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APPENDIX B

FINAL
PROJECT-SPECIFIC HEALTH AND SAFETY PLAN
FOR
SOIL VAPOR EXTRACTION
SUBSURFACE INTERIM
MEASURES/INTERIM
REMEDIAL ACTION
EAST TRENCHES AREA

OPERABLE UNIT NO. 2

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

JULY 1993

HEALTH AND SAFETY PLAN

Project Name:	Soil Vapor Extraction, East Trenches Area, Operable Unit 2
Project Number:	WCFS: 4045
Project Location:	Rocky Flats Plant Jefferson County, Colorado
Woodward-Clyde (W-C) Administrative Operating Unit:	Denver
Project Manager:	Dean Parson
Author of the Plan:	Paula J. Ross
Effective Dates:	July 15, 1993 through December 31, 1993

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July 20, 1993
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July 21, 1993
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LIST OF ACRONYMS

ALARA	as low as reasonably achievable
CFR	Code of Federal Regulations
CRZ	Contamination Reduction Zone
DAC	Derived Air Concentration for Radionuclides
dBA	decibels on the "A" weighted scale
DOT	Department of Transportation
EMRG	Environmental Management Radiological Guidelines
ER	Environmental Restoration
EZ	Exclusion Zone
GAC	granular activated carbon
hr	hours
HSL	Health And Safety Liaison
HSO	Health and Safety Officer
HSP	Rocky Flats Health and Safety Practices Manual
HSS	Health And Safety Specialist
HSST	Health and Safety Specialist in Training
IHSS	Individual Hazardous Substance Site
KV	kilovolt
mrem	one thousandth of a rem
OU2	Operable Unit No. 2
OSHA	Occupational Safety and Health Administration or Act
PCE	tetrachloroethylene (perchloroethylene)
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
PSHSP	Project-Specific Health And Safety Plan
RCA	Radiological Controlled Area
rem	radiation equivalent man - a unit of adsorbed dose
RFP	Rocky Flats Plant
RPT	Radiation Protection Technician
SHSC	Site Health And Safety Coordinator
SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
SZ	Support Zone
TBD	to be determined
TCA	1,1,1-trichloroethane
TCE	trichloroethylene
TSP	total suspended particulate matter
VOC	volatile organic compounds

SECTION B 1
INTRODUCTION

This Project-Specific Health and Safety Plan (PSHSP) provides detailed health and safety guidance for a project planned to investigate soil vapor extraction (SVE) at the East Trenches Areas at the Rocky Flats Plant (RFP).

It is written as an addendum to the previously approved health and safety plan issued by EG&G Rocky Flats, Inc. (EG&G) for environmental work at Operable Unit No. 2 (OU2) entitled "Health and Safety Plan for Phase II RCRA Facility Investigation/ Remedial Investigation at the 903 Pad, Mound, and East Trenches Areas."

The EG&G-approved health and safety plan for OU2 must be reviewed by all site personnel in conjunction with this PSHSP. It includes sections on:

- EG&G Policy for environmental restoration work conducted at OU2.
- Description of specific locations within OU2.
- Assignment of EG&G health and safety personnel and responsibilities.
- Hazard assessment of OU2 locations including chemical, radiological, physical, and mechanical hazards.
- The EG&G hazard communications program.
- Site control requirements.
- Personal protective equipment (PPE) requirements.
- Decontamination procedures.
- Medical Surveillance.
- Air monitoring, training, and emergency response requirements.
- Material handling.

Details of the work to be conducted are described in the "*In Situ* Volatilization Pilot Test Plan – East Trenches Area" (EG&G, October 1992). A summary of the areas in which the soil vapor survey will be conducted is included in Section B 3 of this PSHSP. Section B 4 summarizes the SVE tasks and methods used and the potential hazards present. Additional sections of this PSHSP describe the contractor's health and safety action plan including the elements of site control, PPE, decontamination, medical surveillance, air monitoring, training, and emergency response.

The EG&G project manager is responsible for enforcing the PSHSP. The primary subcontractor and all lower tier subcontractors are responsible for complying with the PSHSP.

SECTION B 2

SOIL VAPOR EXTRACTION (SVE) PERSONNEL

The following personnel have been assigned to this project. Descriptions of the responsibilities of these positions are included in the approved Health and Safety Plan for OU2 (EG&G, 1991).

EG&G Project Manager
Michael Klein
(303) 966-6950/Pager (303) 966-4000, # 7458

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EG&G ER Health and Safety Officer
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(303) 740-2700

Woodward-Clyde Health and Safety Officer (HSO)
Paula Ross
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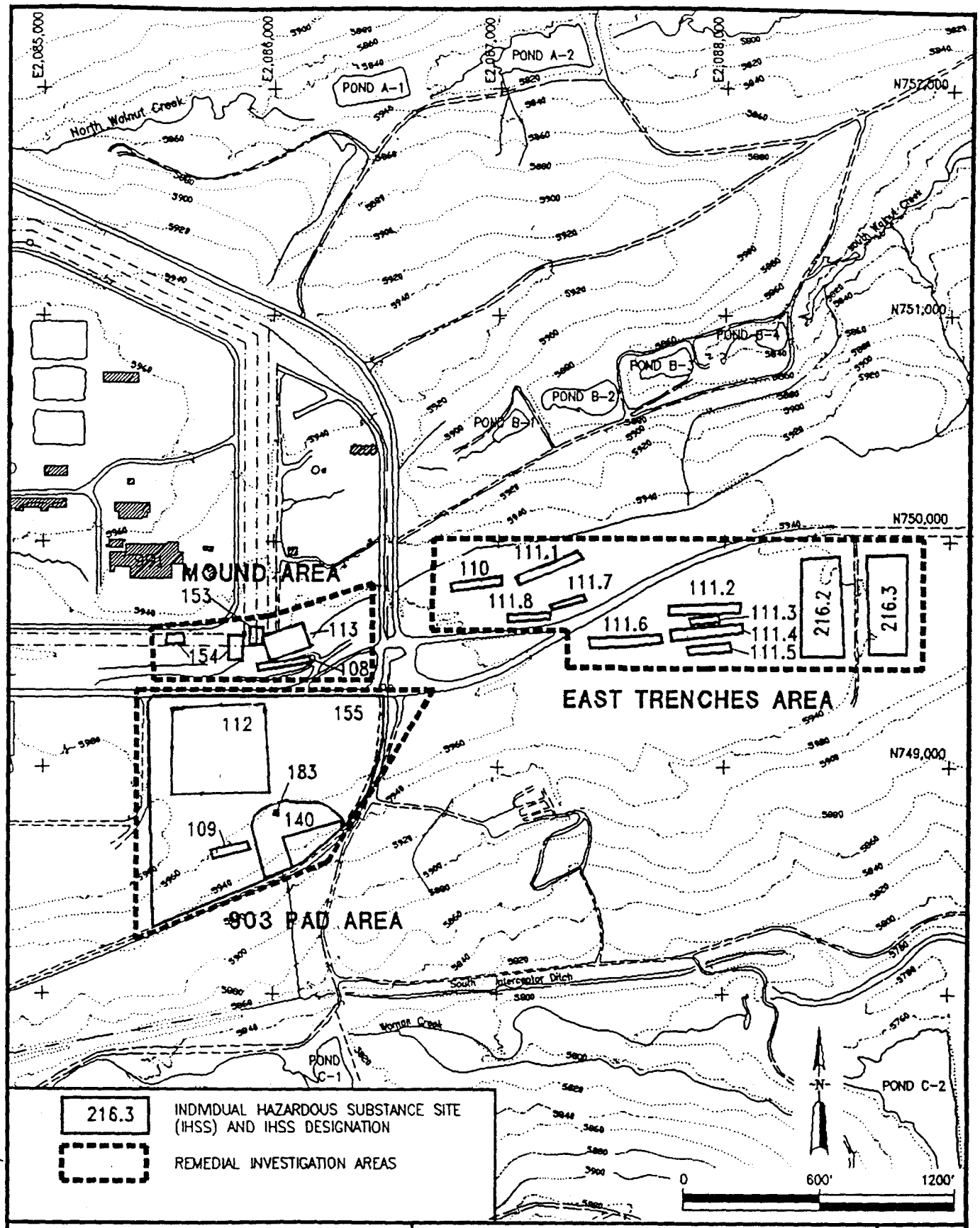
Woodward-Clyde Site Health and Safety Coordinator (SHSC)/Health and Safety Specialist (HSS)
Gregg Miller
(303) 966-8022/Pager (303) 280-4610

Woodward-Clyde Field Equipment Operators
To be determined - Trailer telephone number (303) 966-8022

SECTION B 3
SITE DESCRIPTION

The SVE pilot testing will be initially conducted adjacent to an Individual Hazardous Substance Site (IHSS) within OU2 known as IHSS No. 110 (Figure B 3-1). This site is also known as Trench T-3 and is described in detail in Sections 1 and 2 of the "ISV Pilot Test Plan" preceding this PSHSP.

In brief, it is expected that carbon tetrachloride, chloroform, methylene chloride, tetrachloroethylene (PCE), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA) comprise the majority of released volatile organic compounds (VOC) contaminants at the SVE site. Inorganic contaminants may include uranium, plutonium, americium, and several heavy metals including beryllium.



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U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	PROPOSED SOIL VAPOR EXTRACTION PILOT TEST SITES OPERABLE UNIT NO. 2	FIGURE B 3-1

SECTION B 4

SOIL VAPOR EXTRACTION (SVE) METHODS AND TASKS

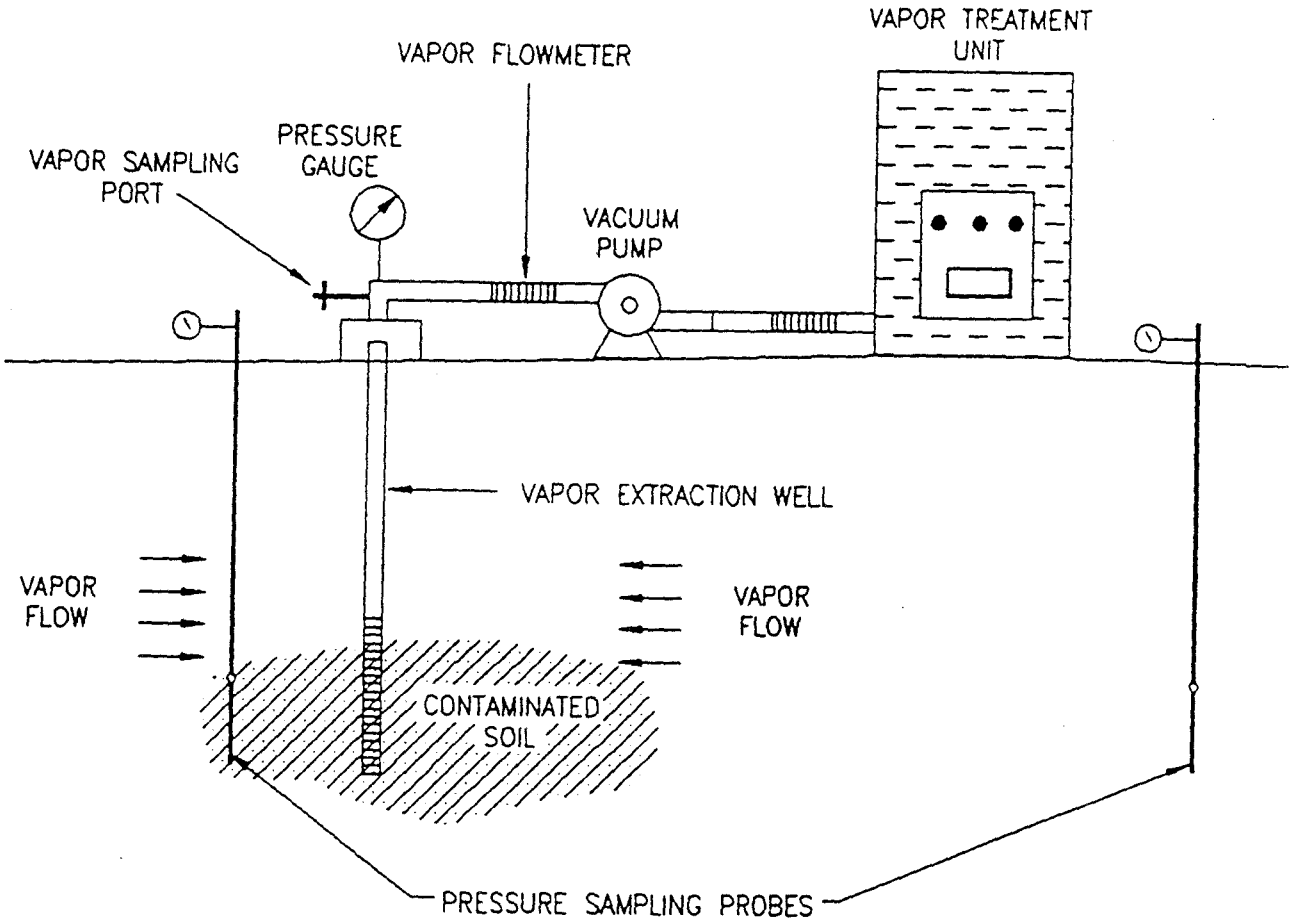
SVE methods are described in detail in Sections 2 and 4 of the SVE Test Plan preceding this PSHSP. SVE is a relatively new hazardous waste treatment technology that offers an alternative to the conventional excavation, treatment, and disposal approach. SVE removes volatile contaminants from the subsurface by mechanically drawing air through pore spaces in the soil. The flow of air through unsaturated soil pores enhances volatilization of organic compounds and results in movement of organic vapors through the soil to extraction vents. The extraction vents are connected to a blower system which draws the contaminant-laden air stream to the surface. The air stream is typically treated for removal of harmful contaminants prior to discharge to the atmosphere. A typical schematic diagram of a single extraction vent system is presented in Figure B 4-1.

The following tasks have been identified for the purpose of health and safety risk analysis:

Task 1	Drilling and sampling
Task 2	Construction of the SVE system
Task 3	Operation of the SVE system

- Groundwater extraction
- Extraction venting

Most of the drilling (Task 1) will be performed using a truck-mounted, hollow stem auger drilling rig. However, drilling for the installation of surface casing may be conducted using a solid stem, continuous flight or bucket auger. Undisturbed soil samples will be collected continuously during hollow stem auger drilling. The samples will be collected using a "California" ring sampler. The sampler will be driven ahead of the auger to the desired depth with a standard 140-pound slide hammer falling freely from a height of 30 inches. The sample will be brought to the surface and removed by opening the sampler along its length or by using an extruder. Soils will be extruded from the appropriate sampling rings, placed on clean butcher or kraft paper and divided so that no clumps remain. Soil samples will be submitted to a laboratory for VOC and radionuclide analysis.



U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado	SCHEMATIC DIAGRAM OF TYPICAL SINGLE WELL VENT SYSTEM	FIGURE B4-1

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In general, construction (Task 2) will involve the ordering and delivering of the necessary components; drilling of wells for and installation of groundwater extraction pumps; drilling for and installation of various air extraction and air injection vents; installation of various pressure monitoring probes; and assembly of various piping, blower, granular activated carbon (GAC), HEPA filtration, monitoring, tank storage, and power systems.

Once the SVE system is constructed, operations (Task 3) will involve inspection and maintenance of its components; collection, storage, and transportation of potentially contaminated groundwater; and extraction of contaminated soil vapor to the GAC adsorption units.

SECTION B 5

HAZARD ASSESSMENT

Potential physical, chemical, and radiological hazards that may be encountered during work within OU2 are described in detail in the EG&G HASP (EG&G, 1991). This section will summarize the specific hazards expected to be encountered during the SVE Pilot Study.

5.1 PHYSICAL HAZARDS

TASK	HAZARD	MEASURES OR CONTROLS TO REDUCE HAZARD
(1) **Drilling and Sampling**	Noise	Noise exposure may occur during the various drilling and sampling activities. Prior to any activity hearing protection will be donned and noise monitoring will be conducted during the initial activities. If noise exposures exceed 85 dBA, hearing protection will be required; if not, hearing protection can be removed.
	Pinch Points	The SHSC will identify drilling and sampling related pinch points, and will train sampling personnel in safe work practices. The drillers will demonstrate that a kill switch is operational.
	Material Handling	The SHSC will identify items such as augers, core boxes, and other materials which may present lifting/material handling stress and will train drillers/samplers in proper techniques. Site personnel will wear safety shoes to protect their feet and other PPE ro prevent personal exposures.
	Overhead	All individuals within a distance equivalent to the height of the boom on the drilling rig will wear a hard hat when the drilling rig is on-site.
	Trip/Fall	Pre-designated routes will be established to prevent trips and falls. Safe housekeeping and material handling techniques will be stressed. Tripping hazards presented by the terrain will be identified and communicated to drillers/samplers.
	Electrical	Drillers/samplers will be trained in electrical safety. Ground fault interrupters will be used with all electrical generators and electrically powered equipment.

TASK	HAZARD	MEASURES OR CONTROLS TO REDUCE HAZARD
Drilling and Sampling Continued	Cold Stress	Drillers/samplers will be trained in the symptoms of cold stress. Warm PPE will be worn if temperatures drop below 55 degrees F and PPE will be changed if it gets wet. Direct contact with cold surfaces and air will be avoided. Extra breaks to warm areas may be needed on days below 40 degrees F.
	Heat Stress	If outside temperatures exceed 70 degrees F, driller/samplers will have radial pulse monitored for 30 seconds as early as possible in the resting period. If the heart rate exceeds 110 beats per minute, the next work period will be shortened by 33%. If the heart rate exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle will be further reduced by 33%. Plenty of cool water or other non-caffeinated drinks shall be available. The SHSC shall observe field personnel for symptoms of heat stress.
	Buried Drums	Screening with a magnetometer or equivalent shall be done to identify the presence of buried drums. Drilling/sampling shall not be attempted above such areas. All intrusive activities shall proceed with caution and will be aborted in locations where buried drums are encountered.
(2) **Construction**	Noise	Noise exposure may occur during the various drilling and sampling activities. Prior to any activity hearing protection will be donned and noise monitoring will be conducted during the initial activities. If noise exposures exceed 85 dBA, hearing protection will be required; if not, hearing protection can be removed.
	Pinch Points	The hazard related to pinch points during construction is considered to be significant. It shall be controlled as discussed above.
	Material Handling	Proper lifting and carrying techniques will be stressed by the SHSC. Devices which minimize physical stress, such as hoists and carts, will be used when feasible.

TASK	HAZARD	MEASURES OR CONTROLS TO REDUCE HAZARD
Construction Continued	Overhead	Hard hats will be required during construction by all individuals in the area of construction.
	Trip/Fall	Shall be controlled as discussed for Task 1 above.
	Electrical	As per Task 1 above.
	Cold Stress	Shall be controlled as discussed above.
	Heat Stress	As per Task 1 above.
	Buried Drums	As per Task 1 above.
	Flammable Gases	The handling, storage, and use shall be per Occupational Safety and Halth Administration (OSHA) and Department of Transportation (DOT) standards. Cylinders shall be secured and non-sparking tools will be used.
(3) S V E Operations	General	Hazards and control measures for Task 3 are, in general, the same as for Task 2. Buried drum and overhead hazards are not expected to be significant for Task 3. If noise exceed 85 dBA, efforts to dampen/control the pump and blower motors will be made, and hearing protection will be required. Other hazards for Task 3 are listed below.
	Transportation	Since potentially contaminated groundwater will be collected and transported to an RFP treatment facility, typical risks associated with motor vehicles and accidental spills exist. The SHSC shall ensure that all drivers are trained in vehicle safety and spill reporting. Periodic audits/inspections will be made to check the adequacy of vehicle and transfer hose maintenance, compliance of drivers with RFP transportation regulations, and adequacy of vehicle safety procedures (such as using wheel chocks or other vehicle restrain methods when loading and unloading tank trucks).

TASK	HAZARD	MEASURES OR CONTROLS TO REDUCE HAZARD
S V E Operations Continued	Explosive/ flammable vapors	This is not expected to be a significant hazard for the SVE since the primary soil contaminants are non flammable chlorinated compounds. However, flammable compressed gases used by the gas chromatograph or during system maintenance (for example, if cutting or welding gases are used) will be used/stored in accordance with OSHA and DOT regulations.
	Illumination	During the 24-hour operastion of the SVE system, minimum illumination will be provided in accordance with the action levels staetd in Table B 6-1. If a component of the SVE system requires repair or maintenance, the repair operation will only be conducted during daylight hours.

A survey of both above ground and underground utilities will be conducted prior to any drilling. Minimum clearances required when working near energized overhead power lines are as follows:

- 10 feet from a 50 kilovolt (KV) or less line
- 20 feet from a 50 KV to 345 KV line and
- 34 feet from a 345 KV to 750 KV line

Prior to the commencement of work, the driller needs to ensure that there is enough room for the mast to be raised safely. The minimum safe overhead clearance is equal to the maximum mast height plus 5 feet. If buildings or pipes are overhead, additional height could be required to provide safe clearance while raising A-rods and augers above the mast height. The team leader should coordinate with the drilling company to determine clearance requirements for specific drill rigs to be used.

5.2 CHEMICAL HAZARDS

The major chemical contaminants present in the soil at OU 2, permissible exposure limits (PEL), the most important exposure routes, and the major symptoms of exposure are summarized in Table 5-1.

Air monitoring during soil vapor sampling for volatile organics will be performed by the SHSC with a Photoionization Detector (PID) or a detector tube system for carbon tetrachloride and chloroform. Beryllium is the most toxic metal present within OU2. The highest level of beryllium found within OU2 is 15 µg/kg of sediment (EG&G, 1991). Therefore, if all the particulate in the air were from this highest source, there would still need to be 133,000 mg/m^3 of dust in the air to reach the PEL of 0.002 mg/m^3 beryllium. Fifteen mg/m^3 of particulate is a dense dust cloud. This means that it will be literally impossible for SVE technicians to exceed the risk exposure limits to beryllium. Although overexposure to airborne contamination is unlikely, the SVE technicians shall stay on the upwind side of the drill rig to further reduce exposure potential. To identify the wind direction a wind sock, piece of banner tape or other suitable lightweight material will be placed on a pole at a height of approximately 5.5 feet above the ground. The wind direction can then be determined by observing the device.

Table B 5-1

Chemical Hazards

Chemical Name	PEL	Route of Entry	Symptoms of Exposure
Carbon tetrachloride	2 ppm	Inh., Abs., Ing., Con.	CNS depression, nausea, liver/kidney damage.
Chloroform	2 ppm	Inh., Ing., Con.	Irritate eyes, skin; dizziness, nausea, headache, fatigue, liver damage, cancer.
Methylene Chloride	50 ppm	Inh., Ing., Con.	Fatigue, lightheadedness, nausea, numbness in limbs, eye irritation, (Cancer)
Trichloroethylene	50 ppm	Inh., Ing., Con.	Headache, dizziness, visual disturbance, nausea.
1,1,1-Trichloroethane	350 ppm	Inh., Ing., Con	Headache, CNS depression, irritate eyes and skin, irregular heart bear.
Tetrachloroethylene	25 ppm	Inh., Ing., Con.	Irritate eyes, nose, throat; nausea, CNS depression, decreased alertness, headache, liver damage (cancer).
Beryllium	0.002 mg/m^3	Inh.	Respiratory irritation, weakness, fatigue, weight loss, cancer.

Key:
- Abs – Skin Adsorption
- Inh – Inhalation
- Ing – Ingestion
- Con – Skin and/or eye contact
- CNS – Central Nervous System
- PEL – OSHA permissible exposure level

Monitoring of the ambient environment for VOCs has been conducted during recent drilling operations at OU 2. The results listed below (Table B5-2) are the maximum ambient levels detected during drilling in 1991 in the areas where the SVS will be performed:

Table B 5-2

Total Volatile Organic Concentrations

From Recent Drilling Activities

At Operable Unit 2

Well No.	IHSS No.	Total VOC Concentration (ppm)
20191	111.1	1 ppm
08591	111.5	1-3 ppm
07391	109	3-5 ppm
09991	113	3 ppm
10191	110	8-10 ppm
10291	111.1	15 ppm

5.3 RADIOLOGICAL HAZARDS

Five radionuclide contaminants may be present in particulate form during the SVE pilot study. These five are uranium-238, uranium-235, uranium-234, plutonium-239; and americium-241. The primary type of radiation of concern relative to particulate exposure is "alpha" radiation. Alpha radiation presents an internal hazard when radionuclides in particulate form are inhaled or ingested. The relatively large amount of ionization occurring in a small volume from alpha particulates inside the body is typically 20 times more damaging than ionization caused by X-ray or gamma radiation. Radiation exposure is reduced when the concentration of the radionuclides in the soil is low or the potential for the material to become airborne is low (EG&G, 1991).

The risk of radiation uptake from inhalation during conduct of the SVE is expected to be low because it is distributed throughout large volumes of soil (EG&G, 1991). The risk of uptake through ingestion is also low and can be further minimized by following good hygienic practices

such as wearing gloves, washing hands after working around contaminated soil, and not smoking, drinking, or eating in or around the contaminated areas. The highest potential for contamination occurs within 1 foot of the contaminated soil.

Since the exposure to radiation can cause serious health effects, it is important to assess the amount of these materials present and the potential for exposure during work operations. Plutonium-239 is the most hazardous radionuclide present in the SVE soils. If adequate protection is taken for plutonium, protection will also be adequate for other alpha emitting radionuclides (EG&G, 1991).

The derived air concentration (DAC) is the concentration of a single radionuclide in air, which if inhaled over a 1-year period would irradiate a person to the occupational exposure limit of 5 rem per year. In general, 1/10 of the DAC is the action level for upgrade to a full-face respirator.

5.3.1 Radiological Monitoring and Screening

Radiological monitoring and screening will be conducted by the HSST. Radiation meter deflections above background will be logged/recorded. Radiation levels which exceed 5 mrem/hr signify radiation exposure. Table B 5-3 shows the information that will be used to ensure that airborne concentrations are maintained below the DAC during field operations. This procedure was developed by RFP Environmental Restoration personnel and will be implemented by the subcontractor in the areas of suspected contamination of soils (EG&G, 1991).

Sampling technicians will also be "frisked" with the Ludlum 12-1A prior to leaving any area suspected of containing radiological hazards. All radiation monitoring shall be conducted in accordance to Environmental Management Radiological Guidelines (EMRG) 1.3,2.1,3.1,and 3.2. Likewise, all instrumentation for radiological monitoring will be in accordance to the EMRG.

Table B 5-3

Local Air Monitoring Trigger Levels for ^{239}Plutonium in Soils

Soil Activity pCi/gram	1.8 Rem/yr. TSP mg/m^3	DAC/10 TSP mg/m^3
0.001	1,060,500	2,000,000
0.01	106,050	20,000
0.1	10,605	2,000
1	1,061	200
5	212	40
10	106	20
20	53	10
40	27	5
60	18	3
80	13	3
100	11	2
200	5	1
400	3	0.5
600	2	0.3
800	1.3	0.3
1,000	1.1	0.2
1,500	0.7	0.13
2,000	0.5	0.10
5,000	0.2	0.04
10,000	0.1	0.02
20,000	0.05	0.01
50,000	0.02	0.004
80,000	0.013	0.003
100,000	0.011	0.002

Trigger levels are for Total Suspended Particulate matter (TSP) concentrations measured in the breathing zone as 8-hour, time-weighted averages. They are based on (1) the Derived Air Concentration (DAC)/10 which DOE recognizes as the criteria for implementing respiratory protection and (2) the RFP ALARA based recommended annual committed effective dose equivalent of 1.8 Rem/year.

Use of the Table B 5-3

1) Identify the approximate soil activity in the area where intrusive activities are to be conducted.
2) Identify the corresponding DAC/10 and annual committed effective dose equivalent (i.e., 1.8 Rem/yr.) trigger levels. Those values represent total suspended particulate (TSP) concentrations that trigger the following actions:
   A) Donning respiratory protection equipment: DAC/10 threshold.
   B) Stop intrusive actions and reevaluate the activities, conditions, and precautionary requirements: 1.8 rem/yr TSP threshold.
3) Measure TSP breathing zone concentrations during intrusive activities using a Piezometric Balance, Mini-RAM, or comparable real-time instrument.
4) If measured TSP concentrations attain the trigger levels identified above, for a sustained period of time (15-30 minutes), such that the 8-hour time-weighted average could be approached, follow the appropriate requirements identified above (A or B) and notify the SHSC.
5) RFP practice dictates that reasonable measures be taken to keep exposures to radionuclides as low as reasonable achievable (ALARA). Routine dust avoidance procedures such as avoiding the dust plume path should be implemented, to the extent practicable, regardless of the TSP measurements.
6) Environmental concentration measurements and estimates can vary at a given location. Thus, users of this table are encouraged to exercise conservative judgment regarding the selection of trigger levels.

Source: EG&G, Industrial Hygiene.

A Health and Safety Specialist in Training (HSST) that is familiar with how to operate the radiological monitoring equipment will be present at each activity that requires radiation monitoring. The HSST are considered to be semi-skilled radiation monitors and will conduct day-to-day monitoring activities, immediately implement the action levels in Section B 6 and notify the EG&G Health and Safety Liaison (HSL) of all monitoring results. Arrangements will be made for a Health and Safety Specialist (HSS) to verify any of the HSSTs radiation monitoring results that indicate the presence of greater than 250 counts per minute (cpm). A HSS will have in depth familiarity and experience in radiation monitoring.

Surfaces that could have contamination present shall be decontaminated in accordance to the Field Operations SOP FO.03 on that subject. The contamination limits from the Rocky Flats Health and Safety Practices (HSP) Manual are listed in Table B5-4. The release of property shall be conducted in accordance to Radiological Engineering 1003, EMRG 3.2 and HSP 18.10.

5.4 BIOLOGICAL HAZARDS

Snakes, arachnids, and insects are the major biological hazards that may be encountered at the RFP. Care should be taken when performing field work at the facility. Wearing hightop work boots will provide some measure of protection. Leather work gloves are also recommended when handling items on or near the ground. In the unlikely event of a snake bite or other bite, the following procedures should be followed.

- Call an ambulance or get the victim to a medical facility as soon as possible.
- Keep victim calm and still. Snakebite reactions are aggravated by anxiety and fear.
- Keep bitten area below level of heart, if possible, and keep it immobile.
- Treat for shock, if necessary.
- Give mouth-to-mouth resuscitation if breathing stops.
- Begin cardiopulmonary resuscitation (CPR) if breathing and heartbeat stop.
- Do not give victim aspirin.
- Do not use ice on the bite.

Table B 5-4

Radioactive Contamination Limits

ALPHA LIMITS			
Area	Removable		Total Fixed Plus Removable (dpm/100 cm^2)
	Smears (dpm/100 cm^2)	Swipes (dpm)	
Uncontrolled	20	N/A	300[2]
Controlled	20	N/A	300[2]
Radiological	200	500[1]	3000[2]

BETA/GAMMA LIMITS		
Area	Removable Smear (dpm/100 cm^2)	Total Fixed Plus Removable (dpm/100 cm^2)
Uncontrolled	200	5,000[3]
Controlled	200	5,000[3]
Radiological	1,000	5,000[3]

1 Minimum detectable activity using a Ludlum Model 12-1A with an air proportional detector. Total efficiency (instrument and detector) is 50 percent or as indicated on the calibration sticker. 250 cpm equals 500 dpm. No activity per area is specified since swipes are not used to quantify activity levels.

2 300 dpm/100 cm^2 is the DOE Limit for Uncontrolled and Controlled Areas. 3000 dpm/100 cm^2 is the DOE Limit for Radiological Areas. The minimum detectable activity using the Ludlum Model 12-1A with an air proportional detector of approximately 50 cm^2 is 1000 dpm/100 cm^2 with corresponds to a 250 cpm instrument meter reading of 500 dpm.

3 5000 dpm/100 cm^2 is the DOE Limit for Uncontrolled and Controlled Areas and is the Rocky Flats Limit for Radiological Areas. The minimum detectable activity (MDA) using the Ludlum Model 31 rate meter with the 44-9 pancake GM detector is 5000 dpm/100 cm^2. The maximum allowed background for this MDA is 100 cpm with the instrument range switch on the X1 setting.

Mortality rates of rattlesnake bite victims are low, but crippling injuries can result. Medical care should be sought even if the victim shows no adverse reactions.

The following biological hazards could be encountered in the field and precautions should be taken to protect field personnel:

Prairie Rattlesnake: The prairie rattlesnake generally has brown blotches giving way to crossbands on its tail. The blotches are usually well defined and the entire body has a greenish cast. Another characteristic of rattlesnakes is interlocking joints at the end of the tail that make a sharp rattling noise when shaken. Field personnel need to be aware that snakes could be in the area and should exercise caution when working in undisturbed areas and locations with animal dens. Extra care should be taken around rocks, particularly those with overhangs. Rattlesnakes are generally timid and will not attack unless disturbed.

Black Widow Spiders: The black widow spider has a black shiny body about the size of a pea. The abdomen is the shape of a sphere and there is a red or yellow hourglass-shaped mark on the underside of abdomen. They are usually found in shady areas or under rocks and wood. It weaves shapeless webs in undisturbed areas. A bite could result in severe pain, illness, and possible death from complications, but not usually from the bite itself.

Scorpions: There are several types of scorpions native to Colorado. Scorpions can be green or brown to yellowish in color and range from 1/2 inch to 8 inches in length. Their bodies are divided into two parts - a short, thick, upper body and a long abdomen with a six-segmented tail with venomous sting at the end. A scorpion has six pairs of jointed appendages -- one pair of small pincers, one pair of large claws, and four pairs of jointed legs. They are most active at night. A scorpion sting is very painful, but usually will not result in death.

Wood Ticks: Ticks are external blood feeding parasites. Bites from tick could result in the transmission of Rocky Mountain Spotted Fever, a serious and possibly fatal disease. The *Rickettsia* virus infects wood ticks, mostly in the late spring and early summer. It is characterized by chills, fever, severe pain in leg muscles and joints, and a body rash. Personal protective equipment can offer some protection, but the use of insect repellent on outside clothing could also be warranted. Field personnel should search their bodies at the end of each day to check for ticks and chiggers.

Violin Spider: Also known as the "Brown Recluse Spider." These spiders are 1/4 to 3/8 inches in length. The bases of its legs are orange -yellow with the rest of the legs grayish to dark brown. The abdomen is grayish to dark brown with no obvious pattern. Each foot has two claws. Its habitat is in cornered areas. These spiders sometimes take refuge in towels or articles of clothing. Their venom is particularly poisonous to people and the wound commonly develops a crust which falls off leaving a deep crater which does not heal for months.

Other biological hazards include chiggers, wasps, bees, and poison ivy. Bees and wasps are especially dangerous to people who have allergic reactions to their venom. Workers who are sensitive to insect stings are responsible for notifying the SHSC, the HSS, the field team leader, and the project manager prior to the commencement of field work.

SECTION B 6
MONITORING

The following Table B 6-1 indicates the air and personal monitoring instruments, frequency of monitoring, action limits, and action required for all work conducted as a part of the SVE.

Table B 6-1
Area and Personal Monitoring Actions Limits

Physical Hazard	Instrument	Frequency	Action Limit	Action
Heat Stress	Pulse Check (heat stress)	(H)	50-110 bpm	Continue work. If approaching 110 bpm, reduce work load to minimize heat stress.
			>110 bpm	No field work permitted. Rest in cool location. Drink cool fluids.
Illumination	Light Meter	(D)	5 foot-candles	General site areas, excavation and waste areas, accessways, active storage areas, loading platforms, refueling, field maintenance areas, warehouses, corridors, hallways, exitways, tunnels, shafts, and general underground work areas.
			10 foot-candles	Mechanical and electrial equipment rooms, active storage rooms, locker or dressing rooms, dining areas, and indoor toliets and workrooms
			30 foot-candles	First aid stations, infirmaries, and offices
Noise	Sound Level Meter	(H+D)	< 85 dBA	Site work may be conducted without hearing protection
			> 85 dBA	Hearing protection must be work during site work
Chemical Hazard	**Instrument**	**Frequency**	**Action Limit**	**Action**
Organic Vapors	Photoionization Detector (PID, HNu 11.7 eV lamp)	(H + D)	0-1 ppm	Level D, no respiratory protection required to be worn.
			1-10 ppm	Level C respiratory protection required. Respirator equipped with combination cartridge approved for organic vapors (OV) and high efficiency particulate air filter (HEPA).
			>10 ppm	With draw from site or go to Level B protection.
Carbon Tetrachloride	Detector Tubes (Draeger 8101021)	(H+D)	0-1 ppm	Level D, no respiratory protection required to be worn.
			>1 ppm	Withdraw from site or go to Level B protection.

Chemical Hazard	Instrument	Frequency	Action Limit	Action
Chloroform	Detector Tubes (Draeger 6728861)	(H+D)	0-1 ppm	Level D, no respiratory protection required to be worn.
			>1 ppm	Withdraw from site or go to Level B protection.
Dust	Mini-RAM	(H + D)	>2.5 mg/m	Stop work. Call the HSS. Trigger level based on annual committed effective dose equivalent of 1.8 Rem/yr. assuming worst-case soil level of 500 pCi/g plutonium.
			>0.4 mg/m^3	Level C respiratory protection required.
			<0.4 mg/m^3	Respirators not required.
Radiological Hazard	**Instrument**	**Frequency**	**Action Limit**	**Action**
Whole Body Dosimeter	TLD Badge	(C)		Normal TLD badge use.
Alpha Radiation	Ludlum Model 12-1A	(H + D)	> 250 counts per minute	Don level C PPE and notify HSL.

(H + D) is hourly plus more frequent monitoring during activities which disturb the soil.
(C) is continuous monitoring.
(H) is hourly monitoring.

In addition to the above monitoring equipment, an oral thermometer shall be kept on site to monitor body temperature (in particular, to check for heat or cold stress).

SECTION B 7

EXPOSURE SYMPTOMS AND ACTION REQUIRED

Specific exposure conditions/agents, warning symptoms, and actions required during this SVE project if warning symptoms are encountered are specified in Table B 7-1. Actions required if radiation or chemical exposures occur are given in Sections B 5 and B 6.

Table B 7-1

Exposure Symptoms and Action Required

Condition/ Agent	Warning Symptoms	Action Required
Pre heat stress	Headache Pulse over 110 bpm	Check pulse. Rest and drink cool fluids until heart rate is below 110. Increase frequency of breaks and increase cool water intake.
Heat cramps	Cramps Exhaustion Dizziness	Move to cool place. Give cool fluids to drink. Massage cramping area. Withdraw from field work for minimum of 1 day.
Heat exhaustion	Rapid breathing Weak pulse Cold, clammy skin Heavy perspiration	Move to cool place. Make patient rest. Remove PPE. Give cool fluids to drink. Withdraw from field work for a minimum of 2 days.
Heat stroke	Pulse over 110 bpm Hot, dry skin Dilated pupils disorientation	Remove PPE. Cool rapidly using cool–**NOT COLD**–water. Treat for shock. **TRANSPORT TO HOSPITAL. LIFE THREATENING:** Doctor must provide written permission for return to work.
Frostbite	Gray, blanched skin Numbness	If medical attention is not available, the affected area should be carefully warmed. If warming is done, it should be done by immersing the affected area in water that is approximately body temp. (100-105°F). Do not allow the affected body parts to touch the sides or bottom of the container (bath tub). Do not place pressure on the affected area. The presence of pain is an indicator of successful rewarming. Wrap rewarmed area in gauze and transport to hospital for treatment.
Hypothermia	Shivering Body temperature below 95.6°F	**SEEK MEDIAL ATTENTION IMMEDIATELY,** if not readily available, remove wet clothing, dry the person, keep victim at rest, slowly warm core without warming legs, give warm (not hot) liquids if person is conscious, transport to hospital as soon as possible.
Radiation	No exposure symptoms expected	Trace quantities of americium, plutonium, tritium, and uranium may be present as soil and groundwater contaminants. Based on maximum soil contaminant concentrations found in nearby areas, resuspended dust is not expected to exceed regulatory limits for airborne radiation. See Sections B 5 and B 6 for action limits
Chemicals	No symptoms expected	Airborne contaminant concentrations are expected to remain well below occupational exposure limits. No exposure symptoms are therefore expected. Exposures above the PEL may produce headache, nausea, dizziness, irritation of eyes, nose and lungs. See Section B 5 and B 6 if action levels are exceeded.

SECTION B 8

PERSONAL PROTECTIVE EQUIPMENT

Work on this project will begin in level C protection. Upgrading to level B respiratory protection or downgrading to level D respiratory protection will proceed depending on how air monitoring results compare to action levels identified in Section B 6. Table B 8-1 specifies PPE required.

Table B 8-1

Personal Protective Equipment

Item	Task	Comment
Respiratory Protection	1, 2 or 3	Full-face air purifying respirators (manufacturers: MSA or North) when action levels or conditions dictate the use. Initial drilling/sampling (Task 1), construction (Task 2), and SVE operation (Task 3) will be done using respirators in Level C PPE. PPE can be downgraded to Level D (no respirator) if action levels are not exceeded. If monitoring results indicate that organic vapors exceed 10 ppm and/or the detector tubes indicate a concentration of 1 ppm carbon tetrachloride and/or PCE, withdraw from site or go to level B protection.
Respirator Cartridges	1, 2, or 3	Use organic vapor and high efficiency particulate filter cartridges (OV/HEPA) when Level C respirator required. Cartridges to use: North = 7137 and MSA = GMA-H.
Boots, safety (leather) steel toe, steel shank	1, 2, or 3	OSHA requirement
Overboots, latex	1	To prevent potential for direct contact with radiological and chemical wastes.
Gloves (leather) to be disposed of as they are contaminated	1, 2, or 3	To prevent potential for direct contact with radiological and chemical wastes.
Outer gloves (Nitrile, ≥ 11 mil)	1, 2, or 3	To prevent potential for direct contact with radiological and chemical wastes. May be worn alone for Tasks 2 and 3, as needed.
Inner gloves (Nitrile, 4 mil)	1, 2 or 3	To provide added protection.
Coveralls (Saranex or poly-coated Tyvek)	1, 2 (or 3)	Potential for radiological contact during SVE is considered to be low. To protect against potential contact, chemical resistant disposable clothing will be worn during Tasks 1 and 2. The need for chemical resistant clothing during Task 3 will be determined on the basis of monitoring by the SHSC.
Eye wash	1, 2, and 3	Eye wash solution shall be available at SVE test location to perform initial flushing if necessary. Can transport to RFP medical clinic in immediate vicinity for remainder of 15 minute flushing or further first aid/medical attention if needed.
Ear Plugs, NRR ≥ 25 dB	1, 2 or 3	To provide hearing protection as required by OHSA. Will be worn as noise monitoring dictates.
First Aid Kit	1, 2, and 3	Contains antiseptic spray, sterile eye wash, 1" x 5-yd. roller bandage, 1½" x 2" gauze pads, 1½" x 5-yd. spool of tape, aspirin, clean wipes, ice pack, ammonia inhalants, tweezers kit, triangular bandage, plastic bandage, compress, finger bandages, knuckle bandages, surgical gloves, CPR faceheild, bloodborne pathogens control kit and first-aid book.

SECTION B 9
WORK ZONES

The SVE site will be divided into three basic zones: 1) Exclusion Zone, 2) Contamination Reduction Zone, and 3) the Support Zone. The Exclusion Zones (EZ) include areas of high physical, chemical, or radiological hazards. Only authorized personnel are permitted within the exclusion zones. Examples of exclusion zones are a 4-foot radius around a rotating auger, and areas where respiratory protection is required. The exclusion zone will be clearly marked with traffic cones, survey flags, banner tape, or other high visibility markings.

The Contamination Reduction Zone (CRZ) or decontamination area is the corridor through which all authorized personnel may enter or exit from the exclusion zone. The CRZ contains decontamination equipment and containers for disposable outerwear, etc. The CRZ is located on the upwind side of the EZ. Entrances and exits are clearly marked with high visibility items such as traffic cones.

The Support Zone (SZ) contains personnel who perform support functions for the physical work and a break area. It is upwind of the CRZ. Managers, spare equipment, etc., are generally located in the SZ. All personnel exiting the EZ must be decontaminated prior to entering the SZ. Heat stress monitoring is performed in the SZ.

Contamination prevention techniques will be used wherever feasible. Monitoring equipment will be wrapped in plastic to prevent possible contamination and to minimize decontamination, to the extent possible, without interfering with their function. The plastic will be discarded as contaminated waste after each day's use.

Engineering controls will be used first, wherever feasible, followed by a combination of administrative and personal protective equipment controls. The possibility of significant dust generation during SVE is considered to be low.

SVE technicians will be wearing full-face respirators at the beginning of work until monitoring confirms that they are no longer needed. PPE will be used when other controls are not feasible

or will not adequately control potential exposures. Initial access into the operations side of the trailer (where the blowers, GAC, etc. are located) will be initially treated as an EZ until the SHSC determines the appropriate level of respiratory protection.

All equipment to be used by personnel will be checked to ensure proper function and to make sure that all calibration/safety checks have been performed to manufacturer's specifications prior to use in the field. Testing of the breathing zone atmosphere is required for OSHA documentation. If special hazards are identified, appropriate equipment must be selected to assess the hazard level. The instruments selected must detect all suspected hazards, substances, agents, or materials of concern (radiation, VOCs, and dust/particulate hazards). Woodward-Clydes respiratory protection operating procedures are included in Appendix B-2.

Equipment and instrument calibration, safety and function checks, and the daily safety briefings will be documented in the field logbook. Incidents, exposures, accidents, and other health and safety problems or conversations relating to field activities will also be documented.

Only authorized personnel are permitted to enter the EZ. Authorized personnel are those preapproved personnel, named in this PSHSP, who are needed in the EZ to perform essential site functions.

Additionally, in Radiological Controlled Areas (RCAs) a Radiological Work Permit is required. All work in the RCA shall be done in accordance to EMRG 1.3.

SECTION B 10
DECONTAMINATION

10.1 PERSONNEL

Discard disposable outerwear.[1] Non-disposible personnel protective equipment should be washed with soap and water and placed in a plastic bag for late use. Wash exposed skin with soap and water. Rinse with water.

10.2 FIELD MONITORING EQUIPMENT

Remove and dispose of plastic wrapping. All potentially exposed surfaces will be wiped with a cloth dampened with soap and water after each use and housed in a trailer on the RFP site. Effectiveness of decontamination will be checked by frisking or wipe testing each instrument. Contaminated equipment is not permitted to be stored in general use areas or to leave the site. Decontamination wash and rinse water will be disposed of in the client's approved disposal area or as stated in the contract.

10.3 EQUIPMENT

Rental equipment will be washed and wipe tested for removable surface contamination. Equipment will not be removed from the site until RFP determines that it is safe for use by the general public (obtain written RFP approval). A copy of the RFP approval will be maintained in the project file.

All equipment, regardless of ownership, shall be monitored in accordance to RFP Safety Standards per the Rocky Flats Health and Safety Practices Manual Section 18.10 and Department Of Energy Orders 5480:11 before leaving plant site.

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[1]Solid wastes will be placed in a plastic bag, labelled and transferred to RFP for proper disposal. Liquid wastes will be containerized and transferred to RFP for proper disposal.

10.4 VEHICLES

Vehicles used in potentially radioactive areas will be surveyed for radioactive contamination prior to leaving the RFP facility. Vehicles must meet facility decontamination standards before exiting the site (obtain written RFP approval).

SECTION B 11
TRAINING REQUIREMENTS

All field personnel will have completed and be current in the training specified in 20 CFR 1910.120. This training includes, but is not limited to:

40-hour Hazardous Waste Site Worker Training
8-hour annual refresher training
8-hour supervisory training (field supervisors only)
24-hour on-the-job training
8-hour Environmental Restoration Radiation Worker Safety Training

The 8-hour Environmental Restoration Radiation Worker Safety Training is a requirement for all field personnel. It is specialized training given at RFP specifically for personnel in the field performing environmental work who could potentially be exposed to sources of ionizing radiation.

In addition to the above training, the SHSC needs to train all personnel working in the field on pinch points, material handling hazards, and other hazards listed in Section 5.0. All training must be documented and copies of the documentation must be both supplied to EG&G Rocky Flats and must kept in the field in an accessible location as the project begins or aas new people join the project. Appendix B 3 contains a table of personnel training status.

Table B 11-1

Required Personnel Training

	Medical Clearance	OSHA 40-hour Training	OSHA Supervisory Training	First Aid	CPR
PROJECT MANAGER					
Dean Parson	X	X	X	X	X
TASK MANAGERS					
Barry O'Melia	X	X	X	X	X
FIELD SUPERVISORS					
Bill Fronczak,	X	X	X	X	X
Dave Nicholson,	X	X	X	X	X
Nick Gomez,	X	X	X	X	X
Mike May,	X	X	X	X	X
Others	X	X	X	X	X
FIELD STAFF					
Jeanette Dubois	X	X		X	X
Steve Baca	X	X		X	X
Mike Ryan	X	X		X	X
Frank Lopez	X	X		X	X
Bill Snyder	X	X		X	X
Kathleen Fischer	X	X		X	X
Eumy Hung	X	X		X	X
Others	X	X		X	X

Note: X = Required Training

SECTION B 12
MEDICAL MONITORING REQUIREMENTS

All field personnel are participants in a medical monitoring program which fulfills the requirements of 29 CFR 1910.120. The program includes:

Baseline Medical Examination
Annual Medical Examination (or as frequent as required by a Physician)
Exit Medical Examination
Incident Specific Examination
Bioassay For Radiological Constituent

The protocol for Woodward-Clyde's medical surveillance program is included in Appendix B 4.

A written copy of this PSHSP must be present on site. The contents of this PSHSP must be discussed, and understood by all personnel prior to beginning each day's work (site safety briefing). A final visual and paperwork check of site hazards will be made to ensure that all safety concerns have been addressed.

SECTION B 13

CONTINGENCY PLANS

The concentrations of chemical and radiological contaminants are suspected to be low. Site emergencies are therefore expected to be limited to the slip, trip, fall, cut, and abrasion variety. The highest potential for injuries is expected to occur during drilling and construction operations (material handling).

If emergencies arise, the injuries will be stabilized using standard first aid practices. All injuries will be documented in the field logbook and reported to the contractors project manager and/or SHSC. Minor injuries and cuts will be treated by the field workers using basic first aid procedures and materials. Additional medical attention will be sought if the worker's injury requires more than basic first aid measures or the condition worsens.

Injuries which require more than simple first aid measures will be treated by medical personnel (at the RFP or through the prearranged medical hospital or clinic as stated below).

- Exposures or suspected exposures to chemical or radiological hazards will be taken seriously. If treatment is required, the individual will be taken to a hospital without delay. Effective diagnosis and treatment sometimes require the individual to be tested within hours of the suspected exposure. After rendering first aid and transport to the medical facility, the exposure will be reported to the contractor's project manager or SHSC as soon as possible.

- If a chemical gets in the eyes, first flush eyes with emergency eye wash. Phone emergency response personnel and transport to medical clinic and flush eyes with water for 15 minutes. Remember to occasionally lift the upper and lower lids during flushing.

- If a chemical gets on the skin, flush the affected skin with water for 10-15 minutes. Phone emergency response personnel.

- If a chemical is ingested, call emergency medical personnel.

- If a chemical is inhaled, move the victim to fresh air at once. Phone emergency response personnel.

Ambulance:	Building 331 – Phone: 2911 RFPFD
Hospital:	Phone: 2911 or Avista Hospital 673-1000
Police:	Phone: 2911
Fire:	Phone: 2911

EMERGENCY CONTACT PHONE NUMBERS

	Phone Number	Pager
EG&G Emergency Coordinator TBD		
EG&G Project Manager James P. Koffer	(303) 966-6954	
W-C Project Manager Dean Parson	(303) 740-2700	
W-C Health & Safety Officer Paula Ross	(303) 740-2700	(303) 760-1814
W-C Site Health and Safety Coodinator Gregg Miller	(303) 966-8022	(303) 286-4610

SECTION B 14

UNDERSTANDING AND COMPLIANCE STATEMENT

The undersigned persons understand the provisions of this safety plan and agree to abide by its provisions:

Name Lettered	Signature	Date

SECTION B 15

REFERENCES

EG&G. 1991. Final Health and Safety Plan for Phase II RCRA Facility Investigation/Remedial Investigation at the 903 Pad, Mound, and East Trenches Areas.

APPENDIX B 1

ROUTES TO HOSPITAL

Directions to the hospital: Avista Hospital 673-1000

From the contractor's compound, take a northbound to Central Avenue and turn left onto Central Avenue. Continue west to the west gate, turn north. Continue north on Highway 93 to Highway 170, turn east. Continue on Highway 170 past Interstate 36. Turn east on Dillin Road and continue to South 88th Street, turn south. The hospital is located at 100 Health Park Drive.

APPENDIX B 2

RESPIRATORY PROTECTIVE EQUIPMENT OPERATING PROCEDURES

OPERATING PROCEDURE NO. HS-201

201.0 SELECTION AND USE OF RESPIRATORY PROTECTION EQUIPMENT

201.1 PURPOSE

The purpose of this OP is to provide information for the proper selection of respiratory protection equipment. It is to insure that respirators are properly selected and used in accordance with OSHA requirements. Respirators must be selected on the basis of the hazards to which personnel are or may potentially be exposed.

201.2 REQUIREMENTS

The OSHA standards found in Title 29 of the Code of Federal Regulations, Section 1910.134 establishes requirements for respiratory protection programs, that is summarized in the following eleven major points:

1. Establish Written Operating Procedures - A formal written document outlining aspects of the respiratory protection program must be developed.

2. Respirator Selection - Proper selection of respirators shall be made according to the guidance of ANSI Z88.2-1980. In choosing respirators, consider the nature and extent of the hazard, the work requirements and conditions, and the characteristics and limitations of the respirators available. When examining the hazardous environment, some of the questions that should be asked are:

- What are the contaminants?
- What are their concentrations?
- Are they gaseous or particulate?
- Do they have adequate warning properties?
- Are concentrations immediately dangerous to life or health?
- Does the air contain at least 19.5 percent oxygen?
- Are protective clothing and hand protection necessary?

3. Training - Users of respirators should be trained in how to select, use, clean, maintain, and store their respirators. Such training must provide the respirator user with an opportunity to handle the respirator, have it properly fitted, test its facepiece-to-face seal, wear it in normal air for a long familiarity period, and finally, wear it in a test atmosphere. Every respirator wearer must receive fitting instructions, including demonstrations and practice in how to determine if it fits properly.

4. Assign Individual Respirators Where Practical - When respirators are assigned individually, there is less chance that a worker will use one that does not give him or her the best protection. Sometimes it overcomes the unwillingness of an employee to wear a respirator if he or she thinks someone else has used it, and that it was not properly sanitized afterward.

5. Regularly Clean and Sanitize Respirators - There is a three-step method of washing the respirator in a detergent or cleaner-sanitizer, rinsing it in warm water, and air drying it.

- Poorly ventilated areas, or confined spaces such as tanks, small rooms, tunnels or vessels, unless the confined space is well ventilated and the concentration of toxic contaminants is known to be below the upper limit recommended for the respirator.

- Atmospheres where the concentrations of toxic contaminants are unknown or are IDLH.

- For fire fighting.

- At concentrations of substances higher than the upper limits recommended for air purifying respirators.

3. Immediately leave the area and replace the respirator if:

   - Breathing becomes difficult;
   - Dizziness or other distress occurs;
   - You sense irritation, smell or taste the contaminants; and
   - If the respirator becomes damaged.

4. The respirator selected must properly fit the wearer. Carefully follow the fitting instructions, fit tests, and fit checks contained in the Instruction Booklet that accompanies each respirator to make certain the respirator fits and operates properly (also see OP HS-202, Respirator Fit Testing).

5. If the worker is exposed to two or more contaminants for which different air-purifying elements are recommended

(e.g., ammonia and benzene) and a combination element is not available, then air supplied respirators should be used.

6. Some toxic contaminants are readily absorbed through the skin. In these cases, appropriate gloves and/or protective clothing may be required to protect other areas of the body that might be exposed to the contaminant.

7. Respirators should not be used by individuals with beards, or other facial hair, that passes between the sealing flange of the respirator facepiece and the wearer's face. Facial hair may cause leakage or interfere with the proper operation of the respirator exhalation valve, thereby exposing the wearer to the hazardous contaminants.

8. Air-purifying respirator should not be used for sandblasting or for gas or vapor contaminants with poor warning properties.

9. Any air-purifying respirator, when properly selected and fitted, will significantly reduce, but will not completely eliminate, the breathing of contaminant(s) by the respirator wearer. The wearer, when working in atmospheres containing substances such as asbestos (that are reputed to cause cancer in amounts below their TLV) will obtain better protection from a continuous flow or positive pressure air supplied respirator.

201.7 SPECIAL RESPIRATOR-USE PROBLEMS

201.7.1 FACIAL HAIR

Facial hair lying between the sealing surface of a respirator face piece and the wearer's skin will prevent a good seal. Except with positive pressure air-line respirators, powered air-purifying respirators, and pressure-demand SCBA, a negative pressure exists within the mask upon inhalation; a poor seal will permit contaminated air to enter the facepiece. Even a few days' growth of beard can permit contaminant penetration.

Respirators should not be worn when conditions prevent a good seal of the facepiece to the face. **Facial hair in the form of beards, mustaches, sideburns, and stubble should not be permitted on employees required to wear respirators, if the hair comes between the facepiece sealing surface and the face.**

201.7.2 CORRECTIVE LENSES

Employees wearing corrective eye glasses present a special problem with respect to respiratory protection. Spectacle temple bars, or straps that pass between the sealing surface of a full facepiece respirator and the wearer's face, prevent a good seal and thus must not be worn.

Spectacles with short temple bars that do not interfere with respirator sealing and are taped to the employee's face may be used temporarily. Special corrective lenses or spectacle inserts that can be permanently mounted inside a full facepiece respirator are available from most manufacturers. Such corrective lenses should be mounted in the facepiece such that it ensures good vision and comfort.

Spectacles or goggles may also interfere with quarter or half-mask sealing; in this case a full facepiece respirator should be employed.

Contact lenses shall not be worn while wearing a respirator in a contaminated atmosphere. Contaminants may get into the eyes and cause severe irritation and/or discomfort with quarter or half-masks. Full facepieces can pull at the side of the eye and pop out the lens.

201.7.3 COLD WEATHER USE OF RESPIRATOR

Under cold weather conditions a number of problems can develop, such as fogging of full facepiece respirators, valve sticking and rubber stiffness that prevents good facial seal.

Fogging of full facepiece respirators can be eliminated easily by installing a nose-cup into the facepiece. This device, available from most manufacturers, deflects the exhalation breath away from the cold facepiece lens. Defogging solution should also be used.

Other cold weather problems should be discussed with the respirator manufacturer.

201.7.4 VOICE COMMUNICATION

Under some conditions it is necessary for respirator wearers to communicate with other personnel within or outside the contaminated area. When this is necessary, special communicating equipment, generally available from the respirator manufacturer, can be installed inside the facepiece. If penetration of the facepiece or altering of the respirator in any way is necessary to

install communications equipment, check with the respirator manufacturer to be sure that the NIOSH/MSHA approval will not be voided by the installation.

201.8 POWERED AIR-PURIFYING RESPIRATORS

Powered air-purifying respirators protect against particulates and/or gases and vapors. The great advantage of the powered air-purifying respirator is that it usually supplies air at a positive pressure so that any leakage is outward from the facepiece. It may be used with a helmet, hood or facepiece. Air can be supplied by a user mounted, battery powered backpack purifier, or by a stationary pump through up to 25 feet of low pressure hose. It has good applicability to abrasive blasting, grinding, pesticide spraying and operations using asbestos.

Generally, powered air-purifying units can be used up to 25 times the PEL for dusts, mists, and fumes, when used with filters that are approved for materials with PELs not less than 0.05 mg/M^3 or 2 mppcf and nuisance dusts. Such respirators can be used up to 25 times the PEL when used with high efficiency filters. For use in chemical vapor or gaseous atmospheres, the MUC depends on the chemical cartridge or canister used. In all cases check the manufacturer's specifications and the NIOSH/MSHA approval for the particular configuration used. Consideration should first be given to standard air-purifying units, supplied air devices and SCBA.

201.9 DISPOSABLE RESPIRATORY PROTECTION EQUIPMENT

The use of disposable respiratory protection devices eliminates the need to clean, disinfect, inspect and repair equipment. Since the cleaning and maintenance aspects of a respiratory protection program can require time and dollar

expenditures, the use of equipment not requiring such services may be desirable in some instances. While the cost of disposable equipment may, in some cases, be higher than comparable reusable devises, this cost may be offset or recoverable by the savings of labor and capital investments for cleaning and inspection facilities.

Disposable chemical vapor or gas respirators might be used economically where limited numbers of this type of respirator are in use or where specific operations are performed infrequently.

201.10 REFERENCES

American Conference of Governmental Industrial Hygienists, TLVs, Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment 1984-85, ACGIH, 6500 Glenway Avenue, Building D-5, Cincinnati, Ohio 45211.

Birkner, L.R., Respirator Protection, A Manual and Guideline, American Industrial Hygiene Association, 1980.

American National Standard, Practices for Respiratory Protection ANSI Z88.2-1980, American National Standards Institute, 1430 Broadway, New York, New York 10018.

National Institute for Occupational Safety and Health, Guide to Industrial Respiratory Protection, DHEW (NIOSH) Publication 87-116, September 1987, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

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NIOSH/OSHA Pocket Guide to Chemical Hazards, U.S. DHEW (NIOSH), Publication No. 78-210, September 1978.

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OPERATING PROCEDURE NO. HS-202

202.0 RESPIRATOR FIT TESTING

202.1 PURPOSE

The purpose of this OP is to identify and to establish respirator fit testing requirements and procedures.

202.2 REQUIREMENTS

In compliance with OSHA regulation 1910.134, all WCC employees whose job assignments require use of non-powered air-purifying respirators (APR) or air-supplied respirators (ASR) that operate in the demand mode, must be fit tested using the isoamyl acetate (IAA) and/or the irritant smoke (IS) test. Fit tests shall be performed to identify the brand and size of respirator that fits each employee and to facilitate final fitting adjustments in the field.

Fit tests must be recorded for each tested employee. The record shall include test dates and identify the brands, models, and sizes of respirators tested.

202.3 TEST EQUIPMENT

202.3.1 ISOAMYL ACETATE TEST

- Isoamyl acetate (USP grade in bottles or in ampules).
- Two bottles for odor recognition testing.

- Test enclosure. A simple test enclosure can be constructed by cutting a small slit at the center of the closed end of a clear plastic bag and inserting the hook of a wire clothes hanger through the slit so that the bag will hand open side down. The bag should be at least 3 mil thick and approximately the size of a garbage bag (large size).

202.4 TESTING PROCEDURES

202.4.1 ISOAMYL ACETATE (IAA) TEST

1. The wearer puts on the respirator and adjusts the facepiece and head straps to achieve a snug, but comfortable fit. The positive-negative pressure test (see Section 202.4.4) should be applied at this point. If the respirator is the air-purifying type, it must be equipped with a fresh cartridge(s) or canister designed to protect against organic vapors.

2. The wearer is exposed to IAA by entering a test enclosure containing IAA vapors. The wearer is exposed first while holding his/her head still. If the wearer does not smell IAA, he/she is exposed again while performing the activities listed in Section 202.4.3.

3. If the wearer does not smell IAA while active and inactive, a satisfactory fit can be assumed; however, if the wearer smells IAA, he/she readjusts the facepiece and/or headstraps, and Step 2 is repeated.

4. If the wearer continues to smell IAA, an attempt is made to locate the leakage point. If the leakage point cannot be found or corrected, another respirator of the same brand and size is tried. If the respirator leaks, a respirator of another size or brand is tried.

202.4.2 IRRITANT SMOKE TEST

1. The wearer puts on the respirator and adjusts facepiece and head straps to achieve a snug, but comfortable fit. The positive-negative pressure test (see Section 202.4.4) should be applied at this point. If the respirator is the air-purifying type, it must be equipped with a HEPA (high efficiency) filter(s).

2. The wearer stands with his/her back towards a fume hood or other ventilation source and is asked to keep his/her eyes closed during the test. (Note: eyes must be closed even when full-face respirators are tested.)

3. With the wearer holding his/her head still, the tester lightly puffs smoke over the facepiece, holding the tube at least 2 feet from it. The volume of smoke should be kept minimal and the wearer's reaction observed between puffs.

4. If the wearer detects no leakage, the tester increases smoke density and moves the tube progressively closer to the wearer, but no closer than 6 inches. If no leakage is detected, exposure is continued while the wearer performs the activities listed in Section 202.4.3.

5. If no leakage is detected with and without head movements, a satisfactory fit can be assumed. However,

if leakage is detected, smoke generation should be stopped and Steps 3 and 4 repeated after the wearer readjusts the facepiece and/or head straps.

6. If a respirator under test continues to leak, another respirator of the same brand, model, and size should be tried. If it does not pass the test, another size or another brand should be tried.

202.4.3 ACTIVITIES

If, during the IAA or IS test, no leakage occurs while the wearer is holding his/her head still, the test shall be continued while the wearer is instructed to perform the following activities:

1. Deep breathing as in heavy exertion. This activity should not be done long enough to cause hyperventilation.

2. Side-to-side, then up-and-down head movements (exaggerated).

3. Read the "Rainbow Passage." Must be loud enough to be heard by someone standing nearby.

202.4.4 POSITIVE-NEGATIVE PRESSURE TESTS

These tests can be performed by the wearer alone and requires no special equipment. The positive-negative test should be performed each time the respirator is put on. The tests should be performed only on respirators that have passed the IAA or IS tests and for preliminary fitting during the IAA and IS tests.

In the positive pressure test, the wearer closes off the exhalation value of the respirator by gently placing his/her palm over the valve and gently exhales into the facepiece. The fit is considered satisfactory if a slight pressure builds up in the facepiece without any evidence of outward leakage.

In the negative pressure test, the wearer closes off the inlet of the canister, cartridge(s) or filter(s) with his/her palm or of the breathing tube of a SA respirator by squeezing the tube and inhaling gently so that the facepiece collapses slightly. Breath is held for about 10 seconds. If the facepiece remains slightly collapsed and no inward leakage is detected during the 10-second period, fit may be considered satisfactory.

202.5 TEST FREQUENCY

An IAA and/or IS test must be performed whenever an employee is provided: (1) a respirator for the first time and (2) a replacement respirator of a different brand, model, or size. A test must also be performed whenever: (1) medical records indicate that an employee may have been exposed despite wearing a respirator and (2) an employee complains of having a faulty respirator.

The positive-negative test should be performed each time the respirator is put on.

202.6 DOCUMENTATION

Respirator fit-test records must be maintained. Form 202 should be used to document the results of each fit test. It should be signed by the individual being tested and also the person administering the test.

WOODWARD-CLYDE
HEALTH AND SAFETY TRAINING

RESPIRATOR FIT TEST RECORD

NAME: _____ SOCIAL SECURITY NO: _____

COMPANY/OFFICE: _____ LAST MEDICAL EXAM: _____

FIT TEST DATE: _____ CORRECTIVE LENSES NEEDED: YES ☐ NO ☐

Briefed on fundamental principles of respiratory protection, use, selection, inspection, cleaning, maintenance and storage of equipment. YES ☐ NO ☐

Isoamyl acetate odor recognition Pass ☐ Fail ☐

	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
EQUIPMENT TYPE			
MANUFACTURER'S NAME			
MODEL			
SIZE			
FACEPIECE COMPOSITION (Rubber/Silicone)			

TEST PERFORMED	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Negative Pressure Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Positive Pressure Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Isoamyl Acetate Vapor Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Irritant Smoke Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐

The individual named above has been fit-tested according to procedures specified in Woodward-Clyde's Health and Safety Manual. This qualitative fit test protocol has been adapted from OSHA 29 CFR 1910 and 29 CFR 1926.

_____ _____ _____
Examiner's Name (Please Print) Examiner's Signature Date

_____ _____
Employee's Signature Date

(P = Pass, F = Fail)

OPERATING PROCEDURE NO. HS-203

203.0 RESPIRATOR INSPECTION, CARE, MAINTENANCE, AND STORAGE

203.1 PURPOSE

The purpose of this document is to provide guidance on the proper care and use of respiratory protective devices, to assist in adequately protecting personnel as well as complying with OSHA respiratory protection standard 1910.134. Guidance in the selection of respiratory devices is provided in OP No. HS 201.

203.2 APPLICABILITY

This procedure is applicable for use in caring for half-face and full-face respirators of either air-purifying or air supplying type. Proper care of respirators is essential for their satisfactory performance. Of importance is respirator inspection, care, maintenance, and storage.

203.3 REQUIREMENTS

OSHA requires, as part of an inspection program, that all respirators be leak checked, a determination that the complete assembly is gas tight. Follow field inspection procedures to examine the freshly cleaned, reassembled respirator.

Cleaning and Disinfecting - OSHA 1910.134 states "routinely used respirators shall be collected, cleaned and disinfected as frequently as necessary to ensure that proper protection is provided..." and that emergency use respirators "shall be cleaned and disinfected after each use."

The OSHA standard states that "replacement or repair shall be done by experienced persons with parts designed for the respirators." Besides being contrary to OSHA requirements, **substitution of parts from a different brand or type of respirator invalidates approval (i.e., NIOSH, MSHA) of the device.**

OSHA requires that respirators be stored to protect against:

- Dust;
- Sunlight;
- Heat;
- Extreme cold;
- Excessive moisture;
- Damaging chemicals; and
- Mechanical damage.

The OSHA standard suggests that respirators be in their original cartons, however, this may provide only minimal protection from mechanical damage.

203.4 INSPECTION

203.4.1 AIR-PURIFYING RESPIRATORS

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

1. 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.

2. Examine the head straps or head harness for:

   - Breaks;
   - Loss of elasticity;
   - Broken or malfunctioning buckles and attachments; and
   - Excessively worn serrations on head harness, that might permit slippage (full facepieces only).

3. Examine the exhalation valve for the following after removing its cover:

   - Foreign material, such as detergent residue, dust particles or human hair under the valve seat;
   - Cracks, tears or distortion in the valve material;
   - Improper insertion of the valve body in the facepiece;
   - Cracks, breaks, or chips in the valve body, particularly in the sealing surface;
   - Missing or defective valve cover; and
   - Improper installation of the valve in the valve body.

4. 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.

5. 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.

6. Examine the harness of a front-or back-mounted gas mask for:

   - Damage or wear to the canister holder, that may prevent its being held in place; and
   - Broken harness straps for fastening.

203.4.2 ATMOSPHERE-SUPPLYING RESPIRATORS

For a routinely used atmosphere-supplying device, use the following procedures:

1. If the device is a tight-fitting facepiece, use the procedures outlined under air-purifying respirators, except those pertaining to the air-purifying elements.

2. If the device is a hood, helmet, blouse or full suit, use the following procedures:

   - Examine the hood, blouse or full suit for rips and tears, seam integrity, etc.;

   - Examine the protective headgear, if required, for general condition with emphasis on the suspension inside the headgear;

   - Examine the protective face shield, if any, for cracks or breaks or impaired vision; and

   - Make sure the protective screen is intact and secured correctly over the face shield.

3. Examine the air supply systems for:

   - Integrity and good condition of air supply lines and hoses, including attachment and end fittings; and

   - Correct operation and condition of all regulators, or other air flow regulators.

In addition to the above, for self-contained breathing apparatus (SCBA) units also determine that:

1. The high pressure cylinder of compressed air or oxygen is sufficiently charged for the intended use, preferably full charged.

2. On closed circuit SCBA, a fresh canister of CO_2 (carbon dioxide) sorbent is installed.

3. On open circuit SCBA, the cylinder has been recharged if less than 25 percent of the useful service time remains.

All SCBAs are required to have a warning device that indicates when the 25 percent level is reached. However, it is recommended that an open-circuit SCBA be fully charged before use.

203.4.3 RESPIRATOR DISASSEMBLY

The used respirators should be collected and deposited in a central location. They are taken to an area where the filters, cartridges or canisters are removed and discarded. Canisters should be damaged or marked to prevent accidental reuse. If facepieces are equipped with reusable dust filters, they may be cleaned with compressed air in a hood. This prevents dust from getting into the room and affecting the respirator personnel. If SCBA are used, tanks are removed and connected to an area where the SCBA regulators and low-air warning devices are tested. SCBA facepieces are cleaned like air-purifying respirator facepieces.

203.4.4 DEFECTS FOUND IN FIELD INSPECTION

If defects are found during any field inspection, two remedies are possible. If the defect is minor, repair and/or adjustment may be made on the spot. If it is major, the device should be removed from service until it can be repaired. (A spare unit should replace the unit removed from service.) **Under no**

circumstances should a device that is known to be defective remain in the field.

203.4.5 INSPECTION DURING CLEANING

Because respirator cleaning usually involves some disassembly, it presents a good opportunity to examine each respirator thoroughly. The procedures outlined above for a field inspection should be used. Respirators should be inspected after cleaning operations and reassembly have been accomplished.

203.5 RESPIRATOR CARE

When used routinely, respirators should be exchanged daily for cleaning and inspection. Where respirators are used only occasionally, the exchange period could be weekly or monthly. workers maintaining their own respirators should be thoroughly briefed on cleaning and disinfecting them. Although workers may not be required to maintain their own respirators, briefing on the cleaning procedure will encourage their acceptance of a respirator by providing knowledge of what is a clean, disinfected, properly maintained device. This is particularly important where respirators are not individually assigned.

Where respirators are individually assigned (a practice to be encouraged), they should be identified to ensure that the worker always receives the same device. Identification markers must not penetrate the facepiece, block the filter, cartridge parts or exhaust valves.

When a relatively small number of respirators are used, or where workers clean their own respirators, the generally accepted procedure is washing with detergent and warm water using a brush, thoroughly rinsing in clean water, and drying in a clean

place. Precautions should be taken to prevent damage from rough handling during this procedure.

When large numbers of respirators are used, it is recommended that centralized cleaning and maintenance be performed and that specialized equipment and personnel trained in respirator maintenance be utilized.

203.5.1 CLEANING AND SANITIZING

The actual cleaning may be done in a variety of ways. A commercial dishwasher can be used. A standard domestic clothes washer may also be used if a rack is installed around the agitator to hold the facepieces in fixed positions. If the facepieces are placed loose in the washer, the agitator may damage them. A standard domestic dishwasher may be used, but it is not preferred because it does not immerse the facepieces. any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one step operation. Disinfection is not absolutely necessary if the respirator is reused by the same person. However, where individual issue is not practical, disinfection is strongly recommended. Reliable, effective disinfectants may be made from readily available household solutions, including:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Chlorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.

2. Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of water, or one teaspoon of tincture of

iodine per gallon of water. Again, a two-minute immersion is sufficient.

If the respirators are washed by hand, a separate disinfecting rinse may be provided. If a washing machine or dishwasher is used, the disinfectant must be added to the rinse cycle; the amount of water in the machine at that time will have to be measured to determine the correct amount of disinfectant.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140°F, but it should not be less than 120°F to ensure adequate cleaning. In addition, if commercial or domestic dishwashers are used, the drying cycle should be eliminated, since the temperatures reached in these cycles may damage the respirators.

203.5.2 RINSING

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

203.5.3 DRYING

The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes, but care must be taken not to damage or distort the facepieces. Another method is to equip a standard steel storage cabinet with an electric heater that has a built-in circulating fan, and to replace the solid steel shelves with steel mesh.

203.5.4 REASSEMBLY AND INSPECTION

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

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

203.6 MAINTENANCE AND REPAIR

Maintenance personnel must be thoroughly trained. They must be aware of the limitations and never try to replace components or make repairs and adjustments beyond the manufacturer's recommendations, unless they have been specially trained by the manufacturer.

These restrictions apply primarily to maintenance of the more complicated devices, especially closed- and open-circuit SCBA, and more specifically, regulator valves and low pressures warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair. there should be no major problems in repairing and maintaining most respirators, particularly the commonly used air-purifying type.

An important aspect of any maintenance program is having enough spare parts on hand. Only continual surveillance of replacement rates will determine what parts and quantities should

be kept in stock. It is desirable to have a recording system to indicate spare parts usage and the inventory on hand.

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

203.7 RESPIRATOR STORAGE

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt. Freshly cleaned respirators should be placed in heat-sealed, ziplock, or other reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set."

Air-purifying respirators kept ready for non-routine or emergency used should be stored in a cabinet with individual compartments. The storage cabinet should be readily accessible, and all workers should be made aware of its location, as is done for fire extinguishers. Preventing serious injury from the inhalation of a toxic substance depends entirely on how quickly workers can get to the emergency respirators.

A chest or wall-mounted case may be used for storing SCBA for use in emergencies. Again, the location of SCBA should be well-known and clearly marked. Unlike fire extinguishers, however, they should be located in an area that will predictably remain uncontaminated. Putting on a SCBA in a highly contaminated atmosphere such as might be created by massive release of a toxic material may take too long a time to perform safety in that area.

Therefore, the first reaction should be to escape to an uncontaminated area, then put on the SCBA, that should be located there, and re-enter the hazardous area for whatever task must be done. Exceptions to this rule may be encountered, and only a thorough evaluation of the process and escape routes will permit a final decision about the correct storage location for SCBA. Respirators should be stored in a plastic bag inside a rigid container.

Workers who are adequately trained should develop a respect for respirators that will be an automatic incentive to protect respirators from damage. Besides providing better assurance of adequate protection, this training will lower maintenance costs by decreasing damage.

203.8 RECORDKEEPING

Records should be maintained to document that proper care and maintenance has been performed on respiratory protection devices. Records should indicate when and what was done to each respirator, and also by whom.

203.9 REFERENCES

U.S. Department of Labor, OSHA, Safety and Health for General Industry (29 CFR Part 1910), Respiratory Protection 1910.134, U.S. Department of Labor Occupational Safety and Health Administration.

American National Standard, Practices for Respiratory Protection, ANSI Z88.2-1980, American National Standards Institute.

Birkner, L.R., Respiratory Protection A Manual and Guideline, American Industrial Hygiene Association, 1980.

APPENDIX B 3

W-C'S PERSONNEL TRAINING STATUS

Pilot Scale Soil Vapor Extraction - Operable Unit 2

Personnel Training Status as of 7/16/93

Name		SSN No.	Physical Exam	Respirator Fit Test	Training						Rocky Flats Training				
					24/40 Hour (OSHA)	Refresher (OSHA)	Supervisor	W-C Level B	CPR	First Aid	SOP Training	OJT	GET	ER RAD	RAD WORKER
			annual	annual	once	annual	once	once	annual	3 years	once	once	once	2 years	Annual
Dubois	Jeanette	[redacted]	11/11/92	3/16/93	3/18/93							4/12/93	1/8/93	3/29/93	
Fischer	Kathleen	[redacted]	5/26/93	5/7/93	6/5/92	5/7/93	9/25/92		12/10/92	12/9/92			3/19/93	8/19/92	
Fronczak	Bill	[redacted]	4/23/93	4/10/92	6/7/93	4/9/93	9/30/91	9/6/93	12/10/92	12/9/92		4/19/93	11/19/92	3/2/92	
Gomez	Nicholas	[redacted]	5/20/93	5/7/93	6/7/91	5/7/93	9/30/91	9/6/91	12/10/92	12/9/92		4/7/93	3/19/93	1/10/92	
Hencmann	Robert	[redacted]	3/30/93	4/10/92	4/6/90	4/9/93	7/13/90	6/15/90	8/9/91	8/9/91		3/26/90	9/17/92	7/18/91	
Hung	Eumy	[redacted]	8/5/92	4/13/92	8/22/91	9/18/92	9/30/91	9/6/91	INSTR	12/31/92		8/29/91	9/8/92	8/1/91	
Lopez	M. Frank	[redacted]	9/17/92	1/15/93	9/26/92	1/15/93			1/20/93	1/20/91		12/30/91	9/22/92	10/1/91	
May	Michael	[redacted]	1/10/93	1/15/93	2/15/91	1/15/93	9/30/91	4/22/91				7/12/91	9/8/92	2/25/93	
Miller	Gregory	[redacted]	5/19/93	11/15/91	8/20/88	11/6/92	5/10/91	4/22/91	12/10/92	12/9/92		8/28/90	9/8/92	4/1/91	
Nicholson	Dave	[redacted]	4/6/93	4/9/93	6/8/90	4/9/93	7/13/90	6/15/90	12/10/92					3/29/93	
O'Melia	Barry	[redacted]	10/9/92	11/6/92	11/22/91	11/6/92	4/16/92	1/22/92					3/19/93	9/17/92	
Parson	Dean	[redacted]	5/6/93	4/9/93	9/18/87	4/9/93	12/28/87	1/22/92					11/6/92		
Ross	Paula	[redacted]	9/25/92	11/6/92	10/14/88	11/6/92	10/13/89	1/22/92	12/10/92	12/9/92		10/4/91	11/20/92	10/4/91	
Ryan	Michael	[redacted]	7/29/92	5/7/93	7/30/90	5/7/93	9/30/91	1/22/92				8/9/90	1/8/93	7/18/91	
Schroer	Douglas	[redacted]	9/17/92	1/15/93	6/22/92	1/15/93			1/20/93	1/20/93			9/22/92	4/1/91	
Snyder	William	[redacted]	4/8/93	4/12/93	1/11/91	1/28/92								3/29/93	
Layne		[redacted]													
Layne															
Layne															
Hazen															
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APPENDIX B 4

W-C'S MEDICAL SURVEILLANCE PROGRAM

3.0 MEDICAL SURVEILLANCE

Medical surveillance is a major component of the WC health and safety program. It was established to monitor and promote the health of employees engaged in projects which have the potential for exposure to hazardous substances.

Medical surveillance provides a clinical base of information useful in evaluating employee's fitness to work at hazardous waste sites, to identify anomalies in a person's medical history that may be related to potential impaired health, to evaluate a person's capability to use respiratory protection equipment, and to identify illnesses that may be related to chemical exposure while on the job. This base of medical information includes personnel health history, exposure history, physical examination results, laboratory analyses, and results of screening and special tests. Medical examinations include:

- Past Medical History - on entry to the program, information concerning past occupational exposures and personal as well as family history of disease.

- Present Medical Profile - all pertinent medical information regarding present state of health and during each year of field work in hazardous material projects.

- Exposure History - information concerning the cumulative duration of time spent on potentially hazardous sites, the primary toxic substances, and the levels of protection employed by each site.

- Laboratory Analyses - hematology, liver and kidney function tests, and urinalysis.

- Hearing test.
- Vision test.
- Pulmonary function test.
- Electrocardiogram.
- X-ray.
- Physical examination.
- Special Tests - medical information concerning the effects of exposure to specific contaminants.

3.1 OBJECTIVES

The objectives of the medical surveillance component of the health and safety program are:

- Protect the health of employees assigned to work on hazardous material projects.
- Pre-assignment screening of employee's health to determine present status and to identify existing problems that may be aggravated by chemical exposures or physical stress.
- Monitoring employee health for early signs of work-related illness and employee suitability for further field or laboratory assignments on sites containing potentially hazardous substances.

- Evaluation and care of individuals with work-related illnesses or injuries.

- Satisfy the requirements of OSHA Part 1910.134 regarding respiratory protection and OSHA 1910.120 for hazardous waste workers.

3.2 RESPONSIBILITIES OF WC OPERATING UNITS

Each operating unit, through its HSO, must comply with the medical surveillance provisions of the health and safety program. It is the responsibility of the operating unit manager to assure that the following activities are punctually and thoroughly conducted.

- Arrange for health monitoring services by a qualified local physician or medical organization, preferably with occupational health expertise. The physician must be willing to perform all physician-related tasks described in the WC medical surveillance program.

- Identify personnel within the operating unit required to enter the program.

- Inform participants of the specific arrangements for scheduling and receiving medical examinations.

- Comply with the examining and/or the reviewing physician's recommendations regarding work restrictions and attending to all work-related illnesses.

- Document and report work/exposure histories for all employees engaged in field activities.

3.3 REQUIREMENTS

Under Part 1910.120, OSHA requires medical surveillance for personnel involved in hazardous waste operations. OSHA states that persons should not be assigned to tasks unless it has been determined that they are physically able to perform the work and use the equipment.

The OSHA program has two essential components: routine health care and emergency treatment. Routine health care and maintenance shall consist of at least:

1. Pre-employment medical examinations to establish the individual's state of health, baseline physiological data, and ability to wear personal protective equipment. The frequency and type of examination to be conducted thereafter should be determined by medical personnel knowledgeable in the area of occupational medicine.

2. Arrangements to provide special medical examinations, care, and counseling in case of known or suspected exposures to toxic substances. Any special tests performed depend on the chemical substance in which the individual has been exposed.

The site safety plan must address emergency medical care and treatment of personnel, including possible exposures to toxic substances and injuries due to physical hazards. The following items should be considered in emergency care provisions.

- The name, address, and telephone number of the nearest medical treatment facility should be conspicuously posted. A map and/or directions for locating the

facility, plus the travel time, should be readily available.

- The facility's ability to provide care and treatment of personnel exposed or suspected of being exposed to toxic (or otherwise hazardous) substances should be ascertained. If the facility lacks toxicological capability, arrangements should be made for consultant services.

- All administration arrangements for accepting patients should be made in advance with the facility.

- Arrangements should be made to quickly obtain ambulance, emergency, fire, and police services. Telephone numbers and procedures for obtaining these services should be conspicuously posted.

- Emergency showers, eye wash fountains, and first aid equipment should be readily available on-site. Personnel should have first aid and medical emergency training.

- Provisions should be made for rapid identification of the substance to which the worker has been exposed (if this has not previously been done). This information must be provided to medical personnel.

3.4 MEDICAL EXAMINATIONS

3.4.1 INITIAL BASELINE EXAMINATION

All applicable employees shall be given a baseline examination before being assigned to work at sites containing

potentially hazardous substances. The purpose of the baseline examination is pre-assignment screening.

3.4.2 ROUTINE EXAMINATIONS

All personnel who have taken the initial baseline examination and have received clearance by the examining and/or reviewing physician to participate in field or laboratory activities shall be re-examined on an annual or biennial basis. Generally, employees with less than 100 hours of annual hazardous waste field work may have biennial examinations. Employees with greater than 100 hours hazardous waste field work will have annual examinations. The reviewing physician will have final authority in reducing examination frequency.

3.4.3 EXIT EXAMINATION

An exit examination shall be given to any employee whose employment with WC has included hazardous materials work and who has been a participant in medical surveillance. The exit examination may be waived by the reviewing physician if the most recent examination was in the past six months.

3.4.4 SPECIAL TESTING

Special testing may be required on certain projects due to the potential for exposure to specific substances. This may also be necessary where the potential for heat or cold stress exists. The need for special testing will be assessed on a project-by-project basis. Examples of special testing conditions include sites containing asbestos, arsenic, or lead where specific OSHA medical requirements for these compounds are in effect.

3.5 EXAMINATION PROTOCOLS

The protocols presented in Table 3-1 apply to baseline, annual, and exit examinations. A detailed health/work history questionnaire is provided before baseline and routine examinations. The protocols may be expanded by the reviewing or examining physician after consultation with WC.

3.6 PHYSICIAN'S REPORTS

Examining physicians will use information provided by the employee in the questionnaire, the examination results, and the results of laboratory tests to determine if any work restrictions or occupational health problems appear to be present. The examining physician will provide the results of the examination to the WC reviewing physician for final evaluation of employee suitability for work at hazardous material sites. The reviewing physician's conclusions shall supercede those of the examining physician. A physician's report on the examination will be sent directly to the employee with a separate letter stating ability to work at hazardous waste sites sent to WC.

Employer reports received by WC shall be reviewed by the HSO and kept in the Operating Unit's health and safety file. Physician recommendations regarding limitations must be followed.

3.7 EMPLOYEE MEDICAL SURVEILLANCE PROGRAM

The employee medical surveillance program (EMSP) is a computerized database which stores and processes employee medical surveillance information such as medical examination results, exposure history, training and respirator fit testing data. The purpose of EMSP is to facilitate record documentation, the reviewing physician's evaluation of the medical surveillance data,

and administration of the WC Health and Safety Program. Administrative and quality control features include: profile reports on employee eligibility for site work, medical examination scheduling reports, training requirement notices, and listing of qualified staff by operating unit and firmwide.

3.8 REVIEWING PHYSICIAN

Dr. Peter Greaney of Anaheim, California has been retained to provide medical oversight to the WC medical surveillance program. The reviewing physician receives copies of all medical questionnaires, examinations, and laboratory testing results, reviews the opinions of examining physicians, and determines an employee's fitness for work at hazardous material sites. The physician also provides advice and assistance regarding site specific medical monitoring needs and programs.

3.9 CONFIDENTIALITY

Employee medical records are confidential and available for review only by the examining and/or reviewing physicians and their medical personnel.

Each employee can obtain information on his/her health by asking the examining physician for the information at the time of, or after, an examination. The employee may also request release of records or information, and/or designate a representative, in a letter to the physician. The request must contain the full name and address of the representative and indicate the records to be released. Medical information about an employee will not be made available to anyone without authorization from the individual concerned.

3.10 FINANCIAL RESPONSIBILITY

The costs of baseline, routine, special, and exit examinations will be paid to the examining physician by WC operating units. The cost of examinations and tests that the employee voluntarily takes on recommendations by the examining or reviewing physician shall be borne by the employee unless the examinations/tests are related to the employee ability to work or to diagnose a work-related illness. The cost of the reviewing physician and the EMSP data base will be paid by Corporate Health and Safety.

WOODWARD-CLYDE

HEALTH AND SAFETY MANUAL

Revised

TABLE 3-1

MEDICAL EXAMINATION PROTOCOL

Dated September 1991

TABLE 3-1

MEDICAL EXAMINATION PROTOCOL

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Height and Weight	X	X	X	
Blood Pressure	X	X	X	
Pulse (resting)	X	X	X	
Temperature (oral) Fahrenheit	X	X	X	
Stool for Occult Blood	X	X	X	
Vision Snellen (R&L)		X	X	
Vision Titmus (R&L)	X			
Near-corrected & Uncorrected				
Far-corrected & Uncorrected				
Peripheral (Visual Field)				
Color				
Audiogram	X	X	X	
Pulmonary Function Test	X	X	X	
CBC Count (Hemogram)	X	X	X	
WBC				
RBC				
HGB				
HCT				
MCV				
MCH				
MCHC				
Differential White Count	X	X	X	
Seg				
Band				
Lymph				
Mono				
Eosin				
Baso				
Platelets				
Platelet Count				

Table 3-1 (continued) **MEDICAL EXAMINATION PROTOCOL**

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Reticulocyte Count	X	X	X	
Chest X-ray	X	*See Remarks	*Note	Every 3 years for less than or equal to 40 years old. Every 2 years for more than or equal to 40 years old to less than or equal to 55 years old. Every year for more than 55 years old. *NOTE: For Exit exams chest x-ray performed only if not performed in past year.
Cardiogram	X	*See Remarks	*Note	Every 3 years for less than or equal to 40 years old. Every year for more than 40 years old. NOTE: For Exit exam, EKG performed only if not performed in past year.
Treadmill	*See Remarks	*See Remarks		*Only if: *Abnormal EKG (except sinus bradycardia, unless an otherwise healthy person) <u>or</u> *History of angina <u>or</u> *History of myocardial infarction (MI) <u>or</u> *History of cardiac surgery.

Table 3-1 (continued) **MEDICAL EXAMINATION PROTOCOL**

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Urinalysis	X	X	X	
Appearance				
Color				
pH				
Ketones				
Direct Bilirubin				
Total Bilirubin				
Glucose				
Blood				
Urobilinogen				
L. Esterase				
WBC				
RBC				
Casts				
Mucus				
Bacteria				
Epithelial				
Blood Chemistry Panel	X	X	X	
Required:				
Glucose	Sodium			
Potassium	Chloride			
BUN	Creatinine			
Uric Acid	Phosphate			
Calcium	Cholesterol			
Triglycerides	Total Protein			
Albumin	Globulin			
Total Bilirubin				
Alk. Phosphatase				
G-Glutamyl Transpep.				
Transaminase, SGO				
Transaminase, SGP				
LDH				