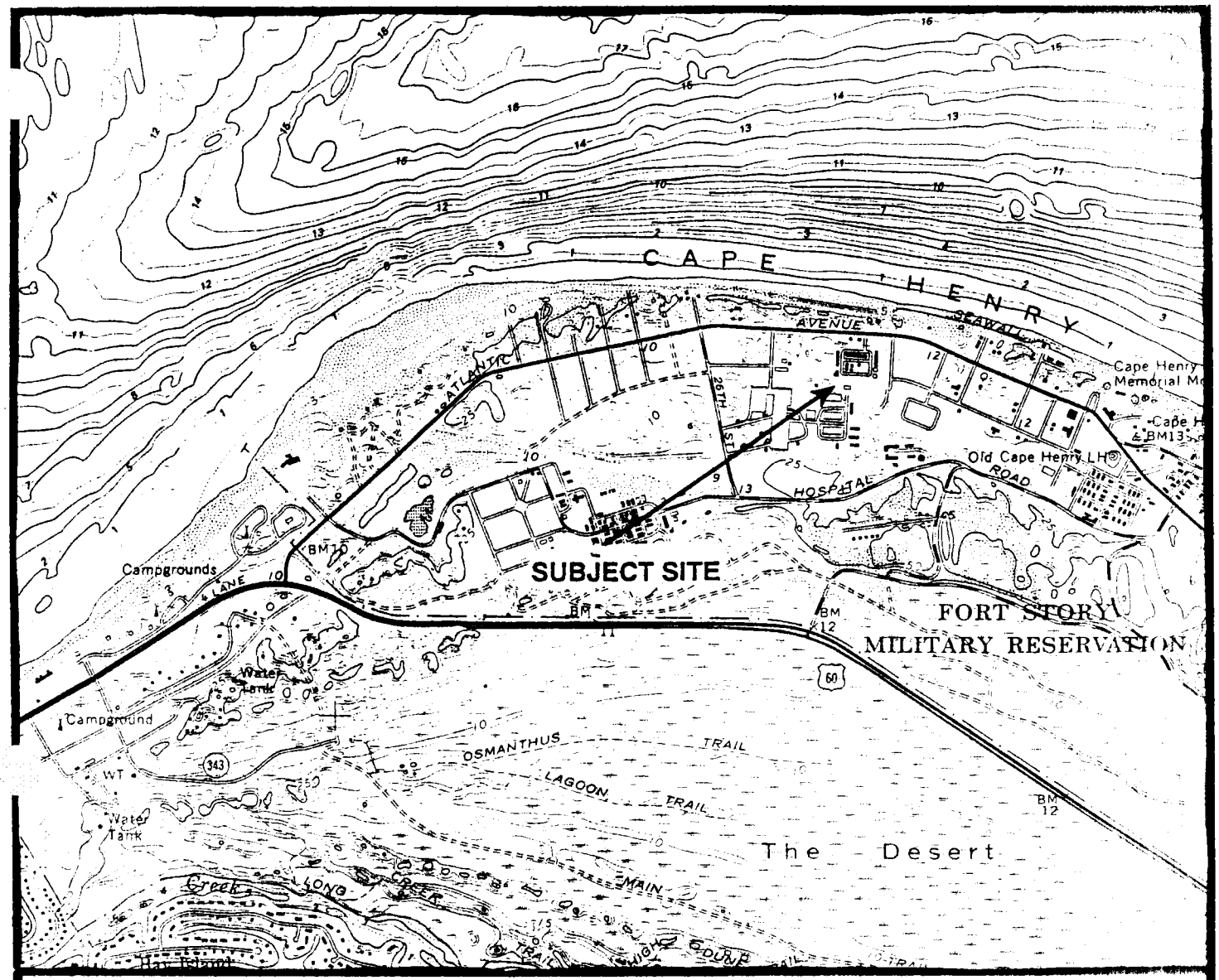
6.0 COMPLETION OF REMEDIATION

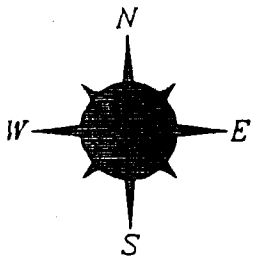
During the initial analysis, the area of soil contamination and groundwater interface will be outlined. At completion the level of contamination in the soil will be below the 50 ppm as specified by the U.S. Army. This will be verified by a random grid selection of samples that will include samples that encompass soil to the groundwater level. Since the groundwater in the area may be contaminated, the depth of our remediation responsibility must be determined before work begins at the site. In the remediation process outlined in Section 5 above, the groundwater and other wastes on site will be used as a transportation vehicle for soil remediation and not for groundwater remediation.

At completion, all surface will be returned to original contour and our remediation equipment removed. Installed underground piping will be left for future use.

List of Enclosures

1. General Location Map
2. Detailed Site Plan
3. Bioremediation Schematic
4. Bioremediation System Cross Section





SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET–DATUM IS MEAN LOW WATER
THE RELATIONSHIP BETWEEN THE TWO DATUMS IS VARIABLE
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 2.7 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SOURCE:

U.S.G.S. 7.5 Minute Series

Cape Henry, VA

1964

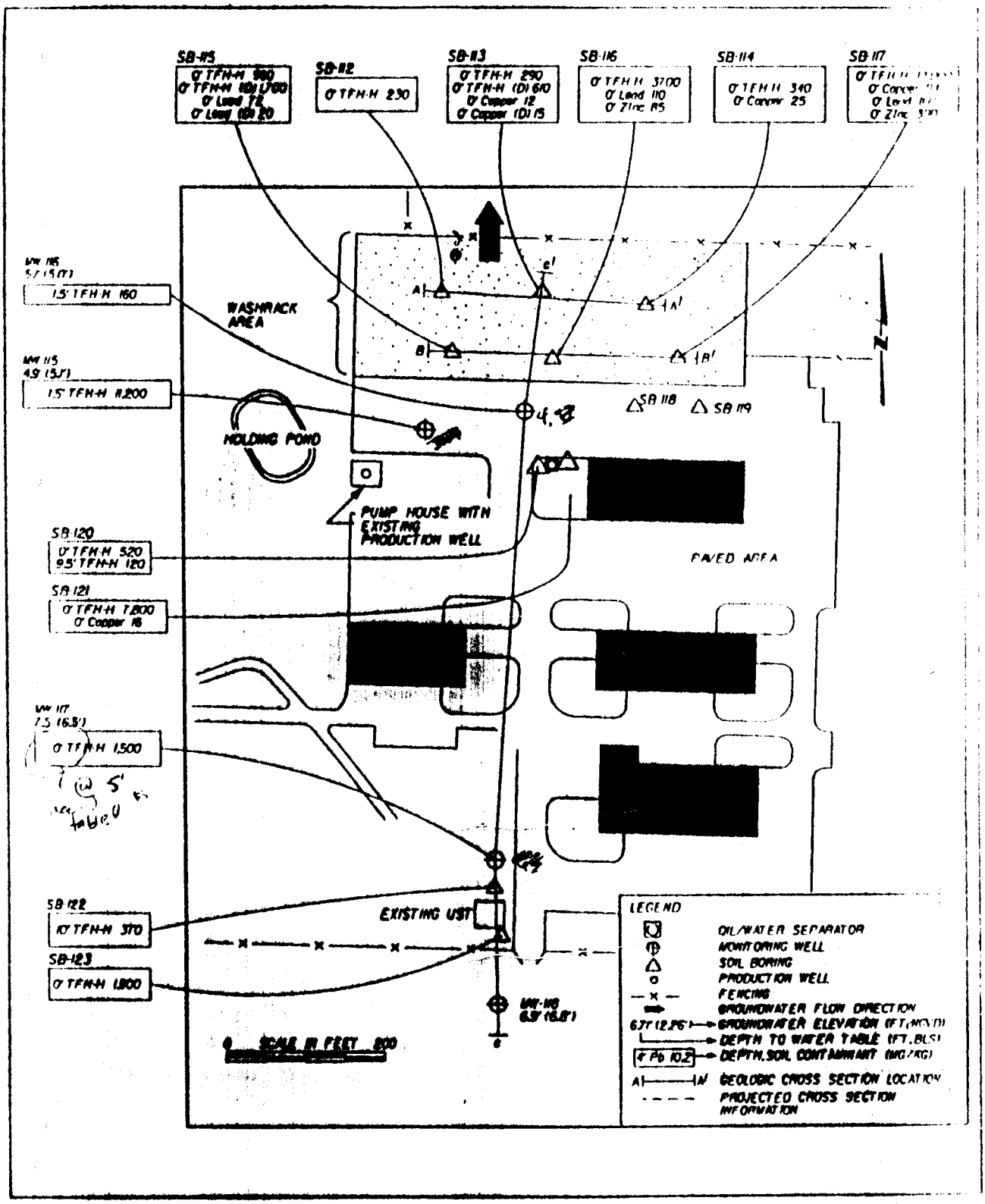
Photorevised 1986

Bathymetry Added 1986

DAVIS ENGINEERING ASSOCIATES, P.C.

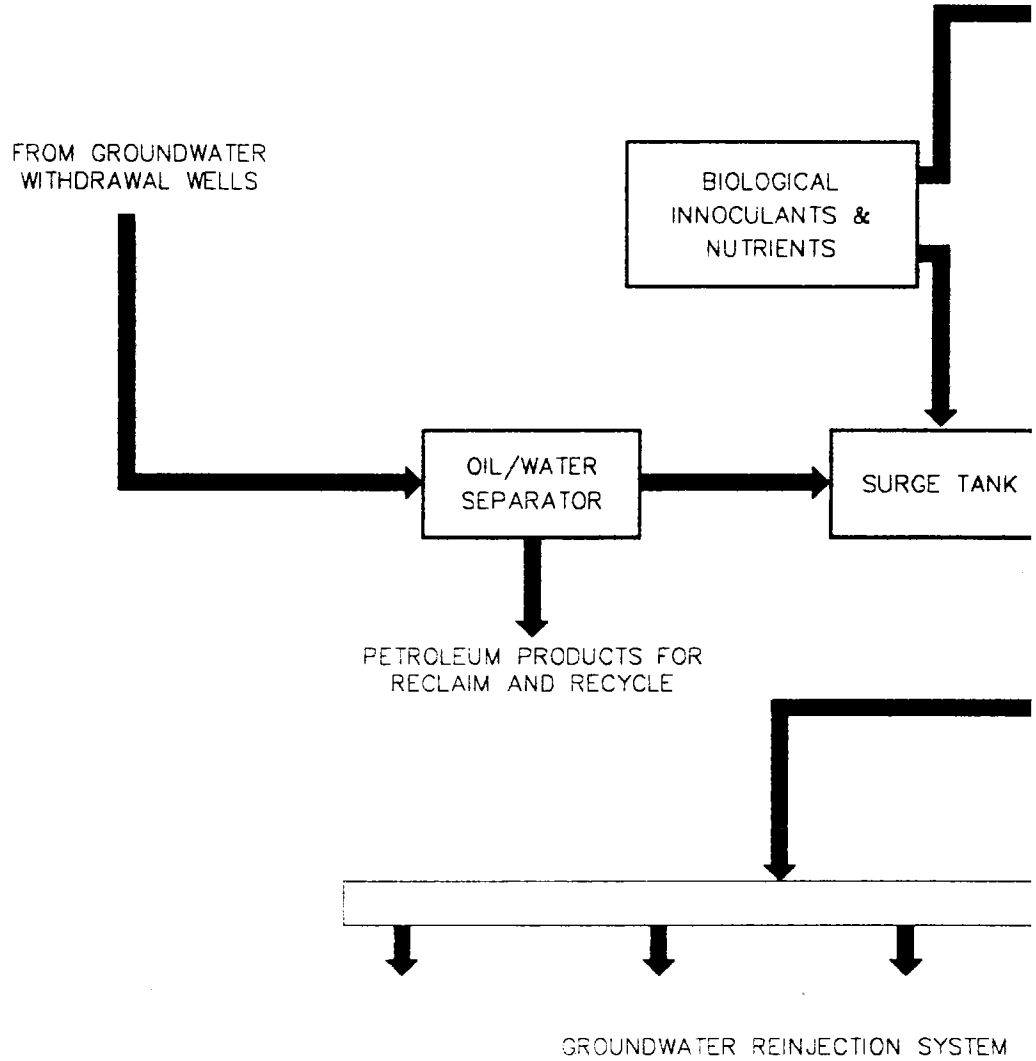
ENCLOSURE 1

General Location Map

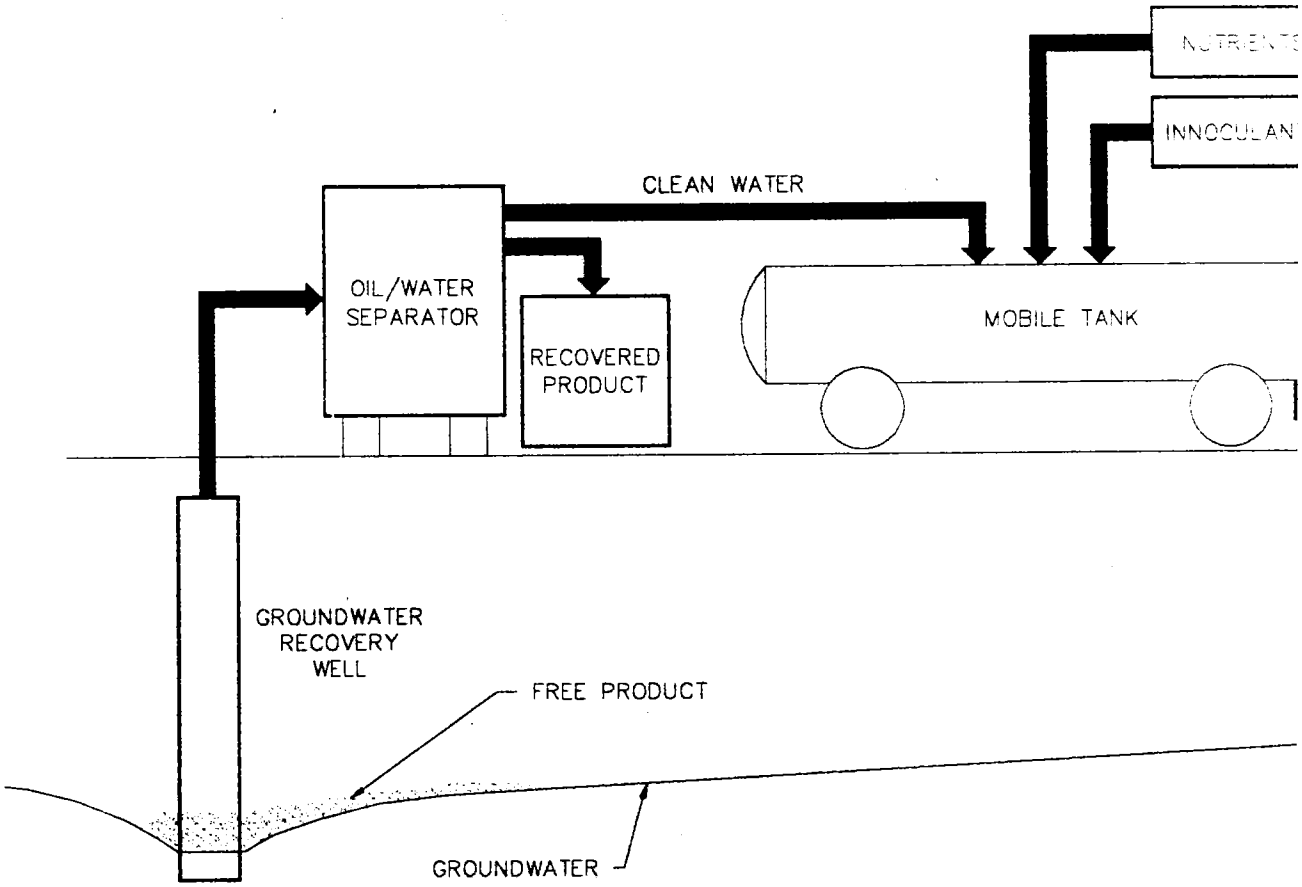


Soil Chemistry Concentration and Geologic Cross Section Locations,
LARC Maintenance Area
Ft. Story, VA

Enclosure 2



REMEDIATION SYSTE



BIOREMEDIATION SYSTEM CROSS-S

APPENDIX C
LARC AREA BIOREMEDIAITON WORK PLAN

APPENDIX D
ANALYTICAL RESULTS

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

IT Corporation/Fort Story
2790 Mosside Boulevard
Monroeville, PA 15146
Attn: Tom Mathison

February 11, 1993

Job Number: Q301097/099

The Certificate of Analysis is for the following:

Client Project ID:	519029
Date Received by Lab:	01/22/93
Number of Samples:	Five
Sample Type:	Soil/Water

1.0 INTRODUCTION

On January 22, 1993, three soil and two water samples were received at ITAS Pittsburgh, labeled as follows:

Soil:	519029-S001	519029-S003	Water:	519029-W001
	519029-S002			TRIP BLANK

2.0 ANALYTICAL RESULTS/METHODOLOGY

Results are presented in the enclosed tables and were determined in accordance with Methods 1010, 3010, 3020, 6010, 7060, 7470, 7740, 7841, referenced in Test Methods for Evaluating Solid Waste, USEPA SW-846, 3rd Ed., 1986; Environmental Protection Agency, Contract Laboratory Program, Statement of Work No. 788, Section IV, Exhibit-D, Part E, July, 1988; Federal Register, Vol. 57, No. 227, Tuesday, November 24, 1992, Appendix II.

Reviewed and Approved:

Veronica Bortot

Veronica Bortot, Project Manager

2.0 ANALYTICAL RESULTS/METHODOLOGY (Continued)

Results are based on sample concentration and expressed in milligrams per liter or parts per million and micrograms per liter or parts per billion. ND denotes that the compound is not detected at or above the indicated detection limit.

3.0 QUALITY CONTROL

QA/QC information can be found immediately following the analytical data.

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

General Chemistry Analysis

Client Sample ID: See below
Sample Date: 01/21/93
Analysis Date: 01/27/93

Client Sample ID	Lab Sample ID	Ignitability	pH
519029-W001	Q30109901	> 140 °F / > 140 °F	6.82/6.71

682-1-89

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

Volatile Organic Compounds

Client Sample ID: 519029-W001
Sample Date: 01/21/93
Lab Sample ID: Q30109901
Analysis Date: 01/28/93

Compound	Concentration µg/L	Compound	Concentration µg/L
Chloromethane	ND10	cis-1,3-Dichloropropene	ND5
Bromomethane	ND10	Trichloroethene	ND5
Vinyl chloride	ND10	Dibromochloromethane	ND5
Chloroethane	ND10	1,1,2-Trichloroethane	ND5
Methylene chloride	ND5	Benzene	ND5
Acetone	ND100	trans-1,3-Dichloropropene	ND5
Carbon disulfide	ND5	2-Chloroethylvinylether	ND10
1,1-Dichloroethene	ND5	Bromoform	ND5
1,1-Dichloroethane	ND5	4-Methyl-2-pentanone	ND50
1,2-Dichloroethene (total)	ND5	2-Hexanone	ND50
Chloroform	ND5	Tetrachloroethene	ND5
1,2-Dichloroethane	ND5	1,1,2,2-Tetrachloroethane	ND5
2-Butanone	ND100	Toluene	ND5
1,1,1-Trichloroethane	ND5	Chlorobenzene	ND5
Carbon tetrachloride	ND5	Ethylbenzene	ND5
Vinyl acetate	ND50	Styrene	ND5
Bromodichloromethane	ND5	Xylenes (total)	ND5
1,2-Dichloropropane	ND5		

	Surrogate Spike Percent Recovery
Toluene-d_8	96%
Bromofluorobenzene	95%
1,2-Dichloroethane-d_4	90%

Volatile Organic Compounds

Client Sample ID: TRIP BLANK
Sample Date: 01/21/93
Lab Sample ID: Q30109902
Analysis Date: 01/28/93

Compound	Concentration µg/L	Compound	Concentration µg/L
Chloromethane	ND10	cis-1,3-Dichloropropene	ND5
Bromomethane	ND10	Trichloroethene	ND5
Vinyl chloride	ND10	Dibromochloromethane	ND5
Chloroethane	ND10	1,1,2-Trichloroethane	ND5
Methylene chloride	ND5	Benzene	ND5
Acetone	ND100	trans-1,3-Dichloropropene	ND5
Carbon disulfide	ND5	2-Chloroethylvinylether	ND10
1,1-Dichloroethene	ND5	Bromoform	ND5
1,1-Dichloroethane	ND5	4-Methyl-2-pentanone	ND50
1,2-Dichloroethene (total)	ND5	2-Hexanone	ND50
Chloroform	ND5	Tetrachloroethene	ND5
1,2-Dichloroethane	ND5	1,1,2,2-Tetrachloroethane	ND5
2-Butanone	ND100	Toluene	ND5
1,1,1-Trichloroethane	ND5	Chlorobenzene	ND5
Carbon tetrachloride	ND5	Ethylbenzene	ND5
Vinyl acetate	ND50	Styrene	ND5
Bromodichloromethane	ND5	Xylenes (total)	ND5
1,2-Dichloropropane	ND5		

	Surrogate Spike Percent Recovery
Toluene-d_8	100%
Bromofluorobenzene	109%
1,2-Dichloroethane-d_4	94%

Volatile Organic Compounds

Lab Sample ID: METHOD BLANK
Analysis Date: 01/28/93

Compound	Concentration µg/L	Compound	Concentration µg/L
Chloromethane	ND10	cis-1,3-Dichloropropene	ND5
Bromomethane	ND10	Trichloroethene	ND5
Vinyl chloride	ND10	Dibromochloromethane	ND5
Chloroethane	ND10	1,1,2-Trichloroethane	ND5
Methylene chloride	ND5	Benzene	ND5
Acetone	ND100	trans-1,3-Dichloropropene	ND5
Carbon disulfide	ND5	2-Chloroethylvinylether	ND10
1,1-Dichloroethene	ND5	Bromoform	ND5
1,1-Dichloroethane	ND5	4-Methyl-2-pentanone	ND50
1,2-Dichloroethene (total)	ND5	2-Hexanone	ND50
Chloroform	ND5	Tetrachloroethene	ND5
1,2-Dichloroethane	ND5	1,1,2,2-Tetrachloroethane	ND5
2-Butanone	ND100	Toluene	ND5
1,1,1-Trichloroethane	ND5	Chlorobenzene	ND5
Carbon tetrachloride	ND5	Ethylbenzene	ND5
Vinyl acetate	ND50	Styrene	ND5
Bromodichloromethane	ND5	Xylenes (total)	ND5
1,2-Dichloropropane	ND5		

	Surrogate Spike Percent Recovery
Toluene-d_8	97%
Bromofluorobenzene	94%
1,2-Dichloroethane-d_4	88%

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

Semivolatile Organic Compounds

Client Sample ID: 519029-W001
Sample Date: 01/21/93
Lab Sample ID: Q30109901
Extraction Date: 01/27/93
Analysis Date: 02/01/93

Compound	Concentration µg/L	Compound	Concentration µg/L
Phenol	ND10	3-Nitroaniline	ND50
bis(2-Chloroethyl)ether	ND10	Acenaphthene	ND10
2-Chlorophenol	ND10	2,4-Dinitrophenol	ND50
1,3-Dichlorobenzene	ND10	4-Nitrophenol	ND50
1,4-Dichlorobenzene	ND10	Dibenzofuran	ND10
Benzyl alcohol	ND20	2,4-Dinitrotoluene	ND10
1,2-Dichlorobenzene	ND10	Diethylphthalate	ND10
2-Methylphenol	ND10	4-Chlorophenyl-phenylether	ND10
bis(2-Chloroisopropyl)ether	ND10	Fluorene	ND10
4-Methylphenol	ND10	4-Nitroaniline	ND50
N-Nitroso-di-n-propylamine	ND10	4,6-Dinitro-2-methylphenol	ND50
Hexachloroethane	ND10	N-Nitrosodiphenylamine	ND10
Nitrobenzene	ND10	4-Bromophenyl-phenylether	ND10
Isophorone	ND10	Hexachlorobenzene	ND10
2-Nitrophenol	ND10	Pentachlorophenol	ND50
2,4-Dimethylphenol	ND10	Phenanthrene	ND10
Benzoic acid	ND50	Anthracene	ND10
bis(2-Chloroethoxy)methane	ND10	Di-n-butylphthalate	ND50
2,4-Dichlorophenol	ND10	Fluoranthene	ND10
1,2,4-Trichlorobenzene	ND10	Pyrene	ND10
Naphthalene	ND10	Butylbenzylphthalate	ND10
4-Chloroaniline	ND20	3,3'-Dichlorobenzidine	ND20
Hexachlorobutadiene	ND10	Benzo(a)anthracene	ND10
4-Chloro-3-methylphenol	ND20	Chrysene	ND10
2-Methylnaphthalene	ND10	bis(2-Ethylhexyl)phthalate	ND50
Hexachlorocyclopentadiene	ND10	Di-n-octylphthalate	ND50
2,4,6-Trichlorophenol	ND10	Benzo(b)fluoranthene	ND10
2,4,5-Trichlorophenol	ND10	Benzo(k)fluoranthene	ND10
2-Chloronaphthalene	ND10	Benzo(a)pyrene	ND10
2-Nitroaniline	ND50	Indeno(1,2,3-cd)pyrene	ND10
Dimethylphthalate	ND10	Dibenzo(a,h)anthracene	ND10
Acenaphthylene	ND10	Benzo(g,h,i)perylene	ND10
2,6-Dinitrotoluene	ND10		

Surrogate Spike Percent Recovery:

Nitrobenzene-d_5	71%	Phenol-d_6	29%
2-Fluorobiphenyl	75%	2-Fluorophenol	48%
Terphenyl	80%	2,4,6-Tribromophenol	93%

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

Semivolatile Organic Compounds

Lab Sample ID: METHOD BLANK
Extraction Date: 01/27/93
Analysis Date: 01/29/93

Compound	Concentration µg/L	Compound	Concentration µg/L
Phenol	ND10	3-Nitroaniline	ND50
bis(2-Chloroethyl)ether	ND10	Acenaphthene	ND10
2-Chlorophenol	ND10	2,4-Dinitrophenol	ND50
1,3-Dichlorobenzene	ND10	4-Nitrophenol	ND50
1,4-Dichlorobenzene	ND10	Dibenzofuran	ND10
Benzyl alcohol	ND20	2,4-Dinitrotoluene	ND10
1,2-Dichlorobenzene	ND10	Diethylphthalate	ND10
2-Methylphenol	ND10	4-Chlorophenyl-phenylether	ND10
bis(2-Chloroisopropyl)ether	ND10	Fluorene	ND10
4-Methylphenol	ND10	4-Nitroaniline	ND50
N-Nitroso-di-n-propylamine	ND10	4,6-Dinitro-2-methylphenol	ND50
Hexachloroethane	ND10	N-Nitrosodiphenylamine	ND10
Nitrobenzene	ND10	4-Bromophenyl-phenylether	ND10
Isophorone	ND10	Hexachlorobenzene	ND10
2-Nitrophenol	ND10	Pentachlorophenol	ND50
2,4-Dimethylphenol	ND10	Phenanthrene	ND10
Benzoic acid	ND50	Anthracene	ND10
bis(2-Chloroethoxy)methane	ND10	Di-n-butylphthalate	ND10
2,4-Dichlorophenol	ND10	Fluoranthene	ND10
1,2,4-Trichlorobenzene	ND10	Pyrene	ND10
Naphthalene	ND10	Butylbenzylphthalate	ND10
4-Chloroaniline	ND20	3,3'-Dichlorobenzidine	ND20
Hexachlorobutadiene	ND10	Benzo(a)anthracene	ND10
4-Chloro-3-methylphenol	ND20	Chrysene	ND10
2-Methylnaphthalene	ND10	bis(2-Ethylhexyl)phthalate	ND10
Hexachlorocyclopentadiene	ND10	Di-n-octylphthalate	ND10
2,4,6-Trichlorophenol	ND10	Benzo(b)fluoranthene	ND10
2,4,5-Trichlorophenol	ND10	Benzo(k)fluoranthene	ND10
2-Chloronaphthalene	ND10	Benzo(a)pyrene	ND10
2-Nitroaniline	ND50	Indeno(1,2,3-cd)pyrene	ND10
Dimethylphthalate	ND10	Dibenzo(a,h)anthracene	ND10
Acenaphthylene	ND10	Benzo(g,h,i)perylene	ND10
2,6-Dinitrotoluene	ND10		

Surrogate Spike Percent Recovery:

Nitrobenzene-d_5	58%	Phenol-d_6	24%
2-Fluorobiphenyl	72%	2-Fluorophenol	36%
Terphenyl	87%	2,4,6-Tribromophenol	71%

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IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

Total Metals Analysis

Client Sample ID: 519029-W001
Sample Date: 01/21/93
Lab Sample ID: Q30109901
Analysis Date: 01/26,27,29/93
Mercury: 01/26/93

Parameter	Concentration µg/L	Matrix Spike Percent Recovery
Aluminum	ND100	103%
Antimony	ND60.0	98%
Arsenic	58.7	99%
Barium	50.3	105%
Beryllium	ND5.0	96%
Cadmium	ND5.0	93%
Calcium	7000	-
Chromium	ND10.0	97%
Cobalt	ND20.0	102%
Copper	ND25.0	101%
Iron	1480	140%
Lead	ND50.0	94%/95%
Magnesium	823	-
Manganese	12.3	97%
Mercury	ND0.20	105%
Nickel	ND40.0	99%
Potassium	5560	-
Selenium	ND5.0	103%
Silver	ND10.0	88%
Sodium	4590	-
Thallium	ND10.0	31%
Vanadium	ND20.0	99%
Zinc	ND20.0	106%

Total Metals Analysis

Lab Sample ID: METHOD BLANK
Analysis Date: 01/26,27,29/93
Mercury: 01/26/93

Parameter	Concentration µg/L
Aluminum	ND100
Antimony	ND60.0
Arsenic	ND10.0
Barium	ND10.0
Beryllium	ND5.0
Cadmium	ND5.0
Calcium	ND500.0
Chromium	ND10.0
Cobalt	ND20.0
Copper	ND25.0
Iron	ND30.0
Lead	ND50.0
Magnesium	ND500.0
Manganese	ND10.0
Mercury	ND0.20
Nickel	ND40.0
Potassium	ND2000
Selenium	ND5.0
Silver	ND10.0
Sodium	ND500.0
Thallium	ND10.0
Vanadium	ND20.0
Zinc	ND20.0

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

Pesticide/PCB Analysis

Client Sample ID: 519029-W001
Sample Date: 01/21/93
Lab Sample ID: Q30109901
Extraction Date: 01/28/93
Analysis Date: 02/02, 09/93

Compound	Concentration µg/L
alpha-BHC	ND0.03
gamma-BHC	ND0.04
beta-BHC	ND0.06
Heptachlor	0.03
delta-BHC	ND0.09
Aldrin	ND0.04
Heptachlor epoxide	ND0.83
Tecnical Chlordane	ND0.14
Endosulfan I	ND0.14
4,4'-DDE	ND0.04
Dieldrin	ND0.02
Endrin	ND0.06
4,4'-DDD	ND0.11
Endosulfan II	ND0.04
4,4'-DDT	ND0.12
Endrin aldehyde	ND0.23
Endosulfan sulfate	ND0.66
Methoxychlor	ND1.8
Toxaphene	ND2.4
Aroclor 1016	ND0.65
Aroclor 1221	ND0.65
Aroclor 1232	ND0.65
Aroclor 1242	ND0.65
Aroclor 1248	ND0.65
Aroclor 1254	ND0.65
Aroclor 1260	ND0.65
	Surrogate Spike Percent Recovery
Tetrachlorometaxylene	82%
Dibutylchlorendate	58%

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

Pesticide/PCB Analysis

Lab Sample ID: Method Blank
Extraction Date: 01/28/93
Analysis Date: 02/02, 09/93

Compound	Concentration µg/L
alpha-BHC	ND0.03
gamma-BHC	ND0.04
beta-BHC	ND0.06
Heptachlor	ND0.03
delta-BHC	ND0.09
Aldrin	ND0.04
Heptachlor epoxide	ND0.83
Tecnical Chlordane	ND0.14
Endosulfan I	ND0.14
4,4'-DDE	ND0.04
Dieldrin	ND0.02
Endrin	ND0.06
4,4'-DDD	ND0.11
Endosulfan II	ND0.04
4,4'-DDT	ND0.12
Endrin aldehyde	ND0.23
Endosulfan sulfate	ND0.66
Methoxychlor	ND1.8
Toxaphene	ND2.4
Aroclor 1016	ND0.65
Aroclor 1221	ND0.65
Aroclor 1232	ND0.65
Aroclor 1242	ND0.65
Aroclor 1248	ND0.65
Aroclor 1254	ND0.65
Aroclor 1260	ND0.65
	Surrogate Spike Percent Recovery
Tetrachlorometaxylene	74%
Dibutylchlorendate	73%

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

Cyanide Analysis

Client Sample ID: 519029-W001
Sample Date: 01/21/93
Analysis Date: 01/27/93

Client Sample ID	Lab Sample ID	Concentration mg/L
519029-W001	Q30109901	ND0.01
-	METHOD BLANK	ND0.01

IT Corporation/Fort Story
Date: 02/11/93

IT ANALYTICAL SERVICES
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q301097/099

TCLP Lead Analysis

Client Sample ID: See below
Sample Date: 01/21/93
TCLP Extraction Date: 01/25/93
Analysis Date: 01/27/93

Client Sample ID	Lab Sample ID	Concentration mg/L	Matrix Spike Percent Recovery
519029-S001	Q30109701	0.765	-
519029-S002	Q30109702	0.138	-
519029-S003	Q30109703	2.54	96%
-	TCLP PREPARATION BLANK	ND0.05	-
-	METHOD BLANK	ND0.05	-

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DATE	0 1 2 1 9 3
TIME	
PAGE	1 OF 1
PAGE	0 0 0 0 2
PROJECT NO.	519029

SAMPLE COLLECTION LOG

PROJECT NAME FT. STORY

SAMPLE NO. 519029-W001

SAMPLE LOCATION FIRE TRAINING PIT

SAMPLE TYPE LIQUID - GRAB

COMPOSITE ____ YES X NO

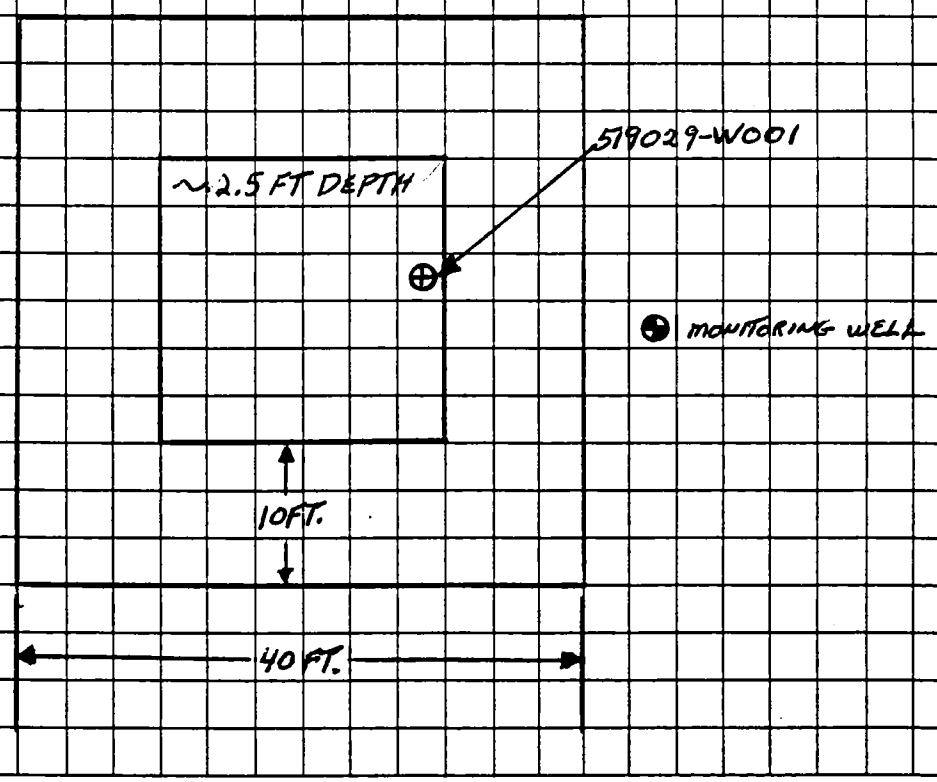
COMPOSITE TYPE ____

DEPTH OF SAMPLE ~1 FT

WEATHER CLOUDY ~ 40°F

CONTAINERS USED PER SAMPLE	AMOUNT COLLECTED
2-80 oz	2-80 oz FULL
2-1 LITER	2-1 LITER FULL
1-500 mL	1-500 mL FULL
2-40 mL	2-40 mL FULL

COMMENTS: ONE LIQUID SAMPLE WAS COLLECTED FROM THE FIRE TRAINING PIT TO BE ANALYZED FOR PESTICIDES, PCB's, BNA, CYANIDE, METALS, MERCURY AND VOA's.



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