

NOTICE

All drawings located at the end of the document.

RFP/ER-SAF-93-OU 2.14



ROCKY FLATS

ROCKY FLATS FIELD TREATABILITY UNIT HEALTH & SAFETY PLAN OPERABLE UNIT NO. 2



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**ROCKY FLATS PLANT
OPERABLE UNIT 2
FIELD TREATABILITY UNIT
HEALTH AND SAFETY PLAN**

**ROCKY FLATS PLANT
OPERABLE UNIT 2 FIELD TREATABILITY UNIT
HEALTH AND SAFETY PLAN**

Plan Approvals:

Resource Technologies Group, Inc.

Bartley W. Conroy
Bartley W. Conroy
Corporate Health and Safety Officer

July 20, 1993
Date

EG&G Rocky Flats

Mark C. Burmeister
Mark Burmeister
Contractor's Technical Representative

7-20-93
Date

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
Operable Unit 2 Field Treatability Unit
Health and Safety Plan

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HEALTH AND SAFETY PLAN

Site-Specific Health and Safety Plan for the Rocky Flats Plant Operable Unit 2 Field Treatability Unit, prepared by Resource Technologies Group, Inc.

This site specific health and safety plan has been written for the use of Resource Technologies Group, Inc., and its employees and subcontractors. All EG&G personnel associated with this project shall comply with all aspects of the plan as to field health and safety requirements.

REVIEW AND APPROVAL

Mark C. Burmeister
EG&G Project Manager

7-22-93
Date

J. H. Buel
Industrial Hygiene Health and Safety
Liaison Officer

7-22-93
Date

Kevin D. O
Environmental Restoration Health
and Safety Officer

7/22/93
Date

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1.0 INTRODUCTION AND PURPOSE

1.1 PURPOSE

This plan establishes requirements and provides guidelines for worker safety and hazard identification during the operation of the Chemical Precipitation, Micro Filtration and Granular Activated Carbon Treatment System for Operable Unit No. 2 (OU2) located at the Rocky Flats Plant in Golden, Colorado. The purpose of this plan is to identify procedures for avoiding potential hazards from chemicals, equipment, or the environment, and for responding to serious injury or accident. Revisions to this Plan will be made in accordance with the subcontractor Health and Safety Program and will be approved by the operating contractor.

2.0 SITE HISTORY, DESCRIPTION AND SCOPE OF WORK

2.1 SITE HISTORY AND DESCRIPTION

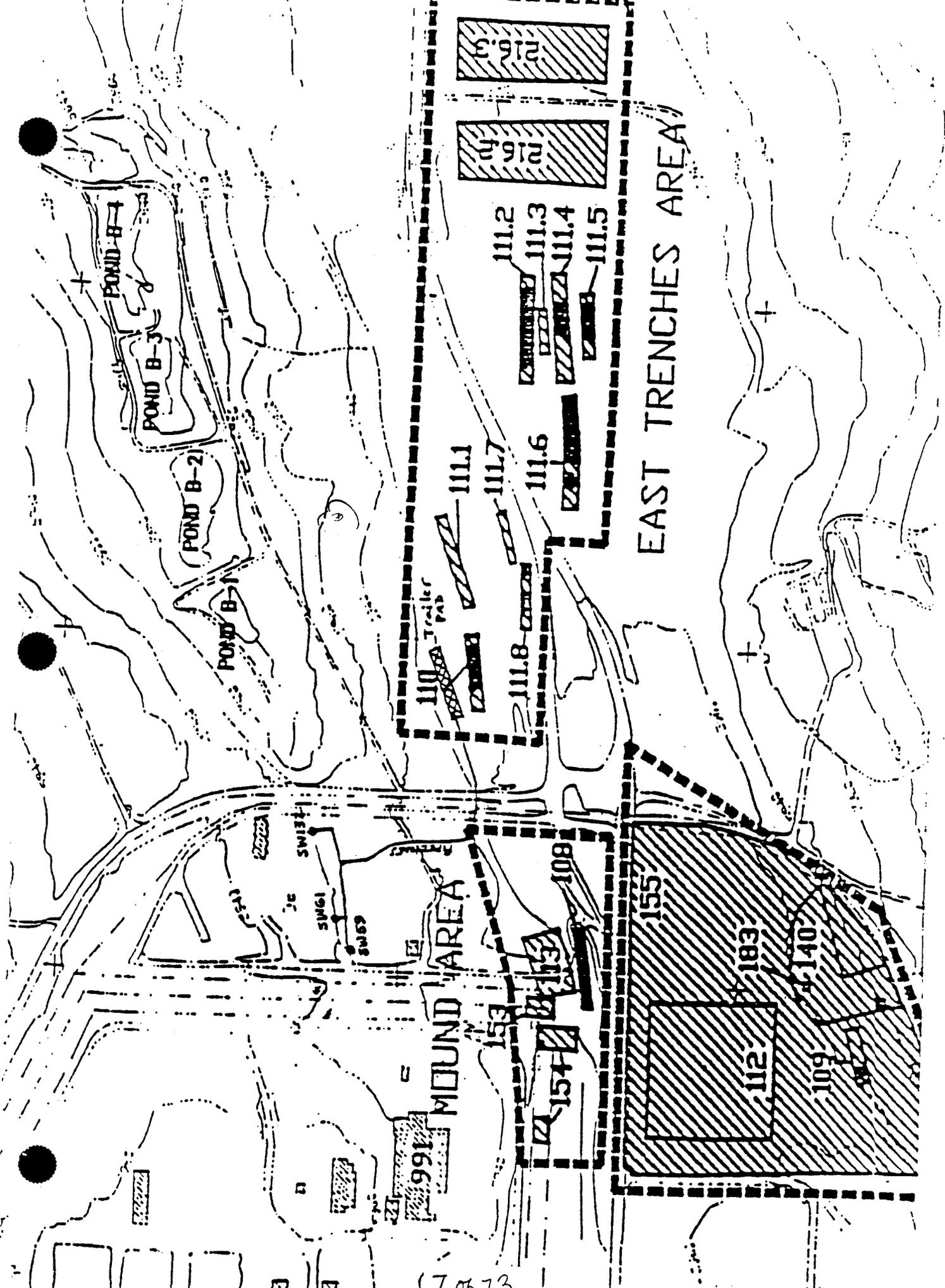
Operable Unit 2 (OU2) is comprised of the 903 Pad, Mound, and East Trenches Areas which are located east-southeast of Rocky Flats as shown in Figure 2.1. The areas of OU2 lie within either the South Walnut Creek or Woman Creek drainage basins. Twenty sites, designated as Individual Hazards Substance Sites (IHSS), lie within OU2: five in the 903 Pad area; four in the Mound area; and 11 in the East Trenches area.

The 903 Pad Area consists of the following IHSS sites:

- 903 Drum Storage Site (#112) - Areas used during the 1950's and 1960's for storage of drums containing cutting oils containing the following:
 - Uranium
 - Carbon Tetrachloride
 - Tetrachloroethane
 - Acetone
 - Mineral Oil
 - Trichloroethane
 - Silicone Oils
 - Ethanolamine

These drums were removed by 1968; the contaminated areas (resulting from leaking drums) were scraped into one area and capped with dirt and asphalt.

- 903 Lip Site (#155) - Area contaminated by wind-carried contaminants from the pad area.
- Trench T-2 Site (#109) - Trenches used for disposal of sanitary sewage sludge and flattened uranium and plutonium contaminated drums.
- Reactive Metal Destruction Site (#140) - Area previously used for destruction of lithium, sodium, calcium and magnesium metals and various organic solvents.
- Gas Detoxification Site (#183) - Building 952 - used to detoxify bottled gases.



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FIGURE 2.1 IHSS LOCATIONS

The Mound Area consists of the following IHSS sites:

- Mound Site (#113) - Uranium, plutonium and solvent drum storage area. Area has been partially remediated.
- Trench T-1 Site (#108) - Trench containing approximately 125 buried drums of depleted uranium and plutonium chips coated with lathe coolant.
- Oil Burn Pit No. 2 site (#153) - 2 trenches previously used for burning oil containing uranium.
- Pallet Burn Site (#154) - Area used to burn pallets which might have been contaminated with solvent and/or radionuclides.

The East Trenches Area consists of 9 trenches which were previously used to dispose of depleted uranium, flattened depleted uranium and plutonium-contaminated drums, and sanitary sludge. These may be found in Figure 2.1 as follows:

Trench T-3	#110
Trench T-4	#111.1
Trench T-5	#111.2
Trench T-6	#111.3
Trench T-7	#111.4
Trench T-8	#111.5
Trench T-9	#111.6
Trench T-10	#111.7
Trench T-11	#111.8

Additionally, two (2) areas (#216.2 and #216.3) were used for spray irrigation of sewage treatment plant effluent.

Also present in the vicinity of the OU2 are six (6) other IHSS previously designated as Solid Waste Management Units (SWMU) (see Figure 2.2).



- IHSS 21 Original Process Waste Lines
- IHSS 101 Sludge Disposal
- IHSS 142.8 Reservoir Pond B-1
- IHSS 165 Storage Area
- IHSS 116 Center Flow Path
- IHSS 182 Overbank Flow Path

FIGURE 2

SITE LOCATION MAP OF IHSS

SIP DRYING BEDS

 EBB&B
 GROUNDWATER
 MONITORING
 PLAN

PROJECT No. 208 0201

SCALE: 1" = 100'

50 0 100 Feet

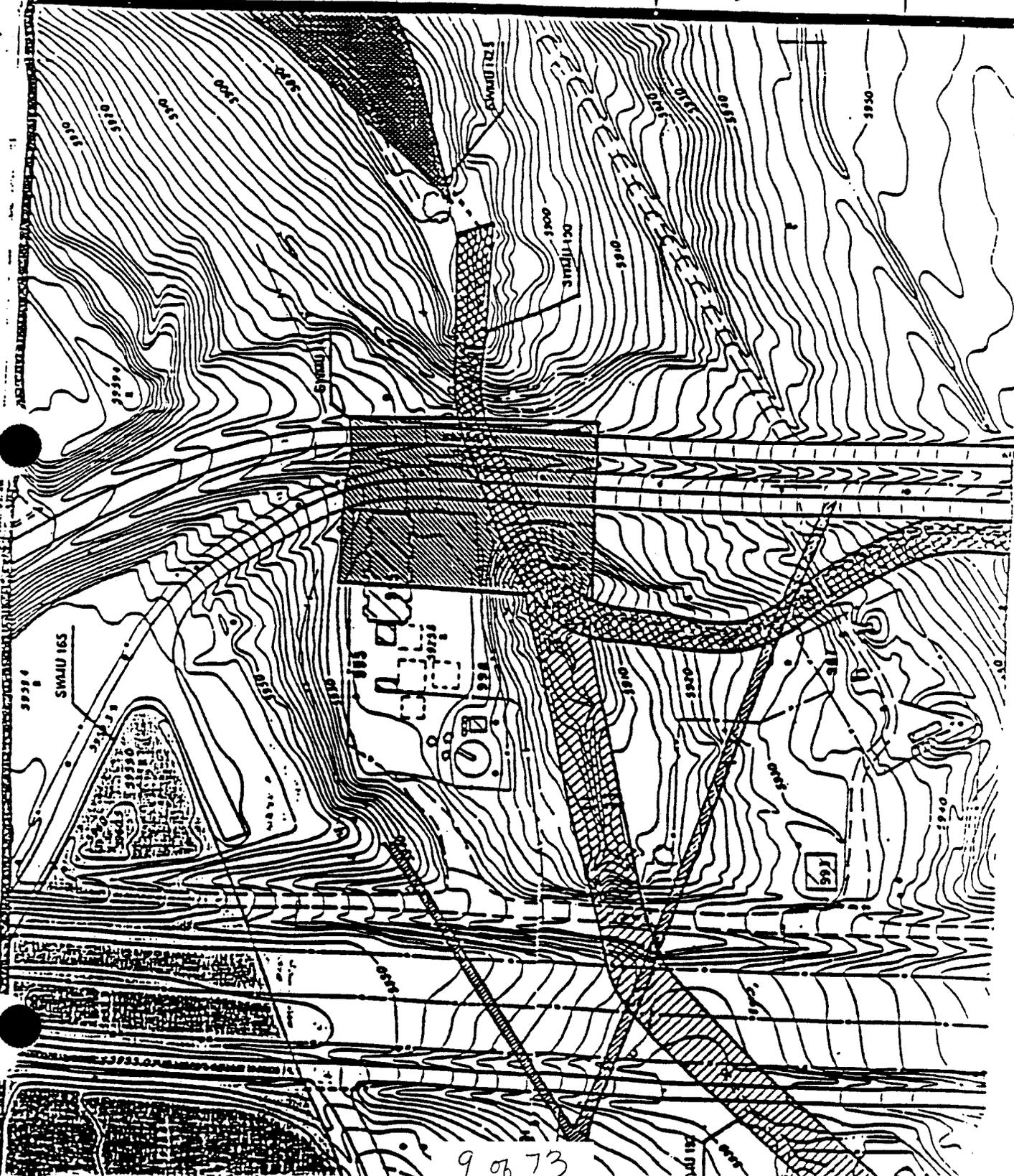


FIGURE 2.2 IHSS LOCATIONS (PREVIOUSLY SWMU)

- IHSS 121 Original Process Waste Lines - These are abandoned process effluent lines from the process areas at the facility. Potential groundwater contaminants are tetrachloroethylene, trichloroethylene, carbon tetrachloride, radionuclides, and nitrates.
- IHSS 141 Sludge Dispersal Plume - This area is believed to have been impacted by wind dispersion of dried sludge from the Sewage Treatment Plant drying beds.
- IHSS 142.5 Retention Pond B-1 - This pond is believed to have been contaminated by various wastes containing nitrates and low level radioactive waste.
- IHSS 165 Triangle Area - This area was used from 1966 to 1975 for the storage of drums containing plutonium contaminated wastes. These wastes have since been removed.
- IHSS 190 Caustic Flow Path - This area was caused by a spill of caustic wastes near the steam plant (building 443). Snowmelt is believed to have transported potassium hydroxide (which had been neutralized) to Pond B-1.
- IHSS 192 Chromium Flow Path - This area was caused by the transport of cooling-tower blow down, which may have contained chromium-laden biocides, to Pond B-1.

Chemical Hazards Sheets for the various contaminants present may be found in Section 5.0.

2.2 SCOPE OF WORK

As part of the Interim Measures/Interim Remedial Action (IM/IRA) Plan for Operable Unit Number 2, a Field Treatability Unit (FTU) consisting of a water filtration system was designed, constructed and installed for Rocky Flats. The FTU consists of the following systems:

- *Collection System* - Catch basins in the field to collect water and pump it to a 10,000 gallon process storage tank.
- *Process System* - Collected waters flow through the chemical precipitation, microfiltration and granular activated carbon system to remove various hydrocarbons, chlorohydrocarbons and low level radioactive contaminants.
- *Trailers* - Housing for process system, sludge holding tank, chemical treatment tanks and office.
- *Electrical System Generator* - Support for alarms, process system, collection system, air conditioner, heater, and trailer.

The startup date for the Phase I GAC system was May 13, 1991. The Phase II system consisting of the chemical pretreatment and microfiltration systems was placed in operation on April 27, 1992. The subcontractor is responsible for operation and maintenance of the FTU. Figure 2.3 shows the location of the FTU and collection system. Section 3.0 provides a more detailed description of the treatment system.

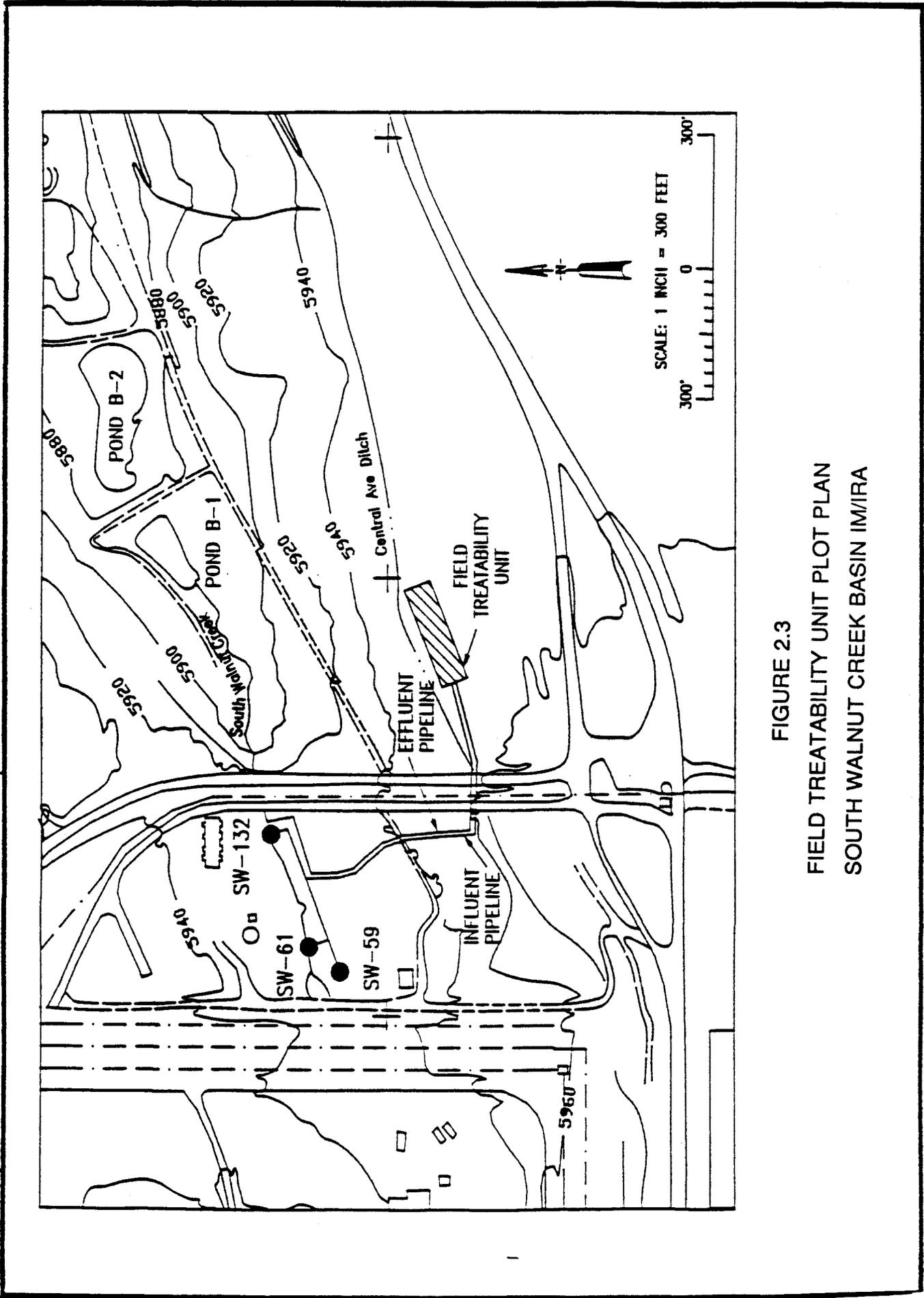


FIGURE 2.3
 FIELD TREATABILITY UNIT PLOT PLAN
 SOUTH WALNUT CREEK BASIN IM/IRA

3.0 SYSTEM DESCRIPTION

The FTU is illustrated in Figure 3.1 and consists of the following subsystems:

- Surface water collection and equalization.
- Chemical treatment.
- Concentration and microfiltration.
- Neutralization.
- Solids dewatering.
- Granular Activated Carbon (GAC) adsorption.

Each of these FTU process subsystems are discussed in detail below.

3.1 COLLECTION AND EQUALIZATION SYSTEM

Surface water collection systems CS-59, CS-61, and CS-132 serve to divert and transfer design flows from SW-59, SW-61 and SW-132, respectively. Surface water flows at each station in excess of the CS design flows may be permitted to overflow the collection system and continue downstream along its pre-IM/IRA flow path. Each collection system includes a precast reinforced concrete catch basin with a stainless steel submersible pump.

The pump is located inside each catch basin and its operation is controlled by a float switch. The raw water is pumped from the catch basins to a flow equalization tank through double-wall polyethylene piping. The piping is wrapped with heat tape and insulation to protect against freezing during the winter months.

The equalization tank has a capacity of 10,000 gallons and is fabricated of cross-linked polyethylene. Surface water influent levels in the tank are continuously monitored and displayed. Level indication includes low, high, and overflow visual and audible alarms at 5, 90, and 95 percent of tank capacity, respectively. At peak flow (60 GPM) the tank can provide nearly 3 hours of equalization time.

3.2 CHEMICAL TREATMENT SYSTEM

The first step of chemical treatment is to lower influent pH in Reaction Tank No. 1 with sulfuric acid to approximately 4.5 to avoid carbonate complexation of uranium and to neutralize total alkalinity. Ferric sulfate is then added as a coagulant and co-precipitating agent. Lime is added in Reaction Tank No. 2 to raise the pH to 9.5 which causes the precipitation of iron and dissolved heavy metals as metal hydroxides. Radionuclides and metals adsorb to particulates and are entrained in the floc. Auxiliary chemicals such as biological inhibitors and coagulant aids may be added to enhance the overall effectiveness of the process. The chemical treatment system in Trailer No. 1 consists of two reaction tanks (800 gallons each); one ferric sulfate addition tank (50 gallons); one lime addition tank (250 gallons); and one auxiliary chemical addition tank (250 gallons). All the tanks are equipped with level control instrumentation and mixers.

The ferric sulfate and any auxiliary chemical solutions are prepared in feed tanks by mixing powdered reagent and water and are fed to Reaction Tank No. 1 by metering pumps. The pH in Reaction Tank No. 1 is maintained within the optimal range by acid addition, which is controlled by on-line pH instrumentation. From Reaction Tank No. 1, the surface water overflows to Reaction Tank No. 2 where lime slurry and any required auxiliary chemicals are added. The lime slurry is prepared in the lime addition tank which is provided with a filter, dust control hood, and a slurry recirculation pump. The supply of lime to Reaction Tank No. 2 is controlled by an automated pH monitoring and control system.

3.3 CONCENTRATION AND MICROFILTRATION SYSTEM

The concentration and microfiltration system in Trailer No. 2 physically separates the floc formed in Reaction Tank No. 2. Surface waters from Reaction Tank No. 2 gravity flow to the concentration tank (3,000 gallons), which is constructed of fiberglass reinforced plastic and equipped with baffles, level controls and a recirculation pump. The process stream is pumped from the concentration tank to a microfiltration system. The membrane filter is a shell and tube configuration with the membrane on the inside of the tubes. The permeate passes through the tubes perpendicular to the main flow at a relatively low operating pressure. Manifolds are provided

to collect the filtrate and direct it by gravity to the neutralization tank.

Filtered solids are returned to the concentration tank. Solids in the concentration tank are periodically pumped to the solids holding tank in Trailer No. 1. Overflow from the solids holding tank is recycled to the concentration tank. The solids removal rate from the concentration tank is adjusted manually to maintain the desired solids concentration in the filtration modules. A clean-in-place system, comprised of a flush tank and a chemical holding tank, is included in the design of the microfiltration unit. Both tanks have a 400-gallon capacity.

3.4 NEUTRALIZATION SYSTEM

A skid-mounted neutralization system is provided to adjust the filtrate pH to 7 by addition of sulfuric acid. The pH adjustment prepares the filtrate for GAC treatment and discharge or recycle. The equipment and components of the neutralization system are as follows:

- 1,500 gallon, heavy-duty plastic tank.
- Heavy-duty rim mounted mixer.
- 55-gallon acid drum with metering pump.
- Control panel containing:
 - pH monitor/controller/alarm.
 - pH recorder.

3.5 SOLIDS DEWATERING SYSTEM

The solids dewatering system is used to process the solids in the solids holding tank. This system includes an air operated slurry pump to transfer concentrated solids from the solids holding tank to the filter press. The filter press removes water from the solids and creates a filter cake that is 35 to 50 percent solids by weight. The filtrate produced by the filter press is recycled to the concentration tank. The filter cake is transferred into drums placed beneath the elevated filter press.

3.6 GRANULAR ACTIVATED CARBON (GAC) TREATMENT SYSTEM

After neutralization, the process water is pumped through two GAC columns in Trailer No. 3 configured in series. Two additional GAC adsorption units are configured in parallel to the on-line units and are maintained in an on-line, standby mode. Each carbon column is 60 inches in diameter and 87 inches high. The GAC units are skid-mounted and are connected to the process piping via stainless steel, quick connect couplings.

Rotation of the GAC units into the lead, polishing, and standby positions is accomplished by changing the open/closed configuration of the process valves. Physical movement of GAC units is not necessary except when removing a spent unit for disposal. Each of the four vessels contains 2,000 pounds of GAC.

Following GAC treatment, the water is continuously discharged to South Walnut Creek just downgradient of the surface water collection systems.

4.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

The Rocky Flats operating contractor has overall responsibility for the Health and Safety Program at the Rocky Flats Plant. The operations subcontractor is specifically responsible for implementation of the Health and Safety Plan for the operation and maintenance of the FTU at OU2. The project Health and Safety Organization is shown in Figure 4.1. Table 4.1 presents lead management and field personnel on the project. Major responsibilities for key personnel are summarized in Table 4.2.

FIGURE 4.1

HEALTH AND SAFETY ORGANIZATION

RESOURCE TECHNOLOGIES GROUP, INC.

EG&G ROCKY PLATS

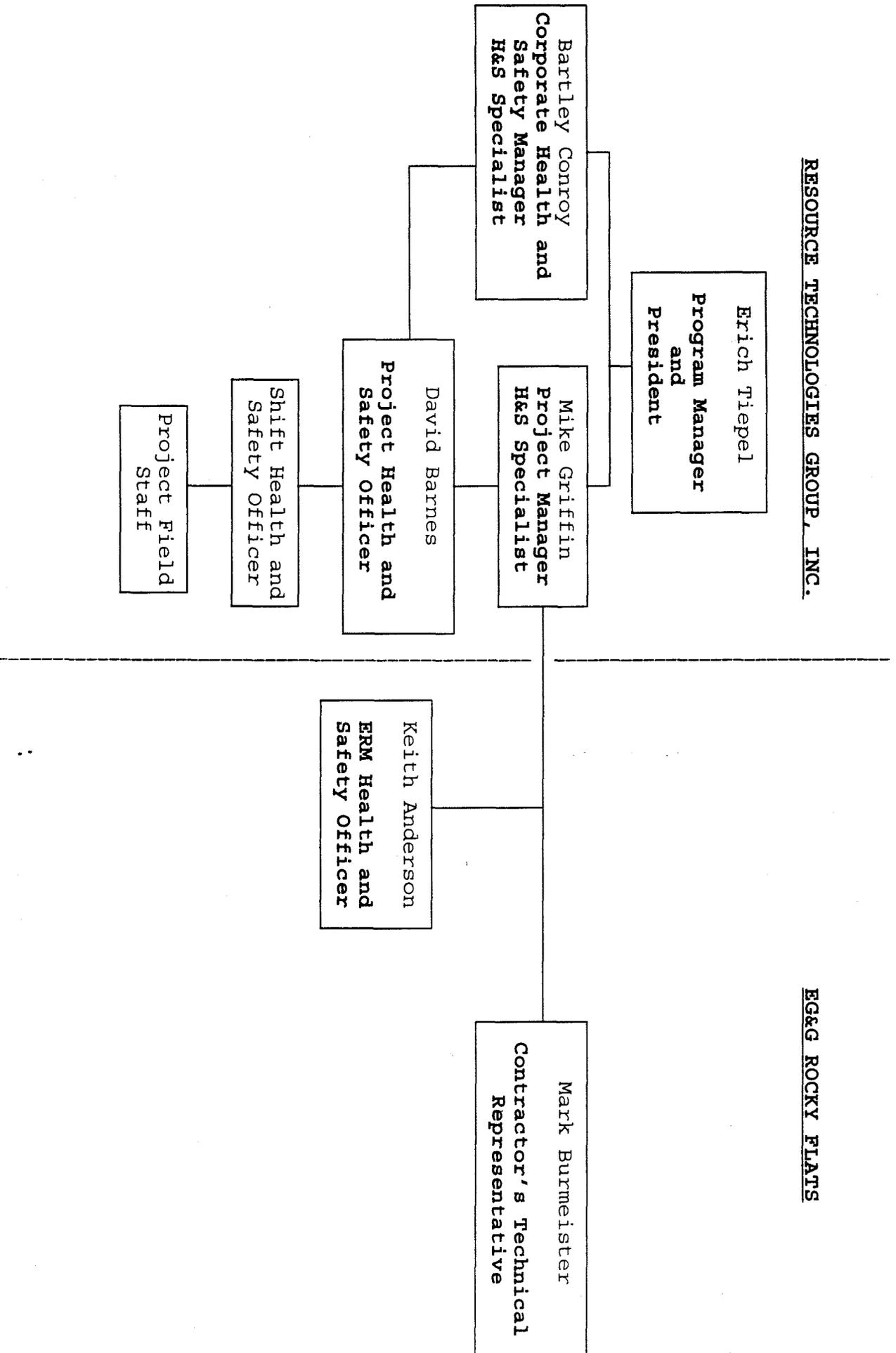


TABLE 4.1
Project Personnel

<u>COMPANY</u>	<u>FUNCTION</u>	<u>NAME</u>	<u>PHONE</u>
EG&G	Contractor's Technical Representative	Mark Burmeister	966-5891
EG&G	ERM Health and Safety Officer	Keith Anderson	966-6979
RTG	Program Manager	Erich Tiepel	969-8511
RTG	Corporate Health and Safety Manager	Bartley Conroy	969-8511
RTG	Project Manager Alternate Health and Safety Specialist	Michael Griffin	969-8511
RTG	Project Health and Safety Officer Health and Safety Specialist	David Barnes	966-4310

TABLE 4.2
Personnel Responsibilities

Title	General Description	Responsibilities
Project Manager	<p>Has authority to direct response operations. Assumes total control over site activities. Stop work authority.</p>	<ul style="list-style-type: none"> o Prepares and organizes the background review of the situation, Work Plan, the Project Health and Safety Plan, and the field team. o Ensures that the Work Plan is completed and on schedule. o Uses the Project Health and Safety Officer to ensure that safety and health requirements are met. o Prepares the final report and support files on the project activities.
Project Health and Safety Officer	<p>Advises the Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety.</p>	<ul style="list-style-type: none"> o Periodically inspects PPE and equipment. o Ensures that protective clothing and equipment are properly stored and maintained. o Implements the health and safety plan. o Conducts periodic inspections to determine if the Project Health and Safety Plan is being followed. o Knows emergency procedures, evacuation routes, and the telephone numbers for emergency response.

**TABLE 4.2 (Continued)
Personnel Responsibilities**

Title	General Description	Responsibilities
Project Health and Safety Officer (continued)		<ul style="list-style-type: none"> o Sets up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on site. o Controls the decontamination of all equipment, personnel, and samples from the contaminated areas. o Assures proper disposal of contaminated clothing and materials. o Ensures that all required equipment is available. o Notifies EG&G emergency response personnel by telephone or radio in the event of a emergency.
Subcontractor Health and Safety Manager		<ul style="list-style-type: none"> o Develops Health and Safety Guidelines. o Reviews Project Health & Safety Plans. o Develops site-specific Health & Safety procedures with Project Health & Safety Officer. o Conducts inspections, reviews compliance and review health & safety records.

TABLE 4.2 (Continued)
Personnel Responsibilities

Title	General Description	Responsibilities
Health and Safety Specialist	Provides support of operations involving monitoring of system processes and components for radiological contaminants.	<ul style="list-style-type: none"> o Performs routine monitoring of lab and PPE waste materials in accordance with EG&G procedures to ensure control of radiological contaminants. o Performs routine monitoring of sample shipment containers in accordance with EG&G procedures to ensure control of radiological contaminants. o Performs special monitoring for radiological contaminants as required in accordance with EG&G procedures.
Plant Operator	Provides daily operation and maintenance of plant. Stop work authority.	<ul style="list-style-type: none"> o Follows standard operating procedures. Verifies that plant is operating in a safe manner & complies with operations and environmental regulations. o Maintains daily records of all activities. o Conducts air monitoring, as required. o Advises Project Health and Safety Officer of any unusual events.

5.0 HEALTH AND SAFETY RISK ANALYSIS

The hazards associated with the operation of the FTU at OU2 include hazardous substances (chemical and radiological); physical hazards; heat and cold hazards; and possible construction hazards.

5.1 HAZARDOUS SUBSTANCES

Potentially contaminated surface water collected at the three weirs (SW-59, SW-61, and SW-132) is expected to contain numerous hazardous substances. This Section identifies and addresses potential chemical hazards.

5.1.1 Chemical Contaminant Hazards

Table 5.1 presents influent concentrations of site contaminants from the Design Basis of the Surface Water IM/IRA Treatment System. Actual operating experience indicates that the influent concentrations of most contaminants are well below the Design Basis concentrations.

Table 5.2 presents a summary of the chemical hazards, routes of exposure and first aid for each contaminant listed in Table 5.1.

5.1.2 Process Chemical Hazards

In addition to the hazards posed by contaminants contained in the influent waste stream, chemicals used in the treatment process pose a hazard to personnel. Table 5.3 presents a summary of the chemical hazards, routes of exposure and first aid for each process chemical used in the FTU. Material Safety Data sheets are contained in Appendix A.

TABLE 5.1

Basis for Design of Surface Water IM/IRA Treatment System

Constituent	Unit	Influent Concentration
<u>Organics:</u>		
Vinyl Chloride	$\mu\text{g/l}$	14
1,1-Dichloroethene	$\mu\text{g/l}$	142
1,1-Dichloroethane	$\mu\text{g/l}$	6
1,2-Dichloroethene (total)	$\mu\text{g/l}$	10
Chloroform	$\mu\text{g/l}$	82
Carbon Tetrachloride	$\mu\text{g/l}$	219
Trichloroethylene	$\mu\text{g/l}$	153
Tetrachloroethylene	$\mu\text{g/l}$	279
Methylene Chloride	$\mu\text{g/l}$	40
Acetone	$\mu\text{g/l}$	117
<u>Dissolved Metals:</u>		
Beryllium	mg/l	0.0053
Manganese	mg/l	0.5790
Strontium	mg/l	0.8396
Tin	mg/l	0.9036
<u>Total Metals:</u>		
Arsenic	mg/l	0.01 U ^a
Aluminum	mg/l	25.1214
Antimony	mg/l	0.0655
Barium	mg/l	1.853
Beryllium	mg/l	0.0519
Cadmium	mg/l	0.0132

TABLE 5.1 (Continued)

Basis for Design of Surface Water IM/IRA Treatment System

Constituent	Unit	Influent Concentration
<u>Total Metals (Con't):</u>		
Chromium	mg/l	0.1918
Cobalt	mg/l	0.1232
Copper	mg/l	0.2664
Iron	mg/l	183.9643
Lead	mg/l	0.1954
Lithium	mg/l	0.41
Manganese	mg/l	3.3068
Mercury	mg/l	0.0022
Nickel	mg/l	0.2239
Selenium	mg/l	0.007
Strontium	mg/l	0.8600
Vanadium	mg/l	0.5019
Zinc	mg/l	1.3475

^a The "U" designation following the Design Basis Concentration indicates the concentration is the detection limit for that constituent.

TABLE 5.2

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration (ACGIH) μg/l	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Vinyl chloride	14	1 ppm	Carcinogen	Colorless Gas or liquid (Below 56°F) Pleasant odor UEL: 33% LEL: 3.6%	Inhalation	Artificial Respiration	Weakness, abdominal pain; GI bleeding	9.99
1,1-Dichloroethylene (Vinylidene chloride) (1,1-Dichloroethene) (1,1-DCE)	142	1 ppm	Carcinogen	Colorless Liquid, mild sweet odor. LEL: 7.3% UEL: 16%	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Liver and kidney changes.	9.65
1,1-Dichloroethane	6	100 ppm	4,000 ppm	Colorless, oily liquid Chloroform-like odor	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	CNS depression; liver and kidney damage; skin irritation.	11.06
1,2-Dichloroethene (1,2-Dichloroethylene)	10	200 ppm	4,000 ppm	Colorless liquid with slightly acrid, chloroform-like odor. UEL: 12.8% LEL: 5.6%	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Eye irritation; CNS depression; Respiratory system	9.65
Chloroform (Methane trichloride; Trichloromethane)	82	2 ppm	Carcinogen (1,000 ppm)	Colorless liquid with pleasant odor. Not combustible.	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Dizziness; mental dullness; nausea; disorientation; ; fatigue; anesthesia; eye and skin irritation.	11.42

TABLE 5.2 (Continued)

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration $\mu\text{g/l}$	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Carbon Tetrachloride (Tetrachloro- methane)	219	2 ppm	Carcinogen (300 ppm)	Colorless liquid, sweet odor, not combustible. VP: 91 mm Hg	Inhalation Ingestion Absorption Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	CNS depression; nausea and vomiting; liver and kidney damage; skin irritation.	11.47
Trichloro- ethylene (Ethylene Trichloride) (TCE)	153	50 ppm	Carcinogen (1,000 ppm)	Colorless liquid, sweet odor. LEL: 8% UEL: 10.5% VP: 58 mm Hg	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Headache; vertigo; visual disturbance; nausea; eye and skin irritation.	9.45
Tetrachloro- ethylene Perchloro- ethylene) (Tetrachloro- ethene) (Perchlor)	279	25 ppm	Carcinogen (500 ppm)	Colorless liquid with sweet odor. Not combustible. VP: 14 mm Hg	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Eye, Nose, throat irritation; nausea; flush face; vertigo; headache; liver; kidney; CNS	9.32
Methylene Chloride (Dichloro- methane. Methylene Dichloride)	40	500 ppm	Carcinogen (5,000 ppm)	Colorless liquid with chloroform- like odor; BP: 104°F UEL: 22% LEL: 14%	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Fatigue; weakness; sleepiness; lightheaded- ness; numb- ness and tingling in limbs; nausea; eye and skin irritation	11.32

TABLE 5.2 (Continued)

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration $\mu\text{g/l}$	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Acetone	117	750 ppm	20,000 ppm	Colorless liquid with a fragrant mint-like odor. Fl. pt. 1.4°F LEL: 2.6% UEL: 12.8% VP: 266 mm Hg (@ 77°F)	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Eye, nose, and throat irritation; headache; dizziness; dermatitis	9.69
Beryllium	0.0053 mg/l (Dissolved) 0.0519 mg/l (Total)	0.002 mg/m ³	Carcinogen (10 mg/m ³)	Metal: a brittle, grey-white solid; noncombustible; slight explosion hazard in dust or powder form	Inhalation	For eye exposure, irrigate eyes immediately.	Respiratory symptoms; fatigue; weakness; weight loss.	N/A
Manganese	0.5790 mg/l (Dissolved) 3.3068 mg/l (Total)	5 mg/m ³	No evidence	Metal; a lustrous, brittle, silvery solid. Combustible.	Inhalation Ingestion	Artificial respiration; Seek medical attention.	Parkinson's; asthenia; insomnia; mental confusion; metal fume fever; dry throat; cough, tight chest.	N/A
Strontium	0.8396 mg/l (Dissolved) 0.8600 mg/l (Total)	NA	NA	Silvery-white metal.	Ingestion Inhalation	NA	Moderately toxic by ingestion, inhalation	N/A
Tin	0.9036 mg/l (Dissolved)	2 mg/m ³	400 mg/m ³	Gray to silver-white solid.	Inhalation Contact	Artificial respiration; Irrigate and wash affected area.	Skin and eye irritation.	N/A

TABLE 5.2 (Continued)

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration mg/l	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Arsenic	0.01 (Detection Limit)	0.010 mg/m ³	Carcinogen (100 mg/m ³)	Silver-gray or tin-white brittle solid.	Inhalation Absorption Contact Ingestion	Irrigate and wash affected area; immediate medical attention.	Nasal ulceration; GI disturbances; respiratory irritation.	N/A
Aluminum	25.1214	15 mg/m ³ (Total) 5 mg/m ³ Respirable)	NA	Silvery ductile metal	Inhalation	NA	Pulmonary fibrosis; possibly Alzheimer	N/A
Antimony	0.0655	0.5 mg/m ³	80 mg/m ³	Silvery white metal	Inhalation Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area;	Irritates eyes, nose, throat; cramps; vomiting; diarrhea; affects sleep and appetite	N/A
Barium	1.853	0.5 mg/m ³	1,100 mg/m ³	Silver-white, slightly lustrous	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Irritates eyes, nose, throat, upper respiratory; GI; muscle spasm; slow pulse; skin burns	N/A
Beryllium	0.0053 (Dissolved) 0.0519 (Total)	0.002 mg/m ³	Carcinogen (10 mg/m ³)	Metal; a brittle grey- white solid; noncombust ible; slight explosion hazard in dust or powder form	Inhalation	Irrigate eyes immediately	Respiratory symptoms; fatigue; weakness; weight loss	N/A

TABLE 5.2 (Continued)

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration mg/l	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Cadmium	0.0132	0.2 mg/m ³	Carcinogen (50 mg/m ³)	Silver-white, blue tinged solid	Inhalation Ingestion	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Pulmonary edema; cough; tight chest; chills, muscle aches; nausea, vomiting; diarrhea.	N/A
Chromium	0.1918	1 mg/m ³	No Evidence	Blue-white to steel-gray, lustrous solid	Inhalation Ingestion	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Corrosive to skin and mucous membranes; carcinogen of the lungs, nasal cavity, stomach, larynx	N/A
Cobalt	0.1232	0.05 mg/m ³	20 mg/m ³	Silver-gray to black solid	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Cough; decrease pulmonary function; dermatitis; respiratory hypersensi- tivity	N/A
Copper	0.2664	1mg/m ³	No Evidence	Reddish, lustrous malleable solid	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Irritation of eyes and mucous membranes, pharynx; poison by ingestion; metal taste; damage of nervous system, kidneys, and liver	N/A

TABLE 5.2 (Continued)

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration mg/l	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Iron	183.9643	10 mg/m ³	No Evidence	Silvery-white, tenacious, lustrous, ductile metal	Inhalation Ingestion	Artificial respiration; Seek medical attention	Poison by intraperitoneal route; tissue and lung irritant; and carcinogen	N/A
Lead	0.1954	0.050 mg/m ³	700 mg/m ³	Bluish-gray, soft metal	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Carcinogen of lungs and kidneys; affects CNS. GI tract, blood	N/A
Lithium	0.41	NA	NA	Silver-colored light metal	Inhalation Ingestion	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Reacts with body moisture to cause burns; toxic to CNS	N/A
Manganese	0.5790 (Dissolved) 3.3068 (Total)	5 mg/m ³	No Evidence	Silvery or reddish gray solid; brittle; combustible	Inhalation Ingestion	Artificial respiration; seek medical attention.	Parkinson's, CNS and lung damage; sleepiness; vomit; weakness; tremors	N/A
Mercury	0.0022	0.01 mg/m ³	10 mg/m ³	Silvery, mobile, odorless liquid	Inhalation Ingestion Contact Absorption	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Eye and skin irritant; poison by inhalation; cough; tremor; headache; irritability; GI and CNS affected	N/A

TABLE 5.2 (Continued)

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Contaminant (Synonyms) (Abbreviations)	Design Basis Concentration mg/l	PEL (OSHA) or TLV (ACGIH) or REL	IDLH	Physical/ Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms	IP eV
Nickel	0.2239	1 mg/m ³ (Insoluble) 0.1 mg/m ³ (Soluble)	Carcinogen (No Evidence)	Silvery- white, hard, malleable, and ductile metal	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Nasal, lung and skin irritant; carcinogenic	N/A
Selenium	0.007	0.2 mg/m ³	Unknown	Steel gray, nonmetallic element; combustible	Inhalation Absorption Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Irritated eyes, nose, throat; GI distress; chills; headache	N/A
Strontium	0.8396 (Dissolved) 0.8600 (Total)	NA	NA	Silvery-white metal	Ingestion Inhalation	NA	Moderately toxic by ingestion, inhalation	N/A
Vanadium	0.5019	NA	NA	Bright, white; soft ductile, slightly radioactive metal	NA	NA	NA	N/A
Zinc	1.3475	NA	NA	Bluish-white, lustrous metal	Inhalation Contact	NA	Lung and skin irritant; relatively nontoxic to humans by inhalation	N/A

TABLE 5.2 (Continued)

Chemical Hazards Posed by Site Contaminants and Route of Exposure

Key:

ACGIH	-	American Conference of Governmental Industrial Hygienists
C	-	Ceiling-Concentration shall not be exceeded at any time
CNS	-	Central Nervous System
Fl. pt.	-	Flash point-closed cup, unless otherwise noted
IDLH	-	Immediately Dangerous to Life and Health-Maximum concentration from which one could escape within 30 minutes without experiencing any irreversible health effects
IP	-	Ionization potential (eV)
LEL	-	Lower Explosive Limit
NA	-	Not available
OSHA	-	Occupational Safety and Health Administration
PEL	-	Permissible Exposure Limit-Concentration that nearly all workers may be repeatedly exposed, day after day, without adverse effect. (Based on an 8-hour workday and 40-hour workweek).
PPM	-	Parts Per Million
TLV	-	Threshold Limit Value-Concentration that nearly all workers may be repeatedly exposed, day after day, without adverse effect. (Based on an 8-hour workday and 40-hour workweek).
UEL	-	Upper Explosive Limit
$\mu\text{g}/\text{m}^3$	-	micrograms per cubic meter
VP	-	Vapor Pressure at 68°F in millimeters (mm) mercury (Hg) unless otherwise noted.

References

Air Contaminants- Permissible Exposure Limits (29 CFR 1910.1000).

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990 to 1991.

National Institute of Occupational Safety and Health, Pocket Guide to Chemical Hazards, June, 1990.

Sax, N. Irving, Dangerous Properties of Industrial Materials. Van Nostrand Reinhold Company, New York, 1979.

TABLE 5.3

Chemical Hazards Posed by Process Chemicals and Routes of Exposure

CHEMICAL (Synonyms)	CONCENTRATION	TLV/PEL	IDLH	PHYSICAL/ CHEMICAL CHARACTERISTICS	ROUTES OF EXPOSURE	FIRST AID	EXPOSURE SYMPTOMS
Ferric Sulfate (Ferri-Floc)	89% (Dry Chemical)	1 mg/m ³ (as Fe)	NA	Soluble Iron-Acid Dust	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Abdominal pain; diarrhea; pallor; lassitude, drowsiness
Sulfuric Acid	93% (in drum) 20% (TK-5) 10% (TK-9) 3% (Feed to TK-11)	1 mg/m ³ STEL = 3 mg/m ³	80 mg/m ³	Colorless to dark brown, oily, odorless liquid; non-combustible	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Eye, nose and throat irritation; pulmonary edema; bronchitis, emphysema
Hydrochloric Acid	7-38% (Reagent Grade)	5 ppm (7 mg/m ³)	100 ppm	Colorless liquid	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Nose and throat irritation; burns throat and eyes; cough, choking.
Calcium Hydroxide (Hydrated Lime)	10% Solution	5 mg/m ³	Unknown	White, odorless solid before mixing; disagreeable, sweet odor in solution	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Severe skin irritation; nose irritation; eye irritation.
Hydrogen Peroxide	35% (in drum) 2-3% (TK-9)	1 ppm	75 ppm	Colorless liquid with a slightly sharp odor. Noncombustible	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Eye, nose and throat irritation; corneal ulcer
Granular Activated Carbon (GAC)	100%	0.7 mg/m ³ (Respirable) 2.1 mg/m ³ (Total)	NA	Black granular solid	Inhalation Ingestion Contact	Remove to fresh air; drink liquids; irrigate and wash affected area immediately.	Cough; skin irritation; GI distress; eye irritation

TABLE 5.3 (Continued)
Chemical Hazards Posed by Process Chemicals and Routes of Exposure

CHEMICAL (Synonyms)	CONCENTRATION	PHYSICAL/ CHEMICAL TLV/PEL	PHYSICAL/ CHEMICAL IDLH	CHARACTERISTICS	ROUTES OF EXPOSURE	FIRST AID	EXPOSURE SYMPTOMS
Sodium Hydroxide (Caustic Soda, Lye)	25% Solution	2 mg/m ³	250 mg/m ³	Liquid; White, odorless solid before mixing; disagreeable, sweet odor in solution.	Inhalation Ingestion Contact	Artificial respiration; Seek medical attention; Irrigate and wash affected area immediately.	Severe skin irritation; nose irritation; temporary loss of hair.

5.2 RADIOLOGICAL HAZARDS

The radiological hazards associated with operation of the FTU arise from alpha, beta, and gamma radiations which are emitted from the present radionuclides during decay. Table 5.4 lists radionuclides and design basis concentrations. Alpha, beta, and gamma radiations are all forms of ionizing radiation. The chronic health hazards associated with exposure to ionizing radiation may include an increased risk of cancer and genetic effects. Various acute health effects are associated with high radiation exposures. An acute health effect is defined as an observable physiological change appearing within days to several weeks after exposure. However, radiation levels associated with operation of the FTU are well below those necessary to produce acute health effects. The radionuclide concentrations in the plant influent water are well below these design basis values.

TABLE 5.4
RADIOLOGICAL CONTAMINANT DESIGN BASIS FOR IM/IRA TREATMENT
SYSTEM

Constituent	Units	Influent Concentration
Dissolved Radionuclides:		
Gross Alpha	pCi/l	20.11
Gross Beta	pCi/l	39.90
Total Uranium	pCi/l	9.96
Total Radionuclides:		
Gross Alpha	pCi/l	730.0
Gross Beta	pCi/l	545.0
Plutonium 239, 240	pCi/l	3.28
Americium 241	pCi/l	0.53
Total Uranium	pCi/l	11.69

FTU operators may be exposed to low levels of alpha, beta, and gamma radiation through external beta/gamma radiation, radioactive air particulates, and radioactive contamination. The greatest potential for any health effects from radiation are at processes or material locations in which the contaminants contained in the water are concentrated (e.g., the solids handling systems, concentration tank solids, settling tank, and the filter press). Monitoring methods, worker exposure limits, and administrative action levels for these radiation exposure aspects are addressed in Section 9.0 of this plan.

5.2.1 External Radiation Exposure

Both beta and gamma radiations are emitted by the radionuclides present in the FTU waste stream. External beta radiation cannot penetrate beyond the shallow layers of the skin or the lens of the eye, and so associated hazards are confined to these areas. However, eye exposure to external beta radiation is greatly reduced or eliminated through the use of eye protection.

External gamma radiation, unlike beta radiation, readily penetrates deep into the body and is therefore hazardous to internal organs. Clothing and eye protection are not effective at reducing external gamma radiation exposure. Three accepted methods to minimize gamma exposures are:

- the use of shielding between personnel and the radiation source;
- minimizing time in the radiation area; and
- maximizing distance from the radiation source.

Due to low levels of gamma radiation, external shielding designed to reduce gamma radiation exposure should not be necessary for workers at the FTU. Should external radiation be of concern, the most effective methods of reducing worker exposure to external gamma radiation will be by posting areas where elevated gamma exposure rates exist, limiting the amount of time workers spend in these areas, and maintaining a maximum distance from radiation sources.

5.2.2 Internal Radiation Exposure

Alpha radiation is present in the FTU waste stream. Alpha radiation, due to its relatively large mass and charge, does not pose an external hazard and will not penetrate the layer of dead skin cells. However, alpha radiation is a significant internal hazard due to the large amount of energy deposited in small, localized areas of internal organs. Alpha radiation is principally admitted to the body by inhalation of airborne contamination or ingestion, injection, or absorption of surface contamination.

Radioactive contamination existing in the form of loose material is capable of migrating or being transported by a variety of mechanisms such as movement of personnel, vehicles, equipment, and wind. Several hazards are posed to workers concerning loose contamination. These hazards are inhalation, ingestion, injection, and absorption of contamination.

Air particulates that are suspended or have settled out on horizontal surfaces (equipment) and have been resuspended pose an inhalation hazard. Drinking contaminated water, eating contaminated food, and/or transferring contamination to the mouth pose an ingestion hazard. Abrasions, lacerations, or punctures of the skin resulting from contact with contaminated surfaces pose an absorption hazard.

5.3 OPERATIONAL SAFETY HAZARDS

The primary operational safety hazards and associated with this work and the control measures which will be implemented include the following:

- Injuries from moving and/or energized parts and machinery; engineering controls include the installation of guards to prevent contact with moving machinery; administrative controls include the use of lock out/tag out procedures to prevent injury from energized and/or pressurized systems.
- Injuries from defective tools or mishandling of tools, materials, or equipment; controls will include inspection of all tools prior to use for defects or damage and thorough training of operational personnel in the proper handling and use of the materials and equipment in use at the FTU; proper equipment use will be controlled through the use of approved Standard Operating Procedures.
- Injuries from falls during work performed at above ground locations or from being struck by falling objects; controls will include training and use of the proper fall protection equipment and use of hard hats where overhead hazards are present.

- Injuries from slips, trips, and falls from working on wet surfaces or in inadequately illuminated work areas; controls will include proper housekeeping and control of liquid and snow and ice on walking surfaces and the use of slip resistant surfaces; adequate lighting will be provided and maintained in all work areas requiring access during darkness.
- Injury during work in confined spaces; All entries into designated confined spaces will be performed in accordance with current Rocky Flats confined space policies and procedures by properly trained personnel.
- Injuries from failure to wear proper personal protective equipment; Section 8.0 of this Health and Safety Plan contains requirements for selection and use of personal protective equipment during all tasks associated with operation and maintenance of the FTU. Operational personnel receive training in the use of personal protective equipment and are required to read and acknowledge understanding of the contents of this plan. Additionally, Daily Safety Briefings are conducted at the beginning of each shift to discuss planned activities and control measures required, including the proper personal protective clothing.

5.4 ENVIRONMENTAL AND BIOLOGICAL HAZARDS

In addition to the hazards described above, during the operation and maintenance of the FTU, there is the potential for worker exposure to high winds, serious temperature extremes, biological hazards, and noise. High winds pose a hazard to workers in areas outside the FTU trailers. Outside work will be curtailed due to sustained winds following Rocky Flats sitewide announcements. Potentially serious temperature extremes could produce heat related illnesses such as heat stroke, heat exhaustion, and heat cramps. The FTU will not be cooled except for the office and GAC trailers. During extreme cold weather, the primary hazards of concern will be hypothermia and frostbite. This is of concern primarily while outside, since the trailers are heated in the winter months. The main biological hazards of concern, primarily outside the FTU trailers, will be insect and snake bites. Additionally, equipment and machinery may generate levels of noise that could contribute to chronic hearing loss.

6.0 GENERAL SITE REQUIREMENTS

Given the diverse nature and potential effects of the expected contaminants at the OU2 water treatment plant, careful safety precautions are necessary to ensure maximum protection of human health and the environment. This section presents general requirements which apply to all activities on the site. The purpose of these requirements is to ensure that operators and other subcontractor personnel involved with the operation of OU2 are properly prepared for the activities they will be performing.

6.1 EMPLOYEE TRAINING

All operators and associated personnel working on this project shall be trained in accordance with the requirements of 29 CFR 1910.120. A training file for each subcontractor site employee will be maintained on site. This training file will include certificates and training records required by the subcontractor as well as site specific forms generated by the operating contractor. A training file containing subcontractor training records will also be maintained at the subcontractors office.

6.1.1 40-Hour Hazardous Waste Site Training

This training shall be a 40-hour hazardous waste course including the following elements:

- Hazard identification;
- Applicable regulations;
- Permissible exposure limits;
- Hazard communication (MSDS, reference sources);
- Physical & chemical effects of hazardous materials;
- Air monitoring; and
- Respiratory protection including fit testing.

6.1.2 24-Hour On-The-Job Training

In addition, a site specific OSHA 24-hour on-the-job training shall be given to all workers and properly documented. This shall consist of a review of site contaminants and hazards, the contents of this plan, and the actions to be taken in the event of emergencies. Employees shall also be trained on the use of MSDS sheets which will be available to all personnel for chemicals used in the FTU.

6.1.3 Respiratory Protection Training

Respiratory Protection training is integral to the subcontractor Respiratory Protection Program. Field personnel will complete the level of respiratory protection training that is appropriate to their job description during initial 40 hour OSHA training and annually thereafter. Topics that will be covered for subcontractor operations personnel at the FTU will include the following:

- Overview of respiratory protection;
- Physiology of the respiratory system;
- Classification of respiratory hazards;
- Air-purifying respirators;
- Respirator selection, use and limitations;
- Fit testing, maintenance and cleaning;
- Air supplying respirators/SCBAs/airline respirators;
- SCBA/airline respirators field exercise; and
- Examination.

6.1.4 Supplemental Training

Supplemental training shall include the following:

- 8-hour supervisor training (shift foremen, Health and Safety Officer);
- Current 8 hour refresher training (all employees); and
- First aid and CPR training (at least one employee per shift).

The Project Manager shall be responsible for verifying the current status of training for all employees assigned to the project. Any deficiencies shall be cleared prior to the employee beginning work on the field portion of the project.

Finally, all employees must read and acknowledge in writing that they have read this site specific Health and Safety Plan. A sample acknowledgement is shown on Figure 6.1. Blank acknowledgement forms must be kept in the operations trailer at OU2 at all times and original signed forms kept by the Project Manager in the project files. Subcontractors shall also sign Health and Safety Plan Acknowledgements if they are working under the subcontractor Project Health and Safety Plan.

The preceding requirements are those that must be satisfied for any field work regardless of the site. There are also several training requirements to satisfy the site-specific requirements of both the subcontractor and the operating contractor. These site specific requirements include:

- Rocky Flats Radiation Workers for Environmental Restoration Safety Training;
- Pressure Safety Awareness training (as directed by the Rocky Flats Project Manager);
- Rocky Flats Waste Generator Non PA Training Course (for operation of filter press equipment and packaging of waste drums); and



RESOURCE
TECHNOLOGIES
GROUP, INC.

HEALTH AND SAFETY PROGRAM HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT

Project Number _____

Project Name _____

Project Location _____

I hereby acknowledge that I have been given a safety briefing on the work I am to do on the above-referenced site. I understand that the site may contain materials classified by EPA or others as potentially hazardous. I have read and understand the safety plans for this project and will adhere to the procedures contained therein. I have been instructed in and understand the use of the safety equipment for this project.

Employee

Date _____

Print Name _____

Signature _____

Project Manager or Representative

Date _____

Print Name _____

Signature _____

- All operations personnel will receive site specific training pertaining to chemicals and materials used in the operation of the OU2 treatment facility regarding the routes of exposure and adverse health effects.

6.2 MEDICAL MONITORING

In accordance with 29 CFR 1910, all employees assigned to a field project at a hazardous waste site shall be part of a Medical Monitoring Program. The Project Manager shall be responsible for verifying the current medical monitoring status for all employees assigned to the project. Any deficiencies shall be cleared prior to the employee doing any field work on the field project.

6.3 DAILY SAFETY BRIEFINGS

As described in Section 6.1, all workers shall receive a safety briefing on the contents of this plan prior to beginning work. In addition, a health and safety briefing shall be performed at the beginning of each shift. The briefing shall be conducted by the shift Health and Safety Officer, and shall cover the specific tasks to be performed for that shift. Health and safety concerns for planned tasks shall be reviewed, and required procedures discussed. The attendees at the briefing, and the items discussed, shall be documented in the daily Safety Briefing Report shown on Figure 6.2. A supply of blank Safety Briefing Forms will be kept in the operations trailer for OU2.

6.4 POSTING AND SITE ACCESS

The Rocky Flats site is a controlled access area with the OU2 treatment plant located inside the perimeter Rocky Flats fencing. Access to the treatment plant is through one of several security points at the facility and requires proper badging. Access to the OU2 treatment trailers shall be limited to subcontractor operations and supervisory personnel in addition to appropriate operating contractor personnel. Any maintenance or other personnel will be trained in accordance with the requirements presented in this section. Personnel without proof of 40-hour OSHA training will also be accompanied by an operator.



HEALTH AND SAFETY PROGRAM SAFETY BRIEFING REPORT

Project Number _____ Name _____

Project Location _____

Project Manager _____

Site Health and Safety Officer _____

Date _____ Weather _____

Task Specific Safety Requirements

Task: _____

Personnel:

<u>Name</u>	<u>Assignment</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Safety Requirements: _____

Task Specific Safety Requirements

Task: _____

Personnel:

<u>Name</u>	<u>Assignment</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Safety Requirements: _____



Task Specific Safety Requirements

Task: _____

Personnel:

Name

Assignment

_____	_____
_____	_____
_____	_____

Safety Requirements: _____

Task Specific Safety Requirements

Task: _____

Personnel:

Name

Assignment

_____	_____
_____	_____
_____	_____

Safety Requirements: _____

Briefing Acknowledgement:

Printed Name

Signature

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Briefing Conducted By:

6.5 BUDDY SYSTEM

All work which requires an operator to directly handle, sample or transport hazardous materials, hazardous waste or waste containers at Rocky Flats requires the use of the buddy system. This includes process chemical preparation, drum or chemical transfers, maintenance, and operation of the filter press. The buddy system ensures that each worker is observed by another worker who can provide rapid assistance in case of emergency. In addition, any work requiring greater than Level D protection requires use of the buddy system. Operators may monitor controls and gauges in the plant without use of the buddy system provided radio contact is maintained with the roving foreman. At no time shall any worker engage in any kind of emergency response without the use of the buddy system. Workers shall immediately evacuate the danger area upon discovery of a potential emergency situation.

7.0 EMERGENCY RESPONSE PLAN

This project involves the operation of an existing water treatment plant. Potential emergency situations during work at the OU2 site include fire, hazardous substance release, employee contamination, accidents and injuries. Safety precautions will be taken to avoid emergency situations. However, if an emergency does arise, the procedures described in this section will be followed. Also, preparatory steps necessary for responding to an emergency situation are given below and they should be complied with before beginning any work at the site.

The integrating contractor maintains an emergency response telephone extension of **2911** at Rocky Flats. Extension **2911** may be reached from any plant site telephone system instrument and will immediately connect the caller with the Fire Department, the Central Alarm Station, the Shift Superintendent and, during first shift, Occupational Health.

7.1 FIRE

All personnel should move or be moved to a safe distance from any area involved in a fire situation. The Rocky Flats emergency extension at **2911** shall be called immediately. The subcontractor Shift Foreman shall immediately notify subcontractor and Rocky Flats personnel as shown on page 7-8. Fire extinguishers shall be inspected on a monthly basis in accordance with Rocky Flats requirements.

7.2 HAZARDOUS SUBSTANCE RELEASE

7.2.1 Definitions

EMERGENCY RESPONSE action is a response effort to an occurrence which results, or is likely to result, in an uncontrolled release of hazardous materials or substances. This does not include response to incidental releases of hazardous materials or substances. An **EMERGENCY RESPONSE** involves support efforts by employees from outside the immediate release area or by designated responders (e.g., HAZMAT Team or Radiological Assistance Team).

INCIDENTAL RELEASE includes spills, leaks or other releases where the substance can be safely absorbed, neutralized, or otherwise controlled by employees or maintenance personnel in the immediate release area at the time of the release. It also includes releases of hazardous substances for which there is no potential safety or health hazard (i.e., fire, explosion or chemical exposure) above the normal operating conditions in the work area. Use of additional personal protective equipment (e.g., chemical cartridge respirators) not used during normal work activities is not allowed.

RELEASE means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, or dumping of a hazardous material or hazardous waste in any building/containment or to the environment.

REPORTABLE RELEASE are all solid and liquid releases of a hazardous material or a hazardous substance greater than or equal to one pound (or **one pint** for aqueous liquids) and all gaseous (gas/vapor) releases that threaten or occur inside or outside of any building/containment and that are unplanned.

A list of hazardous and extremely hazardous substances (including radionuclides) is included as Attachment 1 to Section 4.0 of the Hazardous Waste Requirements Manual, 1-10000-HWR.

7.2.2 Field Treatability Unit Release Hazard Analysis

Table 7.1 contains a hazard analysis of all materials at the Field Treatability Unit which

TABLE 7.1
SPILL RESPONSE HAZARD ANALYSIS

MATERIAL SPILLED	SPILL PROCEDURES	PERSONAL PROTECTIVE EQUIPMENT REQUIRED
Calcium Hydroxide	<p>Dry: Sweep up and containerize for reuse or disposal; control dust generation during cleanup.</p> <p>Liquid solution: Absorb with universal absorbants or clean up with wet vacuum.</p>	Level D: Work clothes (Tyvek optional); safety shoes; safety glasses or goggles and full face shield; leather work gloves. Air purifying respirator with HEPA cartridges for dry cleanup if dust cannot be controlled.
Sulfuric Acid	Cover with sand; neutralize with soda ash, lime, or neutralizer only with adequate ventilation as carbon dioxide is generated; place in appropriate container for disposal.	Level D: Work clothes with plastic coated Tyvek; safety shoes with neoprene boot covers; safety glasses with full face shield; elbow length neoprene or butyl gloves. No entry without PAPR ^a or SA ^b if monitoring indicates levels above TLV of 1 mg/m ³ .
Hydrochloric Acid	Flush with water; neutralize with soda ash or lime only with adequate ventilation as carbon dioxide is generated; eliminate sources of ignition as hydrogen may be generated; place in appropriate container for disposal.	Level D: Work clothes with plastic coated Tyvek; safety shoes with neoprene boot covers; safety glasses with full face shield; elbow length neoprene or butyl gloves. No entry without SCBA in event of a spill of concentrated hydrochloric acid.
Hydrogen Peroxide	Flush area with water; place in appropriate container for disposal.	Level D: Work clothes with plastic-coated Tyvek; safety shoes with neoprene boot covers; safety glasses with full face mask; neoprene or butyl gloves. SA or SCBA ^c required if monitoring indicates levels above TWA of 1 ppm.
Sludge	Place sludge material in appropriate container for disposal; perform decontamination of area with soap and water.	Level D: Tyvek coverall; safety shoes; safety glasses with full face shield; neoprene or butyl gloves; APR or SCBA required if monitoring indicates levels above those noted in Section 8.2.

**TABLE 7.1 (Continued)
 SPILL RESPONSE HAZARD ANALYSIS**

MATERIAL SPILLED	SPILL PROCEDURES	PERSONAL PROTECTIVE EQUIPMENT REQUIRED
Generator Fuel	Contain spill; absorb with universal or oil absorbant; place in appropriate container for disposal.	Level D: Work clothes; safety shoes with boot covers; safety glasses or goggles; leather gloves.
Spent Granular Activated Carbon	Contain spill; place material in appropriate container for disposal.	Level B: Total body Saranex suit; safety shoes with neoprene boot covers; inner and outer chemical resistant gloves; Air monitoring for compounds in Section 8.2.
Sodium Hydroxide	Flush with water; neutralize with dilute acid; absorb with universal absorbants or pick up spill with vacuum or pumping equipment; place in appropriate container for disposal.	Level D: Work clothes with plastic coated Tyvek or apron, elbow length neoprene or butyl gloves and overboots; safety glasses with full face shield.
Liquid Wastewater and Slurry	Contain spill; absorb with universal absorbants or recover with wet vacuum or pump; place in appropriate container for disposal.	Level D: Work clothes with plastic coated Tyvek; safety shoes with neoprene boot covers; safety glasses or goggles with full face shield; neoprene or butyl gloves. Air monitoring for compounds in Section 8.2.

Notes:

- a Powered, air purifying respirator
- b Supplied Air
- c Self Contained Breathing Apparatus

have the potential to be released and the appropriate level of personal protective equipment required for spill response.

7.2.3 Initial Response Requirements

If an employee properly trained in accordance with the requirement in Section 6.0 discovers an incidental release in his/her work area and is knowledgeable of the associated hazards, the employee may take immediate action to contain and/or control the release (e.g., shut a valve to stop the flow). Such action shall not be undertaken without the presence of the shift foreman in accordance with Section 6.5. An incidental release may be cleaned up as part of the first response actions.

Note: Action should only be taken if the employee can perform them in a safe manner without endangering himself/herself or others.

If the spill or release is life threatening or involves a fire, the Shift Foreman shall immediately call the Plant Emergency Number (extension **2911**). All other spills and releases shall be immediately reported to the operating contractor and subcontractor supervision, who will assess the event or condition to determine if an emergency response is required. Supervision may request assistance, as required, of support groups (e.g., Industrial Hygiene, Radiological Engineering, etc.) to make this determination.

If the event or condition requires an emergency response, supervision shall immediately call the Plant Emergency Number (extension **2911** for life threatening emergencies) or the Shift Superintendent (extension **2914** for non-life threatening emergencies) for assistance. Containment measures shall only be performed by personnel with First Responder Operations Level training. Following containment of the spill, adequately trained FTU operations personnel or Hazmat team members may perform cleanup operations.

7.3 EMPLOYEE CONTAMINATION

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her coworker(s) will immediately leave the work area for which the PPE was required. Re-entry to the secondary containment area will not be permitted until the equipment has been repaired or replaced. If any other incidents occur that involve the contamination or exposure of an employee to hazardous or toxic substances, the Rocky Flats emergency extension at **2911** shall be notified immediately to dispatch the appropriate emergency personnel.

First aid or other decontamination procedures should be administered if they can be without endangering other operations personnel. A first aid kit will be located in the office area of the operations trailer. The Shift Foreman shall notify operating contractor and subcontractor supervision immediately.

7.4 ACCIDENT/INJURY

In the event of an accident or other event that causes injury to operations or any other personnel present at the OU2 site, the Rocky Flats emergency extension at **2911** shall be notified immediately. The site Fire Department, EMT's and Security will be dispatched immediately. Details of the emergency and the exact location must be given over the phone. Basic first aid may be administered by subcontractor personnel until emergency medical assistance is available. Each shift will have a minimum of one subcontractor staff member trained in American Red Cross First Aid and CPR. A first aid kit will be kept in the office section of the operations trailer.

Any non-emergency medical situation such as minor cuts or sprains should be attended to at:
Rocky Flats Medical - Building 122

The Shift Foreman shall immediately notify Rocky Flats and subcontractor supervision of any accident or injury.

7.5 COMMUNICATIONS

The OU2 water treatment facility consists of three treatment trailers and an operations trailer all located in close proximity. The small work area and requirement of the "buddy system" during work activities allows face to face communication among workers. A phone is located in the office part of the operations trailer and in Trailer #2 near the main control panel for communication in emergencies. Any work required at other areas of the Rocky Flats plantsite require the availability of two way radios for emergency use. The onsite emergency extension is **2911**.

7.6 INCIDENT REPORTING

The following list of supervisory personnel and their telephone numbers will be posted by the telephone(s) closest to ongoing field activities. One contractor and subcontractor staff member will be notified using the call-in order listed of any spill, release, personnel contamination, accident or injury, major equipment failure or out of specification discharge.

EMERGENCY TELEPHONE NUMBERS

Site OU2 Emergency Contacts

Telephone Number

Contact: Ty Vess

Rocky Flats Phone: 966-6540
Pager: 5476
Home Phone: 277-1241

Back-up: Mark Burmeister

Rocky Flats Phone: 966-5891
Pager: 4630
Home Phone: 666-0903

Back-up: Russ Cirillo

Rocky Flats Phone: 966-5876
Pager: 5477
Home Phone: 763-4711

Back-up: Marla Broussard

Rocky Flats Phone: 966-8517
Pager: 4010
Home Phone: 530-5562

If none of the Rocky Flats personnel listed above are available, contact the Rocky Flats Shift Superintendent at 966-2914.

Rocky Flats Emergency Response Extension 2911

RTG OU2 Emergency Contacts

RTG Project Manager

Contact: Mike Griffin

RTG Phone: 969-8511
Home Phone: 838-9590

RTG Health and Safety Officer

Contact: Bart Conroy

RTG Phone: 969-8511
Home Phone: 989-1347

RTG Program Manager

Contact: Erich Tiepel

RTG Phone: 969-8511
Home Phone: 795-1381

RTG Site Health and Safety Officer

Contact: David Barnes

RTG Phone: 966-4310
Home Phone: 989-6003

8.0 PERSONAL PROTECTIVE REQUIREMENTS

The purpose of personal protective equipment (PPE), including clothing, is to shield or isolate individuals from the chemical, physical and biological hazards that they may encounter at sites containing hazardous or toxic materials. The careful selection and use of PPE will protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. In addition, use of PPE is required by Occupational Safety and Health Administration (OSHA) regulations in 29 CFR Part 1910, and reinforced by U.S. Environmental Protection Agency (EPA) regulations and American Standards Institute (ANSI) standards and guidelines.

No single combination of protective equipment and clothing is capable of protecting against all hazards, and PPE must be used in conjunction with other protective methods. The use of PPE can in itself create significant worker hazards, such as heat stress, physical and psychological stress, impaired vision, mobility, and communication.

Specific protective garments are selected on the basis of a variety of criteria. In general, the greater the level of PPE, the greater the associated risks. For any given situation, equipment and clothing must be selected to provide an adequate level of protection. Over-protection as well as under-protection can be hazardous and should be avoided.

Table 8-1 summarizes PPE requirements for specific tasks associated with operation of the FTU. The following sections detail the criteria for selecting specific personal protective equipment (PPE) which will apply to this project.

TABLE 8.1

Personal Protective Equipment Summary

Task	Level	Body	Foot	Head ¹	Eye	Hand	Respirator
Operation of FTU	D	Work Clothes	Safety Shoes	None Required	Safety Glasses	None Required	None Required ³
Mixing Sulfuric Acid in TK-5, TK-9 and Mix tank for TK-11; Mixing hydrochloric acid for TK-9	D	Acid Apron or plastic-coated Tyvek suit	Safety Shoes with neoprene boot covers	None Required	Safety Glasses and full face splash shield	Elbow length Neoprene or Butyl gloves	None Required ³
Adding Hydrated Lime to TK-6	D	Work Clothes (Tyvek optional)	Safety Shoes	None Required	Safety Glasses and face shield	Leather work gloves	None Required ³ with blower and filter operational.
Adding Ferric Sulfate to TK-5	D	Work Clothes (Tyvek optional)	Safety Shoes	None Required	Safety Glasses and face shield	Leather work gloves	None Required ³
Adding Hydrogen Peroxide to TK-9	D	Acid Apron or plastic-coated Tyvek suit	Safety Shoes with neoprene boot covers	None Required	Safety Glasses and full face splash shield	Neoprene or Butyl gloves	None required ³
Packaging sludge with filter press	D	Saranex total body coverall ²	Safety shoes	None Required	Safety glasses	Neoprene or butyl gloves	None required ³
Cleaning filter press	D	Plastic-coated Tyvek suit	Safety shoes with neoprene boot covers	None Required	Safety glasses with full face splash shield	Neoprene or butyl gloves	None required ³
Collecting water samples	D	Work clothes	Safety shoes	None required	Safety glasses with full face splash shield	Neoprene or butyl gloves	None required ³

TABLE 8.1

Personal Protective Equipment Summary

Task	Level	Body	Foot	Head¹	Eye	Hand	Respirator
Operation of FTU	D	Work Clothes	Safety Shoes	None Required	Safety Glasses	None Required	None Required ²
Mixing Sulfuric Acid in TK-5, TK-9 and Mix tank for TK-11; Mixing hydrochloric acid for TK-9; Handling/mixing sodium hydroxide.	D	Acid Apron or plastic-coated Tyvek suit or Saranex	Safety Shoes with neoprene boot covers	None Required	Safety Glasses and full face splash shield	Elbow length Neoprene or Butyl gloves	None Required ²
Adding Hydrated Lime to TK-6	D	Work Clothes (Tyvek optional)	Safety Shoes	None Required	Safety Glasses and face shield	Leather work gloves	None Required ² with blower and filter operational.
Adding Ferric Sulfate to TK-5	D	Work Clothes (Tyvek optional)	Safety Shoes	None Required	Safety Glasses and face shield	Leather work gloves	None Required ²
Adding Hydrogen Peroxide to TK-9	D	Acid Apron or plastic-coated Tyvek suit	Safety Shoes with neoprene boot covers	None Required	Safety Glasses and full face splash shield	Neoprene or Butyl gloves	None required ²
Packaging sludge with filter press	D	Tyvek suit	Safety shoes	None Required	Safety glasses	Neoprene or butyl gloves	None required ²
Cleaning filter press	D	Plastic-coated Tyvek suit	Safety shoes with neoprene boot covers	None Required	Safety glasses with full face splash shield	Neoprene or butyl gloves	None required ²
Collecting water samples	D	Work clothes	Safety shoes	None required	Safety glasses with full face splash shield	Neoprene or butyl gloves	None required ²

TABLE 8.1 (Continued)
Personal Protective Equipment Summary

Task	Level	Body	Foot	Head¹	Eye	Hand	Respirator
Cleanup of small spills	See Table 7.1	See Table 7.1	See Table 7.1	See Table 7.1	See Table 7.1	See Table 7.1	See Table 7.1
Miscellaneous maintenance work	D	Work Clothes	Safety shoes	Hardhat	Safety glasses	Leather work gloves or none required	None required

¹ The subcontractor Health and Safety Manager and Rocky Flats IH shall specify hardhat areas.

² Respiratory protection requirements based upon continuing monitoring for airborne contaminants as discussed in Section 8.0

8.1 CLOTHING

The use of Level D protective equipment is defined by the following criteria:

- No contaminants are present, or contaminants are present below the action levels established in the HASP for respirator use; and
- Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

Experience with previous treatment operations indicates that the chance of encountering contamination in the work area is minimal given the low concentration of contaminants. Therefore, Level D protection will be adequate during most normal work activities. This is a field work uniform affording minimal protection, consisting of the following PPE:

- Safety boots, leather or chemical resistant, with steel toe and shank;
- Safety glasses (ANSI Z87.1-1989 compliant) with side shields or goggles.

The following additional PPE may be required as part of Level D protection depending on the specific tasks being performed:

- Coveralls;
- Work gloves;
- Hearing protection;
- Hard hat with face shield.

Table 8.1 provides a Personal Protective Equipment Summary for routine tasks associated with the operation and maintenance of the FTU. Non-routine tasks which are not listed in Table 8.1 will be addressed on a case-by-case basis by the subcontractor and the operating contractor and the appropriate level of PPE will be determined with approval from the operating contractor.

Hearing protection (ear plugs or ear muffs) with a minimum Noise Reduction Rating (NRR) of 18 decibels is required for operating and visiting personnel in Trailer T900A during operation of the Process Pump and in T900B during operation of the system air compressor. Sound level surveys should be conducted periodically to detect any changes in conditions.

Chemical resistant gloves shall be worn when handling process treatment chemicals. Disposable gloves shall not be reused. Reusable gloves shall be stored properly in zip lock plastic bags when not in use. Face shields and aprons shall also be worn during operations with the potential for splashing. A Tyvek suit may also be worn if splashing potential is judged to be high.

Tank top shirts, shorts, and tennis shoes are not permissible. PPE shall meet the applicable ANSI and OSHA standards. Where appropriate and more stringent, the subcontractor will comply with Rocky Flats Plant PPE requirements. Modifications or substitutions of the PPE specified herein shall be subject to written approval by the operating contractor.

If air monitoring as described in Section 9.0 indicates the presence of organic vapors in excess of action levels, Level C PPE may be required. The PPE for Level C shall include the following:

- Full Face Air-purifying respirator with appropriate cartridges or canisters;
- Chemical-resistant clothing consisting of:
 - coveralls,
 - hooded one- or two-piece chemical splash suit, or
 - chemical-resistant hood and apron, or
 - disposable chemical-resistant coveralls
 - inner and outer chemical resistant gloves.

Optional

- hard hat

- outer disposable chemical-resistant boot covers,
- face shield,
- 2-way, intrinsically safe radios,
- long cotton underwear.

The criteria to evaluate when considering whether Level C PPE is required include the following:

- Oxygen concentrations are greater than 19.5 percent and less than 23.5 percent by volume;
- Measured air concentrations of identified substances will be reduced by the respirator below the PEL, TLV, or REL, and the concentration is within the service limit of the cartridge;
- Atmospheric contaminant concentrations do not exceed IDLH levels;
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect anyone left unprotected by chemical-resistant clothing;
- Job functions do not require self-contained breathing apparatus; and
- Continuous direct readings on monitoring instruments, such as FIDs or PIDs, are within the action levels prescribed in the Health And Safety Plan for air-purifying respirator use.

The main selection criterion for Level C, as opposed to the more restrictive Level B, is that conditions permit wearing air-purifying respirators. Cartridges must be able to remove the substances encountered.

A full-face, air-purifying respirator can be used only if:

- The substance has adequate warning properties;

- The individual using the mask has passed at least a qualitative fit-test;
- The individual has medical clearance for the use of respirators; and
- The appropriate cartridge is used and its service limit concentration is not exceeded.

The chemical and radiological hazards expected to be encountered at the OU2 site were discussed previously in Section 5.0 and presented on Table 5.2, 5.3, and 5.4. It is apparent from reviewing this information that a full-face respirator with a combination organic vapor/HEPA cartridge should be adequate in situations that require respiratory protection and will be maintained at the site in the event that they are required. If experience and data indicate that the contaminants are significantly different than those discussed in Section 5, then the respiratory protection requirements must be reevaluated.

An air surveillance program is part of all hazardous material/waste site operations when atmospheric contamination is known or suspected. It is mandatory that the ambient air be thoroughly and continuously monitored when personnel are wearing air-purifying respirators. Surveillance using a direct-reading instrument and/or other air sampling equipment, in accordance with the HASP, is required during all Level C and B operations to detect changes in air quality necessitating a higher level of respiratory protection. Level C protection with an air purifying respirator will be worn routinely in an atmosphere only after the type of air contaminant is identified, concentrations measured, and the criteria for wearing air-purifying respirators are met.

8.2 RESPIRATORY PROTECTION

The requirements for respiratory protection have been discussed briefly in Section 8.1 and will be presented in greater detail in this section. Respiratory protection requirements shall be based on air monitoring data. Air quality shall be monitored with a photoionization detector (PID), colorimetric tubes, or personal air samplers. Action levels for respiratory protection shall be as follows:

As can be seen from the data in Table 5.2, there are several VOCs in the wastewater to be treated. These VOCs and their respective permissible exposure limits (PEL) and action levels are:

<u>Compound</u>	<u>PEL</u>	<u>PPE Level C</u>	<u>PPE Level B</u>
- Vinyl chloride	1 ppm	0.5 ppm	10 ppm
- 1,1 Dichloroethene	1 ppm	0.5 ppm	50 ppm
- 1,1 Dichloroethane	100 ppm	50 ppm	1000 ppm
- 1,2 Dichloroethene	200 ppm	100 ppm	1000 ppm
- Chloroform	2 ppm	NO USE	1 ppm
- Carbon Tetrachloride	2 ppm	NO USE	1 ppm
- Trichloroethylene	50 ppm	25 ppm	1000 ppm
- Tetrachloroethylene	25 ppm	12 ppm	1000 ppm
- Methylene Chloride	500 ppm	NO USE	25 ppm
- Acetone	750 ppm	375 ppm	1000 ppm

Exposure to the VOCs listed would occur only during handling of the spent Granular Activated Carbon (GAC). Air monitoring will be performed during handling of spent GAC to monitor for these compounds.

The atmosphere in the trailer and the surrounding area will be monitored weekly (in conjunction with process chemistry sampling) with a calibrated PID and, if detectable levels are measured at 50% of the most limiting PEL of 1 ppm (0.5 ppm on the PID), the work area shall be evacuated immediately. The area will then be evaluated to determine the compound(s) present by personnel wearing the appropriate respiratory protection. The subcontractor Health and Safety Manager, Project Manager and the operating contractor Project Manager will review the results of this evaluation to determine whether engineering controls can be installed to minimize the concentration of VOCs. If engineering controls can be utilized, they will be recommended and installed upon approval.

If engineering controls are not practical, work may continue only after air monitoring results are completed and with the concurrence of the subcontractor and the operating contractor.

8.3 GENERAL REQUIREMENTS FOR PROCESS CHEMICAL HANDLING

To maintain pH levels, the water treatment process uses acids and caustics in bulk quantities in conjunction with automatic feed controllers. Direct contact with all chemicals shall be prevented with the use of personal protective equipment. Subcontractor operations personnel shall ensure that the emergency shower and eyewash are in operable condition prior to handling process chemical materials. Emergency eyewash and shower facilities shall be inspected and the condition documented at least once per week. Transfer of chemicals shall be performed only within approved secondary containment areas of the FTU. Chemicals should never be mixed outside the parameters given in the system Standard Operating Procedures.

8.4 GENERAL REQUIREMENTS FOR CHEMICAL STORAGE

Chemicals shall be stored in separate areas in the approved chemical storage areas to prevent inadvertent mixing of incompatible materials. Container labeling shall be maintained in accordance with Rocky Flats requirements and the NFPA hazard warning system.

8.5 GENERAL REQUIREMENTS FOR SLUDGE HANDLING

The ventilation fans shall be operational and running at all times while sludge or residues are being processed in the filter press. The access doors of Trailer #2 shall remain open. The internal surfaces of the filter press and hoppers have the potential of allowing the sludge to dry. These surfaces shall be kept as moist as practical contingent upon air monitoring and contamination survey results. All sludges and contaminated solids should not contact the skin and should remain in designated containers. Dried sludges which could create airborne contamination or emission problems shall be maintained wet. Sludge filter cake drums shall remain closed except when filling or sampling. Sludges shall be maintained in the appropriate designated storage areas. Sludge outside of these areas shall be immediately cleaned to prevent airborne emissions.

9.0 AREA MONITORING

Monitoring of the environmental conditions in and around OU2 must occur because of the potential for contaminants to be present in environmental media, the water being treated, and dewatered sludges. The following sections describe the monitoring program to be implemented and appropriate exposure limits and actions levels. Where feasible, personnel exposures to hazardous materials (other than radioactive substances) shall be maintained within the TLVs adopted by the ACGIH or the PELs adopted by OSHA, whichever is more stringent. Exposure to radioactive material will be maintained below the Rocky Flats administrative limits. Table 9.1 presents a summary of the monitoring program.

9.1 CHEMICAL MONITORING

Air monitoring for hazardous chemical compounds shall be conducted weekly and during opening of the GAC process system (e.g., carbon adsorber rupture disk replacement) in and around the OU2 trailers using a Photovac TIP II PID or HNu PID device with at least an 11.5 eV lamp. These devices are used to monitor for the presence of volatile organic compounds. PID devices are used as a screening instrument to detect the presence of organic compounds but cannot quantify or identify specific organic substances. The PID will be calibrated with a 100 ppm standard of isobutylene prior to use. If any reading above 50% of the most limiting PEL is found, the Health and Safety Officer will investigate to determine the source and will make the necessary changes to reduce the concentration below 50% of the PEL. Monitoring with colorimetric tubes and/or personal air samplers to determine the compound(s) present may be necessary.

Work can be resumed provided that the monitoring results can be reduced to less than 50% of the PEL. If readings are more than 50% of the PEL, it will be necessary to don respiratory protection and to investigate to determine the compound(s) present, the source of the compound, and whether the use of engineering controls can reduce concentrations to less than 50% of the PEL.

TABLE 9.1

Monitoring Program Summary

Hazard/Sample Type	Action Level	Precaution if Action Level is Exceeded	Monitoring Frequency
RADIATION:			
Equipment and material contamination	Alpha contamination: > 20 dpm/100cm ² removable > 300 dpm/100cm ² total; Beta/gamma contamination: > 1000 dpm/100cm ² removable > 5000 dpm/100cm ² total.	Equipment and material decontamination.	Prior to removal from radiological control area.
Personnel contamination.	Background.	Personnel decontamination.	Prior to exiting access control.
Long-lived radioactive airborne particulates.	10% of the DAC* (if respirators not worn).	Full face-piece air purifying respirators (APRs) with HEPA cartridges.	As determined by EG&G.
External shallow beta/gamma radiation exposure rate.	> 5 mrem per hour.	Remove personnel from elevated beta/gamma exposure rate area and investigate source.	As specified in Section 9.2.3.
CHEMICAL:			
Air monitoring for volatile organic compounds	50% of the most limiting PEL for compounds present.	Full face air-purifying respirators with organic vapor-acid-fumes cartridges	As specified in Section 9.1.
MISCELLANEOUS MONITORING			
NOISE:			
Area.	85 decibels 8-hour Time Weighted Average (TWA).	Suitable hearing protection.	At discretion of the subcontractor Health and Safety Officer and EG&G IH

TABLE 9.1 (Continued)
Monitoring Program Summary

HEAT STRESS:			
Oral and heart rate monitoring. ^b	Oral temperature 38°C (99.6°F), heart rate 110 bpm.	Use of ice vests, reduce work cycle duration, or other EG&G approved measures.	Monitoring frequency will be dependent on work area temperature and at the discretion of the subcontractor Health and Safety Officer and EG&G IH.

^a DAC - Derived Air Concentration.

^b Monitoring will be performed when work area temperature exceeds 85_F and coveralls or protective clothing is being worn.

Air monitoring may also be done utilizing colorimetric tubes for any of the VOCs present. Any indication of concentrations exceeding the PEL for a specific compound will require work to stop unless Level C respiratory protection (full-face APR) is donned. Air monitoring with detector tubes for Methylene Chloride and Carbon Tetrachloride shall be performed to document the absence of these two compounds prior to donning air-purifying respirators. Air-purifying respirators are not approved for these contaminants.

Compliance with limits on airborne metal contaminants can be reasonably assured if dust concentrations in the worker breathing zone are kept under control.

9.2 RADIOLOGICAL MONITORING

The radiation exposure of an occupational worker will be maintained as far below the U.S. Department of Energy (DOE) limits as is reasonably achievable. A Rocky Flats annual administrative dose equivalent level of 1,800 mRem committed effective dose equivalent will be in

effect. If any worker exceeds the administrative dose equivalent level, a comprehensive evaluation will be performed and if necessary, the employee will be reassigned to a job where his or her radiation exposure will not exceed an additional 100 mRem for the remainder of the calendar year.

9.2.1 Personnel and Equipment Contamination

Personnel and equipment leaving the radiologically controlled area will be monitored for radiological contamination in accordance with the action levels specified in Table 9.1. Release of all equipment and materials from a radiologically controlled area will be in accordance with Rocky Flats Procedures HSP 18.10 and EMRG 3.02.

9.2.2 Radioactive Air Particulate Monitoring

The operating contractor is responsible for air sampling for radioactive airborne particulates. These samples will be taken in the breathing zone of workers, within the work zone, and outside the work zone.

Workers may be required to wear personal air monitoring devices to sample for radioactive particulates in the worker's breathing zone. Air sampling in the work areas will be performed at the discretion of the operating contractor. Area sampling may also be performed in locations within and outside the work zone.

9.2.3 External Beta/Gamma Radiation Monitoring

After successful completion of the medical and training requirements specified in Section 6.0 of this plan, all employees who will work within radiologically-controlled areas will be issued radiation monitoring badges by Rocky Flats Dosimetry. Radiological surveys indicate that external exposure rates are well below Rocky Flats administrative limits requiring dosimetry. Personnel dosimetry will be required during filter press cleaning and operation and during handling of white waste drums. Additionally, dosimetry is required in the laboratory room used for storage of radioactive instrument check sources. Periodic external exposure surveys will be performed in the

FTU to ensure that any change in radiation levels will be detected.

9.2.4 Internal Radiation Exposure (Bioassay) Monitoring

Subcontractor employees who are issued radiation monitoring badges are subject to periodic urine and/or fecal samples at the discretion of the operating contractor. Additional urine and/or fecal bioassay samples may be required at the discretion of the operating contractor if a substantial exposure is suspected. These samples will be analyzed for radionuclides to determine whether the employee has received an internal radiation dose while performing work at OU2. Sample containers will be provided by the operating contractor.

9.3 MISCELLANEOUS MONITORING

9.3.1 Sound Level Monitoring

Sound pressure levels shall be monitored to delineate hearing protection areas. Monitoring frequency will be at the discretion of the operating contractor. Additionally, a personal noise dosimeter may be used in conjunction with a sound level meter in order to assess noise exposures of selected individuals based upon area monitoring. Suitable hearing protection with a minimum Noise Reduction Rating (NRR) of 18 dBa shall be worn in areas with an 8-hour TWA noise level greater than 85 decibels. Monitoring indicates that Trailers T900A and T900B exceed 85 decibels during equipment operation and these areas are posted as "Hearing Protection Required" areas.

9.3.2 Heat Stress Monitoring

Monitoring will generally consist of periodic measurement of workers body temperature and heart rate during periods when work area temperatures exceed 85_F and protective coveralls are required to be worn. Monitoring frequency will be determined by the subcontractor Health and Safety Officer and Rocky Flats IH and will depend on the work area temperature and the type of work being performed.

10.0 SITE CONTROL

Within the controlled access area there are restricted and unrestricted areas. In general, controlled access areas in which radioactive or chemical contamination is present above established guidelines are "restricted areas". Restricted area signs have been posted indicating the nature of contamination present in each of these areas. Controlled access areas in which site characterization data has indicated that no significant chemical and radiological hazard is present are "unrestricted areas". Subcontractor personnel shall not be permitted access to restricted areas of the site other than those included in the scope of this project unless specifically authorized access by the operating contractor. Access to all areas posted as confined spaces shall be in accordance with established Rocky Flats Procedures.

Access to the FTU shall be controlled by subcontractor operations personnel. A log-in sheet located in the office trailer will be implemented to record the presence of all personnel including visitors. Subcontractor Operators will be responsible for escorting visitors and providing a short briefing concerning hazards associated with visiting the FTU. The operators will also be responsible for ensuring that all visitors have the appropriate protective equipment prior to access to the FTU operating areas.

APPENDIX A

Material Safety Data Sheets



Curtin Matheson Scientific, Inc.
20100 EAST 35TH DRIVE

AURORA, CO 80011

FISONS

MATERIAL SAFETY DATA SHEET

MAIL TO: RESOURCE TECHNOLOGIES

GROUP INC
SUITE 250
3190 S WADSWORTH BLVD
DENVER, CO 80227-4800

SECTION 1 - NAME AND PRODUCT

MANUFACTURER NAME AND ADDRESS

BIOCHEMICAL SCIENCES
PVT LABEL
PO BOX 518
BRIDGEPORT NJ 08014
EMERGENCY PHONE 800-524-0294

CHEMICAL NUMBER:

ITEM NUMBER: 0061614
VNDR CATLG NBR: 75005-5G
ENTRY DATE: 02-26-90
CHANGE DATE: 08-07-92
PO NUMBER: 1500

COMMON NAME (ON LABEL)

CMS BUFFER SOLUTION PH 4.00 (COLOR CODED BUFFER)

CHEMICAL FAMILY

N/G

TRADE NAME & SYNONYMS

CMS BUFFER SOLUTION PH 4.00 (COLOR CODED BUFFER)

CHEMICAL FORMULA

N/G

SECTION 2 - HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENT	CAS	% (WT)	TLV	PEL
SEE OTHER INGREDIENT INFORMATION	*	.00	NOT GIVEN	NOT GIVEN

PEL: Permissible Exposure Limit established by the Occupational Safety and Health Administration (OSHA).

TLV: Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 1986-87.

OTHER INGREDIENT INFORMATION

NON-HAZARDOUS COMPONENTS: POTASSIUM ACID PHTHALATE - CAS #877-24-7 - EQUIVALENT TO 1%.
FOOD COLORING - CAS #845-10-3 - TRACE.
INHIBITOR - CAS #99-76-3 - TRACE.

SECTION 3 - PHYSICAL DATA

BOILING POINT 100 C	VOLATILE BY VOLUME (%) N/G	VAPOR PRESSURE 24
MELTING POINT N/A	VAPOR DENSITY N/A	SOLUBILITY IN WATER N/A
EVAPORATION RATE (BUAC N/A	SPECIFIC GRAVITY 1.0	
APPEARANCE AND ODOR PINK, ODORLESS SOLUTION		

OTHER PHYSICAL DATA

NO OTHER PHYSICAL DATA GIVEN.

SECTION 4 - FIRE AND EXPLOSION DATA**FLASH POINT**

N/A

LOWER EXPLOSIVE LIMIT

N/A

UPPER EXPLOSIVE LIMIT

N/A

EXTINGUISHING MEDIA

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

NONE

SPECIAL FIRE FIGHTING PROCEDURES

N/A

SECTION 5 - HEALTH HAZARD DATA**HEALTH HAZARDS (ACUTE & CHRONIC)**
SEE SIGNS AND SYMPTOMS OF EXPOSURE.**PRIMARY ROUTES OF EXPOSURE**

SKIN CONTACT, INGESTION.

SIGNS AND SYMPTOMS OF EXPOSURE

PRODUCT IS NOT EXPECTED TO PRESENT A HEALTH HAZARD WHEN EMPLOYING GOOD LABORATORY PRACTICES.

SECTION 5 - HEALTH HAZARD DATA (CONTINUED)

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

N/A

CARCINOGENICITY

NOT OSHA REGULATED.

NTP Yes No

IARC Yes No

OSHA Yes No

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: INDUCE VOMITING OF CONSCIOUS PATIENT BY GIVING TWO GLASSES OF WATER AND PRESSING FINGER DOWN THROAT. CONTACT A PHYSICIAN IMMEDIATELY.

INHALATION: N/A

SKIN CONTACT: REMOVE CONTAMINATED CLOTHING AND WASH SKIN WITH WATER. IF IRRITATION PERSISTS, CONTACT A PHYSICIAN. EYE CONTACT: FLUSH EYES WITH WATER FOR 15 MINUTES. CONTACT A PHYSICIAN IMMEDIATELY.

THRESHOLD LIMITS / TOXICITY DATA

NONE INDICATED.

SECTION 6 - REACTIVITY DATA

STABILITY Unstable Stable

CONDITIONS TO AVOID

NONE

INCOMPATIBILITY (MATERIALS TO AVOID)

NONE

SECTION 6 - REACTIVITY DATA (CONTINUED)

HAZARDOUS DECOMPOSITION OR BYPRODUCTS
NONEHAZARDOUS POLYMERIZATION May Occur Will Not Occur
CONDITIONS TO AVOID
WILL NOT OCCUR

SECTION 7 - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
CONTAIN THE SPILL WITH ABSORBENT MATERIAL OR MOP UP WITH WATER.WASTE DISPOSAL METHOD
DISPOSAL SHOULD BE CARRIED OUT IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL
REGULATIONS.

SECTION 8 - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION
NONE

LOCAL VENTILATION

N/A

MECHANICAL VENTILATION

GENERAL

SPECIAL VENTILATION

N/A

SECTION 8 - SPECIAL PROTECTION INFORMATION (CONTINUED)

OTHER VENTILATION

N/A

PROTECTIVE GLOVES

NONE

EYE PROTECTION

SAFETY GLASSES

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

N/A

SECTION 9 - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

NORMAL LABORATORY CARE. WASH WITH SOAP AND WATER AFTER HANDLING.

SECTION 10 - OTHER INFORMATION

MISCELLANEOUS INFO.

N/A = NOT APPLICABLE. N/A = NOT AVAILABLE. N/G = NOT GIVEN.

A-5 of 78



Curtin Matheson Scientific, Inc.
20100 EAST 35TH DRIVE
AURORA, CO 80011

FISONS

MATERIAL SAFETY DATA SHEET

MAIL TO: RESOURCE TECHNOLOGIES
GROUP INC
SUITE 250
3190 S WADSWORTH BLVD
DENVER, CO 80227-4800

SECTION 1 - NAME AND PRODUCT

MANUFACTURER NAME AND ADDRESS
BIOCHEMICAL SCIENCES
PVT LABEL
PO BOX 518
BRIDGEPORT NJ 08014
EMERGENCY PHONE 800-524-0294

CHEMICAL NUMBER:
ITEM NUMBER: 0061622
VNR CATLG NBR: 75009-5G
ENTRY DATE: 02-26-90
CHANGE DATE: 08-07-92
PD NUMBER: 1500

COMMON NAME (ON LABEL)

CMS BUFFER SOLUTION PH 7.00 (COLOR CODED BUFFERS)

CHEMICAL FAMILY

N/G

TRADE NAME & SYNONYMS

CMS BUFFER SOLUTION PH 7.00

CHEMICAL FORMULA

N/G

SECTION 2 - HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENT	CAS	% (WT)	TLV	PEL
SEE OTHER INGREDIENT INFORMATION	*	.00	NOT GIVEN	NOT GIVEN

PEL: Permissible Exposure Limit established by the Occupational Safety and Health Administration (OSHA).

TLV: Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 1986-87.

OTHER INGREDIENT INFORMATION

NON-HAZARDOUS COMPONENTS: POTASSIUM PHOSPHATE, MONOBASIC - CAS #7776-77-0 - LESS THAN 1%.
SODIUM PHOSPHATE, DIBASIC - CAS #7558-79-4 - LESS THAN 1%. FOOD COLORING - CAS #1934-21-0 - TRACE.
INHIBITOR - CAS #99-76-3 - TRACE.

SECTION 3 - PHYSICAL DATA

BOILING POINT 100 C	VOLATILE BY VOLUME (%) N/G	VAPOR PRESSURE 24
MELTING POINT N/A	VAPOR DENSITY N/A	SOLUBILITY IN WATER N/A
EVAPORATION RATE (BUAC = 1) N/A	SPECIFIC GRAVITY EQUIVALENT OF 1.0	
APPEARANCE AND ODOR YELLOW, ODORLESS SOLUTION		

OTHER PHYSICAL DATA
NO OTHER PHYSICAL DATA AVAILABLE.

SECTION 4 - FIRE AND EXPLOSION DATA**FLASH POINT**

N/A

LOWER EXPLOSIVE LIMIT

N/A

UPPER EXPLOSIVE LIMIT

N/A

EXTINGUISHING MEDIA

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

NONE

SPECIAL FIRE FIGHTING PROCEDURES

N/A

SECTION 5 - HEALTH HAZARD DATA**HEALTH HAZARDS (ACUTE & CHRONIC)**
SEE SIGNS AND SYMPTOMS OF EXPOSURE.**PRIMARY ROUTES OF EXPOSURE**
INGESTION, SKIN CONTACT.**SIGNS AND SYMPTOMS OF EXPOSURE**

PRODUCT IS NOT EXPECTED TO PRESENT A HEALTH HAZARD WHEN EMPLOYING GOOD LABORATORY PRACTICES.

SECTION 5 - HEALTH HAZARD DATA (CONTINUED)

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
NONE INDICATED.

CARCINOGENICITY

NOT OSHA REGULATED.

NTP Yes No

IARC Yes No

OSHA Yes No

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: INDUCE VOMITING OF CONSCIOUS PATIENT BY GIVING TWO GLASSES OF WATER AND PRESSING FINGER DOWN THROAT. CONTACT A PHYSICIAN IMMEDIATELY.

INHALATION: N/A

SKIN CONTACT: REMOVE CONTAMINATED CLOTHING AND WASH SKIN WITH WATER.

IF IRRITATION PERSISTS, CONTACT A PHYSICIAN. EYE CONTACT: FLUSH EYES WITH WATER FOR 15 MINUTES. CONTACT A PHYSICIAN IMMEDIATELY.

THRESHOLD LIMITS / TOXICITY DATA

NONE INDICATED.

SECTION 6 - REACTIVITY DATA

STABILITY Unstable Stable

CONDITIONS TO AVOID

NONE

INCOMPATIBILITY (MATERIALS TO AVOID)

NONE

SECTION 6 - REACTIVITY DATA (CONTINUED)

HAZARDOUS DECOMPOSITION OR BYPRODUCTS
NONE.

HAZARDOUS POLYMERIZATION May Occur Will Not Occur
CONDITIONS TO AVOID
WILL NOT OCCUR.

SECTION 7 - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
CONTAIN THE SPILL WITH ABSORBENT MATERIAL OR MOP UP WITH WATER.

WASTE DISPOSAL METHOD
DISPOSAL SHOULD BE CARRIED OUT IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL
REGULATIONS.

SECTION 8 - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION
NONE

LOCAL VENTILATION

N/A

MECHANICAL VENTILATION

GENERAL

SPECIAL VENTILATION

N/A

SECTION 8 - SPECIAL PROTECTION INFORMATION (CONTINUED)

OTHER VENTILATION

N/A

PROTECTIVE GLOVES

NONE

EYE PROTECTION

SAFETY GLASSES

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

N/A

SECTION 9 - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

WASH WITH SOAP AND WATER AFTER HANDLING.

SECTION 10 - OTHER INFORMATION

MISCELLANEOUS INFO.

N/A = NOT

AVAILABLE. N/A = NOT APPLICABLE.

N/G = NOT GIVEN.

A-8 of 7A



Curtin Matheson Scientific, Inc.
20100 EAST 35TH DRIVE
AURORA, CO 80011

FISONS

MATERIAL SAFETY DATA SHEET

MAIL TO: RESOURCE TECHNOLOGIES
GROUP INC
SUITE 250
3190 S WADSWORTH BLVD
DENVER, CO 80227-4800

SECTION 1 - NAME AND PRODUCT

MANUFACTURER NAME AND ADDRESS
BIOCHEMICAL SCIENCES
PVT LABEL
PO BOX 518
BRIDGEPORT NJ 08014
EMERGENCY PHONE 800-524-0294

CHEMICAL NUMBER:
ITEM NUMBER: 0061648
VNR CATLG NBR: 75014-5G
ENTRY DATE: 02-26-90
CHANGE DATE: 08-07-92
PD NUMBER: 1500

COMMON NAME (ON LABEL)

CMS BUFFER SOLUTION PH 10.00 (COLOR CODED BUFFERS)

CHEMICAL FAMILY

N/G

TRADE NAME & SYNONYMS

CMS BUFFER SOLUTION PH 10.00

CHEMICAL FORMULA

N/G

SECTION 2 - HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENT	CAS	% (WT)	TLV	PEL
SEE OTHER INGREDIENT INFORMATION.	*	.00	NOT GIVEN	NOT GIVEN

PEL: Permissible Exposure Limit established by the Occupational Safety and Health Administration (OSHA).

TLV: Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 1986-87.

OTHER INGREDIENT INFORMATION

NON-HAZARDOUS COMPONENTS: BORIC ACID - CAS #10043-35-3 - LESS THAN 1%. POTASSIUM HYDROXIDE
- CAS #1310-58-3 - LESS THAN 1%. FOOD COLORING - CAS # 1934-21-0 - TRACE. INHIBITOR -
CAS # 99-76-3 - TRACE.

SECTION 3 - PHYSICAL DATA

BOILING POINT 100 C	VOLATILE BY VOLUME (%) N/G	VAPOR PRESSURE 24
MELTING POINT N/A	VAPOR DENSITY N/A	SOLUBILITY IN WATER N/A
EVAPORATION RATE (BUAC = 1) N/A	SPECIFIC GRAVITY EQUIVALENT OF 1.0	
APPEARANCE AND ODOR BLUE, ODORLESS SOLUTION		

OTHER PHYSICAL DATA
NO OTHER PHYSICAL DATA GIVEN.

SECTION 4 - FIRE AND EXPLOSION DATA**FLASH POINT**

N/A

LOWER EXPLOSIVE LIMIT

N/A

UPPER EXPLOSIVE LIMIT

N/A

EXTINGUISHING MEDIA

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

NONE

SPECIAL FIRE FIGHTING PROCEDURES

N/A

SECTION 5 - HEALTH HAZARD DATA**HEALTH HAZARDS (ACUTE & CHRONIC)**

SEE SIGNS AND SYMPTOMS OF EXPOSURE.

PRIMARY ROUTES OF EXPOSURE

SKIN, INGESTION

SIGNS AND SYMPTOMS OF EXPOSURE

PRODUCT IS NOT EXPECTED TO PRESENT A HEALTH HAZARD WHEN EMPLOYING GOOD LABORATORY PRACTICES.

SECTION 5 - HEALTH HAZARD DATA (CONTINUED)

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

N/A

CARCINOGENICITY

NO

NTP Yes No | IARC Yes No | OSHA Yes No

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: INDUCE VOMITING OF CONSCIOUS PATIENT BY GIVING TWO GLASSES OF WATER AND PRESSING FINGER DOWN THROAT. CONTACT A PHYSICIAN IMMEDIATELY. INHALATION: N/A
 SKIN CONTACT: REMOVE CONTAMINATED CLOTHING AND WASH SKIN WITH WATER. IF IRRITATION PERSISTS, CONTACT A PHYSICIAN.
 EYE CONTACT: FLUSH EYES WITH WATER FOR 15 MINUTES. CONTACT A PHYSICIAN IMMEDIATELY.

THRESHOLD LIMITS / TOXICITY DATA

NONE INDICATED.

SECTION 6 - REACTIVITY DATA

STABILITY Unstable Stable

CONDITIONS TO AVOID

NONE

INCOMPATIBILITY (MATERIALS TO AVOID)

NONE

SECTION 6 - REACTIVITY DATA (CONTINUED)

HAZARDOUS DECOMPOSITION OR BYPRODUCTS
NONE

HAZARDOUS POLYMERIZATION May Occur Will Not Occur
CONDITIONS TO AVOID
WILL NOT OCCUR

SECTION 7 - SPILL, LEAK, AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
CONTAIN THE SPILL WITH ABSORBENT MATERIAL OR MOP UP WITH WATER.

WASTE DISPOSAL METHOD
DISPOSAL SHOULD BE CARRIED OUT IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL
REGULATIONS.

SECTION 8 - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION
NONE

LOCAL VENTILATION

N/A

MECHANICAL VENTILATION

GENERAL

SPECIAL VENTILATION

N/A

SECTION 8 - SPECIAL PROTECTION INFORMATION (CONTINUED)

OTHER VENTILATION

N/A

PROTECTIVE GLOVES

NONE

EYE PROTECTION

SAFETY GLASSES

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

N/A

SECTION 9 - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

NORMAL LABORATORY CARE. WASH WITH SOAP AND
WATER AFTER HANDLING.

SECTION 10 - OTHER INFORMATION

MISCELLANEOUS INFO.

N/A = NOT APPLICABLE. N/A = NOT
AVAILABLE. N/G = NOT GIVEN.

 MATERIAL SAFETY DATA SHEET

Identity

Revised: March 31, 1989

Substance: Calcium Hydroxide $\text{Ca}(\text{OH})_2$
 Ash Grove Snowflake, Ash Grove Kemlime, Ash Grove Slik

CAS-Number 1305-62-0

Trade Names/Synonyms: Hydrated Lime; Calcium Hydrate; Lime Water;
 Slaked Lime; Caustic Lime; Carboxide;
 Calcium Dihydroxide; Milk of Lime

Chemical Family:
 Inorganic Base

Molecular Formula: $\text{Ca-H}_2\text{-O}_2$ MOL WT: 74.10
 CERCLA Ratings (Scale 0-3): Health=1 Fire=0 Reactivity=0
 Persistence=0
 NFPA Ratings (Scale 0-4): Health=1 Fire=0 Reactivity=0

 * Section I

Ash Grove Cement Company
 8900 Indian Creek Parkway
 P. O. Box 25900
 Overland Park, Kansas
 66225

 * Section II - Hazardous Ingredients/Identity Information

	OSHA PEL	ACGIH TLV
Lime, $\text{Ca}(\text{OH})_2$	5 mg/ M^3	5mg/ M^3

 * Section III - Physical/Chemical Characteristics

Boiling Point	Decomposes	Specific Gravity	2.2
Vapor Pressure (mmHg)	NA	Melting Point	1076OF
Vapor Density (Air=1)	NA	Evaporation Rate	NA
Solubility in Water	.185% @ 0° C	(Butyl Alcohol=1)	
Appearance and Odor	White granules or Powder; faint earthy odor		

 * Section IV - Fire and Explosion Hazard Data

Flash Point (method used)	NA, not flammable		
Flammable Limits	NA	LEL: NA	UEL: NA
Extinguishing Media	NA		
Special Fire Fighting Procedures:	$\text{Ca}(\text{OH})_2$ is incombustible.		
Firefighting Media:	Dry Chemical, Carbon dioxide, water spray or foam. For larger fires, use water spray, fog or alcohol foam.		

Firefighting.

Move container from area if possible. Do not scatter spilled material with more water than needed for fire control. Dike fire control water for later disposal.

(1984 Emergency Response Guidebook, DOT p 5800.3)

Unusual Fire and Explosion Hazards: None

* Section V - Reactivity Data

Stability: Stable under normal temperatures and pressures. It will absorb carbon dioxide when exposed to air, forming calcium carbonate.

Incompatibility (Materials to avoid)

Maleic Anhydride: Explosive decomposition of Maleic Anhydride

Nitroperoxyfinc: Formation of an explosive salt

Nitromethane: Formation of an explosive salt

Nitroethane: Formation of an explosive salt

Nitropropane: Formation of an explosive salt

Phosphorous: When boiled with alkaline hydroxides yields mixed phosphines which may ignite spontaneously in air.

Water: Forms a corrosive solution

Hazardous Decomposition or by products when heated at temperatures above 500°C, the substance loses water to form calcium oxide.

Hazardous Polymerization will not occur: X

Conditions to avoid NA

* Section VI - Health Hazard Data

Route(s) of Entry: Inhalation? X Skin? X Ingestion? X

Health Hazards (Acute and Chronic) & Emergency First Aid Procedures

INHALATION:

CORROSIVE.

ACUTE EXPOSURE- Inhalation of low concentrations may cause sore throat, coughing, choking, dyspnea, and variable symptoms of headache, dizziness, and weakness. Intense exposures may result in tightness in the chest and delayed pulmonary edema. The solubility of the substance allows further penetration that may continue for several days.

CHRONIC EXPOSURE- Bronchial irritation with chronic cough and frequent attacks of bronchial pneumonia are common.

FIRST AID- Remove from exposure to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. Get medical attention.

**SKIN CONTACT:
CORROSIVE.**

ACUTE EXPOSURE- The substance penetrates the skin slowly, producing soft, necrotic, deeply penetrating areas on contact. The solubility allows further penetration that may continue for several days. The extent of damage depends on duration of contact.

Chronic Exposure- A chronic dermatitis may follow repeated contact.

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 (approximately 15-20 minutes). In the case of chemical burns, cover the affected areas with sterile, dry dressing. Bandage securely, but not too tightly. Get medical attention.

**EYE CONTACT:
CORROSIVE.**

ACUTE EXPOSURE- Direct contact with the solid or aqueous solutions may cause conjunctival edema and corneal destruction. Blindness may occur.

CHRONIC EXPOSURE- Prolonged contact may cause conjunctivitis.

FIRST AID- Wash eyes immediately with large amounts of water, occasionally lifting the upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). A near neutral solution of 0.01 to 0.05 molar sodium EDTA is helpful as an irrigant to loosen masses from tissues. Get medical attention immediately. (Grant, toxicology of the eye, volume II). Administration of drugs to the eyes should be performed by qualified medical personnel.

**INGESTION;
CORROSIVE.**

ACUTE EXPOSURE- Ingestion is followed by severe pain, vomiting, diarrhea, and collapse. The vomitus may contain blood and desquamated mucosal lining. If death does not occur in the first 24 hours, the patient may improve for 2-4 days and then have a sudden onset of severe abdominal pain, abdominal rigidity, and rapid hypotension indicating delayed gastric esophageal perforation.

Chronic Exposure- None known.

First Aid- Dilute by giving water or milk to drink immediately and allow vomiting to occur. As soon as possible, examine mouth and throat and irrigate injured areas with 1% acetic acid until alkali is completely neutralized. Avoid gastric lavage or emetics. These may increase the possibility of perforation.

(Dreisbach, handbook of poisoning, 11th ed.) Administration of drugs or antidote should be performed by qualified medical personnel.

ANTIDOTE:

Give calcium gluconate, 10 ML of 10% solution diluted in 1 liter of 5% glucose intravenously as necessary to maintain normal serum calcium levels. Calcium administration may cause anuria due to the precipitation of calcium oxalate in the kidney. (Dreisbach, handbook of poisoning, 11th ed.) Antidotes should be given by qualified medical personnel.

Carcinogenicity: NA NTP: NA IARC Monograph? NA
 OSHA Regulated? Yes, TLV of 5 mg/M³

Medical Conditions Generally

Aggravated by Exposure: NA

* Section VII - Precautions for Safe Handling and Use

Steps to be taken in case material is released or spilled:

SPILL AND LEAK PROCEDURES

Pick up spilled powder avoiding dusting conditions and place in a clean steel container for disposal. Safety personnel should be involved when large spills occur. Traces of residue can be flushed to the sewer, but neutralization before flushing may be required. Those involved in clean-up of spills should use protective equipment.

Precautions to be Taken in Handling and Storing

Handling: Use protective equipment as described in Section VIII.

Storing: Protect against physical damage and store in dry place away from water or moisture (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

* Section VIII - Control Measures

PROTECTIVE EQUIPMENT

VENTILATION:

Provide Local Exhaust Ventilation or general dilution ventilation to meet permissible exposure limits.

RESPIRATOR:

HIGH LEVELS-Supplied-Air Respirator with a full facepiece, helmet, or hood. Self-contained breathing apparatus with a full facepiece.

FIREFIGHTING-Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive-pressure mode.

CLOTHING:

Employee must wear appropriate protective 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 goggles to prevent contact with this substance.

Where there is any possibility that an employee's eyes may be exposed to this substance, the employer shall provide an eye-wash fountain within the immediate work area for emergency use.

MATERIAL SAFETY DATA SHEET



American Norit Company, Inc.
 Box 61628
 Jacksonville, Florida 32236-1628
 (904) 783-6406

Bulletin No. - MSDS - 101
 Revised August 1, 1987

SECTION 1 NAME

All DARCO® Lignite Based Carbons to include:

DARCO® S-51

DARCO® S-51 A (B,C,CE,H,FF,RL,RW,T)

Premium DARCO®

DARCO® TRS

DARCO® GFP

GRO-SAFE®

All HYDRODARCO® Grades

All Granular DARCO®

SECTION 2 INGREDIENTS

	%	TLV (ACGIH)
Activated carbon (CAS 7440-44-0) (U.N.-1362)	100	Not listed *

* Product normally contains greater than 1% quartz;
 see Section 8

SECTION 3 PHYSICAL DATA

Boiling point: Not applicable

Vapor pressure (mmHg at 20°C): zero

Vapor density (air = 1): Not applicable

Solubility: Insoluble in water and organic solvents

pH: Not applicable

Specific gravity: 250 - 600 g/l

% Volatile by volume: Not applicable

Appearance and odor: Black granules or powder without taste or odor

SECTION 4 FIRE AND EXPLOSION HAZARD DATA

Flash point (and method): Not applicable

Autoignition temp.: Powdered - No generally accepted test method available
 Granular - About 450°C (ANSI/ASTM D3466)

All carbonaceous materials will burn under certain conditions and activated carbons are no exception. Activated carbons, however, are not highly flammable and burn slowly without producing smoke or flame.

Extinguishing media:

Water (fog or fine spray), carbon dioxide

Avoid methods which may stir up dust clouds.

Special fire fighting protective equipment:

Self-contained breathing apparatus.

Unusual fire and explosion hazards:

Airborne dust is a weak explosion hazard.

MATERIAL SAFETY DATA SHEET (continued)

SECTION 5 REACTIVITY DATA

Stability:
Stable under normal conditions.

Incompatibility (materials to avoid):
Strong oxidizing agents.

Hazardous decomposition products:
Carbon dioxide, carbon monoxide.

Hazardous polymerization:
Will not occur.

SECTION 6 HEALTH HAZARD ASSESSMENT

General:

No toxicity data are available. Physical and chemical properties of activated carbon are used for the health hazard assessment.

Carcinogenicity: Activated carbon is not listed in the National Toxicology Program (NTP) Annual report on carcinogens nor has it been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) monographs or by OSHA.

Ingestion:

The acute oral LD values are not available. Relative to other materials, a single dose of this product is relatively harmless by ingestion. Hodge, H.C. and Sterner, J.H., American Industrial Hygiene Association Quarterly, 10:4, 93, Dec. 1949.

Eye Contact:

This material will probably cause some mild physical irritation if contact is made with human eyes.

Skin Contact:

This material is not likely to be a primary irritant on human skin; it has a low potential for sensitization after skin contact.

Skin absorption:

This product is not known to be absorbed through the human skin.

Inhalation:

Acute toxic effects are not likely to develop after inhalation from this material.

MATERIAL SAFETY DATA SHEET (continued)

SECTION 6 HEALTH HAZARD ASSESSMENT (continued)

Effect of overexposure:

No adverse clinical effects have been associated with exposures to this material

First aid procedures:

Skin: Wash material off the skin with soap and water. If redness, itching or a burning sensation develops, get medical attention.

Eyes: Immediately flush with copious amounts of water. If redness, itching or a burning sensation develops, have eyes examined and treated by medical personnel.

Ingestion: Give one or two glasses of water to drink. If gastrointestinal symptoms develop, consult medical personnel. (Never give anything by mouth to an unconscious person.)

Inhalation: Remove victim to fresh air. If cough or other respiratory symptoms develop, consult medical personnel.

SECTION 7 SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled:

Wear respiratory protection during cleanup. Sweep up and recover or mix material with moist absorbent and shovel into waste container. Wash down spill area with water containing detergent and flush away with plenty of water.

Disposal method:

Dispose of virgin (unused) carbon (waste or spillage) in a facility for non-hazardous wastes.

Container disposal:

Do not reuse empty bags. Dispose of in facility permitted for non-hazardous waste.

SECTION 8 SPECIAL PROTECTION INFORMATION

TLV or suggested control value:

The current OSHA and ACGIH limit for dusts which contain more than 1% quartz are as follows for Darco lignite carbons:

Respirable Dust Limit (OSHA and ACGIH)	=	0.7 mg/m ³
Total Dust Limit (OSHA)	=	2.1 mg/m ³
Total Dust Limit (ACGIH)	=	2.0 mg/m ³

Ventilation:

Provide adequate general and local exhaust ventilation to meet suggested control value requirements.

SECTION 8 SPECIAL PROTECTION INFORMATION (continued)

Respiratory protection:

If needed, use MSHA-NIOSH approved respirator for dusts, mists and fumes whose TLV is greater than 0.05 mg/m³ or (European) filter 2b.

Protective Clothing:

For personal hygiene purposes use adequate clothing to prevent skin contact.

Eye protection:

Safety glasses with side shields.
Contact lenses should not be worn when working with activated carbon.

Other protective equipment:

Eyewash station in work area.

SECTION 9 SPECIAL PRECAUTIONS OR OTHER COMMENTS

Precautions to be taken in handling or storing:

Activated carbon can be safely stored in any normal storage area, but away from sources of direct heat.

An oxygen deficiency may be created when activated carbon is stored in an enclosed space/silo. Ventilate or wear self-contained breathing apparatus.

The information herein is given in good faith
but no warranty, expressed or implied, is made.

Robert W. Edwards
Marketing Manager

Topic: OILS, FUEL: 2-D

OVERVIEW

Material name:

OILS, FUEL: 2-D

Common synonyms:

* Diesel oil, medium

Characteristics:

Oily liquid Yellow-brown Lube or fuel oil odor

Floats on water.

Emergency actions:

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.

RESPONSE TO DISCHARGE

Mechanical containment Should be removed Chemical and physical treatment

LABEL

Category: None

Class: Not pertinent

CHEMICAL DESIGNATIONS

CG compatibility class: Miscellaneous Hydrocarbon Mixtures

Formula: Not applicable

IMO/UN designation: 3.1/1270

DOT id no.: 1270

CAS registry no.: Data not available

OBSERVABLE CHARACTERISTICS

Physical state: Liquid

Color: Light brown

Odor: Characteristic

HEALTH HAZARDS

Topic: OILS, FUEL: 2-D

shad/TLM/salt water

Perfowl toxicity: Data not available

Biological oxygen demand (BOD): Data not available

Food chain concentration potential: None

SHIPPING INFORMATION

Grades of purity: Diesel fuel 2-D (ASTM)

Storage temperature: Ambient

Inert atmosphere: No requirement

Venting: Open (flame arrester)

HAZARD CLASSIFICATIONS

Code of federal regulations: Combustible liquid

NAS hazard rating for bulk water transportation: Not listed

NFPA HAZARD CLASSIFICATION:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Reactivity (Yellow).....	0

PHYSICAL AND CHEMICAL PROPERTIES

Physical state at 15 degrees C. and 1 ATM: Liquid

Molecular weight: Not pertinent

Boiling point at 1 ATM: 540-640 degrees F = 282-338 degrees C = 555-611 degrees K

Freezing point: 0 degrees F = 18 degrees C = 255 degrees K

Critical temperature: Not pertinent

Critical pressure: Not pertinent

Specific gravity: 0.87-0.90 at 20 degrees C (liquid)

Liquid surface tension: Data not available

Liquid water interfacial tension: Data not available

Vapor (gas) specific gravity: Not pertinent

Ratio of specific heats of vapor (gas): Not pertinent

Latent heat of vaporization: Not pertinent

Heat of combustion: -19,440 Btu/lb = -10,800 cal/g = -452.17 X 10(5) J/kg

Heat of decomposition: Not pertinent

Heat of solution: Not pertinent

Heat of polymerization: Not pertinent

Heat of fusion: Data not available

Limiting value: Data not available

REID vapor pressure: Data not available

Topic: OILS, FUEL: 2-D

Personal protective equipment: Protective gloves; goggles or face shield.

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.

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.

Threshold limit value: No single TLV applicable.

Short term inhalation limits: Data not available

Toxicity by ingestion: Grade 1; LD(50) = 5-15 g/kg

Late toxicity: Data not available

Vapor (gas) irritant characteristics: Slight smarting of eyes or respiratory system if present in high concentrations. The effect is temporary.

Liquid or solid irritant characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

Corrosion threshold: Data not available

IDLH value: Data not available

FIRE HAZARDS

Flash point: 125 degrees F C.C.

Flammable limits in air: 1.3%-6.0%

Fire extinguishing agents: Dry chemical, foam, or carbon dioxide

Fire extinguishing agents NOT to be used: Water may be ineffective

Special hazards of combustion products: Not pertinent

Behavior in fire: Not pertinent

Ignition temperature: 490-545 degrees F

Electrical hazard: Not pertinent

Burning rate: 4 mm/min.

Adiabatic flame temperature: Data not available

Stoichiometric air to fuel ratio: Data not available

Flame temperature: Data not available

CHEMICAL REACTIVITY

Reactivity with water: No reaction

Reactivity with common materials: No reaction

Stability during transport: Stable

Neutralizing agents for acids and caustics: Not pertinent

Polymerization: Not pertinent

Inhibitor of polymerization: Not pertinent

Reaction ratio (reactant to product): Data not available

Activity group: 33

WATER POLLUTION

Aquatic toxicity: 204 mg/l/24 hr/juvenile American

I PRODUCT IDENTIFICATION

MANUFACTURER'S NAME	Tennessee Chemical Company	REGULAR TELEPHONE NO. (404) 239-6700 EMERGENCY TELEPHONE NO. Chemtrec 800-424-9301
ADDRESS	3400 Peachtree Rd. NE, Suite 401 Atlanta, Georgia 30326	
TRADE NAME	Ferri-Floc	
SYNONYMS	Ferric Sulfate	
SHIPPING NAME ¹	DOT: Bulk: Hazardous substance Solid n. o. s. IATA: (Ferric sulfate) ORM-E NA 9188 RQ	

II HAZARDOUS INGREDIENTS²

MATERIAL OR COMPONENT	CAS NO.	%	HAZARD DATA
Ferric sulfate	100-28-22-5	89.0	Health Hazard: Product is corrosive to the eye. is
Residual sulfuric acid *	7664-93-9	2.7	not toxic dermally nor by inhalation or orally, may irritate the skin and mucous membranes.
			Aquatic Toxicity: Product is listed as toxic to aquatic life. Category C. 40 CFR Parts 116 - 118.
			OSHA set 8 hr. TWA-PEI at 1 mg/m ³ as iron for soluble iron salts.

* Reportable under SARA Title III Sec. 313.

III PHYSICAL DATA

BOILING POINT, 760 MM HG	N. A. *	MELTING POINT	N. A.
SPECIFIC GRAVITY (H ₂ O = 1)	56- 60 lbs/ft ³	VAPOR PRESSURE	N. A.
VAPOR DENSITY (AIR = 1)	N. A.	SOLUBILITY IN H ₂ O % BY WT	55% by weight
% VOLATILES BY VOL.	None	EVAPORATION RATE (BUTYL ACETATE = 1)	N. A.
APPEARANCE AND ODOR	Grey to brown dry powder to granule.	Ph (AS IS)	N. A. - dry powder
		Ph (1% SOLN.)	(distilled water pH 4.8)

IV FIRE AND EXPLOSION DATA

FLASH POINT TEST METHOD)	None	AUTOIGNITION TEMPERATURE	None known	
FLAMMABLE LIMITS IN AIR, % BY VOL.	LOWER	N. A.	UPPER	N. A.
EXTINGUISHING MEDIA	Product does not burn. If product is present in a fire, water, CO ₂ , or dry chemical may be used.			
SPECIAL FIRE FIGHTING PROCEDURES	If water is used, the product is water soluble and water may be acid, and water should not be allowed to enter a navigable stream. At temperatures above 600° C, product decomposes to iron oxide and sulfur trioxide.			
UNUSUAL FIRE AND EXPLOSION HAZARD	None known.			

V HEALTH HAZARD INFORMATION

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HEALTH HAZARD DATA	HAZARD CLASSIFICATION	BASIS FOR CLASSIFICATION	SOURCE
ROUTES OF EXPOSURE INHALATION	Not toxic by inhalation according to OSHA regulations. Dust of soluble salts may cause mucous membrane irritation.	Test results on product Acute inhalation LC ₅₀ (rats) = In excess of 147.9 mg/l of air.	Determined by Toxicological Laboratory test on product.
SKIN CONTACT	May cause skin irritation.	OSHA set 8 hr. TWA-PEL at 1 mg/m ³ as iron for soluble iron salts.	OSHA regulations Federal Register Vol. 54 (12) Jan. 19, 1989, p. 2466.
SKIN ABSORPTION	Not toxic dermally. In accordance with OSHA regulations.	Test results on product Acute dermal LD ₅₀ (rabbits) (Male) In excess of 2 g/kg body wt. (Female) 2.0 g/kg body wt.	Determined by Toxicological Laboratory test on product.
EYE CONTACT	Corrosive to the eye. In accordance with OSHA regulations.	Test results on product Eye irritation scores: 24 hrs. 45.2 72 hrs. 56.3 48 hrs. 56.2 7 days 63.4	Determined by Toxicological Laboratory test on product.
INGESTION	Not toxic orally according to OSHA regulations.	Test results on product Acute oral LD ₅₀ (rats) = Between 1 - 2.5 g/kg body wt.	Determined by Toxicological Laboratory test on product.

EFFECTS OF OVEREXPOSURE

ACUTE OVEREXPOSURE

Dusty. May cause coughing, irritate lungs and mucous membranes. May be corrosive to the eye if not removed by washing. Also see Sec. V above.

CHRONIC OVEREXPOSURE

None known except as listed above. Prolonged dust inhalation may cause lung mottling and irritation of mucous membranes.

EMERGENCY AND FIRST AID PROCEDURES

EYES:

Irrigate eyes with large amounts of water for at least 15 minutes. Hold eyelids apart during irrigation. Send patient to a physician immediately.

SKIN:

Wash with water. Remove shoes if in a shower. Remove and wash clothes before reuse.

INHALATION: Remove worker from exposure and seek medical aid.

INGESTION:

Treat as a corrosive liquid. Drink large quantities of water or milk to reduce concentration. Seek medical aid immediately.

NOTES TO PHYSICIAN

CONDITIONS CONTRIBUTING TO INSTABILITY

None known.

COMPATIBILITY None known. Product is highly water soluble and solution is highly corrosive to mild steel, copper, copper alloys, and galvanized steel. Strong solutions may be corrosive to paints, enamels, and concrete.

HAZARDOUS DECOMPOSITION PRODUCTS

None normally. At temperatures above 600° C, sulfur trioxide may be released.

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

None known.

VII DISPOSAL, SPILL OR LEAK PROCEDURES

AQUATIC TOXICITY (E.G. 96 HR. TLM):

No data are known to be available. EPA has rated product in Category C in the Water Programs hazardous substances list in 40 CFR Parts 116 - 118.

WASTE DISPOSAL METHOD

Remove dry product to approved land fill. If solution, neutralize with lime, soda ash, or bicarbonate and remove to approved land fill.

ACTIONS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

If spill is dry product, sweep up spill and dispose in approved land fill and wash down spill area with water. If spill is a solution containing product, neutralize and remove to approved land fill. Wash down spill area with water. Check with waste treatment plant before flushing down large amounts of spilled product.

NEUTRALIZING CHEMICALS

Lime, soda ash, or bicarbonate.

VIII SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS

Product is a soluble iron acid dust. Normal ventilation is suggested as product is irritating to the eyes, skin and mucous membranes. If sufficient product is placed in eye, it may be corrosive to the eye. The 8 hr. TWA-PEL is 1 mg/m³ as iron.

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY (SPECIFY IN DETAIL) A chemical dust mask is recommended.

EYE Chemical goggles are recommended when handling product because dust is irritating and corrosive if in eyes.

GLOVES Chemical or rubber gloves may be worn. Product is irritating to the skin but is not toxic dermally.

OTHER CLOTHING AND EQUIPMENT

No other special clothing or equipment than normally used.

IX SPECIAL PRECAUTIONS

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PRECAUTIONARY STATEMENTS

None on product. If in solution, product is corrosive.

OTHER HANDLING AND STORAGE REQUIREMENTS

Store product in a dry place. Product has been classified as irritating to the skin since it is an acid salt and it may cause some irritation to the skin as it picks up moisture. Dust accumulations on hands, face, and body should be removed by washing or showering periodically as necessary.

ADDITIONAL REGULATORY CONCERNS

FEDERAL:

FDA

USDA

CPSC

TSCA IS THIS PRODUCT, OR ALL ITS INGREDIENTS, BEING CERTIFIED FOR INCLUSION ON THE TOXIC SUBSTANCES CONTROL ACT INVENTORY OF CHEMICAL SUBSTANCES? Yes

OTHER Product meets American Water Works Association Standard for Ferric Sulfate in potable water. B 406.

STATE:

OSHA: Product is a hazardous material as defined by 29 CFR § 1910.1200. It is corrosive to the eye and an irritant to the skin and mucous membranes. The 8 hr. TWA-PEL for soluble iron salts is set at 1 mg/m³ as iron. Product is not listed by the National Toxicology Program, the International Agency for Research on Cancer, nor the Registry of Toxic Effects of Chemical Substances (1981-82) as a carcinogen or potential carcinogen.

PREPARED BY: Arthur F. Gohlke, Ph.D.
TITLE: Technical Service Specialist
COMPANY: Tennessee Chemical Company
ADDRESS: 3400 Peachtree Rd. NE, Suite 401
Atlanta, Georgia 30326

The above information is believed to be correct. However, Tennessee Chemical Company make no warranty and assume no liability as to the accuracy or completeness.

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OCEAN NETWORK EMERGENCY PHONE 1-800-OLIN-911

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THIS PRODUCT MAY BE CONSIDERED TO BE A HAZARDOUS CHEMICAL UNDER THAT STANDARD. (REFER TO THE OSHA CLASSIFICATION IN SEC. I.) THIS INFORMATION IS REQUIRED TO BE DISCLOSED FOR SAFETY IN THE WORKPLACE. THE EXPOSURE TO THE COMMUNITY, IF ANY, IS QUITE DIFFERENT.

I. PRODUCT IDENTIFICATION

REVISION NO : 3
 REVISION DATE : 1/02/90
 PRODUCT CODE : HPE880630
 FILE NUMBER : HPE00018.0043
 PRODUCT NAME: HYDROCHLORIC ACID, REAGENT ACS GRADE
 SYNONYMS: Chlorohydric acid, hydrogen chloride, muriatic acid
 CHEMICAL FAMILY: Inorganic acid
 FORMULA: HCl
 DESCRIPTION: Acid
 OSHA HAZARD CLASSIFICATION: Corrosive, eye hazard, lung toxin

II. COMPONENT DATA

PRODUCT COMPOSITION

CAS or CHEMICAL NAME: Hydrochloric acid
 CAS NUMBER: 7647-01-0
 PERCENTAGE RANGE: 7.0-38.0%
 HAZARDOUS PER 29 CFR 1910.1200: Yes
 EXPOSURE STANDARDS:

	OSHA (PEL)		ACGIH (TLV)		OLIN	
	ppm	mg/cubic-meter	ppm	mg/cubic-meter	ppm	mg/cubic-meter
TWA:	None	Established	None	Established	None	Established
CEILING:	5	ppm	5	ppm	None	Established
STEL:	None	Established	None	Established	None	Established

CAS or CHEMICAL NAME: Water
 CAS NUMBER: 7732-18-5
 PERCENTAGE RANGE: 62.0-93.0%
 HAZARDOUS PER 29 CFR 1910.1200: No
 EXPOSURE STANDARDS: None Established

III. PRECAUTIONS FOR SAFE HANDLING AND STORAGE

DO NOT TAKE INTERNALLY. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. UPON CONTACT WITH SKIN OR EYES, WASH OFF WITH WATER.

STORAGE CONDITIONS: Store in cool, clean, well-ventilated area

DO NOT STORE AT TEMPERATURES ABOVE: 38 Deg.C (100 Deg.F)

DO NOT EXPOSE TO DIRECT LIGHT.

PRODUCT STABILITY AND COMPATIBILITY: Stable

SHELF LIFE LIMITATIONS: 1 Year

INCOMPATIBLE MATERIALS FOR PACKAGING: Glass or polyethylene containers recommended.

INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT: When shipped with oxidizers, must be separated by 18 inches, with wood pallets and absorbent material in between.

IV. PHYSICAL DATA

APPEARANCE: Clear, colorless liquid

FREEZING POINT: 7% -2 Deg.C (28 Deg.F)

37% -74 Deg.C (-101 Deg.F)

BOILING POINT: 7% - 20% >100 to 110 Deg.C (>212 to 230 Deg.F)

20% - 38% 110 to 74 Deg.C (230 to 167 Deg.F)

DECOMPOSITION TEMPERATURE: No Data

SPECIFIC GRAVITY: 1.035 - 1.188

BULK DENSITY: Not Applicable

pH @ 25 DEG.C: <1

VAPOR PRESSURE @ 20 DEG.C: 7% to 32% - 0 to 23.5 mm Hg

(Partial pressure HCl) 32% to 38% - 23.5 to 210 mm Hg

SOLUBILITY IN WATER: COMPLETE

VOLATILES, PERCENT BY VOLUME: 100%

EVAPORATION RATE: Approximately 1 (Water = 1)

VAPOR DENSITY: 1.3 (active Ingredient)

MOLECULAR WEIGHT: 36.46 (Active Ingredient)

ODOR: Pungent, suffocating odor.

COEFFICIENT OF OIL/WATER DISTRIBUTION: No Data

V. PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

PERSONAL PROTECTION FOR ROUTINE USE OF PRODUCT

RESPIRATORY PROTECTION: Respirator protection not normally needed since the volatility is low. If vapors, mists, or aerosols are generated, wear a NIOSH/MSHA approved respirator.

VENTILATION: Local exhaust ventilation is recommended if vapors, mists or aerosols are generated. Otherwise, use general exhaust ventilation.

SKIN PROTECTIVE EQUIPMENT: Wear gloves, boots, apron and a face shield with safety glasses. A full impermeable suit is recommended if exposure is possible to large portion of body.

OTHER: Eye wash fountain should be provided.



EQUIPMENT SPECIFICATIONS:

RESPIRATOR TYPE: Full facepiece, high efficiency filters
 GLOVE TYPE: Neoprene
 BOOT TYPE: Neoprene
 APRON TYPE: Neoprene
 FACE SHIELD: Yes
 PROTECTIVE SUIT: Neoprene

VI. FIRE AND EXPLOSION HAZARD INFORMATION

FLAMMABILITY DATA:

FLAMMABLE: No
 COMBUSTIBLE: No
 PYROPHORIC: No
 FLASH POINT: Not Applicable
 AUTOIGNITION TEMPERATURE: Not Applicable
 FLAMMABLE LIMITS AT NORMAL ATMOSPHERIC TEMPERATURE AND PRESSURE (PERCENT VOLUME IN AIR): Not Applicable

NFPA RATINGS:

Health: 3
 Flammability: 0
 Reactivity: 0
 Special Hazard Warning: ACID

HMIS RATINGS:

Health: 3
 Flammability: 0
 Reactivity: 0
 Personal Protection: J or K

EXTINGUISHING MEDIA: Not Applicable

FIRE FIGHTING TECHNIQUES AND COMMENTS: Use water to cool containers exposed to fire. Contact with reactive metals, e.g., aluminum may result in the generation of flammable hydrogen gas. On small fires, use dry chemical or carbon dioxide. On large fires, use water. Not combustible but contact with common metals produces flammable hydrogen gas. May also release chlorine gas by reaction with oxidizing agents.

VII. REACTIVITY INFORMATION

CONDITIONS UNDER WHICH THIS PRODUCT MAY BE UNSTABLE:

TEMPERATURES ABOVE: No Data
 MECHANICAL SHOCK OR IMPACT: No
 ELECTRICAL (STATIC) DISCHARGE: No
 HAZARDOUS POLYMERIZATION: Will Not Occur

INCOMPATIBLE MATERIALS: Alkaline materials, aluminium, amines, carbonates, iron, sulfuric acid, hydroxides, leather and other fabrics, metallic oxides, magnesium, oleum, perchloric acid, zinc
HAZARDOUS DECOMPOSITION PRODUCTS: Flammable hydrogen gas by reaction with many metals. Also, chlorine gas is released by reaction with oxidizing agents.
OTHER CONDITIONS TO AVOID: Heat, exposure to sunlight

SUMMARY OF REACTIVITY:

OXIDIZER: No
PYROPHORIC: No
ORGANIC PEROXIDE: No
WATER REACTIVE: No
CORROSIVE: Yes

VIII. FIRST AID

EYES: Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Call a physician at once.

SKIN: Immediately flush with water for at least 15 minutes. Call a physician. If clothing comes in contact with the product, the clothing should be removed immediately and should be laundered before re-use.

INGESTION: Immediately drink large quantities of water. DO NOT induce vomiting. Call a physician at once. DO NOT give anything by mouth if the person is unconscious or if having convulsions.

INHALATION: If person experiences nausea, headache or dizziness, person should stop work immediately and move to fresh air until these symptoms disappear. If breathing is difficult, administer oxygen, keep the person warm and at rest. Call a physician. In the event that an individual inhales enough vapor to lose consciousness, person should be moved to fresh air at once and a physician should be called immediately. If breathing has stopped, artificial respiration should be given immediately. In all cases, ensure adequate ventilation and provide respiratory protection before the person returns to work.

IX. TOXICOLOGY AND HEALTH INFORMATION

ROUTES OF ABSORPTION

Oral, Dermal, Inhalation, Eye Contact

WARNING STATEMENTS AND WARNING PROPERTIES

MAY BE FATAL IF SWALLOWED.

HARMFUL (CORROSIVE) IF CONTACTED BY SKIN OR EYES.

HARMFUL IF INHALED.



HUMAN DOSE RESPONSE DATA

ODOR THRESHOLD: Hydrogen chloride gas has a reported odor threshold of 1 part per million (ppm) in air.

IRRITATION THRESHOLD: Hydrogen chloride gas has a reported irritation threshold of 1-5 ppm in air.

TOXIC DOSE AND EFFECT: The reported human data are that of corrosivity to skin and eyes due to accidental splashes. In most if not all the cases the amount was not determined.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH: The IDLH for hydrogen chloride gas is 100 ppm.

SIGNS, SYMPTOMS, AND EFFECTS OF EXPOSURE

INHALATION:

ACUTE: Inhalation of the mist or vapor or hydrogen chloride gas may cause irritation of the mucous membranes and respiratory tract with symptoms of burning, choking and coughing. At exposure concentrations greater than the TLV, damage may occur to the mucous membranes (ulceration of the nose and throat) and respiratory tract. At these high concentrations, severe breathing difficulties may occur which may be delayed in onset and may be due to pulmonary edema (fluid in the lung) or laryngeal edema or spasm.

CHRONIC: Repeated or prolonged exposure to concentrations greater than accepted occupational limits may cause dental discoloration and erosion of the teeth.

SKIN:

ACUTE: Hydrochloric acid mist may rapidly cause skin inflammation and burns. Direct contact of the liquid will be corrosive to the skin, with the potential for scarring and ulceration of the contacted tissue.

CHRONIC: Repeated contact with the mist has been reported to cause a contact dermatitis (skin rash).

EYE:

ACUTE: Exposure to the mist may result in eye irritation and/or severe burns with permanent damage and possible loss of sight. Direct contact with the liquid will be corrosive to the eye with resulting severe burns, potential visual impairment or loss of sight.

INGESTION:

ACUTE: Ingestion may result in burns of the mouth, throat and stomach, pain, nausea, vomiting, and possibly death due to esophageal or gastric necrosis.

CHRONIC: There is no data available on the potential effects from repeated exposure by this route as the likelihood of this occurring is low because of the corrosive nature of the chemical.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Respiratory and cardiovascular disease

INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY:

None known or reported

ANIMAL TOXICOLOGY

ACUTE TOXICITY:

Oral LD 50- 900 mg/kg (rabbit)
Inhalation LC 50- 3124 ppm/ 1 hour (rat)
Corrosive to skin and eyes

AQUATIC TOXICITY: No data is available on hydrochloric acid solution. It will disassociate in water to affect the pH of the water and will also cause aquatic toxic effects similar to chlorine.

CHRONIC TOXICITY: The only known or reported health effects from repeated exposure to hydrochloric acid are described above and are related to tissue damage to dental enamel and gums leading to erosion of the teeth. These effects would occur from exposures greater than currently accepted occupational limits.

REPRODUCTIVE TOXICITY: There are no known or reported effects on reproductive function or fetal development.

CARCINOGENICITY: This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP, or EPA.

MUTAGENICITY: Hydrochloric acid has not been adequately tested to determine its mutagenic potential, probably because of its direct toxicity to cells (affecting the pH of the cell).

X. TRANSPORTATION INFORMATION

THIS MATERIAL IS REGULATED AS A DOT HAZARDOUS MATERIAL.

DOT DESCRIPTION FROM THE HAZARDOUS MATERIALS TABLE 49 CFR 172:

Hydrochloric acid corrosive material, UN 1789

REPORTABLE QUANTITY: 5000 lbs. (Per 49 CFR 172.101, Appendix A)



The material described above is subject to the U.S. DOT HAZARDOUS MATERIALS REGULATIONS via the modes and packaging quantities indicated below with the letter "x":

MODE	PACKAGING QUANTITIES	
<input checked="" type="checkbox"/> Rail	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Motor	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Water	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Air	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk

The applicable packaging sections in 49 CFR are 173.244 and 173.263.

DOT EMERGENCY GUIDE NUMBER: 60

XI. SPILL AND LEAKAGE PROCEDURES

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC AT 800-424-9300.

REPORTABLE QUANTITY: 5000 lbs. (Per 40 CFR 302.4)

SPILL MITIGATION PROCEDURES: Hazardous concentrations in air may be found in local spill area and immediately downwind.

Air Release - vapors may be suppressed by the use of a water fog, or vapor suppressant foam. Dike and contain all run-off water for treatment as a hazardous waste.

Water Release - this material is heavier than water. This material is soluble in water. Contain contaminated water by building a dike of compatible absorbents. Vacuum or pump material to a neutralization container and treat. See SPILL RESIDUES below.

Land Spill - Compatible absorbents: Sand, clay soil, and commercial absorbents.

SPILL RESIDUES: Dispose of per guidelines under Section XII, WASTE DISPOSAL. This material may be neutralized for disposal; you are requested to contact OCEAN at 800-OLIN-911 before beginning any such operation.

PERSONAL PROTECTION FOR EMERGENCY SPILL AND FIRE-FIGHTING SITUATIONS: Response to this material MAY REQUIRE the use of a full encapsulated suit and self-contained breathing apparatus (SCBA).

Additional protective clothing must be worn to prevent personal contact with this material. Those items include but are not limited to boots, gloves (see below for compatible materials), hard hat, splash-proof goggles, full face shield, impervious clothing, i.e., chemically impermeable suit, and self-contained breathing apparatus.

Compatible materials for response to this material are Neoprene, Chlorinated Polyethylene, Polyvinyl chloride, Butyl Rubber Viton, and Saranex.

XII. WASTE DISPOSAL

If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste number: D002.

If this product becomes a waste, it will be a hazardous waste which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly.

As a hazardous liquid waste, it must be disposed of in accordance with local, state and Federal regulations in a permitted hazardous waste treatment, storage and disposal facility by treatment.

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL. THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

XIII. ADDITIONAL REGULATORY STATUS INFORMATION

TOXIC SUBSTANCES CONTROL ACT: This substance is listed on the Toxic Substances Control Act inventory.

SUPERFUND AMENDMENT AND REAUTHORIZATION ACT, TITLE III:

HAZARD CATEGORIES, PER 40 CFR 370.2:

HEALTH: Immediate (Acute), Delayed (Chronic)

PHYSICAL: None

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW, PER 40 CFR 355, APP.A:

EXTREMELY HAZARDOUS SUBSTANCE - THRESHOLD PLANNING QUANTITY:

None Established

SUPPLIER NOTIFICATION REQUIREMENTS, PER 40 CFR 372.45:

This mixture or tradename product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372.

CHEMICALS LISTED ARE: Hydrochloric acid

21. Threshold Limit Values and Biological Exposure Indices for 1988-89. Cincinnati, OH: American Conference of Government Industrial Hygienists, 1987.
22. Toxic Substances Control Act Inventory, Washington, DC: U.S. Government Printing Office, 1986.

THE INFORMATION IN THIS MATERIAL SAFETY SHEET SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. OLIN BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION, BUT MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MATERIAL SAFETY DATA SHEET IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT OLIN AT THE PHONE NUMBER LISTED BELOW TO MAKE CERTAIN THAT THIS SHEET IS CURRENT.

OLIN MSDS CONTROL GROUP
Olin Corporation
120 Long Ridge Road
Stamford, CT 06904

Phone Number: (203) 356-3449

OLIN CORPORATION SUBSIDIARIES AND AFFILIATED ENTITIES: ASAHI-OLIN LTD., BRIDGEPORT BRASS CORPORATION, INDY ELECTRONICS, INC., OLIN CHLORATE CORPORATION, OLIN FABRICATED METAL PRODUCTS INC., OLIN HUNT SPECIALTY PRODUCTS INC., OLIN ELECTRONICS TECHNOLOGY, OLIN MESA CORP., OLIN SPECIALTY METALS CORPORATION, PACIFIC ELECTRO DYNAMICS, INC., PHYSICS INTERNATIONAL COMPANY, ROCKET RESEARCH COMPANY.



XIV. ADDITIONAL INFORMATION

No Additional Information

XV. MAJOR REFERENCES

1. ACGIH Guide to Protective Clothing. Cincinnati, OH: American Conference of Government Industrial Hygienists, 1987.
2. ANSI Z88.2. Recommended Practice for Respiratory Protection. American National Standards Institute, New York, NY.
3. Baker, C. J., The Fire Fighter's Handbook of Hazardous Materials, 4th Ed., Indiana: Maltese Enterprises, Inc., 1984.
4. Bretherick, L., Handbook of Reactive Chemical Hazards, 3rd Ed., Boston, MA: Butterworths, 1985.
5. Cassarett, L. and J. Doull, Eds., Toxicology: The Basic Science of Poisons, 3rd Ed., New York: Macmillan Publishing Co., Inc. 1986.
6. CERIS (Chemical Emergency Response Information System) On Line Database. Association of American Railroads.
7. Chemical Degradation and Permeation Database and Selection Guide for Resistant Protective Materials. Austin, TX.
8. Clayton, G. and F. Clayton, Eds., Patty's Industrial Hygiene and Toxicology, Vol. 2A-C 3rd Ed., New York: John Wiley & Sons, 1981-1982.
9. Code of Federal Regulations, Titles 21, 29, 40 and 49. Washington, DC: U.S. Government Printing Office.
10. Emergency Response Guide (D.O.T.). Washington, DC: U.S. Government Printing Office, 1987.
11. Fire Protection Guide on Hazardous Materials, 9th Ed., National Fire Protection Association, Batterymarch Park, Quincy, MA, 1986.
12. Gosselin, R., et al., Gosselin-Clinical Toxicology of Commercial Products, 5th Ed., Baltimore: Williams and Wilkins, 1984.
13. Hazardline, Occupational Health Services Inc., New York, NY.
14. IARC Monogram on the Evaluation of Carcinogenic Risk of Chemicals to Man., Geneva: World Health Organization, International Agency for Research on Cancer.
15. Lenga, R., The Sigma-Aldrich Library of Chemical Safety Data, 1st Ed., Milwaukee, WI: Sigma-Aldrich Corporation, 1985.
16. Lewis, R. and D. Sweet, Eds., Registry of Toxic Effects of Chemical Substances, 1985-1986, Washington, DC: U.S. Government Printing Office, 1987.
17. Medline, U.S. National Library of Medicine, Bethesda, MD.
18. NIOSH Pocket Guide to Chemical Hazards. Washington, DC: U.S. Government Printing Office, 1985.
19. Olin Respiratory Protection Manual.
20. Sax, N. Irving, Dangerous Properties of Hazardous Materials 6th Ed., New York: Van Nostrand Reinhold Company, 1984.

***** VI. FIRE AND EXPLOSION HAZARD DATA *****

FLASH POINT F(C): -40(-40) (ASTM D-56)
 FLAMMABLE LIMITS. LEL: 1.1, UEL: 7.6
 EXTINGUISHING MEDIA: CARBON DIOXIDE, FOAM, DRY CHEMICAL AND WATER FOG.
 SPECIAL FIRE FIGHTING PROCEDURES: FIREFIGHTERS MUST USE SELF-CONTAINED BREATHING APPARATUS. COOL STORAGE DRUMS WITH WATER SPRAY. EVACUATE AREA. PREVENT RUNOFF FROM FIRE CONTROL OR DILUTION FROM ENTERING STREAMS OR DRINKING WATER SUPPLY.
 UNUSUAL FIRE AND EXPLOSION HAZARDS: EXTREMELY FLAMMABLE LIQUID. VAPOR ACCUMULATION COULD FLASH AND/OR EXPLODE IF IN CONTACT WITH OPEN FLAME.
 NFPA HAZARD ID: HEALTH: 1, FLAMMABILITY: 3, REACTIVITY: 0

***** VII. REACTIVITY DATA *****

STABILITY (THERMAL, LIGHT, ETC.): STABLE
 CONDITIONS TO AVOID: HEAT, SPARKS, FLAME AND BUILD UP OF STATIC ELECTRICITY.
 INCOMPATIBILITY (MATERIALS TO AVOID): HALOGENS, STRONG ACIDS, ALKALIES, AND OXIDIZERS.
 HAZARDOUS DECOMPOSITION PRODUCTS: CO.
 HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

***** VIII. SPILL OR LEAK PROCEDURE *****

ENVIRONMENTAL IMPACT: REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. U. S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. REPORT SPILL TO COAST GUARD TOLL FREE NUMBER (800)-414-8802. IN CASE OF ACCIDENT OR ROAD SPILL NOTIFY CHEMTREC (800) 424-9300.
 PROCEDURES IF MATERIAL IS RELEASED OR SPILLED: ELIMINATE ALL IGNITION SOURCES. REMOVE LEAKING CONTAINERS TO DETACHED AREA. ADSORB ON FIRE RETARDANT TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SHOVEL UP AND DISPOSE OF AT AN APPROPRIATE WASTE DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT APPLICABLE LAWS AND REGULATIONS, AND PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL. RUNOFF MAY CREATE FIRE OR EXPLOSION HAZARD IN SEWER SYSTEM.
 WASTE MANAGEMENT: PRODUCT IS SUITABLE FOR BURNING IN AN ENCLOSED, CONTROLLED BURNER FOR FUEL VALUE OR DISPOSAL BY SUPERVISED INCINERATION. IN ADDITION, THE PRODUCT IS SUITABLE FOR PROCESSING BY AN APPROVED RECYCLING FACILITY OR CAN BE DISPOSED OF AT ANY GOVERNMENT APPROVED WASTE DISPOSAL FACILITY. USE OF THESE METHODS IS SUBJECT TO USER COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS AND CONSIDERATION OF PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.

***** IX. SPECIAL PROTECTION INFORMATION *****

EYE PROTECTION: GENERALLY EYE CONTACT IS UNLIKELY WITH THIS TYPE MATERIAL. IF EYE CONTACT IS LIKELY, SAFETY GLASSES WITH SIDE SHIELDS OR CHEMICAL TYPE GOGGLES SHOULD BE WORN.
 SKIN PROTECTION: IF PROLONGED OR REPEATED SKIN CONTACT IS LIKELY, IMPERVIOUS GLOVES SHOULD BE WORN. GOOD PERSONAL HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.
 RESPIRATORY PROTECTION: APPROVED RESPIRATORY EQUIPMENT MUST BE USED WHEN VAPOR OR MIST CONCENTRATIONS ARE UNKNOWN OR EXCEED THE TLV.
 VENTILATION: VENTILATION REQUIRED AND EQUIPMENT MUST BE EXPLOSION PROOF. USE AWAY FROM ALL IGNITION SOURCES.
 OTHER: AVOID PROLONGED REPEATED SKIN CONTACT AND BREATHING MISTS/VAPORS.

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***** X. SPECIAL PRECAUTIONS *****

HANDLING: AVOID CONTACT WITH SKIN. AVOID INHALATION OF VAPORS OR MISTS. USE IN WELL VENTILATED AREA AWAY FROM ALL IGNITION SOURCES.
ORAGE: GROUND AND BOND ALL TRANSFER AND STORAGE EQUIPMENT; USE NON-SPARKING TOOLS AND EQUIPMENT. DRUMS MUST BE GROUNDED AND BONDED AND EQUIPPED WITH SELF-CLOSING VALVES, PRESSURE VACUUM BUNGS AND FLAME ARRESTERS. STORE AWAY FROM ALL IGNITION SOURCES IN A COOL AREA EQUIPPED WITH AN AUTOMATIC SPRINKLING SYSTEM. OUTSIDE OR DETACHED STORAGE PREFERRED. SEE APPENDIX FOR PRECAUTIONARY LABEL.
FL-154

STORED MATERIALS MUST BE LABELED AS: EXTREMELY FLAMMABLE. VAPOR HARMFUL.

***** XI. TOXICOLOGICAL DATA *****

---ACUTE---

ORAL TOXICITY (RATS): LD50: > 5 G/KG 1/10 RATS DIED AT THIS DOSAGE LEVEL. CONSIDERED TO BE NO MORE THAN SLIGHTLY TOXIC BASED ON SINGLE DOSE LEVEL TESTING AT 5 G/KG.

DERMAL TOXICITY (RABBITS): LD50: > 2 G/KG 0/10 RABBITS DIED AT THIS DOSAGE LEVEL. CONSIDERED TO BE NO MORE THAN SLIGHTLY TOXIC BASED ON SINGLE DOSE LEVEL TESTING AT 2 G/KG.

INHALATION TOXICITY (RATS): TOXIC (ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

EYE IRRITATION (RABBITS): CAUSED SLIGHT IRRITATION TO RABBITS. EYE IRRITATION SCORES: 5.3 AT 1 HOUR, 3.3 AT 24 HOURS, 2.3 AT 48 HOURS, 1.0 AT 72 HOURS

SKIN IRRITATION (RABBITS): MODERATELY IRRITATING TO RABBITS. PRIMARY IRRITATION SCORE: 3.2/8

---CHRONIC OR SPECIALIZED (SUMMARY)---

RECENT STUDIES WITH LABORATORY ANIMALS HAVE SHOWN THAT GASOLINE VAPORS WHEN ADMINISTERED IN HIGH CONCENTRATIONS OVER A PROLONGED PERIOD OF TIME, CAUSED KIDNEY DAMAGE AND KIDNEY CANCER IN RATS AND LIVER CANCER IN MICE. AS FAR AS SCIENTIST KNOW, LOW LEVEL OR INFREQUENT EXPOSURE TO GASOLINE VAPORS IS UNLIKELY TO BE ASSOCIATED WITH CANCER OR OTHER SERIOUS DISEASES IN HUMANS.

---OTHER DATA---

GASOLINE CONSISTS OF A COMPLEX BLEND OF PETROLEUM/PROCESSING DERIVED PARAFFINIC, OLEFINIC, NAPHTHENIC AND AROMATIC HYDROCARBONS WHICH MAY CONTAIN UP TO 5 PERCENT BENZENE; AND DOSAGES OF MULTIFUNCTIONAL ADDITIVES.

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***** XII. REGULATORY INFORMATION *****

TSCA INVENTORY STATUS: ALL COMPONENTS REGISTERED.

D.O.T. SHIPPING NAME: GASOLINE

D.O.T. HAZARD CLASS: FLAMMABLE, LIQUID

ID NO: UN NO: 1203

US OSHA HAZARD COMMUNICATION STANDARD: PRODUCT ASSESSED IN ACCORDANCE WITH OSHA CFR 1910.1200 AND DETERMINED TO BE HAZARDOUS.

RCRA INFORMATION: THE DISPOSAL OF THE UNUSED PRODUCT MAY BE SUBJECT TO RCRA REGULATIONS PER 40 CFR PART 261 FOR THE REASONS INCLUDING, BUT NOT LIMITED TO THOSE LISTED BELOW. DISPOSAL OF THE USED PRODUCT MAY BE REGULATED.

LEAD: 0.0016 PCT

FLASH: -40(-40) F(C)

THE FOLLOWING PRODUCT INGREDIENTS ARE CITED ON THE LISTS BELOW:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS
UNLEADED GASOLINE		7,8,9,11,12,13,14,16,17

--- KEY TO LIST CITATIONS ---

- 1 = OSHA Z, 2 = ACGIH, 3 = IARC, 4 = NTP, 5 = NCI,
- 6 = EPA CARC, 7 = NFPA 49, 8 = NFPA 325M, 9 = DOT HMT, 10 = CA RTK,
- 11 = IL RTK, 12 = MA RTK, 13 = MN RTK, 14 = NJ RTK, 15 = MI 293,
- 16 = FL RTK, 17 = PA RTK.

 INFORMATION GIVEN HEREIN IS OFFERED IN GOOD FAITH AS ACCURATE, BUT WITHOUT GUARANTEE. CONDITIONS OF USE AND SUITABILITY OF THE PRODUCT FOR PARTICULAR USES ARE BEYOND OUR CONTROL; ALL RISKS OF USE OF THE PRODUCT ARE THEREFORE ASSUMED BY THE USER AND WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. NOTHING IS INTENDED AS A RECOMMENDATION FOR USES WHICH INFRINGE VALID PATENTS OR AS EXTENDING LICENSE UNDER VALID PATENTS. APPROPRIATE WARNINGS AND SAFE HANDLING PROCEDURES SHOULD BE PROVIDED TO HANDLERS AND USERS.

 PREPARED BY: MOBIL OIL CORPORATION
 ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPARTMENT, PRINCETON, NJ
 FOR FURTHER INFORMATION, CONTACT:
 MOBIL OIL CORPORATION, PRODUCT FORMULATION AND QUALITY CONTROL
 3225 GALLOWAY ROAD, FAIRFAX, VA 22037 (703) 849-3265

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***** APPENDIX *****

FOR MOBIL USE ONLY: MHC: 1 1 3* 1 2 PPEC: APPROVE REVISED: 10/24/85

PRECAUTIONARY LABEL TEXT FOR PACKAGED PRODUCTS:

GASOLINE

DANGER.

EXTREMELY FLAMMABLE.
HARMFUL OR FATAL IF SWALLOWED.
VAPOR HARMFUL.

LONG-TERM EXPOSURE TO VAPORS HAS
CAUSED CANCER IN LABORATORY ANIMALS.

KEEP AWAY FROM HEAT, SPARKS AND FLAME.
AVOID PROLONGED BREATHING OF VAPOR.
KEEP CONTAINER CLOSED.
USE ONLY WITH ADEQUATE VENTILATION.
NOT TO BE USED AS A SKIN CLEANSING AGENT.
NEVER SIPHON BY MOUTH.
KEEP AWAY FROM EYES AND SKIN.
FAILURE TO USE CAUTION MAY CAUSE SERIOUS INJURY OR ILLNESS.

FIRST AID: IF SWALLOWED, DO NOT INDUCE VOMITING.
CALL A PHYSICIAN IMMEDIATELY.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING,
GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH AND
CALL A PHYSICIAN.

ATTENTION.

EMPTY CONTAINERS MAY CONTAIN PRODUCT RESIDUE, INCLUDING
FLAMMABLE OR EXPLOSIVE VAPORS, DO NOT CUT, PUNCTURE OR
WELD ON OR NEAR CONTAINER. ALL LABEL WARNINGS AND
PRECAUTIONS MUST BE OBSERVED UNTIL CONTAINER HAS BEEN
THOROUGHLY CLEANED OR DESTROYED.

REFER TO PRODUCT MATERIAL SAFETY DATA BULLETIN FOR
FURTHER SAFETY AND HEALTH INFORMATION.

MOBIL OIL CORPORATION, NEW YORK, N.Y. FL-154(5-84)

D.O.T. SHIPPING NAME: GASOLINE
D.O.T. HAZARD CLASS: FLAMMABLE LIQUID
D.O.T. HAZARD IDENTIFICATION NUMBER: UN NO: 1203



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110 -04 NEUTRACIT^R-2 Caustic Neutralizer Page: 1
 Effective: 05/01/89 Issued: 08/31/90

T. BAKER INC., 222 Red School Lane, Phillipsburg, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

Product Name: **NEUTRACIT^R-2 Caustic Neutralizer**
 Common Synonyms: N/A
 Chemical Family: Spill Clean-Up Products
 Formula: Proprietary Mixture
 Formula Wt.: N/A
 CAS No.: N/A
 OSHA/RTECS No.: N/A
 Product Use: Spill Clean-Up
 Product Codes: 4441, 4470

PRECAUTIONARY LABELING

SAF-T-DATA* System

HEALTH 1 SLIGHT	FLAMMABILITY 1 SLIGHT	REACTIVITY 1 SLIGHT	CONTACT 1 SLIGHT
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Laboratory Protective Equipment



U.S. Precautionary Labeling

CAUTION!

DO NOT CAUSE IRRITATION.
 During use avoid contact with eyes, skin, clothing. Wash thoroughly after handling. When not in use keep in tightly closed container.



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PRECAUTIONARY LABELING (CONTINUED)

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International Labeling

oid contact with eyes. After contact with skin, wash immediately with
 enty of water. Keep container tightly closed.

F-T-DATA* Storage Color Code: Orange (general storage)

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SECTION II - COMPONENTS

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<u>Component</u>	<u>CAS No.</u>	<u>Weight %</u>	<u>OSHA/PEL</u>	<u>ACGIH/TLU</u>
lica Gel	1343-98-2	15-35	6 mg/m ³	10 mg/m ³
tric Acid, Anhydrous	77-92-9	55-75	N/E	N/E
	N/A	5-20	N/E	N/E
on Phymol Blue, Sodium Salt	34722-90-2	1-10	N/E	N/E

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SECTION III - PHYSICAL DATA

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iling Point: N/A Vapor Pressure (mmHg): N/A

lting Point: N/A Vapor Density (air=1): N/A

pecific Gravity: N/A Evaporation Rate: N/A
 (H₂O=1)

lubility(H₂O): Slight (0.1-1%) % Volatiles by Volume: 0
 (21°C)

: N/A
 or Threshold (ppm): N/A Physical State: Solid

efficient Water/Oil Distribution: N/A

pearance & Odor: Yellow crystals or powder. Odorless.

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NEUTRACIT^R-2 Caustic Neutralizer

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Closed Cup): N/A

Ignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Recommended Extinguishing Media

Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Usual Fire & Explosion Hazards

None identified.

Toxic Gases Produced

carbon monoxide, carbon dioxide

Explosion Data-Sensitivity to Mechanical Impact

None identified.

Explosion Data-Sensitivity to Static Discharge

None identified.

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not Established

Short-Term Exposure Limit (STEL): Not Established

Permissible Exposure Limit (PEL): Not Established

Toxicity of components

1 Rat ^{LD} ₅₀ for Citric Acid, Anhydrous	6730 mg/kg
Mouse LD ₅₀ for Citric Acid, Anhydrous	5040 mg/kg
Intraperitoneal Rat LD ₅₀ for Citric Acid, Anhydrous	883 mg/kg
Subcutaneous Rat LD ₅₀ for Citric Acid, Anhydrous	5500 mg/kg

MOBIL OIL CORPORATION MATERIAL SAFETY DATA BULLETIN

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***** I. PRODUCT IDENTIFICATION *****
UNLEADED GASOLINE

SUPPLIER: MOBIL OIL CORP. HEALTH EMERGENCY TELEPHONE: (212) 883-4411
CHEMICAL NAMES AND SYNONYMS: PETROLEUM HYDROCARBONS TRANSPORT EMERGENCY TELEPHONE: (800) 424-9300 (CHEMTREC)
USE OR DESCRIPTION:

MOTOR FUEL

***** II. TYPICAL CHEMICAL AND PHYSICAL PROPERTIES *****

APPEARANCE: CLEAR LIQUID ODOOR: HYDROCARBON PH: NA
VISCOSITY AT 100 F, SUS: <30.0 AT 40 C, CS: <1.0
VISCOSITY AT 210 F, SUS: NA AT 100 C, CS: NA
FLASH POINT F(C): -40(-40) (ASTM D-56)
MELTING POINT F(C): NA POUR POINT F(C): NA
BOILING POINT F(C): > 80(27)
RELATIVE DENSITY, 15/4 C: 0.7-0.76 SOLUBILITY IN WATER: NEGLIGIBLE
VAPOR PRESSURE-MM HG 20C: 400.0

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER INFORMATION, CONTACT YOUR LOCAL MARKETING OFFICE.

***** III. INGREDIENTS *****

	WT PCT (APPROX)	EXPOSURE LIMITS MG/M3	SOURCES PPM	(AND NOTES)
HAZARDOUS INGREDIENTS: UNLEADED GASOLINE	100	900	300	A

KEY TO SOURCES: A=ACGIH-TLV, A*=SUGGESTED-TLV, M=MOBIL, O=OSHA
NOTE: LIMITS SHOWN FOR GUIDANCE ONLY. FOLLOW APPLICABLE REGULATIONS.

***** IV. HEALTH HAZARD DATA *****

EFFECTS OF OVEREXPOSURE: SLIGHT EYE IRRITATION. MODERATE SKIN IRRITATION. RESPIRATORY IRRITATION, DIZZINESS, NAUSEA, LOSS OF CONSCIOUSNESS.

***** V. EMERGENCY AND FIRST AID PROCEDURES *****

EYE CONTACT: FLUSH WITH WATER.
SKIN CONTACT: WASH CONTACT AREAS WITH SOAP AND WATER. LAUNDRER CONTAMINATED CLOTHING BEFORE REUSE.
INHALATION: REMOVE FROM FURTHER EXPOSURE. IF UNCONSCIOUSNESS OCCURS, SEEK IMMEDIATE MEDICAL ASSISTANCE AND CALL A PHYSICIAN. IF BREATHING HAS STOPPED, USE MOUTH TO MOUTH RESUSCITATION.
INGESTION: DO NOT INDUCE VOMITING. ADMINISTER VEGETABLE OIL. GET MEDICAL ASSISTANCE. (NOTE TO PHYSICIAN: MATERIAL IF ASPIRATED INTO THE LUNGS MAY CAUSE CHEMICAL PNEUMONITIS. TREAT APPROPRIATELY)



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NEUTRACIT^R-2 Caustic Neutralizer

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SECTION V - HEALTH HAZARD DATA (CONTINUED)

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Carcinogenicity: NTP: No IARC: No Z List: No OSHA Reg: No

Carcinogenicity
 None identified.

Reproductive Effects
 None identified.

Effects of Overexposure

INHALATION: irritation of upper respiratory tract

SKIN CONTACT: irritation

EYE CONTACT: irritation

SKIN ABSORPTION: none identified

INGESTION: gastrointestinal irritation

CHRONIC EFFECTS: none identified

Target Organs
 none identified

Medical Conditions Generally Aggravated by Exposure
 none identified

Primary Routes of Entry
 inhalation, ingestion, skin contact, eye contact

Emergency and First Aid Procedures

INGESTION: If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

INHALATION: If a person breathes in large amounts, move the exposed person to fresh air.

SKIN CONTACT: In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.

EYE CONTACT: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.



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 SECTION V - HEALTH HAZARD DATA (CONTINUED)

SARA/TITLE III HAZARD CATEGORIES and LISTS

Acute: No Chronic: No Flammability: No Pressure: No Reactivity: No
 Extremely Hazardous Substance: No
 CERCLA Hazardous Substance: No
 SARA 313 Toxic Chemicals: No
 HCSA Inventory: Yes

 SECTION VI - REACTIVITY DATA

Stability: Stable Hazardous Polymerization: Will not occur
 Conditions to Avoid: none documented
 Incompatibles: strong bases, copper, aluminum, strong oxidizing agents
 Decomposition Products: carbon monoxide, carbon dioxide

 SECTION VII - SPILL & DISPOSAL PROCEDURES

Steps to be Taken in the Event of a Spill or Discharge
 Wear suitable protective clothing. Carefully sweep up and remove.
Disposal Procedure
 Dispose in accordance with all applicable federal, state, and local environmental regulations.

 SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation: Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.
 Respiratory Protection: None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.



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SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT (CONTINUED)
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Eye/Skin Protection: Safety goggles, proper gloves are recommended.

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SECTION IX - STORAGE AND HANDLING PRECAUTIONS
=====

SAF-T-DATA* Storage Color Code: Orange (general storage)

Storage Requirements

Keep container tightly closed. Suitable for any general chemical storage area.

=====
SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION
=====

Domestic (D.O.T.)

Proper Shipping Name: Chemicals, n.o.s. (Non-regulated)

International (I.M.O.)

Proper Shipping Name: Chemicals, n.o.s. (Non-regulated)
Marine Pollutants: No

IR (I.C.A.O.)

Proper Shipping Name: Chemicals, n.o.s. (Non-regulated)

U.S. Customs Harmonization Number: 38239060007

NA = Not Applicable or Not Available

NE = Not Established

The information in this Material Safety Data Sheet meets the requirements of the United States OCCUPATIONAL SAFETY AND HEALTH ACT and regulations promulgated thereunder (29 CFR 1910.1200 et. seq.) and the Canadian WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. This document is intended only as a guide to the appropriate precautionary handling of the material by a person trained in, or supervised by a person trained in, chemical handling. The user is responsible for determining the precautions and dangers of this chemical for his or her particular



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NEUTRACIT^R-2 Caustic Neutralizer

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application. Depending on usage, protective clothing including eye and face guards and respirators must be used to avoid contact with material or breathing chemical vapors/fumes.

Exposure to this product may have serious adverse health effects. This chemical may interact with other substances. Since the potential uses are so varied, Baker cannot warn of all of the potential dangers of use or interaction with other chemicals or materials. Baker warrants that the chemical meets the specifications set forth on the label.

BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.

The user should recognize that this product can cause severe injury and even death, especially if improperly handled or the known dangers of use are not heeded. READ ALL PRECAUTIONARY INFORMATION. As new documented general safety information becomes available, Baker will periodically revise this Material Safety Data Sheet. If you have any questions, please call Customer Service (1-800-JTBAKER) for assistance.

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J.T. BAKER INC., 222 Red School Lane, Phillipsburg, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

Product Name: NEUTRASORB[®] Acid Neutralizer
 Common Synonyms: Proprietary Mixture
 Chemical Family: Spill Clean-Up Products
 Formula: N/A
 Formula Wt.: N/A
 CAS No.: N/A
 OSHA/RTECS No.: N/A
 Product Use: Spill Clean-Up
 Product Codes: 4456, 4442

PRECAUTIONARY LABELING

SAF-T-DATA* System

HEALTH	FLAMMABILITY	REACTIVITY	CONTACT
1	0	1	1
SLIGHT	NONE	SLIGHT	SLIGHT

Laboratory Protective Equipment



GUGGLES



LAB COAT

U.S. Precautionary Labeling

CAUTION!

HARMFUL IF INHALED. MAY CAUSE IRRITATION. MAY BE HARMFUL IF SWALLOWED.
 During use avoid contact with eyes, skin, clothing. Wash thoroughly after
 handling. When not in use keep in tightly closed container.



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=====

PRECAUTIONARY LABELING (CONTINUED)

=====

International Labeling

Avoid contact with eyes. After contact with skin, wash immediately with plenty of water. Keep container tightly closed.

AF-T-DATA* Storage Color Code: Orange (general storage)

=====

SECTION II - COMPONENTS

=====

<u>Component</u>	<u>CAS No.</u>	<u>Weight %</u>	<u>OSHA/PEL</u>	<u>ACGIH/TLU</u>
Chromocresol Purple	115-40-2	<0.1	N/E	N/E
Calcium Carbonate	471-34-1	5-25	15 mg/m ³	10 mg/m ³
Sodium Oxide	1309-48-4	25-45	10 mg/m ³	10 mg/m ³
Calcium Carbonate, Anhydrous	497-19-8	35-55	N/E	N/E

=====

SECTION III - PHYSICAL DATA

=====

Boiling Point: N/A

Vapor Pressure (mmHg): N/A

Melting Point: N/A

Vapor Density (air=1): N/A

Specific Gravity: N/A
 (H₂O=1)

Evaporation Rate: N/A

Solubility(H₂O): Slight (0.1-1%)

% Volatiles by Volume: 0
 (21°C)

Flash Point: N/A

Exposure Threshold (ppm): N/A

Physical State: Solid

Water/Oil Distribution: N/A

Appearance & Odor: Purple granules. Odorless.



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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Closed Cup): N/A

Autoignition Temperature: N/A

Flammable Limits: Upper - N/A Lower - N/A

Fire Extinguishing Media

Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Unusual Fire & Explosion Hazards

None identified.

Toxic Gases Produced

carbon monoxide, carbon dioxide, oxides

Explosion Data-Sensitivity to Mechanical Impact

None identified.

Explosion Data-Sensitivity to Static Discharge

None identified.

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): Not Established

Short-Term Exposure Limit (STEL): Not Established

Permissible Exposure Limit (PEL): Not Established

Toxicity of components

Intraperitoneal Mouse LD₅₀ for Sodium Carbonate, Anhydrous 117 mg/kg

Inhalation-2Hr Mouse LC₅₀ for Sodium Carbonate, Anhydrous 1200 mg/m³

Carcinogenicity: NTP: No IARC: No Z List: No OSHA Reg: No



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 SECTION V - HEALTH HAZARD DATA (CONTINUED)

carcinogenicity

None identified.

reproductive Effects

None identified.

Effects of Overexposure

INHALATION: irritation of upper respiratory tract, tightness and pain in chest, coughing, difficult breathing, leukocytosis

SKIN CONTACT: irritation

EYE CONTACT: irritation

SKIN ABSORPTION: none identified

INGESTION: headache, nausea, vomiting, dizziness, gastrointestinal irritation

CHRONIC EFFECTS: none identified

Target Organs

respiratory system, lungs

Medical Conditions Generally Aggravated by Exposure

none identified

Primary Routes of Entry

inhalation, ingestion, skin contact, eye contact

Emergency and First Aid Procedures

INGESTION: If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

INHALATION: If a person breathes in large amounts, move the exposed person to fresh air.

SKIN CONTACT: In case of contact, immediately wash skin with plenty of soap and water for at least 15 minutes.



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SECTION V - HEALTH HAZARD DATA (CONTINUED)

=====

EYE CONTACT: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

SARA/TITLE III HAZARD CATEGORIES and LISTS

Acute: No Chronic: Yes Flammability: No Pressure: No Reactivity: No

Extremely Hazardous Substance: No
ERCLA Hazardous Substance: No
SARA 313 Toxic Chemicals: No
SCA Inventory: Yes

=====

SECTION VI - REACTIVITY DATA

=====

Stability: Stable Hazardous Polymerization: Will not occur

Conditions to Avoid: moisture

Incompatibles: hydrofluoric acid, fuming sulfuric acid, fuming nitric acid, peroxy(per-) organic acids, aluminum, bromine trifluoride and trichloride, phosphorus pentachloride, fluorine, alum, ammonium salts, oxides of phosphorus, lithium

Decomposition Products: carbon monoxide, carbon dioxide, oxides

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

Steps to be Taken in the Event of a Spill or Discharge

Wear suitable protective clothing. Carefully sweep up and remove.

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.



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MATERIAL SAFETY DATA-SHEET

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SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation: Use adequate general or local exhaust ventilation to keep fume or dust levels as low as possible.

Respiratory Protection: None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask.

Eye/Skin Protection: Safety goggles, neoprene gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

MSDS-T-DATA* Storage Color Code: Orange (general storage)

Storage Requirements

Keep container tightly closed. Suitable for any general chemical storage area.

Special Precautions

NEUTRASORB is NOT recommended for spills of hydrofluoric acid, fuming sulfuric acid, fuming nitric acid, or peroxy(per-) organic acids.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

Domestic (D.O.T.)

Proper Shipping Name: Chemicals, n.o.s. (Non-regulated)

International (I.M.O.)

Proper Shipping Name: Chemicals, n.o.s. (Non-regulated)
Marine Pollutants: No

IR (I.C.A.O.)

Proper Shipping Name: Chemicals, n.o.s. (Non-regulated)

Customs Harmonization Number: 38239060007



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N/A = Not Applicable or Not Available

N/E = Not Established

The information in this Material Safety Data Sheet meets the requirements of the United States OCCUPATIONAL SAFETY AND HEALTH ACT and regulations promulgated thereunder (29 CFR 1910.1200 et. seq.) and the Canadian WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. This document is intended only as a guide to the appropriate precautionary handling of the material by a person trained in, or supervised by a person trained in, chemical handling. The user is responsible for determining the precautions and dangers of this chemical for his or her particular application. Depending on usage, protective clothing including eye and face guards and respirators must be used to avoid contact with material or breathing chemical vapors/fumes.

Exposure to this product may have serious adverse health effects. This chemical may interact with other substances. Since the potential uses are varied, Baker cannot warn of all of the potential dangers of use or interaction with other chemicals or materials. Baker warrants that the chemical meets the specifications set forth on the label.

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FLASH POINT (F).....: NONCOMBUSTIBLE

FLAMMABLE LIMITS LEL %.: N/A

FLAMMABLE LIMITS UEL %.: N/A

EXTINGUISHING MEDIA.....: WATER SPRAY, DRY CHEMICAL

FIRE FIGHTING PROC.....:

WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING.
FIRE & EXPL. HAZARDS...: CAN REACT EXPLOSIVELY WITH CERTAIN REDUCING
AGENTS AND COMBUSTIBLES; SUCH AS, METAL POWDERS, CARBIDES, H₂S,
TURPENTINE.

SECTION V - HEALTH HAZARD DATA (ACUTE AND CHRONIC)

ACGIH TLV/OSHA PEL (TWA).....: 2 PPM; STEL 4 PPM

TOXICITY DATA.....: UNR-MAN LDLO: 110 MG/KG

SYMPTOMS OF EXPOSURE

CAUSES SEVERE BURNS ON CONTACT WITH ANY BODY TISSUE.
INHALATION OF VAPORS OR MISTS CAN CAUSE SEVERE BURNS TO RESPIRATORY
PASSAGES, PNEUMONIA AND PULMONARY EDEMA.
CAN BE FATAL IF INHALED OR SWALLOWED.
SYMPTOMS OF LUNG INJURY MAY BE DELAYED.

MEDICAL COND. AGGRAVATED BY EXP: RESPIRATORY CONDITIONS

ROUTES OF ENTRY.....: INHALATION, INGESTION OR SKIN CONTACT.

CARCINOGENICITY.....:

THE MATERIAL IS NOT LISTED AS A CANCER CAUSING AGENT.

EMERGENCY FIRST AID.....:

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE
SKIN: IMMEDIATELY FLUSH THOROUGHLY WITH LARGE AMOUNTS OF WATER.
EYES: IMMEDIATELY FLUSH THOROUGHLY WITH WATER FOR AT LEAST 15 MINUTES.
INHALATION: REMOVE TO FRESH AIR; GIVE ARTIFICIAL RESPIRATION IF
BREATHING HAS STOPPED.
INGESTION: DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE WATER FREELY
AND GET MEDICAL ATTENTION.

SECTION VI - REACTIVITY DATA

STABILITY.....: YES

CONDITIONS TO AVOID

AVOID CONTACT WITH ALL COMBUSTIBLE MATTER

MATERIALS TO AVOID.....: (X) STEAM () ACIDS

(X) BASES () CORROSIVES () OXIDIZERS

(X) OTHER: REDUCING AGENTS, ORGANIC MATERIALS, COMBUSTIBLE MATTER

HAZARDOUS POLYMERIZATION.: DOES NOT OCCUR

HAZARDOUS DECOMPOSITION.: NO.X.

SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

SPILL RESPONSE: DIKE SPILL WITH SAND AND SODA ASH.

DILUTE WITH WATER AND TAKE UP FOR PROPER DISPOSAL.
WASTE DISPOSAL: TO BE PERFORMED IN COMPLIANCE WITH ALL CURRENT LOCAL,
STATE AND FEDERAL REGULATIONS.

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SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION, RESPIRATORY PROTECTION, PROTECTIVE CLOTHING, EYE PROTECTION:
-MATERIAL MUST BE HANDLED OR TRANSFERRED IN AN APPROVED FUME HOOD
OR WITH EQUIVALENT VENTILATION
PROTECTIVE GLOVES (NATURAL RUBBER, NEOPRENE, PVC OR EQUIVALENT)
MUST BE WORN TO PREVENT SKIN CONTACT
PROTECTIVE CLOTHING (NATURAL RUBBER, NEOPRENE, PVC OR EQUIVALENT)
SHOULD BE WORN WHEN HANDLING THIS MATERIAL
SAFETY GLASSES WITH SIDE SHIELDS MUST BE WORN AT ALL TIMES
NIOSH/MSHA-APPROVED RESPIRATOR SHOULD BE WORN IN THE ABSENCE OF
ADEQUATE VENTILATION

SECTION IX - SPECIAL PRECAUTIONS

HANDLING & STORAGE

KEEP CONTAINER TIGHTLY CLOSED AND PROTECTED FROM PHYSICAL DAMAGE.
STORE IN A COOL, DRY AREA AWAY FROM COMBUSTIBLE OR REDUCING MATERIALS.
DO NOT BREATHE VAPOR OR MIST.
DO NOT GET IN EYES, ON SKIN OR ON CLOTHING.
RETAINED RESIDUE MAY MAKE EMPTY CONTAINERS HAZARDOUS; USE CAUTION
WORK/HYGIENIC PRACTICES: WASH THOROUGHLY AFTER HANDLING. DO NOT TAKE
INTERNALLY. EYE WASH AND SAFETY EQUIPMENT SHOULD BE READILY AVAILABLE.

SECTION X - OTHER INFORMATION

COMMENTS.....:

TESTS ON LABORATORY ANIMALS INDICATE MATERIAL MAY PRODUCE
ADVERSE REPRODUCTIVE EFFECTS.

REVISION HISTORY.....: 08/01/81, 11/83, 1/24/87, 10/27/87, 9/7/88
N/A = NOT AVAILABLE:

REPORT NUMBER: 703
MSDS NO: P11280
EFFECTIVE DATE: 03/05/92

VAN WATERS & ROGERS INC.
MATERIAL SAFETY DATA SHEET

PAGE: 001
VERSION: 002

PRODUCT: LIQUICHLOR (R)

ORDER NO: 144054
PROD NO : 348431

RESOURCE TECHNOLOGIES GRP
ROCKY FLATS FACILITY
RIEDEL ENVIRON SERV.

ROCKY FLATS ,CO 80227

VAN WATERS & ROGERS INC. , SUBSIDIARY OF UNIVAR (206)889-3400
6100 CARILLON POINT , KIRKLAND , WA 98033

----- EMERGENCY ASSISTANCE -----

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL - CHEMTREC
(800)424-9300

----- FOR PRODUCT AND SALES INFORMATION -----

CONTACT YOUR LOCAL VAN WATERS & ROGERS BRANCH OFFICE AT
VW&R DENVER 303-388-5451 DENVER , CO

----- PRODUCT IDENTIFICATION -----

PRODUCT NAME: LIQUICHLOR (R) CAS NO.: UNASSIGNED

COMMON NAMES/SYNONYMS: ~~SODIUM HYPOCHLORITE~~ MSDS #: P11280
LIQUID BLEACH; HYPOCHLOROUS ACID, SODIUM SALT;
SODA BLEACH; SH-12

FORMULA: MIXTURE DATE ISSUED: 03/92

MOLECULAR WEIGHT: NOT APPLICABLE SUPERSEDES: 10/91

HAZARD RATING (NFPA 704 CRITERIA) HMIS RATING

HEALTH: 3 HAZARD RATING SCALE: HEALTH: 2
FIRE: 0 0=MINIMAL 3=SERIOUS FIRE: 0
REACTIVITY: 0 1=SLIGHT 4=SEVERE REACTIVITY: 0
SPECIAL: OXY 2=MODERATE

----- HAZARDOUS INGREDIENTS -----

COMPONENT	CAS NO.	%	EXPOSURE LIMITS, MG/M3			HAZARD
			OSHA PEL	ACGIH TLV	STEL	
			SODIUM HYPOCHLORITE	7681-52-9	9.4-12.5	

REPORT NUMBER: 703
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						OXIDIZER
SODIUM CHLORIDE	7647-14-5	5-13	NONE	NONE	NONE	NONE
SODIUM HYDROXIDE	1310-73-2	<1	2C	2C	NONE	CORROSIVE; TOXIC
WATER	7732-18-5	84L	NONE	NONE	NONE	NONE

* = as Chlorine (Note: OSHA STEL is 3 mg/m³)
 C = Ceiling

-----PRECAUTIONARY STATEMENTS-----

DANGER: CORROSIVE, MAY CAUSE SEVERE SKIN AND EYE IRRITATION OR CHEMICAL BURNS TO BROKEN SKIN. CAUSES EYE DAMAGE. WEAR SAFETY GLASSES OR GOGGLES AND RUBBER GLOVES WHEN HANDLING THIS PRODUCT. WASH AFTER HANDLING. AVOID BREATHING VAPORS. VACATE POORLY VENTILATED AREAS AS SOON AS POSSIBLE. DO NOT RETURN UNTIL STRONG ODORS HAVE DISSIPATED.

STRONG OXIDIZING AGENT: MIX ONLY WITH WATER ACCORDING TO LABEL DIRECTIONS. MIXING THIS PRODUCT WITH CHEMICALS (E.G. AMMONIA, ACIDS, DETERGENTS, ETC.) OR ORGANIC MATTER (URINE, FECES, ETC.) WILL RELEASE CHLORINE GAS WHICH IS IRRITATING TO EYE, LUNGS AND MUCOUS MEMBRANES.

-----PHYSICAL PROPERTIES-----

BOILING POINT, DEG F: DECOMPOSES AT 125

VAPOR PRESSURE, MM HG/125 DEG F: 22

pH: ALKALINE (BASIC)

MELTING POINT, DEG F: 9.4-10.4

VAPOR DENSITY (AIR=1): 0.9

SPECIFIC GRAVITY (WATER=1): 1.1-1.3

WATER SOLUBILITY, %: 100

EVAPORATION RATE (BUTYL ACETATE=1): SAME AS WATER

APPEARANCE AND ODOR: LIGHT YELLOW TO GREEN CLEAR LIQUID, CHLORINE ODOR

PERCENT VOLATILE (BY VOLUME): NO DATA AVAILABLE

-----FIRST AID MEASURES-----

PRODUCT: LIQUICHLOR (R)

ORDER NO: 144054
PROD NO : 348431

IF INHALED: REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET IMMEDIATE MEDICAL ATTENTION.

IN CASE OF EYE CONTACT: IMMEDIATELY FLUSH EYES WITH WATER FOR AT LEAST 15 MINUTES. GET IMMEDIATE MEDICAL ATTENTION.

IN CASE OF SKIN CONTACT: WASH WITH PLENTY OF SOAP AND WATER. REMOVE CONTAMINATED CLOTHING AND SHOES; WASH BEFORE REUSE. GET IMMEDIATE MEDICAL ATTENTION.

IF SWALLOWED: DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE LOTS OF WATER MILK, MILK OF MAGNESIA, OR GELATIN SOLUTION. DO NOT GIVE VINEGAR OR OTHER ACIDS; DO NOT GIVE BAKING SODA OR ACID ANTIDOTES. GET IMMEDIATE MEDICAL ATTENTION. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON.

FIRST AID TO PHYSICIAN: NONE

-----HEALTH HAZARD INFORMATION-----

PRIMARY ROUTES OF EXPOSURE: SKIN OR EYE CONTACT, INHALATION.

SIGNS AND SYMPTOMS OF EXPOSURE

INHALATION: INHALATION OF FUMES OR MISTS CAUSES RESPIRATORY TRACT IRRITATION AND IRRITATION OF MUCOUS MEMBRANES. IF SODIUM HYPOCHLORITE IS MIXED WITH AMMONIA OR OTHER CHEMICALS, EVOLUTION OF CHLORINE OR HYPOCHLOROUS ACID RESULTS. THESE GASES CAN PRODUCE PULMONARY EDEMA.

EYE CONTACT: LIQUID AND MISTS MAY SEVERELY IRRITATE OR DAMAGE THE EYES.

SKIN CONTACT: THE LIQUID WILL IRRITATE THE SKIN, CAUSING REDNESS AND POSSIBLY INFLAMMATION AND CHEMICAL BURNS.

SWALLOWED: MISTS AND LIQUID ARE EXTREMELY CORROSIVE TO THE MOUTH AND THROAT, MUCOUS MEMBRANES AND STOMACH. SWALLOWING THE LIQUID BURNS THE TISSUES, CAUSES SEVERE ABDOMINAL PAIN, NAUSEA, VOMITING, CIRCULATORY COLLAPSE, CONFUSION, DELIRIUM, COMA, AND COLLAPSE. SWALLOWING LARGE QUANTITIES CAN CAUSE DEATH.

CHRONIC EFFECTS OF EXPOSURE: IRRITATION EFFECTS INCREASE WITH STRENGTH OF SOLUTION AND TIME OF EXPOSURE. PROLONGED OR REPEATED EXPOSURE CAN LEAD TO CONSTANT IRRITATION OF EYES AND THROAT. PROLONGED OR REPEATED CONTACT MAY CAUSE DERMATITIS AND SENSITIZATION.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: PEOPLE WITH ASTHMA OR OTHER LUNG PROBLEMS MAY BE MORE SUSCEPTIBLE.

REPORT NUMBER: 703
MSDS NO: P11280
EFFECTIVE DATE: 03/05/92

VAN WATERS & ROGERS INC.
MATERIAL SAFETY DATA SHEET

PAGE: 004

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PRODUCT: LIQUICHLOR (R)

ORDER NO: 144054
PROD NO : 348431

-----TOXICITY DATA-----

ORAL: FOR 5% SOLUTION: RAT LD50 = 13 G/KG
FOR 12.5% SOLUTION: RAT LD50 = 5 G/KG

DERMAL: RAT LD50 >3.0 G/KG

INHALATION: NO DATA AVAILABLE

CARCINOGENICITY: THIS MATERIAL IS NOT CONSIDERED TO BE A CARCINOGEN BY THE NATIONAL TOXICOLOGY PROGRAM, THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER, OR THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OTHER DATA: NONE

-----PERSONAL PROTECTION-----

VENTILATION: LOCAL MECHANICAL EXHAUST VENTILATION CAPABLE OF MINIMIZING EMISSIONS AT THE POINT OF USE.

RESPIRATORY PROTECTION: WEAR A NIOSH-APPROVED RESPIRATOR APPROPRIATE FOR THE VAPOR OR MIST CONCENTRATION AT THE POINT OF USE. APPROPRIATE RESPIRATORS MAY BE A FULL FACEPIECE AIR-PURIFYING CARTRIDGE RESPIRATOR EQUIPPED FOR ACID GASES/MISTS, A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE, OR A SUPPLIED-AIR RESPIRATOR.

EYE PROTECTION: CHEMICAL GOGGLES AND FULL FACESHIELD UNLESS A FULL FACEPIECE RESPIRATOR IS ALSO WORN. IT IS GENERALLY RECOGNIZED THAT CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH CHEMICALS BECAUSE CONTACT LENSES MAY CONTRIBUTE TO THE SEVERITY OF AN EYE INJURY.

PROTECTIVE CLOTHING: LONG-SLEEVED SHIRT, TROUSERS, IMPERVIOUS BOOTS, IMPERVIOUS GLOVES AND IMPERVIOUS APRON.

OTHER PROTECTIVE MEASURES: AN EYEWASH AND SAFETY SHOWER SHOULD BE NEARBY AND READY FOR USE.

-----FIRE AND EXPLOSION INFORMATION-----

FLASH POINT, DEG F: NOT FLAMMABLE
METHOD USED: N/A

FLAMMABLE LIMITS IN AIR, %
LOWER: N/A UPPER: N/A

SELF-IGNITION TEMPERATURE, DEG.F: NOT APPLICABLE

EXTINGUISHING MEDIA: THIS MATERIAL IS NOT COMBUSTIBLE. USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

REPORT NUMBER: 703
MSDS NO: P11280
EFFECTIVE DATE: 03/05/92

VAN WATERS & ROGERS INC.
MATERIAL SAFETY DATA SHEET

PAGE: 005

VERSION: 002

PRODUCT: LIQUICHLOR (R)

ORDER NO: 144054
PROD NO : 348431

SPECIAL FIRE FIGHTING PROCEDURES: FIRE FIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. USE WATER SPRAY TO COOL NEARBY CONTAINERS AND STRUCTURES EXPOSED TO FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS: CONTAINERS OF THIS MATERIAL CAN EXPLODE UNDER FIRE CONDITIONS. OXYGEN MAY BE LIBERATED UPON CONTACT WITH CERTAIN METALS. TOXIC FUMES ARE LIBERATED BY CONTACT WITH ACIDS OR HEAT. HIGHLY EXOTHERMIC REACTIONS WITH ORGANIC MATERIALS AND OXIDIZABLE MATERIALS MAY CAUSE FIRES.

-----HAZARDOUS REACTIVITY-----

STABILITY: STABLE

POLYMERIZATION: WILL NOT OCCUR

STABILITY DECREASES WITH CONCENTRATION, HEAT, LIGHT EXPOSURE, DECREASE IN PH AND CONTAMINATION WITH HEAVY METALS SUCH AS NICKEL, COBALT, CUPRUM AND IRON.

CONDITIONS TO AVOID: EXCESSIVE HEAT, EXPOSURE TO LIGHT, EXCESS ALKALINITY, AND CONTAMINATION OF ANY KIND.

MATERIALS TO AVOID: ETHER, AMMONIA, ACIDS, REDUCING AGENTS, OXIDIZABLE MATERIALS, COMBUSTIBLE MATERIALS (SUCH AS WOOD, CLOTH), ORGANIC MATERIALS, HEAVY METALS SUCH AS IRON AND COPPER AND THEIR ALLOYS, DIRT, DETERGENTS, MAGNESIUM, ALUMINUM, TIN, MANGANESE, ZINC, AND NITRO COMPOUNDS.

HAZARDOUS DECOMPOSITION PRODUCTS: HOCl, CHLORINE, HCl, SODIUM CHLORATE, AND OXYGEN WHICH DEPEND ON PH, TEMPERATURE AND TIME.

-----SPILL, LEAK, AND DISPOSAL PROCEDURES-----

ACTION TO TAKE FOR SPILLS OR LEAKS: WEAR ALKALI-RESISTANT SLICKER SUIT AND COMPLETE PROTECTIVE EQUIPMENT INCLUDING IMPERVIOUS GLOVES, IMPERVIOUS BOOTS, AND A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE OR A SUPPLIED-AIR RESPIRATOR. IF THE SPILL OR LEAK IS SMALL, A FULL FACEPIECE AIR-PURIFYING CARTRIDGE RESPIRATOR EQUIPPED WITH ACID GASES/MISTS FILTERS MAY BE SATISFACTORY. IN ANY EVENT, ALWAYS WEAR EYE PROTECTION.

FOR SMALL SPILLS OR DRIPS, MOP OR WIPE UP AND DISPOSE OF IN DOT APPROVED WASTE CONTAINERS. FOR LARGE SPILLS, CONTAIN BY DIKING WITH NON-COMBUSTIBLE ABSORBENT MATERIAL AND CAREFULLY NEUTRALIZE WITH A 5 % SODIUM BISULFITE SOLUTION. KEEP NON-NEUTRALIZED MATERIAL OUT OF SEWERS, STORM DRAINS, SURFACE WATERS, AND SOIL. THIS PRODUCT IS VERY TOXIC TO AQUATIC LIFE.

COMPLY WITH ALL APPLICABLE GOVERNMENTAL REGULATIONS ON SPILL REPORTING,

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PRODUCT: LIQUICHLOR (R)

ORDER NO: 144054
PROD NO : 348431

AND HANDLING AND DISPOSAL OF WASTE.

DISPOSAL METHODS: DISPOSE OF CONTAMINATED PRODUCT AND MATERIALS USED IN CLEANING UP SPILLS OR LEAKS IN A MANNER APPROVED FOR THIS MATERIAL. CONSULT APPROPRIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES TO ASCERTAIN PROPER DISPOSAL PROCEDURES.

NOTE: EMPTY CONTAINERS CAN HAVE RESIDUES, GASES AND MISTS AND ARE SUBJECT TO PROPER WASTE DISPOSAL, AS ABOVE.

-----SPECIAL PRECAUTIONS-----

STORAGE AND HANDLING PRECAUTIONS: STORE IN A COOL, DRY, WELL-VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. KEEP CONTAINER TIGHTLY CLOSED WHEN NOT IN USE. DO NOT USE PRESSURE TO EMPTY CONTAINER. WASH THOROUGHLY AFTER HANDLING. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING. STORE IN ORIGINAL CONTAINERS ONLY AT TEMPERATURES BELOW 85 DEG. F. DO NOT STORE NEAR ACIDS, OXIDIZABLE MATERIALS, OR ORGANICS. DO NOT STORE DIRECTLY ON WOODEN FLOORS. WOODEN PALLETS MAY BE USED AS LONG AS PRECAUTIONS ARE TAKEN TO PREVENT SPILLAGE OR LEAKAGE ONTO PALLETS.

REPAIR AND MAINTENANCE PRECAUTIONS: NONE.

OTHER PRECAUTIONS: CONTAINERS, EVEN THOSE THAT HAVE BEEN EMPTIED, WILL RETAIN PRODUCT RESIDUE AND VAPORS. ALWAYS OBEY HAZARD WARNINGS AND HANDLE EMPTY CONTAINERS AS IF THEY WERE FULL. DO NOT MIX THIS PRODUCT WITH OTHER CLEANING AGENTS THAT MAY LIBERATE CHLORINE GAS VAPORS (I.E. ACIDIC AGENTS). THIS PRODUCT DEGRADES WITH AGE; USE IT WITHIN ONE MONTH OF RECEIPT. IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH ITS LABELING.

-----ECOLOGICAL INFORMATION SECTION-----

THIS PRODUCT IS TOXIC TO FISH. DO NOT DISCHARGE INTO LAKES, STREAMS, PONDS OR PUBLIC WATERWAYS UNLESS IN ACCORDANCE WITH NPDES PERMIT. FOR GUIDANCE CONTACT THE REGIONAL OFFICE OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY.

-----OTHER REGULATORY INFORMATION-----

SARA SECTION 313: NONE

PROPOSITION 65: NONE

MASSACHUSETTS: NONE

PENNSYLVANIA: UNDER THE PENNSYLVANIA RIGHT-TO-KNOW LAW, HAZARDOUS SUBSTANCES AND SPECIAL HAZARDOUS SUBSTANCES COMPONENTS PRESENT IN THIS PRODUCT WHICH REQUIRE REPORTING ARE:

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VAN WATERS & ROGERS INC.
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SUBJECT: LIQUICHLOR (R)

ORDER NO: 144054
PROD NO : 348431

HAZARDOUS SUBSTANCES

CHEMICAL(S)	CAS NO.	CONCENTRATION (>1%)
SODIUM HYPOCHLORITE	7681-52-9	8.4-13

CALIFORNIA SCAQMD: NONE

TSCA: THE INGREDIENTS OF THIS PRODUCT ARE ON THE TSCA INVENTORY.

-----REVISION-----

03/92: REVISED PRODUCT IDENTIFICATION, SPECIAL PRECAUTIONS, OTHER REGULATORY INFORMATION.

----- FOR ADDITIONAL INFORMATION -----

CONTACT: MSDS COORDINATOR	VW&R DENVER
DURING BUSINESS HOURS, PACIFIC TIME	(206)889-3400

04/23/92 14:39 PRODUCT: 349431 CUST NO: 143579 ORDER NO: 144054

----- NOTICE -----

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* * * E N D O F M S D S * * *

REPORT NUMBER: 703
MSDS NO: P12373V
EFFECTIVE DATE: 03/19/92

VAN WATERS & ROGERS INC.
MATERIAL SAFETY DATA SHEET

PRODUCT: SULFURIC ACID, 77-100%

ORDER NO: 149757
PROD NO : 361200

RIEDEL ENVIRONMENTAL SERV
5850 EAST 58TH AVE
SUITE F

COMMERCE CTY, CO 80022

VAN WATERS & ROGERS INC. , SUBSIDIARY OF UNIVAR (206)889-3400
6100 CARILLON POINT , KIRKLAND , WA 98033

----- EMERGENCY ASSISTANCE -----

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL - CHEMTREC
(800)424-9300

----- FOR PRODUCT AND SALES INFORMATION -----

CONTACT YOUR LOCAL VAN WATERS & ROGERS BRANCH OFFICE AT
VW&R DENVER 303-388-5651 DENVER , CO

PRODUCT IDENTIFICATION

PRODUCT NAME: Sulfuric Acid, 77-100%

MSDS #: P12373V

DATE ISSUED: 02/24/92

GRADE: 77 to 100 % Technical

CHEMICAL FAMILY: Mineral Acid

CAS NAME: Sulfuric Acid

CAS NUMBER: 7664-93-9

FORMULA: H2SO4

MOLECULAR WEIGHT: 98.08

TSCA INVENTORY STATUS: Reported/included

NFPA RATINGS: HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 2 WATER REACTIVE
NFPA-HMIS RATINGS: HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 2

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MATERIAL SAFETY DATA SHEET

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SUBJECT: SULFURIC ACID, 77-100%

ORDER NO: 149757
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Personal protection rating to be supplied by user depending on use conditions.

COMPONENTS

MATERIAL	CAS NUMBER	PERCENT
*Sulfuric Acid	7664-93-9	
60 deg Technical		77.7
66 deg Technical		93.2
1.835 Electrolyte		93.2
Technical		98
Technical		99
100% Technical		100
Water	7732-18-5	

* Regulated as a Toxic Chemical under Section 313 of Title III of the Superfund and Reauthorization Act of 1986 and 40 CFR part 372.

PHYSICAL DATA

BOILING POINT: 193 to 327 deg C (380 to 621 deg F) at mm Hg.

VAPOR PRESSURE: <0.3 mm Hg at 25 deg C (77 deg F)
<0.6 mm Hg at 38 deg C (100 deg F)

VAPOR DENSITY: 3.4

MELTING POINT: -35 to 11 deg C (-31 to 51 deg F)

EVAPORATION RATE: Less than 1

WATER SOLUBILITY: 100 WT %

pH: Less than 1

ODOR: Odorless

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DUCT: SULFURIC ACID, 77-100%

ORDER NO: 149757
PROD NO : 361200

FORM: Oily; clear to turbid liquid

COLOR: Colorless to light gray

GRADE	BOILING POINT		MELTING POINT		SPECIFIC GRAVITY
	DEG C	DEG F	DEG C	DEG F	
60 DEG TECHNICAL	193	380	-12	10	1.706
66 DEG TECHNICAL	279	535	-35	-31	1.835
1.835 ELECTROLYTE	279	535	-35	-31	1.835
98% TECHNICAL	327	621	-2	29	1.844
99% TECHNICAL	310	590	4	40	1.842
TECHNICAL	274	526	11	51	1.839

HAZARDOUS REACTIVITY

INSTABILITY: Stable, but reacts violently with water and organic materials with evolution of heat.

DECOMPOSITION: Release sulfur dioxide at extremely high temperatures.

POLYMERIZATION: Polymerization will not occur.

INCOMPATIBILITY: Vigorous reactions with water; alkaline solutions; metals, metal powder; carbides; chlorates; fuminates; nitrates; picrates; strong oxidizing, reducing, or combustible organic materials. Hazardous gases are evolved on contact with chemicals such as cyanides, sulfides, and carbides.

FIRE AND EXPLOSION DATA

FLASH POINT: Will not burn

AND EXPLOSION MEDIA: Reacts with most metals, especially when dilute, to give flammable, potentially explosive hydrogen gas. Follow appropriate National Fire Protection Association (NFPA) codes.

EXTINGUISHING MEDIA: Use media appropriate for surrounding material.

PRODUCT: SULFURIC ACID, 77-100%

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Use water spray to cool containers exposed to fire; do not get water inside containers.

SPECIAL FIRE FIGHTING INSTRUCTIONS: Evacuate personnel to a safe area. Keep personnel removed and upwind of fire. Generates heat upon addition of water, with possible spattering. Wear full protective clothing. Runoff from fire control may cause pollution. Neutralized run-off with lime, soda ash, etc., to prevent corrosion of metals and formation of hydrogen gas. Wear self-contained breathing apparatus if fumes or mists are present.

HEALTH HAZARD INFORMATION

Causes severe burns to eyes, skin, and all body tissue. Eye damage may be permanent. Destruction of tissue may result from direct chemical reaction tissue, from thermal burns, and from dehydration (removal of water) the tissue.

ANIMAL DATA:

INHALATION 1-HOUR LC50: 317 ppm in rats
ORAL LD50: 2140 ppm mg/kg in rats

The concentrated compound is corrosive to the skin and eyes of animals. By ingestion it is moderately toxic in animals causing corrosion of mucosal surfaces. Toxic effects described in animals from single exposures by inhalation include respiratory irritation. Animal testing indicated that this compound does not have carcinogenic, mutagenic, embryotoxic, or reproductive effects.

HUMAN HEALTH EFFECTS:

Human health effects of overexposure to the liquid by skin or eye contact may cause eye corrosion with corneal or conjunctival ulceration; or skin burns or ulceration. Ingestion of the liquid may cause severe burns to the mucous membranes of the mouth and esophagus. Repeated or prolonged contact with mists may cause eye irritation with discomfort, tearing or blurring of vision; or skin irritation with discomfort or rash. Human health effects of overexposure by inhalation may include irritation of the upper respiratory passages; or erosion of dental surfaces. Higher exposures by inhalation may lead to temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath; or possibly modest initial symptoms followed in hours by severe shortness of breath, requiring prompt medical attention.

The International Agency for Research on Cancer (IARC) classified "strong

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PRODUCT: SULFURIC ACID, 77-100%

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inorganic acid mists containing sulfuric acid" as a Category 1 carcinogen, a substance that is "carcinogenic to humans". This classification is for inorganic acid mists only and does not apply to sulfuric acid or sulfuric acid solutions. The basis for the IARC classification rests on several epidemiology studies which have several deficiencies. These studies did not account for exposure to other substances, some known to be animal or potential human carcinogens, social influences (smoking or alcohol consumptions) and included small numbers of subjects. Based on the overall weight of evidence from all human and chronic animals studies, no definitive causal relationship between sulfuric acid mist exposure and respiratory tract cancer has been shown.

Individuals with preexisting diseases of the lungs may have increased susceptibility to the toxicity of excessive exposures.

CARCINOGENICITY: None of the components in this material is listed by IARC, NTP, OSHA, or ACGIH as a carcinogen.

EXPOSURE LIMITS

Sulfuric Acid, 77 to 100%

AEL * (Du Pont): 1 mg/m³ - 8 & 12 Hr. TWA
TLV (ACGIH): 1 mg/m³ - 8 Hr TWA
STEL: 3 mg/m³

PEL (OSHA): 1 mg/m³ - 8 Hr TWA

* AEL is Du Pont's Acceptable Exposure Limit. Where governmental imposed occupational exposure limits which are lower than the AEL are in effects, such limits shall take precedence.

SAFETY PRECAUTIONS: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling.

Keep containers closed. Do not add water to contents while in container because of violent reaction.

FIRST AID

INHALATION: If inhaled, remove to fresh air immediately and have patient lie down and remain quiet. Apply artificial respiration if breathing has stopped. Give oxygen if breathing is difficult. Call a physician.

INGESTION: If swallowed, do not induce vomiting. Give large quantities of water. Call a physician. Do not neutralized the acid. Never give

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anything by mouth to an unconscious person.

SKIN OR EYE CONTACT: In case of contact, immediately (within seconds) flush eyes or skin with plenty of water (preferably cold water) for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse.

While the patient is being transported to a medical facility apply compresses of iced water. If medical treatment must be delayed, immerse the affected area in iced water. If immersion is not practical, compresses of iced water can be applied. Avoid freezing tissues.

NOTES TO PHYSICIAN: Continued washing of the affected area with cold or iced water will be helpful in removing the last traces of sulfuric acid. Creams or ointments should not be applied before or during the washing phase of the treatment.

GENERALLY APPLICABLE CONTROL MEASURES AND PRECAUTIONS: Good general ventilation should be provided to keep vapor and mist concentrations below the exposure limits.

PERSONAL PROTECTIVE EQUIPMENT: Have available and wear as appropriate for exposure conditions when handling containers or operating equipment containing sulfuric acid: chemical splash goggles; full-length face shield/chemical splash goggle combination; acid-proof gauntlet gloves, apron, and boots; long sleeve wool, acrylic, or polyester clothing; acid proof suit and hood; and appropriate NIOSH/MSHA respiratory protection. In case of emergency or where there is a strong possibility of considerable exposure, wear a complete acid suit with hood, boots, and gloves. If acid vapor or mist are present and exposure limits may be exceeded, wear appropriate NIOSH/MSHA respiratory protection.

DISPOSAL INFORMATION

AQUATIC TOXICITY: The 18-hour TLm in flounder is 100-300 ppm.

SPILL, LEAK, OR RELEASE: NOTE: Review Fire and Explosion Hazards and Safety Precautions before proceeding with clean up. Use appropriate Personal Protective Equipment during clean up. Superfund reportable discharge - 1000 lbs.

Flow if possible. Review "Fire and Explosion Hazards" and "Safety Precautions" before proceeding with clean up. Use appropriate protective equipment during clean up. Soak up small spills with dry sand, clay or diatomaceous earth. Dike large spills, and cautiously dilute and neutralize with lime or soda ash, and transfer to waste water treatment

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system. Prevent liquid from entering sewers, waterways, or low areas. Comply with Federal, State, and local regulations on reporting releases. The EPA reportable discharge is 1000 lbs.

WASTE DISPOSAL: Cleaned-up material may be a RCRA Hazardous Waste on disposal. Do not flush to surface water or sanitary sewer system. Comply with Federal, State, and local regulations. If approved, neutralized and transfer to waste treatment system.

SHIPPING INFORMATION

DOT/IMO

PROPER SHIPPING NAME: Sulfuric Acid*

HAZARD CLASS: 8

UN NO.: 1830

DOT/IMO LABEL: Corrosive

SPECIAL INFORMATION: DOT/IMO PLACARD: Corrosive

PACKAGING GROUP: II

REPORTABLE QUANTITY: 1000 lbs.

SHIPPING CONTAINERS

Tank car, tank truck, steel drums - 55 gallon stainless steel

* If material is shipped in quantities greater than 1000 lbs. per container, the proper shipping name is RQ Sulfuric Acid.

STORAGE CONDITIONS

Keep out of sun and away from heat, sparks, and flame. Keep container tightly closed and (drum) closure up to prevent leakage. Loosen closure fully. Relieve internal pressure when received and at least weekly thereafter. Do not use pressure to empty. Be sure closure is securely fastened before moving container. Do not wash out container or use it for other purposes; replace closure after each withdrawal and return it with empty container.

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TITLE III HAZARD CLASSIFICATIONS

ACUTE: Yes
CHRONIC: Yes
FIRE: No
REACTIVITY: Yes
PRESSURE: No

LISTS:

EXTREMELY HAZARDOUS SUBSTANCE: Yes
CERCLA HAZARDOUS SUBSTANCE: Yes
TOXIC CHEMICAL: Yes



H4065 -01

Hydrogen Peroxide, 30%

Page: 1

Effective: 10/01/85

Issued: 10/01/85

SECTION I - PRODUCT IDENTIFICATION

Product Name: Hydrogen Peroxide, 30%
Formula: H_2O_2
Formula Wt: 34.01
CAS No.: 07722-84-1
NIOSH/RTECS No.: MX0899000
Common Synonyms: Hydrogen Peroxide Solution
Product Codes: 2186, 5369, 2189, 2192, 2190, 2191, 5170

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA™ System

HEALTH 2 MODERATE	FLAMMABILITY 0 NONE	REACTIVITY 3 SEVERE	CONTACT 4 EXTREME
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Laboratory Protective Equipment

 GOGGLES & SHIELD	 LAB COAT & APRON	 VENT HOOD	 PROPER GLOVES
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Precautionary Label Statements

DANGER!
STRONG OXIDIZER - CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE
CAUSES BURNS

MAY CAUSE EYE INJURY. EFFECTS MAY BE DELAYED.

Keep from contact with clothing and other combustible materials. Do not store near combustible materials. Do not get in eyes, on skin, on clothing. Avoid contamination from any source, metals, dust and organic materials that may cause rapid decomposition, generation of large quantities of oxygen gas and high pressure. In case of fire, use water only. In case of spill, flush spill area with water.

SECTION II - HAZARDOUS COMPONENTS

Component	%	CAS No.
Hydrogen Peroxide	30	7722-84-1



J. T. Baker Chemical Co.

222 Red School Lane Phillipsburg, N.J. 08865
24-Hour Emergency Telephone - (201) 859-2151

Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

**MATERIAL
SAFETY DATA
SHEET**

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Hydrogen Peroxide, 30%

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SECTION III - PHYSICAL DATA

Boiling Point: 106°C (223°F) Vapor Pressure(mmHg): 24.8
Melting Point: -25°C (-13°F) Vapor Density(air=1): N/A
Specific Gravity: 1.11 Evaporation Rate: N/A
(H₂O=1) (Butyl Acetate=1)
Solubility(H₂O): Complete (in all proportions) % Volatiles by Volume: 100

Appearance & Odor: Clear, colorless liquid.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A

Fire Extinguishing Media
Use water spray.

Special Fire-Fighting Procedures

Firefighters should wear proper protective equipment and self-contained (positive pressure if available) breathing apparatus with full facepiece. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards

Strong oxidizer. Contact with other material may cause fire.

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 1.5 mg/m³ (1 ppm)

Short-Term Exposure Limit (STEL): 3 mg/m³ (2 ppm)

Effects of Overexposure

Contact with skin or eyes may cause severe irritation or burns.

Emergency and First Aid Procedures

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

SECTION VI - REACTIVITY DATA

Stability: Unstable Hazardous Polymerization: Will not occur

Conditions to Avoid: heat

Continued on Page: 3



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Hydrogen Peroxide, 30%

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SECTION VI - REACTIVITY DATA (Continued)

Incompatibles: organic materials at elevated temperatures, combustible materials, strong reducing agents, most common metals, organic materials

SECTION VII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Flush area with flooding amounts of water. (Use caution.)

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

EPA Hazardous Waste Number: D002, D003 (Corrosive, Reactive Waste)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection: Respiratory protection required if airborne concentration exceeds TLV. At concentrations above 1 ppm, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles and face shield, uniform, protective suit, acid-resistant gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATATM Storage Color Code: Yellow

Special Precautions

Keep container tightly closed. Store separately and away from flammable and combustible materials. Keep containers out of sun and away from heat. Containers should be covered and vented.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

Proper Shipping Name: Hydrogen peroxide solution
Hazard Class: Oxidizer



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J. T. Baker Chemical Co.

222 Red School Lane Phillipsburg, N.J. 08865
24-Hour Emergency Telephone - (201) 859-2151

Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

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Hydrogen Peroxide, 30%

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION (Continued)

UN/NA UN2014
Labels OXIDIZER

INTERNATIONAL (I.M.O.)

Proper Shipping Name Hydrogen peroxide, 20% up to 60% peroxide
Hazard Class 5.1
UN/NA UN2014
Labels OXIDIZING AGENT, CORROSIVE

N/A = Not Applicable or Not Available

The information published in this Material Safety Data Sheet has been compiled from our experience and data presented in various technical publications. It is the user's responsibility to determine the suitability of this information for the adoption of necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.

APPENDIX B

Standard Personal Protective Equipment

8 pages

APPENDIX B. STANDARD PPE

Some pieces of protective equipment, such as hard hats, boots, and respirators, have specific standards for manufacture and only those items meeting these standards should be used. However, there are no such standards for much of the chemical protective clothing used in field activities. The following requirements provide guidance pertaining to the more common types of standard PPE.

EYE PROTECTION

If work is being performed that potentially can harm the eyes, such as tasks that cause splashing, release of projectiles, or release of sufficient vapors or dusts as to cause an eye irritation problem, eye protection shall be worn.

When ambient conditions require the use of a full-face respirator, the respirator provides the primary protection for the eyes, with secondary protection provided by a face shield or a splash hood. However, if respiratory protection is not required, then a combination of safety glasses, safety goggles, face shield, splash hoods, and sweat bands, are used to provide eye protection.

USE OF NON-SAFETY EYEGLASSES AND CONTACT LENSES

Non-safety eyeglasses shall not be worn alone for onsite activities, or activities adjacent to the site, if there is the potential for damage to the eyeglasses due to site related work activities or if the activities cause splashing or release of projectiles. Safety glasses meeting the ANSI Safety Glasses Standard Z87.1-1968 are required. The exception to this rule are eyeglass inserts designed to be worn under a full-face respirator. Note, however, that in some instances, non-safety eyeglasses can be used for site activities if they are used in conjunction with the appropriate goggles or face shields.

In general, eyeglasses do not protect against dusts, vapors, or mists; goggles or a full-face respirator must be worn. Contact lenses shall not be worn for onsite activities or activities adjacent to the site if the activities cause splashing, release of projectiles, generation of dusts in excess of the OSHA nuisance dust standards, or any activity which could not be safely performed using contact lenses. Contact lenses are not to be worn in conjunction with respiratory protection, or in areas with potential for contact with eye irritants.

Contact lenses may be worn for administrative activities adjacent to the site, providing that the activities preclude contact with site contaminants.

Individuals whose vision is not correctable with prescription eyeglasses are handled on a case-by-case basis. These individuals should contact the Health and Safety Manager.

EYEGLOSS INSERTS FOR RESPIRATORS

Eyeglass inserts, designed for use with the specific respirator worn, shall be used by all personnel whose vision is not adequate to safely perform site work activities without the use of corrective lenses.

SAFETY GLASSES

Safety glasses shall meet the current ANSI Z87.1. Safety glasses are used to protect the eyes against large particles and projectiles, but must be used in conjunction with face shields or goggles in order to protect against splashes. They generally do not provide protection against dusts, vapors, or mists. If lasers are used to survey a site, special protective safety glasses are required. Common prescription glasses are sometimes called "safety glasses", but they are not the industrial quality glasses required by ANSI Z87.1.

FACE SHIELDS, SPLASH HOODS, GOGGLES, AND SWEAT BANDS

Face shields and splash hoods protect against chemical splashes, but generally do not provide adequate protection against projectiles or dusts. They are used in conjunction with a respirator when projectile/dust protection is required, or with safety glasses when protection against projectiles is required in addition to splash protection. Face shields and splash hoods must be suitably supported (for example, attached to a hard hat) to prevent them from shifting and exposing portions of the face or obscuring vision.

Goggles can be used to protect against splashes and projectiles if they are constructed with impact resistant lenses, and offer some protection against dusts under some circumstances. However, in many instances, adequate splash protection is provided by using a face shield in conjunction with goggles. Goggles may be worn over non-safety eyeglasses to provide protection against projectiles and some dusts.

HEARING PROTECTION

Ear plugs or muffs will be worn by personnel who are required to perform tasks around heavy machinery and impact tools where physiological damage to the ears is likely. The OSHA noise standards apply, and must be considered, especially in the case of long term site activities. Ear protection must comply with OSHA 29 CFR 1910.95. Use of ear protection must be carefully considered because of the increased potential of chemical contaminants being introduced into the ear as a result of their use.

FOOT PROTECTION

Foot protection, including leather work boots and rubber boots, worn during site activities must meet the specifications of ANSI Z41-1983 and OSHA 29 CFR 1910.136. The

material used to make the boots is not subject to any standards. For RTG field activities, the boots must be steel or fiberglass toe/shank.

Protection against liquid hazardous chemicals requires a boot constructed of an elastomer-neoprene, PVC, butyl rubber, or some other chemically resistant material.

Boots are available in two systems: overboots (boot covers) and chemical resistant boots. Overboots may be inexpensive enough to be considered disposable and are generally worn over a leather steel toe/shank boot. The overboot system has the advantage of allowing the wearer to be fitted to a leather underboot, which then doubles as general site footwear. However, if the overboot rips and contaminants are absorbed into the leather boot, the leather boot may need to be disposed.

Chemically resistant boots are available in a variety of elastomers. Using chemically resistant boots has the advantage of being easier and more convenient than the overboot system, since only one boot is required. The disadvantage is that they need to be decontaminated.

Note that when coveralls or splash suits are worn with boots, the garment is taped over the boot, so that splashed material does not run into the boot.

HAND PROTECTION

Gloves are used to provide hand protection. There are presently no standards governing glove construction and materials.

Gloves must resist puncturing and tearing as well as provide the necessary chemical resistance. In many instances, particularly when protecting against concentrated source materials, gloves may have to be layered. In this case, gloves are referred to as "inner" gloves, and "outer" gloves. Heavy leather gloves may be worn over chemical protective gloves when doing heavy work. If they become contaminated, they should be discarded because leather is difficult to decontaminate.

Jacket cuffs should be taped over glove cuffs to prevent any liquid from flowing into the gloves. If hands are elevated above the head during work, the taping rule should be altered, and the gloves should be taped over the jacket cuffs to prevent any liquid from spilling down the sleeves. In either case, gloves should be sealed to the coveralls or splashsuit with tape.

When selecting gloves, consider thickness and cuff length. The thicker and longer the glove, the greater the protection. However, the glove should not be so thick that it interferes with necessary dexterity.

TAPING OF JOINTS

Boots and gloves are generally taped to the protective garment in order to reduce the possibility of contaminants flowing into them, but the taped joint is not a chemical barrier. Duct tape is most commonly used.

The rule of taping is that the protective garment is taped over the glove or boot so that contaminants do not flow in. However, if a significant amount of "over the head" work will be done, consider taping the glove over the garment sleeve.

HEAD PROTECTION

The hardhat, a basic piece of safety equipment used in many work operations, must meet ANSI Z89.1-1969 and OSHA 29 CFR 1910.135 specifications. Manufacturers have adapted hard hats so that ear protection and faceshields may be easily attached.

Hard hats are adjustable so that a helmet liner can be worn during cold-weather. A chin strap is advantageous when work involves bending and ducking and also helps secure the hardhat to the head when full-face masks are worn.

Faceshields that attach to hard hats provide added protection. A combination that leaves no gap between the shield and the brim of the cap is best, because it prevents overhead splashes from running down inside the faceshield. The faceshield must meet ANSI Z89.1-1968 specifications.

PPE INSPECTION, MAINTENANCE AND STORAGE

INSPECTION

The RTG PPE inspection program applies mainly to protective garments. Inspection of respiratory protection devices is described in Appendix C.

Inspections include:

- Inspection of garments as they are issued and/or prior to field use;
- Inspection after use or training and prior to maintenance;
- Periodic inspection of stored equipment; and
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

Most RTG field operations utilize disposable protective garments, such as Tyvek and coated Tyvek coveralls and nitrile gloves. For some operations, garments which are more expensive or rugged are used, and present the potential for reuse (e.g., Viton gloves and PVC raingear). Inspection of these garments is of particular importance, as chemicals that have begun to permeate clothing during use may not be removed during decontamination and may continue to diffuse through the material toward the inside surface, presenting a direct skin contact hazard to the next person who uses the clothing.

Where such potential hazards may develop, clothing should be checked inside and out for discoloration or other evidence of contamination. This is particularly important for suits which may be subject to reuse due to their cost. Note, however, that negative (i.e., no chemical found) test results do not necessarily preclude the possibility that some absorbed chemical will reach the suit's interior.

At present, little documentation exists regarding clothing reuse. Reuse decisions must consider the known factors of permeation rates as well as the toxicity of the contaminant(s). Unless extreme care is taken to ensure that clothing is properly decontaminated and that the decontamination does not degrade the material, the reuse of chemically protective clothing that has been contaminated with toxic chemicals is not advisable.

The following sections present a general PPE inspection checklist for various types of inspections. Each inspection will cover somewhat different areas in varying degrees of depth. For disposable garments, the inspection steps outlined below will be used before and during use. Reusable garments will be subjected to the "before use" inspection after

they are fully decontaminated. Any garment that is found to be defective in pre- or post-use inspection will be discarded.

Any worker who experiences a garment failure as listed in the "during the work task" check list will immediately exit the work area, go through the decontamination process, and replace the garment. Duct tape patch ups are not acceptable, as duct tape is regarded as having no resistance to chemical permeation or degradation.

Records must be kept of all inspections of reusable garments. At a minimum, each inspection should record the item, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of "downtime".

Before Use Monitoring

- Determine that the clothing material is correct for the specific task at hand;
- Visually inspect for:
 - imperfect seams,
 - non-uniform coatings,
 - tears, malfunctioning closures;
- Hold up to light and check for pinholes;
- Flex product:
 - observe for cracks,
 - observe for other signs of shelf deterioration;
- If the product has been used previously, inspect inside and out for signs of chemical attack:
 - discoloration,
 - swelling,
 - stiffness; and
- Pressurize gloves to check for pinholes. Either blow into the glove, then roll gauntlet towards fingers or inflate glove and hold under water. In either case, no air should escape.

In Use Monitoring

- Evidence of chemical attack, such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects;

- Closure failure;
- Tears;
- Punctures;
- Seam discontinuities;
- Degradation of the protective ensemble;
- Perception of odors;
- Skin irritation;
- Unusual residues on PPE:
- Discomfort;
- Resistance to breathing;
- Fatigue due to respirator use;
- Interference with vision or communication;
- Restriction of movement; or
- Personal responses, such as rapid pulse, nausea, and chest pain.

STORAGE

Clothing and respirators must be stored properly to prevent damage or malfunction due to exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Many equipment failures can be directly attributed to improper storage.

- Potentially contaminated clothing should be stored in an area separate from street clothing.
- Potentially contaminated clothing should be stored in a well-ventilated area, with good air flow around each item, if possible.
- Different types, sizes, and materials of clothing and gloves should be stored separately to prevent issuing the wrong material by mistake.

- Protective clothing should be folded or hung in accordance with manufacturers' recommendations.
- Garments should be stored in the original carton until use.
- Small quantities of garments to be used at the site should be stored in plastic bags.
- Reusable items such as hard hats, goggles and boots, must be fully decontaminated prior to being returned to storage (or the office).
- PPE will not be stored in areas where it can come into contact with chemicals.

MAINTENANCE

Maintenance of respiratory protection devices is described in Appendix C. Maintenance requirements for other PPE items used at typical RTG operations is limited, for most items are either disposable, will be discarded upon failure, or will be returned to the manufacturer for maintenance. The Health and Safety Manager should be contacted for maintenance guidance for any items of personal protective equipment.

APPENDIX C

Respiratory Protection Program

21 pages

INTRODUCTION

This Appendix describes the RTG Respiratory Protection Program as established in the RTG Health and Safety Program Manual. It describes responsibilities and basic requirements for RTG personnel who are required to work in situations where respiratory hazards may be present. This Program was developed in accordance with the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), the American National Standards Institute (ANSI) Practices for Respiratory Protection (Z88.2), and the NIOSH Guide to Respiratory Protection.

This Respiratory Protection Program addresses both field and fixed facility (laboratory) operations. As a result, some portions of the Program will have two different procedures for the same task, such as in the Hazard Evaluation/Respirator Selection section.

RTG will provide approved and certified respirators and component parts to employees at no cost to the individual. Employees will use this respiratory protective equipment in accordance with this Procedure and the instructions and training that are provided.

TYPES OF APPROVED RESPIRATORS

Only respirators approved and certified by the National Institute for Occupational Safety and Health (NIOSH) or the Mine Safety and Health Administration (MSHA) under 30 CFR Part 11 shall be used by RTG personnel. Such respirators are listed in the NIOSH Certified Equipment List, which is issued in December of each year.

Respirators can be divided into two categories, negative pressure and positive pressure. Within these categories, the following types of respirators are approved for use by RTG personnel:

- Negative pressure:
 - half-face air purifying respirators,
 - full-face air purifying respirators; and
- Positive pressure:
 - powered air purifying respirators,
 - pressure-demand self-contained breathing apparatus (2215 psi only),
 - air line/supplied air respirator with escape bottle.

RTG will provide employees with an opportunity to fit test negative pressure air purifying respirators from several manufacturers in order that an employee will get the appropriate fit.

RESPIRATOR SELECTION

The Health and Safety Manager will determine the appropriate type of respirator for a specific hazard. The selection of respiratory protective equipment will be based upon these five steps:

- Identification of the hazard;
- Evaluation of the hazard level;
- Consideration of the user's personal characteristics;
- Consideration of the conditions of use; and
- Use of an approved respirator.

Each step is described in detail in the following sections.

IDENTIFICATION OF THE HAZARD

Identification of the type of hazard is the first step in the selection of a respirator. Although the number of hazardous conditions which might require a respirator are virtually limitless, they will generally fall into one of the following five categories.

Gas or Vapor Contaminant

Gases are substances which normally exist as such at ordinary temperature and pressure (e.g., carbon monoxide or sulfur dioxide), whereas vapors are the gaseous state of substances that would be solid or liquid at ordinary temperature and pressure (e.g., acetone or benzene vapors).

Most gases and vapors are colorless, but may have a distinctive odor which helps in hazard identification. The odor threshold of many gases and vapors is below the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV), and odor can therefore be used as an indication of a hazard. A few gases and vapors, however, have odor thresholds above their respective PEL's, and the perception of their odor indicates that a hazardous concentration has already been exceeded. The Health and Safety Manager can provide information regarding odor thresholds for specific chemicals.

Regardless of the relationship between the odor threshold and PEL, the perception of contaminant odor is an indication of respirator leakage or cartridge breakthrough and the respirator wearer should exit the area immediately.

Particulate Contaminants

Particulate contaminants are made up of tiny particulates or droplets of a substance. Many of these particles are so small (less than 50 microns in diameter) they cannot be seen and those less than 10 microns in diameter can easily be inhaled. Particles less than 5 microns in diameter are small enough to reach deep into the lungs or into the alveoli.

Particulates are produced by mechanical means through the disintegration processes, such as grinding, crushing, drilling, blasting, or spraying, or by physicochemical reactions, such as combustion, vaporization, distillation, sublimation, calcination, or condensation.

Combination of Contaminants

Gaseous and particulate contaminants frequently occur together. Paint spraying, for example, produces both paint mist (particulate) and solvent vapors (gaseous). Smoke also contains particulates and gases.

Oxygen Deficient Atmospheres

In an oxygen deficient atmosphere, the problem is not the presence of something harmful, but the absence of something essential. Such atmospheres are most commonly found in confined and usually poorly ventilated spaces, such as silos, petrochemical tanks, and the holds of ships. Oxygen deficient atmospheres are classified as immediately dangerous to life or health (IDLH).

An accurate description of an oxygen deficient atmosphere is important for proper respirator selection, but one definition has not been universally accepted. For RTG and OSHA compliance purposes, an oxygen deficient atmosphere contains less than 19.5 percent oxygen.

IDLH Atmospheres

This is an atmosphere where employee exposure can:

- Cause serious injury or death within a short period of time (e.g., high concentrations of carbon monoxide or hydrogen sulfide);
- Cause serious delayed effects (e.g., airborne radioactive materials or cancer-causing agents); or
- Prevent exposed personnel from escaping the environment within 30 minutes.

Once a hazardous situation has been categorized as one of the hazards above (i.e., gas, vapor, particulate, oxygen deficient, IDLH), an initial decision can be made concerning the general type of respirator that may be selected.

EVALUATION OF THE HAZARD LEVEL

The second consideration in selecting a respirator is the level or concentration of the hazard requiring the respirator. The concentration of the air contaminant, and how it compares to the TLV or PEL for that substance, must be known in order to determine the "protection factor" which the respirator must provide. The protection factor is the ratio of the concentration of the contaminant outside the respirator to that inside the respirator under conditions of use. Respirators should be selected so that the concentration inside the respirator will not exceed the TLV or PEL.

$$\begin{aligned} \text{MUC} &= \text{PF} \times \text{TLV} \\ \text{PF} &= \text{MUC}/\text{TLV} \end{aligned}$$

where MUC = maximum use concentration
PF = protection factor
TLV = threshold limit
(or use PEL-permissible exposure limit).

Respirator protection factors tend to vary depending upon the specific standard cited. The list below presents protection factors that are generally accepted in the absence of standards that indicate otherwise.

	<u>Protection Factor</u>
Half-face filter or chemical cartridge respirator	10
Full-face filter or chemical cartridge respirator	50
Powered air-purifying respirator	100
Self-contained breathing apparatus, pressure-demand	10,000 +

CONSIDERATION OF THE USER'S PERSONAL CHARACTERISTICS

Medical Condition

The use of any type of respirator will impose some physiological stress on the user. For example:

- Air-purifying respirators make breathing more difficult because the filter or cartridge impedes the flow of air;
- The special exhalation valve on an open circuit pressure demand respirator requires the wearer to exhale against some resistance;

- The bulk and weight of an SCBA can be a burden; and
- If the wearer is using an airline respirator, they might have to drag up to 300 feet of hose around.

All these factors can significantly increase the employee's workload and wearers shall have medical examinations to determine if they are medically able to wear respiratory protective equipment without aggravating preexisting medical problems.

In order for the Health and Safety Manager to render a qualified opinion on employee respirator usage, the physician should be provided with the following information:

- The type of respiratory protection equipment to be used, and its modes of operation;
- The tasks an employee will perform while wearing the respirator;
- The length of time that the employee might wear the equipment; and
- Any substance to which the employee could be exposed, and its related toxicity.

Emotional and Mental Factors

Emotional and mental factors must also be considered when employees wear respirators. Some individuals feel claustrophobic when wearing them, especially with protective clothing. If there are indications that an individual suffers from chronic claustrophobia, such individuals should not be placed in such a situation.

Physical Characteristics

Scars, hollow temples, very prominent cheekbones, deep skin creases, and lack of teeth, or dentures, may cause respirator facepiece sealing problems. Full dentures should be retained when wearing a respirator, but partial dentures may or may not have to be removed, depending upon the possibility of swallowing them under duress.

Corrective Lenses

If glasses or goggles are required, they shall be worn so as not to affect the respirator.

If a full face respirator is worn, a proper seal cannot be established due to eyeglasses temple bars extending through the sealing edge of the facepiece. Wearing contact lenses with any type of respirator is not permitted unless essential for therapeutic reasons and with the concurrence of the Health and Safety Manager.

Systems have been developed for mounting corrective lenses inside full facepieces and when a person must wear corrective lenses, the proper facepiece and lenses must be obtained to provide good vision, comfort, and a gas-tight seal.

CONSIDERATION OF THE CONDITIONS OF USE

Eye Irritation

If the air contaminant can cause eye irritation, a full facepiece respirator should be used.

Skin Irritation or Absorption Through the Skin

Some airborne contaminants are extremely irritating to the skin (ammonia or hydrochloric acid), while others are capable of being absorbed through the skin and into the bloodstream with serious and possible fatal results (hydrocyanic acid or organophosphate pesticides such as parathion, malathion or tetraethyl phosphate).

Rubber facepiece material can cause skin irritation dermatitis for some individuals. The use of non-allergenic silicone facepieces can help alleviate this condition.

Communication

Speech communication may be necessary in jobs where a respirator is required. Conventional respirators, however, distort the human voice to some extent, and shouting can cause facepiece or component leakage.

Mechanical speech transmission devices, called speaking diaphragms, are available as an integral part of some respirators. These consist of a resonant cavity and diaphragm which amplify sound in the frequency range most important to intelligible speech. The diaphragm acts as a barrier to entry of ambient atmospheres, and should be carefully handled and protected by a cover to prevent puncture or breakage.

Methods of electronically transmitting speech from the respirator utilize microphones connected to a telephone, facepiece, or earlobe, while the amplifier, power pack, and loudspeaker or transmitter are attached to the exterior of the mask, are carried on the body, or are remotely located.

Respirators with electric or electronic speech transmission devices having an integral or body-attached battery power supply should be used with caution in explosive atmospheres, and connecting cables from microphones inside the facepiece must have gas-tight seals where they emerge from the facepiece. When the loudspeaker diaphragm is part of the barrier between the respirator wearer and the ambient atmosphere, it should be inspected frequently for leakage and protected from puncture or breakage.

Location of Hazardous Work Area

The location of the contaminated area with respect to a possible source of respirable air requires special consideration. When using an airline respirator, the distance that the wearer can go into a contaminated atmosphere is limited by the length of hose connected to the source of respirable air. The hose also requires that the user must enter and leave the area by the same route, unless the device is equipped with an auxiliary filter cylinder appropriate for use in withdrawal. While wearing an SCBA or filter respirator, a person may leave the contaminated area by any approved exit, but one must make certain that the device will afford protection until reaching respirable air, taking into account possible delays.

Duration of Task

Work time usually determines the period for which respiratory protection is needed, including time necessary to enter and leave a contaminated area. A self-contained breathing apparatus or chemical cartridge respirator provides protection for as long as the facepiece is supplied with adequate respirable air. Particulate-filter respirators can provide protection for long periods, without need for filter replacement, but only if the atmospheric particulate loading is low. Therefore, for protracted periods of use, an airline respirator offers definite advantages over a filter respirator.

Some respirators have a means for indicating remaining service life. Some type of warning is available for all self-contained breathing apparatus. This may be a pressure gauge, timer or an audible or physical alarm. The user should understand the operation and limitations of each type of warning device. Most chemical-cartridge respirators have no indicator of remaining service life. Canisters and cartridges should be changed according to the manufacturer's directions.

Activity Required

The work area to be covered, work rate, and mobility of the wearer in carrying out the work, should be considered in respirator selection. Air-purifying respirators present minimal interference with the wearer's movement. Supplied air respirators with trailing hoses severely restrict the area the wearer can cover and present a potential hazard if the hose comes in contact with machinery or other objects. SCBA presents a size and weight penalty which may restrict climbing and movement in tight places.

The wearer's work rate determines his respiratory volume, maximum inspiratory flow rate, and inhalation and exhalation breathing resistance. The respiratory minute volume is of great significance in self-contained and airline respirators operated from cylinders, since it determines their operating life. It is also a factor in cartridge service life on air-purifying respirators. Useful life under moderate work conditions may be one-third of that under rest conditions.

Peak flow rate is important in the use of constant flow airline equipment. The air supply rate should always be greater than the peak inspiratory flow rate, to maintain the respiratory enclosure under positive pressure.

The high breathing resistance of air-purifying respirators under conditions of heavy work can result in distressed breathing.

Work In Low Temperatures

The major problem in the use of respirators at low temperatures is freezing of exhalation valves, and for full facepieces, poor visibility.

Full facepieces are designed so that the incoming fresh air sweeps over the inside of the lens to reduce fogging. Otherwise, it would be impossible to wear a full facepiece, even at ordinary room temperature, without severe fogging. Anti-fog compounds may be used to coat the inside of the lens to prevent fogging at room temperatures, and down to temperatures approaching 32 degrees Fahrenheit (°F). However, below 0°F, anti-fog compounds will not prevent severe fogging.

Full facepieces are available with nose cups that direct moist exhaled air through the exhalation valve. A properly fitted nose cup should, in theory, allow adequate visibility at temperatures down to -30° F.

At very low temperatures, the exhalation valve may collect moisture and freeze open, allowing the wearer to breathe contaminated air, or freeze closed, which prevents normal exhalation.

High-pressure connections on SCBA may leak because of metal contracting at low temperatures. The connections should not be overtightened since they may break when the temperature returns to normal.

Work In High Temperatures

A person working in areas of high ambient or radiant temperature is already under stress, and any additional stress resulting from use of respirators should be minimized. This can be done by selecting and using respirators having minimum weight and breathing resistance. Supplied-air-respirators and hoods and suits having an adequate supply of cool breathing air are recommended. Also, a simple Venturi valve, operated by compressed breathing air, is available for that purpose.

USE OF AN APPROVED RESPIRATOR

Having considered the type of hazard, the level of the hazard, user characteristics, and the conditions of use, a decision may be made concerning the appropriate type of

respirator. As important as selecting the right type of respirator is the selection of an approved respirator. The National Institute for Occupation Safety and Health (NIOSH) provides a testing, approval, and certification program for respiratory protective devices. Approved devices are listed in the NIOSH Publication, NIOSH Certified Equipment List. This publication is updated periodically with the addition of newly approved equipment and deletion of equipment which has lost its approval.

All approved devices have a "TC" (Tested and Certified) number permanently printed on the item, and this number is referenced in the NIOSH Certified Equipment list described above.

Only NIOSH/MSHA approved respiratory protective equipment will be issued to, and worn by, RTG employees.

RESPIRATOR FIT TESTING

GENERAL REQUIREMENTS

Fit testing is required by OSHA and ANSI. RTG provides each respirator user a fit test in order to select the specific type, make, and model of negative pressure respirator for use by the wearer.

The following policies are observed in the fitting and use of the respirator:

- Fit testing for positive pressure respirators is not required;
- Personnel shall be allowed to use only the specific make(s) and model(s) of air purifying respirators for which the person has obtained a satisfactory fit, verified through fit testing procedures;
- An employee is not permitted to use any respirator not previously fit tested, or if the results of the fit test indicated that the person was unable to obtain a satisfactory fit;
- No facial hair or glasses are allowed that will interfere with the attainment of a good seal. Facial hair (e.g., some moustaches) that does not interfere with a good facepiece-to-face seal is permissible;
- RTG will provide persons requiring glasses with specially mounted glasses inside the full face mask. Under no circumstances will contact lenses be worn while using any type of respirator unless essential for therapeutic reasons and with the concurrence of the Health and Safety Manager;
- If it is found that an employee cannot obtain a good facepiece-to-face seal because of facial features or medical factors, that equipment shall not be used and they shall not enter an atmosphere requiring the use of that equipment;
- The Health and Safety Manager will keep records of the make, model, size, and type of respirator that has been satisfactorily fit tested for each employee. The record will include the date and signature of the person performing the test; and
- Fit tests will be repeated at least annually.

FIT TEST PROCEDURE

An employee shall be allowed to use only the specific make(s) and model(s) of air purifying respirators for which the person has obtained a satisfactory fit, verified through fit testing procedures. An employee is not permitted to use any respirator not previously fit tested, or if the results of the fit test indicated that the person was unable to obtain a satisfactory fit.

RTG's qualitative fit test procedures involve two stages of testing. Stage I involves a simple respirator negative and positive pressure sealing check for facepiece fit. Stage II involves the exposure of the respirator wearer to a test atmosphere. This will include two separate atmosphere tests to double check the adequate fit of the respirator to the wearer.

NOTE: During any fit test, respiratory head straps must be as comfortable as possible. Over tightening the straps can reduce facepiece leakage, but the wearer may not be able to tolerate the mask for any period of time.

Stage I

- **Negative Pressure Sealing Checks For Tightly Fitting Air Purifying Respirators**

The wearer performs this test after donning an air purifying respirator. The test consists of closing off the inlets of the cartridge(s), canister, or filters, by covering them with the palm(s) of the hand(s) so that air cannot pass, inhaling gently, and holding one's breath for at least ten seconds. If the facepiece collapses slightly and no inward leakage of air into the facepiece is detected, it can be reasonably assumed that the fit of the respirator is satisfactory. This is only as a gross determination of fit, none the less, this test shall be used each time prior to entering a toxic atmosphere.

- **Positive Pressure Seal Check for Air Purifying Respirators with Inhalation and Exhalation Valves.**

This test is very much like the negative pressure sealing check, and is conducted by closing off the exhalation valve and exhaling gently. The fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece for at least 10 seconds without detecting any outward leakage of air between the sealing surface of the facepiece and the wearer's face. This test is also used only as a gross determination of fit. This test shall be used each time prior to entering a toxic atmosphere.

NOTE: The positive and negative pressure sealing checks can also be used on SCBA facepieces to determine gross fit characteristics.

Stage II

A person wearing an air purifying respirator will be exposed to two test agents: isoamyl acetate, an odorous vapor; and stannic chloride, an irritant smoke. The respirator will be equipped with a cartridge which effectively removes the test agents from respired air. If the wearer is unable to detect penetration of the test agent into the respirator, the wearer has achieved a satisfactory fit.

Health and Safety Managers should note that there are specific fit testing protocols mandated by Federal regulations for respirator use in atmospheres containing the following substances:

- | | | | |
|---|--------------|---|------------------------------|
| • | Asbestos | - | 29 CFR 1910.1001 and 1926.58 |
| • | Benzene | - | 29 CFR 1910.1028 |
| • | Lead | - | 29 CFR 1910.1025 |
| • | Formaldehyde | - | 20 CFR 1910.1048 |

Procedures for the Isoamyl Acetate Vapor (Banana Oil) Test:

The isoamyl acetate fit test may be conducted by using a plastic bag as a test hood. The bag may be hung from the ceiling over a coat hanger suspended by twine. Inside the plastic bag, a piece of cloth saturated with isoamyl acetate is attached to the hanger at the top of the bag. This produces a concentration of approximately 100 ppm in the test atmosphere inside the plastic bag. Most people can detect isoamyl acetate at 1 to 10 ppm. The permissible exposure is 100 ppm.

- The wearer dons the respirator in a normal manner. The respirator will be fitted with organic vapor cartridges.
- The wearer enters the test enclosure so that the head and shoulders are well inside the bag.
- If the wearer smells banana oil, he returns to clean air and readjusts the facepiece and/or adjusts the headstraps without unduly tightening them.
- The wearer repeats the second step. If he does not smell banana oil, he is assumed to have obtained a satisfactory fit. If he smells the vapor, an attempt should be made to find the leakage point. If the leak cannot be located, another brand of respirator with a facepiece of the same type should be tried.
- After a fit is obtained, if the respirator is an air-purifying device it must be equipped with the correct filter(s), cartridge(s), or canister for the anticipated hazard.

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

- Normal breathing.
- Deep breathing, as during heavy exertion. This should not be done long enough to cause hyperventilation.
- Site-to-side and up-and-down head movements. These movements should be exaggerated, but should approximate those that take place on the job.
- Talking. This is most easily accomplished by reading a prepared test loudly enough to be understood by someone standing nearby.
- Other exercises may be added depending upon the situation. For example, if the wearer is going to spend a significant part of his time bent over at some task, it may be desirable to include an exercise simulating this motion.

The major drawback of the isoamyl acetate test is that the odor threshold varies widely among individuals. Furthermore, the sense of smell is easily dulled and may deteriorate during the test so that the wearer can detect only high vapor concentrations. Consequently, a wearer may say that the respirator fits when there is in fact a large leak. Therefore, check these test results out carefully and move on to the next test atmosphere.

Procedures for the Irritant Smoke (Stannic Chloride) Test:

- This test is similar in concept to the isoamyl acetate test. It usually involves exposing the respirator wearer to an irritating aerosol produced by commercially available smoke tubes normally used to check the quality of ventilation systems. When the tube ends are broken, and air is passed through it, the material inside reacts with the moisture in the air to produce a dense, highly irritating smoke, consisting of hydrochloric acid absorbed on small solid particles. As a qualitative means of determining respirator fit, this test has a distinct advantage, in that the wearer usually reacts involuntarily to leakage, by coughing or sneezing. The likelihood of this test giving a false indication of proper fit is reduced. On the other hand, the aerosol is very irritating and must be used carefully to avoid injury. Also, it is advisable to have exhaust ventilation behind the subject to protect the person doing the testing.

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

The irritant smoke test will be conducted by using a plastic bag as a test hood. The bag shall be hung from the ceiling over a coat hanger suspended by twine. A small hole should be made in the top portion of the bag, so that the irritant smoke can be dispensed into the bag after the test subject has entered the bag.

The air-purifying respirator to be used in this test must be equipped with a high efficiency filter.

The irritant smoke fit test will be performed as follows.

- The wearer puts on the respirator, tightening the headstraps to obtain a good fit, but not overtightened and uncomfortable. Once the respirator is properly on, the subject should enter the suspended bag so that his head and shoulders are well inside the bag.
- The tester shall begin to add the irritant smoke in small quantities at first, pausing between puffs from the applicator.
- The subject should breathe normally.
- After confirming that the respirator functions properly during normal breathing, the subject should breathe deeply, as during heavy exertion. This should not be done long enough to cause hyperventilation.
- Side-to-side and up-and-down head movements should also be tested while the head and shoulders remain in the bag. These movements should be exaggerated, but should approximate those that take place on the job.
- Talking is most easily tested by reading a prepared test loudly enough to be understood by someone standing nearby.
- Other exercises may be added depending upon the situation. For example, if the wearer is going to spend a significant part of his time bent over at some task, it may be desirable to include an exercise simulating this motion.
- If the wearer detects no leakage, the tester may increase the smoke density, still remaining alert to his reaction.

NOTE: When fit testing half-face respirators with irritant smoke, the test subject must keep his eyes tightly closed to avoid irritation. Also, the wearer should be well clear of the test area before removing the respirator (or opening his eyes, if testing a half-face respirator).

INSPECTION, CLEANING, MAINTENANCE, AND STORAGE

Respirator maintenance is an integral part of RTG's Respiratory Protection Program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all. Workers wearing defective devices think they are protected, when in reality, they are not. It is the responsibility of the Project Manager and/or Site Health and Safety Officer to ensure compliance with inspection, cleaning, maintenance and storage requirements. The program requires at a minimum:

- Inspection for defects, including a leak check;
- Repair as required;
- Cleaning and disinfecting; and
- Proper and sanitary storage of equipment.

The maintenance program should ensure that each worker's respirator remains as effective as when it was new.

INSPECTION FOR DEFECTS AND MAINTENANCE

If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. The OSHA standard outlines two types of inspections:

- Before and after use; and
- During cleaning.

All respiratory equipment will be inspected thoroughly during the cleaning process. Before the apparatus is used, any defects will be repaired or the defective part replaced. Proper inspection, maintenance, and cleaning of respiratory equipment is the responsibility of the user.

The following procedure shall be used to inspect half and full-face air-purifying respirators and SCBAs.

Air Purifying Respirators

Air-purifying respirators should be checked as follows before and after each use. Examine the facepiece for:

- Excessive dirt;
- Cracks, tears, holes, or physical distortion of shape from improper storage;
- Inflexibility of rubber facepiece (stretch and knead to restore flexibility);

- Cracked or badly scratched lenses in full facepieces;
- Incorrectly mounted full facepiece lenses, or broken or missing mounting clips; and
- Cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s) if required.

Examine the straps of the head harness for:

- Breaks;
- Loss of elasticity;
- Broken or malfunctioning buckles and attachments; and
- Excessively worn serrations on head harness, which might permit slippage (full facepieces only).

After removing the cover, examine the inhalation and exhalation valves for the following:

- Foreign material, such as detergent residue, dust particles, or human hair, under the valve seat;
- Cracks, tears, or distortion in the valve material;
- Missing or defective valve cover; and
- Improper installation of the valve in the valve body.

Examine the air-purifying element for:

- Incorrect cartridge, canister, or filter for the hazard;
- Incorrect installation, loose connections, missing or worn gasket, or cross threading in the holder;
- Expired shelf-life date on the cartridge or canister; and
- Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc., over the inlet.

If the device has a corrugated breathing tube, examine it for:

- Broken or missing end connectors;
- Missing or loose hose clamps; and
- Deterioration, determined by stretching the tube and looking for cracks.

SCBA Inspection Procedures

Before a self-contained breathing apparatus can be used, it must be properly inspected to help prevent malfunction during use. The checklist that follows can help ensure proper inspection.

Prior to starting checklist, make sure that:

- High-pressure-hose connector is tight on cylinder fitting;
- Bypass valve is closed;
- Mainline valve is closed; and
- Regulator outlet is not covered or obstructed.

Back Pack and Harness Assembly Straps

- Visually inspect for complete set; and
- Visually inspect for frayed or damaged straps.

Regulator and High-Pressure Hose High-Pressure Hose and Connector

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

Regulator and Low-Pressure Alarm

- Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without loss of air. Next, inhale to create a slight negative pressure on regulator; hold for 5 to 10 seconds. The vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus;

- With the regulator outlet uncovered and unobstructed, open and close bypass valve momentarily, to assure flow of air through bypass system;
- Cover regulator outlet with palm of hand. Open mainline valve and read regulator gauge (must read at least 1,800 psi and not more than rated cylinder pressure);
- Remove and replace hand from outlet in rapid movement. Repeat this motion twice more. Air should escape when hand is removed each time, indicating a positive pressure in chamber; and
- Close cylinder valve, leaving the mainline valve open, and slowly move hand from regulatory outlet to allow air to flow slowly. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 520 and 480 psi. Remove hand completely from outlet and close mainline valve.

Storage of Units

- Cylinder refilled as necessary and unit cleaned and inspected;
- Cylinder valve closed;
- High-pressure-hose connector tight on cylinder;
- Pressure bled from high-pressure hose and regulator;
- Bypass valve closed;
- Mainline valve closed;
- All straps completely loosened and laid straight; and
- Facepiece properly stored to protect against dust, direct sunlight, extreme temperatures, excessive moisture, and damaging chemicals.

CLEANING

Cleaning and sanitizing the units is accomplished in the following manner.

- The apparatus is disassembled into its components as described in the manufacturer's schematic display that accompanies the unit. This step also affords the opportunity to thoroughly inspect each of the components for

any defects, excessive wear and tear, etc. Discard any previously used cartridges.

- Thoroughly wash the facepiece and mask components in a cleaning and sanitizing solution, such as one ounce of powdered MSA Cleaner-Sanitizer to 1 gallon of warm water (120°F). The components should be scrubbed with a sponge or soft brush to remove dust, dirt, or other contaminants.
- Thoroughly rinse all component pieces in warm water. This step is important because residuals of cleaning solutions can cause irritation and/or dermatitis for some individuals.
- Air dry all components thoroughly, inspect them again for any defects, reassemble the unit, and store properly until the next use.

STORAGE

Respirators will be stored in a convenient, clean and sanitary location, to protect them against dust, sunlight, excessive heat or cold, excessive moisture, damaging chemicals and mechanical damage. They will be stored individually (e.g., not stacked one upon the other or in cramped spaces), to prevent distortion of rubber or other elastomeric parts. Respirators should be stored in plastic bags, preferably in the cartons in which they came, and be readily identifiable as to the individuals to whom they have been assigned.

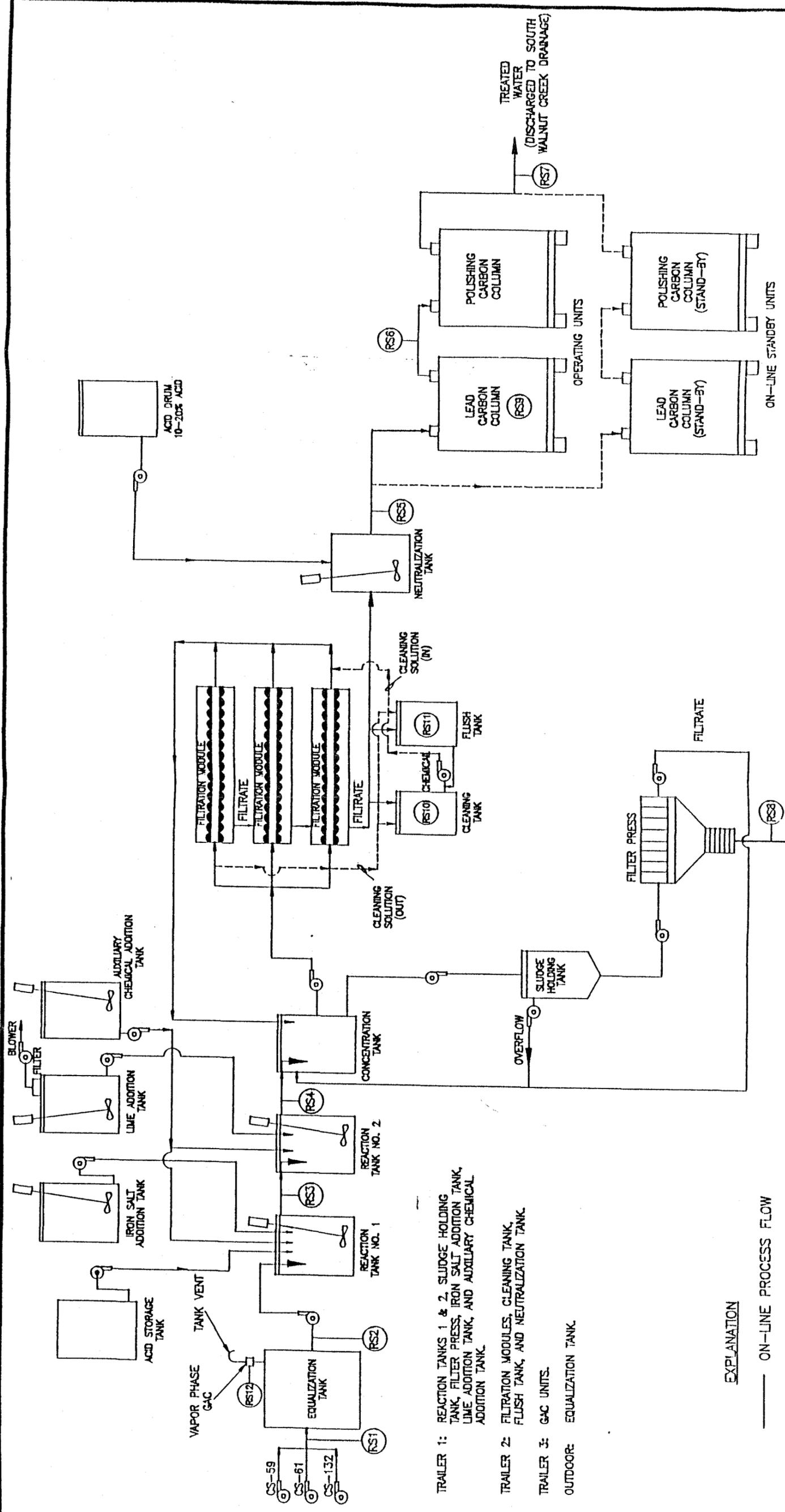
TABLE 1-2

**SAMPLING SUMMARY FOR FIELD TREATABILITY
UNIT SYSTEMS OPERATION**

Sample Point	Sampling Location	Sampling Frequency	Analytical Suites
RS1	Influent to the Equalization Tank	One composite sample per week	VOA, metals, radionuclides ¹ , acetone
RS2	Effluent from the Equalization Tank	One grab sample per month	Metals, radionuclides ¹
RS5	Effluent from the Neutralization Tank	One composite sample per week	VOA, metals, radionuclides ¹ , acetone
RS6	Effluent from the lead GAC Unit	One grab sample per week	VOA, acetone
RS7	Effluent from the GAC polishing unit	One composite sample per week	VOA, metals, radionuclides ¹ , acetone
RS8	Solids cake from filter press	One composite sample per drum as generated	TCLP VOA, TCLP Metals, radionuclides ²
RS9	Spent GAC from lead unit	One sample per lead unit as removed from service	TCLP VOA, TCLP Metals, radionuclides ²
RS9	Virgin GAC from unit	One sample per unit prior to placing in service	Radionuclides ²
RS10	Spent cleaning tank solution	One grab sample after use prior to disposal	Metals, radionuclides ¹
RS11	Spent flushing tank solution	One grab sample after use prior to disposal	Metals, radionuclides ¹
RS12	Equalization Tank vapor-phase GAC	One grab sample prior to disposal	TCLP VOA, TCLP metals

Notes: ¹ Radionuclides include gross alpha and beta activities, Pu 239 and 240, Am 241, U 233/234, 235 and 238, dissolved gross alpha and beta activities, and dissolved u 233/234, 235 and 238.

² Radionuclides include gross alpha and beta activities, Pu 239 and 240, Am 241, U 233/234, 235 and 238.



TRAILER 1: REACTION TANKS 1 & 2, SLUDGE HOLDING TANK, FILTER PRESS, IRON SALT ADDITION TANK, LIME ADDITION TANK, AND AUXILIARY CHEMICAL ADDITION TANK.

TRAILER 2: FILTRATION MODULES, CLEANING TANK, FLUSH TANK, AND NEUTRALIZATION TANK.

TRAILER 3: GAC UNITS.

OUTDOOR: EQUALIZATION TANK.

EXPLANATION

- ON-LINE PROCESS FLOW
- - - FILTRATION MODULE CLEANING FLOW LOOP/
GAC STANDBY FLOW OPERATION
- (RS) ANALYTICAL SAMPLING LOCATION
(SOLIDS AND LIQUIDS)
- CS-59 SURFACE WATER COLLECTION SYSTEM
- (P) PUMP

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

OPERABLE UNIT NO. 2
SURFACE WATER IM/IRA

**FIELD TREATABILITY UNIT
(PHASE II)
PROCESS FLOW DIAGRAM**

Rev.: January, 1993 FIGURE 3.1
Rev.: August, 1992

March, 1992

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