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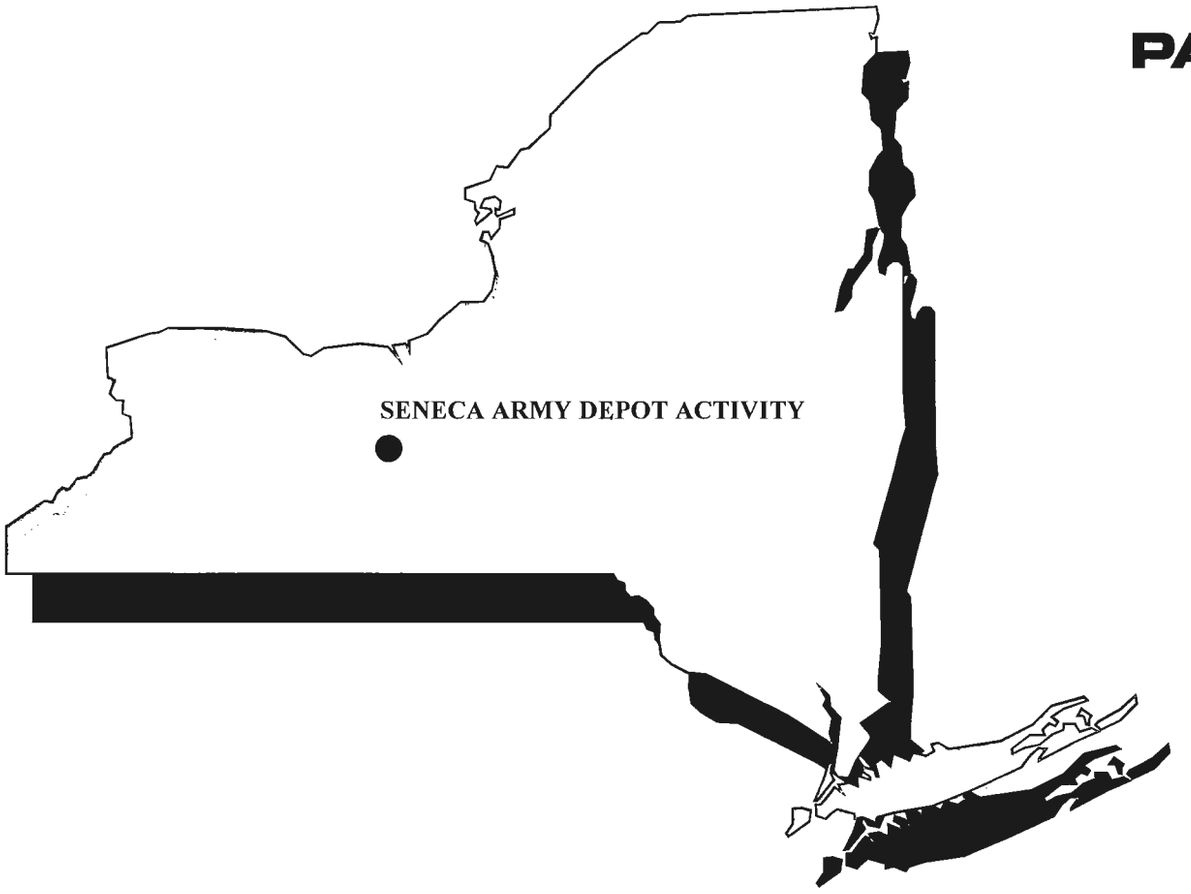

SENECA SITE-WIDE HEALTH AND SAFETY PLAN

SENECA ARMY DEPOT ACTIVITY

SEPTEMBER 2003

SENECA SITE-WIDE HEALTH AND SAFETY PLAN

SENECA ARMY DEPOT ACTIVITY
GENERIC INSTALLATION RI/FS WORK PLAN
ROMULUS, NEW YORK

APPROVED BY: _____
Project Manager

APPROVED BY: _____
Corporate Health and Safety Officer

September, 2003

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1 INTRODUCTION

The purpose of this Seneca Site-Wide Health and Safety Plan (SHSP) is to establish personnel protection standards and mandatory safety practices and procedures for field investigation efforts conducted at Seneca Army Depot, Romulus, New York. This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise during RI/FS investigations and other field work at solid waste management units (SWMUs) at Seneca Army Depot, Romulus, New York. Unless otherwise specified in the individual site-specific Health and Safety Plan (HSP), the standard operating procedures and safety practices presented in this plan shall be followed by all personnel conducting work at Seneca Army Depot. Safety practices and operating procedures deviating from this SHSP or other site-specific requirement will be presented in individual site-specific HSPs to accommodate changes in specific work plans and task specific and location specific hazards for the various SWMU investigation activities.

The provisions of the plan, if applicable to individual SWMU, are mandatory for all Parsons personnel engaged in on-site hazardous waste operations. Subcontractors working for Parsons must conform to this Health and Safety Plan unless they prepare and administer a plan with equivalent requirements. All Parsons and Parsons contract personnel who engage in project activities must be familiar with this plan and comply with its requirements. These personnel must sign-off on the Health and Safety Plan Signature Form , which is attached to each individual HSP. The signed original form will be kept on site and becomes part of the permanent project files. A copy of this form is submitted to the Project Health and Safety Officer (PHSO).

2 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

2.1 SITE HISTORY AND DESCRIPTION

The Seneca Army Depot, a 10,587-acre facility in Seneca County, Romulus, New York, has been owned by the United States Government and operated by the Department of the Army since 1941 (**Figure B-1**). Since its inception in 1941, SEDA's primary mission has been the receipt, storage, maintenance, and supply of military items, including munitions and equipment. The Depot's mission changed in 1995 when the Department of Defense (DOD) recommended closure of the SEDA under its Base Realignment and Closure (BRAC) process.

During active military use, the land use was divided into three categories at the depot. The Main Post accounted for 9,832 acres and consists of an exclusion area containing partially buried, reinforced concrete igloos, general storage magazines, and warehouses. The cantonment areas of the facility consist of the North and South Posts. The North Post, at the north end of the Main Post, included troop housing, troop support, and community services. The South Post is located in the southeast portion of the facility near Route 96 and was a developed area containing warehouses, administration buildings, quarters, and community service.

When the Army arrived in Seneca, New York in 1941, the nearly 10,000 acres in Central New York State were abundant farmland. In June 1941, the War Department approved the munitions project, and in July 1941, construction for the Seneca Ordnance Depot (Depot) began. Construction workers completed nearly 500 storage igloos and six aboveground magazines by the end of the year (Johnson 1984). With the construction of the administrative area, ammunition facilities, warehouses, utility structures and a few housing quarters completed in 1943, the Depot began its primary mission of receipt, storage, maintenance and supply of ammunition. As a filler Depot, it also issued and reconditioned ammunition for the First and Second Service Commands and for the Boston Port of Embarkation. This included all classes of ammunition and explosives except chemical ammunition other than smoke. In 1946, the Army assigned the Depot to the First Army, which included the Mid-Atlantic States of New York, New Jersey and Delaware (Seneca Ordnance Depot 1946).

2.2 PLANNED SITE ACTIVITIES

Depending on specific conditions at individual sites at SEDA, field activities may include, but may not be limited to the following tasks: sampling-related geophysical surveys (e.g., EM-31, GPR); excavation, test pitting, soil boring, monitoring well installment, and sample collection. UXO detection and clearance will be performed at sites where UXOs are concern. In addition, some sites have potential radiological hazards. **Table B-1** presents a list of Solid Waste Management Units (SWMUs) planned for RI/FS or other investigations at Seneca Depot.

2.3 SITE CONTAMINATION CHARACTERIZATION

A large number of compounds have been detected in the previous investigations at the Seneca site. The contaminants detected at the site include metals (e.g., antimony, arsenic, cadmium, chromium, copper, lead, mercury, zinc), volatiles (e.g., benzene, toluene, xylene, trichloroethene, cis-1,2-DCE, vinyl chloride), semi-volatiles (e.g., PAHs). In addition, explosives (HMX, RDX, 2,4,6-TNT, 2,6-DNT, 2,4-DNT, and tetryl) have been detected at sites with potential UXO/OE hazards and elevated radiation levels have been detected at sites with potential radiation hazards (as listed in Table B-1). **Table B-2** lists selected contaminants at SEDA and the ranges of the maximum concentrations observed at selected sites. Contaminants characterization for individual sites will be presented in the site-specific HSPs.

3 HAZARD/RISK ANALYSIS

The chemical and physical hazards that may be encountered at the SEDA sites are described below. **Table B-3** presents a summary of Activity Hazard Analysis (AHA) for tasks that may be conducted at the Seneca Depot, including drilling, excavation/test pitting, sampling, and general site activities. For the individual HSPs, Activity Hazard Analysis will be conducted based on site-specification conditions and tasks that will be conducted at the site and a site-specific AHA table will be presented.

3.1 EXPOSURE POTENTIAL

The primary sources of exposure at the SWMUs will be the surface and subsurface soils, groundwater, surface water, and sediment. Depending on specific conditions at individual sites, these media may be contaminated with heavy metals, VOCs, SVOCs, explosive compounds, or low level radioactive waste. The exposure potential for the planned site activities is presented in the individual HSPs.

3.2 CHEMICAL HAZARDS

Health hazards and the exposure limits associated with chemicals of concern are presented in **Table B-4**. Health hazards and the exposure limits for site-specific chemicals of concern will be presented in the individual HSPs.

3.3 PHYSICAL HAZARDS

3.3.1 Heat Stress

Heat stress is one of the most common (and potentially serious) illnesses that affect field personnel. When site personnel are engaged in operations involving hot environments, a number of physiological responses can occur which may seriously affect the health and safety of the workers. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death.

Sweating does not cool the body unless moisture is removed from the body. The use of personal protective equipment (PPE) reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

Heat stress can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program (see Section 10).

3.3.2 Cold-Related Illness

Symptoms of Cold-Related Illnesses: Exposure to low temperatures presents a risk to employee safety and health both through the direct effect of the low temperature on the body and collateral effects such as slipping on ice, decreased dexterity, and reduced dependability of equipment. Work conducted in the winter months can become a hazard for field personnel due to cold exposure. All personnel must exercise increased care when working in cold environments to prevent accidents that may result from the cold. The symptoms of cold exposure include frostbite and hypothermia. Wind increases the impact of cold on a person's body. Work will cease under unusually hazardous conditions (e.g., windchill less than 10°F, or wind chill less than 20°F with precipitation). Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally labeled frostbite. Recognition of the symptoms of cold-related illness will be discussed during the health and safety briefing conducted prior to the onset of site activities.

- **Hypothermia.** Hypothermia is defined as a decrease in a person's core temperature below 96.8°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interferences with any of these mechanisms can result in hypothermia, even in the absence of "cold" ambient temperatures. The first symptom of systemic hypothermia is shivering. Maximum shivering starts when the core body temperature drops below 95°F. The next set of symptoms as the body's cooling progresses is apathy, listlessness, and sleepiness. The person remains conscious and responsive with normal blood pressure and a core temperature of 93.2°F. The person must be removed immediately to a facility with heat. As hypothermia advances beyond this point, the person has a glassy stare, slow pulse, slow respiratory rate, and may lose consciousness. Severe hypothermia starts when the core body temperature reaches 91.4°F. Finally, the extremities start to freeze hard and death could result.

- **Frostbite.** Frostbite is both a general and medical term given to areas of local cold injury. Frostbite has progressive degrees and this progression may continue until systemic hypothermia occurs. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Frostbite symptoms are a sudden blanching or whitening of the skin; a waxy or white appearance of the skin and it is firm to the touch; tissues are cold, pale, and solid. Superficial frostbite occurs when the skin is white but the underlying tissue is firm. The skin will return to shape when depressed. Deep frostbite causes the underlying tissue to freeze. The skin will either not depress when pressed by the finger or it will depress but not return to the original contour. DEEP FROSTBITE IS A SERIOUS INJURY.

Progressive Clinical Symptoms of Hypothermia

Core Temperature °F	Clinical Signs
95°	Maximum shivering
87° - 89°	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated
84° - 86°	Progressive loss of consciousness; muscular rigidity; respiratory rate decreases
79°	Victim rarely conscious
70° - 72°	Maximum risk of ventricular fibrillation

Cold related illness can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program (see Section 10).

3.3.3 Ultraviolet Radiation

The sun emits ultraviolet radiation (UV) as heat and light. The skin's natural defense mechanisms attempt to reject the UV by distributing melanin pigmentation where needed. However, overexposure to direct sunlight can cause inflammation or blistering of the skin (sunburn). The use of sunscreen, long sleeve shirts, and wide brim hats can help prevent sunburn. Chronic exposure to UV radiation is known to cause skin cancer. In case of sunburn, do not apply burn ointment, cold cream, or butter to relieve pain. Use a dry dressing and get medical attention for severe, extensive sunburns.

3.3.4 Noise

Operating heavy equipment can be a potential noise source. Hearing protection will be worn by personnel operating heavy equipment.

3.4 SAFETY HAZARDS

3.4.1 Slip, Trip, and Fall Hazards

The site may contain slip, trip, and fall hazards for site workers, such as:

- Holes, pits, or ditches.
- Slippery surfaces.
- Steep grades.
- Uneven grades.
- Sharp objects, such as nails, metal shards, and broken glass.

Site personnel will be instructed to look for potential safety hazards and immediately contact the SHSO if hazards are discovered. The SHSO will inform team members of the locations of slip, trip, and fall hazards during daily site safety briefings.

3.4.2 Hazards from Drilling, Excavation, Power Tool Operation, Hand Tool Operation, Material Lifting, Heavy Equipment Operation, and Motorized Equipment Operation

Field operations such as drilling, excavation, power tool operation, hand tool operation, material lifting, heavy equipment operation, and motorized equipment operation may cause hazards to site personnel. Safe practices to prevent the hazards are presented in Section 11.

3.4.3 Thunderstorm Hazards

During the course of field operations, severe weather may be encountered, including thunderstorms, lightning, rainstorms, and other unsafe weather conditions (i.e., high winds and tornadoes). Criteria indicating that severe weather conditions may exist include:

- High winds (greater than 40 miles per hour – depending on the tree cover and other site specific conditions);
- Tornado watch or warning in place for the area including the site;
- Visible lightning;
- Extreme temperatures (e.g., greater than 100 degrees F); or

- Heavy rainfall that makes footing treacherous and visibility difficult.

3.4.4 Ordnance Hazards

Ordnance and ordnance-related items may be encountered at the site. Personnel should be alert for Ordnance and explosives contamination (OE) and OE-related scrap. Safe practices to prevent the hazards are presented in Section 19.

3.4.5 Fire Hazards

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during the conduct of site activities, such as moving drums, mixing/bulking of site chemicals and during refueling of heavy or hand held equipment. Some potential causes of explosions and fires include:

- Mixing of incompatible chemicals, which cause reactions that spontaneously ignite due to the production of both flammable vapors and heat;
- Ignition of explosive or flammable chemical gases or vapors by external ignition sources;
- Ignition of materials due to oxygen enrichment;
- Agitation of shock or friction-sensitive compounds;
- Sudden release of materials under pressure.

Fire prevention and control are discussed in Section 11.

3.5 BIOLOGICAL HAZARDS

Biological hazards can result from encounters with mammals, insects, snakes, spiders, ticks, plants, parasites, and pathogens. Mammals can bite or scratch when cornered or surprised. The bite or scratch can result in local infection or infection with systemic pathogens or parasites. Insect and spider bites can result in severe allergic reactions in sensitive individuals. Exposure to poison ivy, poison oak or poison sumac results in skin rash. Ticks are vectors for a number of serious diseases. Dead animals, organic wastes, and contaminated soil and water can harbor parasites and pathogens. Pictures of poison ivy, snakes, spiders, and ticks are provided in Attachment B-2.

3.5.1 Poison Ivy

Poison ivy is common throughout SEDA. The majority of skin reactions following contact with offending plants are allergic in nature and are characterized by:

- General symptoms of headache and fever;
- Itching;
- Redness; and
- A rash.

Some of the most common and severe allergic reactions result from contact with poison ivy, poison oak, and poison sumac. Contact with the poisonous sap of these plants produces a severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim also may develop a high fever and may be very ill. Ordinarily, the rash begins within a few hours after exposure, but it may be delayed for 24 to 48 hours.

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each (see figure in Attachment B-2). In certain seasons, both plants also have greenish-white flowers and berries that grow in clusters. Poison sumac is a tall shrub or small tree with 6-12 leaflets arranged in pairs with a single leaflet at the end. This plant grows in wooded, swampy areas.

Avoidance of plant/sap contact is the only effective means of preventing the poisoning. Site personnel should know how to recognize the poison ivy plant (see figures in Attachment B-2) and avoid walking through areas of heavy growth. If you must walk through areas of poison ivy, keep extremities covered and avoid contact of bare skin with poison ivy leaves and stems. When digging in areas of poison ivy growth, avoid contact with the roots; these too can produce a reaction.

A person experiencing symptoms of poisoning should remove contaminated clothing; wash all exposed areas thoroughly with soap and water. Oils from the poison ivy plant can adhere to clothes. Wash clothes exposed to poison ivy before wearing again. Apply calamine or other poison ivy/oak lotion if the rash is mild. Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity. Thorough washing of skin and clothing can be used after site work or after potential exposure to reduce severity of irritation.

3.5.2 Ticks and Lyme Disease

3.5.2.1 Introduction

Ticks may be common during the spring and summer at SEDA. Two types of ticks may be encountered: the dog tick and the deer tick. The dog tick is the larger, more common tick. After biting, the dog tick will remain attached to the victim until engorged with blood. Dog ticks may transmit rocky mountain spotted fever and other diseases. The deer tick is much smaller, ranging from poppy seed to grape seed size, and does not remain attached to the skin for very long after biting. Deer ticks can transmit Lyme disease, which can have serious, long-term health effects if left untreated. Lyme disease is characterized by a bulls-eye

type rash; light in the center with an outer red area. Flu-like symptoms may also occur. These signs may occur at different times and the rash may not appear.

If you discover any bites on the skin, wash the affected area and seek medical attention if a rash or flu-like symptoms appear.

Lyme Disease is caused by a bacterium that may be transmitted by the bite of a tick. Ticks carrying Lyme Disease may be found throughout the U. S. living in grassy and wooded areas, and feeding on mammals such as mice, shrews, birds, raccoons, opossums, deer, and humans. Not all ticks are infected with the bacterium. When an infected tick bites, the bacterium is passed into the bloodstream of the host, where it multiplies. If detected early, Lyme Disease can be treated with antibiotics.

The illness typically occurs in the summer months and is characterized by a slowly expanding red rash that develops a few days to a few weeks after the bite of an infected tick. The illness can be accompanied by flu-like symptoms, headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage, treatment by a physician is usually effective; but if left alone, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis; other problems include meningitis, neurological, and cardiac abnormalities. *NOTE: some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of follow-on symptoms is more difficult than early symptoms and is not always successful.*

Rocky Mountain Spotted Fever is another tickborne disease. Nearly all cases of infection occur in the spring and summer, generally several days after exposure to infected ticks. The onset of illness is abrupt and often accompanied by high fever, headache, chills, and severe weakness. After the fourth day of fever, victims develop a spotted pink rash that usually starts on the hands and feet and gradually extends to most of the body. Early detection and treatment significantly reduces the severity of illness. The disease responds to antibiotic therapy with tetracycline or chloramphenicol.

3.5.2.2 Prevention

The following steps should be taken to limit the likelihood of getting tick bites:

- Wear long pants and long sleeved shirts that fit tightly at the ankles and wrists; tape cuffs if necessary. Tuck pants legs into socks.
- Wear hat and closed shoes.
- Wear light colored clothing so ticks can be easily spotted.
- Tick repellents such as DEET (vapor-active repellant) and Permethrin may be useful. Apply DEET to any exposed skin surface (except eyes and lips) or clothes and permethrin to field clothing (allow to dry prior to wearing).
- Inspect clothing frequently while in tick habitat.
- Inspect head and body thoroughly when you return from the field.

- Shower immediately after work and wash work clothes daily.

3.5.2.3 First Aid

If found crawling on a person, ticks should be removed and burned or smashed between two rocks. Remove any ticks by tugging with tweezers. Do not squeeze or crush the tick. If a tick is found to be holding onto the skin, the tick should be covered with Vaseline until it can no longer breathe and backs out of the skin. At that time, all parts of the tick should be removed with tweezers. Do not squeeze the tick's body. Grasp it where the mouth parts enter the skin and tug gently, but firmly, until it releases its hold on the skin. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired. Be sure to remove all parts of the tick's body, and wash and disinfect the bite site with alcohol or an antiseptic. Hot showers are to be taken as soon as possible after site departure to wash away all ticks that have not adhered to the skin.

For several days to several weeks after removal of the tick, look for the signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area, frequently seen with a small welt in the center. Also look for the signs of the onset of Rocky Mountain Spotted Fever (RMSF), such as an inflammation that is visible in the form of a rash comprising many red spots under the skin, which appears 3 to 10 days after the tick bite.

3.5.3 Snakes

3.5.3.1 Introduction

Poison snakes are not common to the area of SEDA, though central New York is within the range of rattlesnakes and copperheads. Descriptions of these snakes are presented below.

Copperhead: These snakes are commonly found near water sources in wooded areas. Copperheads are generally less than four feet in length and are not particularly aggressive. Coloration ranges from golden brown to tan. These snakes have a banded pattern.

Timber Rattlesnake: These are large, not particularly aggressive snakes with yellow through or gray to black, with dark back and side blotches on front of body and blotches fused to form crossbands on rear of body. Head is unmarked and he tail is black. They can be found in many habitats including rocky hillsides, swampy areas, and canebrake thickets.

Eastern Diamondback Rattlesnake: These snakes are commonly found in dry habitats throughout the coastal plain including pine and oak hills, pine flatwoods, and abandoned farmland. They are the largest rattlers ranging from 3 to 8 feet in length. These thick-bodied snakes have highly destructive venom and are considered the most dangerous snakes in North America. The back of the snake is distinctively patterned with dark diamonds with light centers and bordered by cream to yellow-colored scales.

3.5.3.2 Prevention

The best snakebite treatment is to avoid getting bitten. The following suggestions will help in this process:

- Learn to identify poisonous snakes – this shall be reviewed during site-specific safety training. The features identified in **Table B-5** will assist in properly identifying a snake as poisonous or non-poisonous.
- Watch where you sit and place your hands and feet. Do not put hands and feet where you have not looked.
- Avoid rock piles, stacks of old boards, and weeds and brush in wooded areas. If movement is necessary, use a remote means to initially relocate the material. Prior to entering a heavily wooded or brush area, look and listen carefully.
- Never handle "dead" snakes; they may not be completely dead. Do not attempt to capture or kill ***ANY*** snakes. Caution should be used if any snake is encountered.
- Step heavily. Snakes can feel footfalls through the ground and will avoid you if they can.
- Wear heavy leather boots and loose fitting pants.

3.5.3.3 First Aid

A snakebite is usually characterized by extreme pain and swelling at the site of the bite; the presence of one or more puncture wounds created by the fangs; and a general skin discoloration. The manifestations of the bite include general weakness, rapid pulse, nausea and vomiting, shortness of breath, dimness of vision, tingling or numbness of the tongue, mouth or scalp, and shock.

Physical reactions are aggravated by acute fear, anxiety, the amount of venom injected and the speed of absorption of venom into the victim's circulation, the size of the victim, protection provided by clothing (including shoes and gloves), quick anti-venom therapy, and location of the bite.

The rules to follow if someone is bitten by a snake are:

1. DO NOT cut "Xs" over the bite area as this will intensify the effect of the venom.
2. DO NOT apply suction to the wound since this has a minimal effective in removing venom.

3. DO NOT apply a tourniquet since this will concentrate the venom and increase the amount of tissue damage in the immediate area.
4. If possible, try to get a good look at the snake so it can be identified for proper selection of anti-venom.
5. DO NOT allow the victim to run for help since running increases the heart rate and will increase the spread of the venom throughout the body.
6. Calm, reassure and keep the victim calm and immobile. Do not delay evacuation.
7. Have the victim hold the affected extremity lower than the body while waiting for medical assistance.
8. Transport the victim to medical attention immediately.

An incision through the fang marks is not advisable; this procedure is too hazardous to underlying structures and at best removes only 20% of the venom. Do not use cold compresses, ice, dry ice, chemical ice packs, spray refrigerants, or other methods of cold therapy. The caregiver must consider several other factors. A person bitten by a snake should try to lie still and be quiet. If the bite is in the arm or leg, keep the bite lower than the heart. Staying still and holding the bite lower than the heart will help to slow any poison spreading through the body. Get medical care as soon as possible, even if the snake was known to be non-poisonous. The use of snake bite kits is prohibited.

3.5.4 Bees, Wasps, Hornets, and Other Insects

Symptoms of an insect bite are normally a sharp, immediate pain in the body part bitten. Poisonous insects and insect-like creatures that may be encountered at former Seneca Army Depot sites include the following:

- Bees (honeybees, bumble bees, wasps, and hornets);
- Scorpions;
- Caterpillars; and
- Beetles/Bugs.

Site personnel will comply with the following work practices:

- Personnel with a known hypersensitivity to bee, wasp, or hornet stings will inform the PM or SHSO of this condition prior to performing site activities.
- Personnel with a known hypersensitivity condition will keep emergency medication in their possession.
- All personnel will remain vigilant for the presence of these stinging insects. Discovered nests will be flagged and their location reported to other site personnel.
- If stung, immediately inform the SHSO to receive treatment, per **Figure B-2**.

3.5.5 Spiders

The two poisonous spiders that may be encountered on the former Seneca Army Depot project are the Brown Recluse and the Black Widow. The Brown Recluse is up to one inch long with a violin or "fiddle" shaped mark on the top of the head. The Black Widow is a smaller, bulbous black spider with a red hourglass-shaped mark on the underside.

Reactions to a Brown Recluse spider bite include mild to severe pain within two to eight hours and a star shaped area around the bite within three to four days. Significant tissue death and loss accompanies a Brown Recluse spider bite. Reactions to a Black Widow spider include intense pain at the site of the bite after approximately 15 to 60 minutes, followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.

Persons that have been bitten by a Brown Recluse or Black Widow spider should be immediately transported to a hospital. The spider should be collected (if possible) for confirmation of the species. Reactions to a Brown Recluse spider bite include mild to severe pain within two to eight hours and a star shaped area around the bite within three to four days. Significant tissue death and loss accompanies a Brown Recluse spider bite. Reactions to a Black Widow spider include intense pain at the site of the bite after approximately 15 to 60 minutes, followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.

First Aid:

- If possible, catch the spider to confirm its identity. Even if the body is crushed, save it for identification.
- Clean the bitten area with soap and water or rubbing alcohol.
- To relieve pain, place an ice pack over the bite.
- Keep the victim quiet and monitor breathing.
- Seek immediate medical attention.

3.5.6 Bloodborne Pathogens

Bloodborne pathogens enter the human body and blood circulation system through punctures, cuts or abrasions of the skin or mucous membranes. They are not transmitted through ingestion (swallowing), through the lungs (breathing), or by contact with whole, healthy skin. However, under the principle of universal precautions (see below) all blood should be considered infectious, and all skin and mucous membranes should be considered to have possible points of entry for pathogens.

There are a number of infections that are transmitted by insects and arthropods where the infection cycle includes the human blood system. Examples include malaria and lyme disease, which are transmitted by mosquitoes and ticks, respectively. These diseases are serious, and the possibility for infection should be considered in planning field operations in areas where these disease vectors are present. However, these diseases cannot be transmitted through personal contact with human blood, and are not covered by the OSHA *Bloodborne Pathogen Standard*.

Potential bloodborne pathogen exposure include:

- Contact with contaminated medical equipment, medical waste, sharps and other potential infectious material
- Medical emergency response operations such as administering first aid or CPR
- Contact with human wastes such as domestic sewage
- All body fluids in situations where it is difficult or impossible to differentiate between body fluid types

An indoctrination to the bloodborne pathogens standard (29 CFR §1910.1030) will be provided to all employees either during their first aid training, and/or during the initial site health and safety meeting. It is important to recognize the concept of universal precautions. Universal precautions require one to assume that all blood and bodily fluids contain pathogens and require the use of protective barriers to prevent exposure. Latex gloves and CPR barriers will be available in the first aid supplies stored at each site and should be used prior to attending to a victim's needs. Additionally, washing any body part or surface that has been contaminated with blood is an important part of the universal precautions. The SHSO should be notified of any potential contact with blood or bodily fluids resulting from first aid or CPR administered on the job.

3.6 IONIZING RADIATION HAZARDS

Radioactive materials were stored at Seneca Army Depot in the form of pitch blend, a tarry, uranium oxide ore derived from coal. The pitch blend has been removed from the depot; however, the possibility exists that small amounts of this radioactive material were disposed on-site. Monitoring for radioactivity will be conducted at selected SWMUs to minimize the small chance of exposure.

The hazards associated with radioactive materials result from the particles emitted from the material. Three types of radioactive particles are of concern with regard to environmental radioactivity are:

- Alpha particles,
- Beta particles, and

- Gamma or x- rays.

The hazards associated with each of these types of radiation are presented in the Corporate Radiation Protection Manual, which is attached in Attachment B-3.

The following is a summary of the possible long-term toxic effects of the radionuclides of concern that may exist at Seneca.

Radium – Radium (primarily found in nature as Ra-226 and Ra-228) can emit alpha and beta particles and gamma rays. Radium, via oral exposure, is known to cause lung, bone, brain, and nasal passage tumors in humans. Specifically, the primary biological endpoints associated with the ingestion of radium are bone sarcomas and carcinomas of the paranasal sinuses and mastoids. The decay progeny of radium, including radon, polonium, bismuth, and lead, are believed to be in part responsible for the occurrence of tumors after radium exposure.

Thorium – The toxicity of thorium is generally associated with the radioactivity of Th-232 and its decay progeny. Th-232 is primarily an alpha-emitter, but several of its progeny are beta and gamma emitters as well. There is strong evidence of liver cancer resulting from the injection of certain thorium compounds. It is believed that most thorium compounds are retained in the body more or less indefinitely, but due to the chemistry of thorium and the lack of epidemiological studies, there is considerable uncertainty about its long-term health effects.

Uranium – The major pathway for the primary uranium isotopes (U-234, U-235, and U-238) is through ingestion. The uranium isotopes primarily are alpha-emitters, but several of their progeny are beta and gamma emitters as well. The biological endpoints of uranium in the body are the skeletal system, lungs, liver, and kidneys. The radiotoxicity of uranium (the result of the emission of alpha particles and gamma rays) can result in tumors of these organs; in addition, the chemical toxicity of uranium can result in kidney damage. There is also a suggestion of risk from the chronic inhalation of uranium dust. For natural uranium, there may also be health risk associated with its decay progeny, including radium, radon, polonium, bismuth, and lead.

Promethium – The toxicity of promethium (Pm-147) comes from its emission of beta particles. In addition, its decay progeny, samarium-147, is an alpha-emitter. There is little specific information available about the long-term health effects of promethium exposure.

Plutonium – The toxicity of plutonium (Pu-239) primarily comes from its emission of alpha particles. It is thought that inhalation and skin penetration are the two more important exposure pathways, with ingestion being less of a concern because of the poor absorption of plutonium by the gastrointestinal tract. Although few epidemiological studies with plutonium have been performed, it is believed that inhalation of plutonium compounds can result in lung cancer, pulmonary fibrosis, and radiation pneumonitis. After

inhalation or skin penetration, plutonium absorbed into the blood stream is deposited principally in the liver and skeleton, with a small amount deposited in the gonads. Plutonium can be retained by the body for several decades.

Tritium – Tritium (H-3) can be present in the environment as a gas, as water or water vapor, or as part of a more complex molecule, and its toxicity varies depending on its form. Tritium as water or water vapor is several times more toxic than tritium as a gas. Tritium is not retained by the human body for a long period of time. Studies have shown that unborn fetuses may develop birth defects if the mother ingests tritium in the form of water.

Ionizing radiation hazard training, radiological monitoring, personnel decontamination, and equipment decontamination are presented in Sections 5, 9, 13, and 14, respectively. In addition, radiological survey procedure for decontamination of equipment, materials, and tools is presented in Attachment B-4.

4 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

All Parsons site personnel and Parsons subcontractors performing duties or working in areas where there is potential for exposure to hazardous material will meet the training requirements of OSHA 29 CFR §1910.120 before working on-site. Site personnel and their duties are outlined below:

1. Parsons Site Manager, responsible for all Parsons personnel and Parsons' subcontractors on-site and designates duties to the on-site personnel. The name of the Site Manager or, if the Site Manager is absent, the name of the acting Site Manager, shall be posted in the command post.
2. The Project Health and Safety Officer (PHSO) is responsible for oversight and direction to ensure full compliance with all health and safety issues at the project site. The PHSO will oversee all aspects of site safety, including: the preparation of the Safety and Health Plan, performance of the initial site-specific training, and the periodic auditing of site operations to verify OSHA, COE, and SSHP compliance.
3. The Site Health and Safety Officer (SHSO) is responsible for carrying out the provisions of the HSP with regard to site work, and will ensure that all personnel entering the site understand and adhere to the provisions of the HSP and that personnel meet the training and medical monitoring requirements of 29 CFR §1910.120. Any changes in the provisions of the HSP shall be made in writing by the SHSO and shall be approved by the Project Health and Safety Officer (PHSO) or Corporate Health and Safety Officer. Any personal protective equipment upgrades or downgrades shall be documented in writing by the SHSO. The SHSO shall have the authority to stop an operation or site work if, in the opinion of the SHSO, the site conditions or the manner in which the work is being conducted, presents a hazard to site personnel, surrounding populations, or the environment. The name of the SHSO or, if the SHSO is absent, the name of the Acting SHSO, shall be posted in the Command Post. The SHSO is responsible for all air monitoring. Air monitoring requirements for the Seneca Site are set forth in Section 6.0 of the SHSP.
4. For sites with UXO ordnance, UXO/OE Safety Officer (UXOSO) will be responsible for all UXO safety on site. Stops work if any operation threatens work or public health or safety.
5. For sites with potential radiological hazards, Radiation Safety Officer (RSO) is responsible for radiation safety during field activities. The RSO is responsible for compliance with radiation protection standards, determination of radiation-monitoring procedures, preparation of radiation training program, and selection of appropriate Personnel Protection Equipment (PPE) for ionizing radiation hazard.
6. Field personnel will be involved in sampling, inspections, field monitoring, and decontamination, as specified in the Work Plan for each individual site. Site personnel will only perform tasks for which they have received appropriate training.
7. For sites with UXO ordnance, field personnel will be responsible for locating and identifying unexploded ordnance on the site and for clearing access pathways to sampling and work locations. UXO personnel shall not move or dispose of any UXO found. Disposal and demolition of UXOs will be performed by SEDA EOD personnel.

8. For sites with potential radiological hazards, field personnel will be responsible for field monitoring and decontamination.

Site visitors who are not affiliated with Parsons will not be allowed into active work areas without making arrangements with Seneca and Parsons well in advance of the planned visit. Site visitors must present evidence of appropriate training and participation in a medical surveillance program in accordance with 29 CFR §1910.120, and evidence of ability to use a respirator in accordance with 29 CFR §1910.134.

Seneca Army Depot, USEPA and NYSDEC personnel will be permitted into active work areas after presenting a letter addressed to the Parsons' SHSO certifying they have passed a physical examination and are certified to wear the appropriate respiratory protective equipment. However, if the representatives from these agencies are non-UXO qualified personnel, they will not be permitted to be inside the exclusion zone during UXO operations. Also, UXO operations will cease if non-UXO qualified personnel enter any area in which UXO operations are in progress. The representatives are required to wear appropriate PPE.

All visitors will follow the advice and instructions of the Parsons' Site Manager and SHSO. Failure to follow these instructions may endanger the health and safety of visitors and other on-site personnel.

Table B-6 describes the responsibilities of all on-site personnel.

5 HEALTH AND SAFETY TRAINING

All site personnel involved in hazardous work should meet the training requirements set forth in 29 CFR §1910.120(e). All employees engaged in hazardous waste site work should have received 40 hours of training in hazardous waste site operations and safety procedures. In addition, all field personnel will have had at least three days of field experience under the supervision of a trained supervisor. On-site personnel must be up to date on their annual 8-hour refresher training.

Supervisors, SHSO, and site managers should have received an additional 8 hours of specialized training on the safe management of site operations. All site personnel should receive annual updated training. Additional training should be provided to those personnel designated to respond to site emergencies. Additional training should be provided to those employees who may be exposed to unique or special hazards (e.g., radiological hazards, UXO hazards) at the site. At least two people on-site will be currently certified in First Aid and CPR.

On-site safety training will consist of a detailed safety meeting and training session prior to the beginning of any field work. This meeting will cover all site activities and will also review the site emergency response plan. All site personnel are required to attend this meeting. Other topics to be discussed will include donning and doffing of personnel protective equipment as well as a brief toxicological review of site-specific known and suspected contaminants.

Daily safety meetings will also be conducted prior to each day's activities. These meetings will cover the safety measures to be employed during that day's activities and the emergency response and evacuation procedures for each work site and work crew.

On-site training will be documented using the form contained in Attachment B-1, On-Site Documentation Forms. Certificates of training (40-hr, 8-hr refresher, etc) will be maintained on-site by the SHSO.

5.1 INITIAL SITE TRAINING

The PHSO or SHSO is responsible for developing a site-specific occupational hazard training program. The PHSO or SHSO is responsible for providing training to all Parsons personnel and Parsons subcontractors under Parsons H&S supervision that are to work at SEDA. This initial site training shall consist of a review of the site specific Health and Safety Plan and shall cover the following topics:

- Site Personnel and Duties;
- Site Description;
- Site Characterization;
- Chemical and Physical Hazards;
- Heat Stress and Cold Stress;

- Site Layout, Site Control Measures, and Work Zones;
- Personnel Protective Equipment;
- Air and personnel monitoring
- Safe Work Practices and Engineering Controls;
- Emergency Response Plan;
- Evacuation Procedures;
- Emergency and Personnel Protective Equipment;
- Emergency Telephone Numbers;
- Directions to Hospital;
- Medical Surveillance Requirements; and
- Health and Safety Training

All proposed project personnel will be required to complete this training prior to being allowed to work on site. Each worker's attendance and completion of this training will be documented by the SHSO. After the training, each field team member will sign the form in Attachment B-1 attesting to their understanding and acceptance of the SHSP and copies of these forms will be kept on file.

All field inspectors will be provided training in the use of instruments or equipment prior to their assignment to operate these instruments or equipment.

Personnel will also be instructed in the use of the buddy system, which is a method of organizing work groups so that there is someone that is always available to:

- Provide his or her partner with assistance in an emergency.
- Observe his or her partner for signs of chemical or physical exposure.
- Periodically check the integrity of his or her partner's PPE.
- Notify the emergency response personnel when an emergency occurs.

The buddy system will be used at all times when employees are within an exclusion zone (EZ).

5.2 SAFETY BRIEFINGS

Safety briefings shall be conducted each morning while working at the site and at the beginning of new operations, changes in site conditions, and changes in operating procedures due to weather, new equipment, or additional site information. Topics will include a review of safety procedures for that day's activities. Records of on-site training will be maintained by the SHSO.

The topics covered in the safety briefings will include, as appropriate:

- Evacuation routes and emergency procedures;
- Use of additional protective equipment;
- Terrain hazards;
- Weather hazards;
- New chemical or toxicological information;
- Periodic review of portions of the site-specific SSHP; and
- Review of site incidents, follow-up, and corrective measures.

5.3 CPR/FIRST AID TRAINING

Two site personnel certified in First Aid/CPR will be on site to provide immediate response to an accident situation until medical assistance arrives on the site. These selected employees are trained in CPR and first aid for emergency use only. Indoctrination to the bloodborne pathogens standard (29 CFR §1910.1030) will be provided to all employees either during their first aid training, and/or during the initial site health and safety meeting.

5.4 EMERGENCY RESPONSE TRAINING

All site personnel will be made aware of the project emergency assistance network, the most probable route of evacuation from the site in the event of an emergency, and other emergency procedures included in Section 16.

5.5 HAZARD COMMUNICATION TRAINING

In accordance with the OSHA Hazard Communication Standard (29 CFR §1920.1200 and CFR §1926.59), copies of all material safety data sheets (MSDS) for hazardous chemical materials that are used during site operations or that are present on-site will be available from the SHSO. The SHSO will conduct hazard communication training in accordance with 29 CFR §1920.1200 and CFR §1926.59 and the Hazard Communication Program (See Section 11). Training will include, but not limited to, all hazards or potential hazards associated with site activities and any hazardous chemical materials brought to or found on site.

5.6 RADIOLOGICAL TRAINING

All field inspectors will be provided training in the use of hand-held radiation meters, by a person who is knowledgeable in their use, prior to their assignment as lead representative on a survey crew. This training will focus on the proper use of radiation detection instruments (Geiger-Mueller detectors and other detectors if considered appropriate) to assure that all radiation health and safety monitoring equipment is properly used during the field operations. Radiation survey meters must only be used by

persons who have been trained in the proper interpretation of their readings. The meters require frequent calibration and checking to ensure that the readings are accurate.

Additionally, as part of the planned Health and Safety kick-off meeting, all other project personnel will be informed of the possible implications of contact with or exposure to radiological materials. This briefing will focus on:

- Identifying materials that are suspected of being present on site;
- Tentatively identifying areas where exposure to radiological material is believed to be possible based on surface radiation surveys;
- Defining levels that will be used as thresholds for triggering personal safety response actions;
- Explaining how the selected exposure levels are set and why these levels are consistent with established guidance and protection of site worker health, safety and welfare; and,
- Explaining and practicing decontamination procedures that will be implemented if radiological materials are found to be present.

All proposed project personnel will be required to complete this training prior to being allowed to work on site. Each worker's attendance and completion of this training will be documented by the SHSO.

5.7 UXO TRAINING

UXO personnel will be U.S. citizens and graduates of one of the following: U.S. Army Bomb Disposal School, Aberdeen Proving Ground, Maryland; U.S. Naval EOD School, Indian Head, Maryland; EOD Assistants Course, Redstone Arsenal, AL or Eglin Air Force Base, FL; or DoD certified equivalent course. Credit for the EOC experience while assigned to the National Guard or Reserve will be based on the actual documented time spent on active duty, not on the total time of service. Personnel must provide the UXOSO with documentation of the successful completion of Naval Explosive Ordnance Disposal training or US Army Bomb Disposal School. All personnel must meet the requirements set forth in "Personnel/Work Standards" (DID OE-025; March 3, 2000).

The UXO subcontractor will provide site-specific basic UXO Recognition and Avoidance Training. The following areas will be included:

1. Basic UXO and UXO component recognition training;
2. UXO avoidance and reporting procedures;
3. Specific hazards related to UXOs;
4. UXO emergency procedures; and
5. Emergency medical care related to UXOs.

5.8 VISITOR TRAINING

Visitors to the support zone will receive training in the following areas:

- Emergency signals and procedures.
- Work areas and locations.
- Names of field team leader and site health and safety officer.
- Location and description of potential hazards and risks.
- A short briefing about chemical and physical hazards found on-site.
- Areas of the site that are closed to visitors.
- The site excavation plan and emergency procedures.
- Other topics as deemed appropriate.

Site visitors wishing to enter the EZ during site operations will be subject to the same site specific and hazard information training as specified for site personnel. In case of a visitor entering the Exclusion Zone, all intrusive activities will cease. Visitors requesting entry to the EZ will also be required to present documentation of OSHA hazardous waste training and medical surveillance, consistent with the requirements of the general site employees. Non-UXO qualified visitors will not be permitted to be inside the exclusion zone of a UXO site. All visitors will make appropriate entries in the Visitor's Log and shall wear appropriate PPE.

5.9 TRAINING DOCUMENTATION

Documentation of training requirements is the responsibility of each employer. Written documentation verifying compliance with 29 CFR §1910.120 (e)(3), (e)(4) (as applicable) and (e)(8) must be submitted to the SHSO prior to entering the EZ. Documentation of worker's current training credentials will be kept on site.

6 PERSONAL PROTECTIVE EQUIPMENT

The selection and use of personnel protective equipment (PPE) at individual sites will be specified in the individual HSPs. The unknown nature of hazardous waste site work and the possibility of changing conditions during the conduct of the work may require changes in the personal protective equipment. When changes in personal protective equipment become necessary, these changes shall be made in accordance with the action levels and criteria set forth in this plan. As a rule, levels of PPE will need to be reassessed if any of the following occur:

- Appearance of previously unidentified or anticipated chemical conditions or task hazards.
- Ambient weather conditions change which impact the use of assigned PPE.
- A new task is introduced or a previously assigned and evaluated task is expanded in scope.

If work tasks are added to the SOW after approval of the site-specific HSP, the Corporate HSO or PHSO shall identify and assess the task hazards and complete a Certification of Hazard Analysis form and designate the level and type of PPE to be used during conduct of the task. The new certificate, along with any other additions, changes or modifications to the approved site-specific HSP shall be approved by the Corporate HSO and PM.

Routine site work at the Seneca site will be performed in Level D protection, augmented with steel toe boots, inner surgical gloves, and chemical-resistant outer gloves. Level C respiratory protection with organic vapor/P-100 will be carried by all work crews to be donned when air monitoring indicates the need for respiratory protection. Required equipment for Levels B, C, and D are detailed in **Table B-7**, Description of Personal Protective Equipment and Levels of Protection.

The organic vapor monitor will be the primary instrument for determining contaminant concentrations that may trigger a change in respiratory protection. Level C protection will be worn in situations where inhalation of fugitive dust containing metals or explosives is determined to be present in high levels. Action levels for changes in personnel protection equipment are shown in **Table B-8**. It should be noted that the action levels for specific sites may vary depending on the site-specific information. The action levels for individual sites will be specified in the individual HSPs.

In the event that personal protective equipment is ripped or torn, work shall stop and PPE shall be removed and replaced as soon as possible.

6.1 PPE SELECTION

Appropriate PPE shall be identified by SHSO based on site-specific conditions and shall be presented in individual HSPs. In general, the following considerations shall be observed in the selection of PPE:

- Hard hats will be required when working around heavy equipment or when an overhead hazard exists;
- Steel toe/shank boots are required when working around heavy equipment;
- Safety glasses shall be selected which protect site personnel from potential hazards. Goggles may be necessary to protect from splash hazards during sampling;
- Hearing protection should be used when working around heavy equipment or using power tools;
- Leather gloves should be used when drilling is conducted;
- The SHSO shall continually evaluate site tasks to identify hazards and shall provide any PPE necessary to ensure the safety and health of site personnel, regardless of the activity they perform; and
- Other task-specific PPE based on site-specific conditions.

6.2 Respiratory Protection

Respiratory protection is required whenever it is determined necessary by the SHSO. The selection and use of a full respiratory protection must comply with the OSHA respirator standards and U.S. Army EM385-1-1. All respirators must be NIOSH approved and properly fit tested. Fit test forms are located in Attachment B-1. Respirator use and maintenance must be documented. A respiratory protection program is presented in Attachment B-5.

When usage of a respirator is deemed necessary, the following will be completed:

- All project personnel to be wearing a respirator will be fit tested;
- Used cartridges for Level C operation will be disposed at the end of the day and new cartridges will be used for the next working day; and
- Respirators will be cleaned daily by project personnel.

6.3 EQUIPMENT

First aid kits for the treatment of minor injuries and burns shall be maintained onsite. The first aid kits shall be inspected by the SHSO at least weekly to ensure adequate supplies are available and in proper working order. The contents and number of first aid kits shall be determined by EM-385-1-1, Section 03.B and approved by the SHSO prior to the start of site activities.

At a minimum, the following general emergency equipment will be available at the site at all times:

Equipment	Location
Fire Extinguishers	Two (10ABC) in the vehicle transporting explosives, one in each transport vehicle and piece of heavy equipment
Emergency Eyewash	Each vehicle on-site
First Aid Kit	Each vehicle on-site
Stretchers	One in the vehicle

7 MEDICAL SURVEILLANCE

All personnel conducting work in the exclusion and contamination reduction zones will be participating in a medical surveillance program which meets the criteria set forth in OSHA 29 CFR Part 1910.120. This rule requires that employees engaged in hazardous waste site work receive a medical examination at least annually, and they be certified by the examining physician to wear a respirator without restrictions. All subcontractors performing hazardous waste work must be enrolled in a medical surveillance program. Written certification of completion of medical exams will be maintained by the SHSO. The medical surveillance program requires all field personnel receive medical examinations:

- Prior to site activities;
- Annually;
- Upon termination;
- Following exposure or injury; and
- Additionally as needed on a case-specific basis.

Employees of Seneca Army Depot (SEDA) who will be performing activities in active work areas at SEDA will be required to participate in SEDA's medical surveillance program.

7.1 PHYSICAL EXAMINATIONS

OSHA (29 CFR Part 1910.120 [f]) requires the enrollment of personnel engaged in operations involving hazardous materials in a medical surveillance program. The content of the examination must be sufficiently detailed to determine an individual's fitness for duty, including ability to work while wearing protective equipment (e.g., respirator, impermeable clothing, etc.). The results of these examinations will be kept on file at least 30 years after employment has been terminated.

All personnel who will be engaged in hazardous waste operations on this project will present to the PHSO or SHSO a physician's certification of completion of a comprehensive medical monitoring examination within the 12 months prior to the beginning of activities. Additionally, the SHSO will ensure that workers remain current in their medical monitoring throughout the duration of the project as well as meet the medical surveillance inclusion criteria for their specific job assignments. The certification shall attest to the individual's fitness for duty, including his or her ability to work while wearing PPE (e.g., respirator, impermeable clothing, etc.). Copies of employees' Health Status Reports will be provided to the SHSO prior to the commencement of field operations.

7.2 RADIOLOGICAL MONITORING

For sites with potential radiological hazards, dosimetry will be used to monitor exposure to ionizing radiation resources. Section 8 provides guidance on the use of radiation dosimetry.

8 RADIATION DOSIMETRY

All site personnel involved in radiological surveys or investigations shall wear personal radiation dosimeters during their work. These badges will be used to determine each individual's exposure to radiation as a result of their involvement in the site activities. The exposure data will also be used to verify compliance with OSHA and NRC's regulatory limits.

Each crew member will be assigned an individual, pre-numbered thermoluminescent dosimeter (TLD) badge. Whenever the employee is in the area, he/she will be required to wear their TLD in a prominent location, specifically in a region on the front of the body between the waist and the neck. At the end of each work shift or whenever the employee leaves the site, this badge will be returned to the field logistics support office for storage in a secure location. This badge will not be assigned or used by any other individual and is intended to provide data on the site worker's cumulative exposure while on site. At the end of each calendar quarter, all assigned badges will be recovered and sent to a laboratory for analysis. Project personnel will also be assigned a new badge for the next period of work on site.

Reports of exposure to ionizing radiation will be furnished to each site personnel working within a radiologically restricted area annually, upon termination, and within 30 days of any personal request. In addition, reports of exposure to ionizing radiation will be furnished to the RSO as soon as available.

9 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Environmental and personal monitoring program will be developed based on site-specific information for individual HSPs. This section present general information on wind direction monitoring, volatile organic compound (VOC) monitoring, and radiation monitoring.

9.1 WIND DIRECTION MONITORING

A wind direction indicator (such as survey flagging tied to a stake) will be erected at every active work site. This will enable the site safety monitor and on-site personnel to determine upwind locations necessary for proper health and safety procedure implementation, (work areas relative to the excavation) and, if necessary, evacuation procedures.

9.2 VOLATILE ORGANICS MONITORING

Field work at sites with VOC contamination shall use photoionization detector (OVM-580B/580S or equivalent) equipped with a 10.6e V lamp or other monitoring instrument deemed appropriate by PHSO to monitor VOC concentrations in the working area. Readings detected by the PID or other instrument will be used to determine the appropriate levels of protection. Action levels for VOCs and particulates are presented in Table B-8. Action levels for individual sites, if different from the levels in Table B-8, will be presented in the individual HSPs.

9.3 RADIATION MONITORING

Radiation monitoring will be conducted at sites with potential radiological hazards (see Table B-1). The monitoring includes site pre-screening, personal radiological exposure monitoring, real-time site radiation monitoring, and personnel and PPE exit monitoring as discussed in the following subsections.

9.3.1 Site Pre-Screening

Site pre-screening will be conducted prior to investigations in the areas with potential radiological hazards. As part of this operation, background levels of radiation will be defined. Background levels will be established by collecting field data from areas on- or off-site where there is no historic information to indicate that radiological materials have been used or handled and which are believed to be representative of other site conditions present at SEDA.

As part of the site clearance process for intrusive investigations, an area of roughly 900 square feet around the stake (i.e., 30 x 30 foot square) will be surveyed to determine radiation levels that are present. If radiation levels of greater than two times the background level are found, intrusive work at the proposed location will be postponed pending further clarification of the source of the radiation. If excessive radiation is not found,

this information will be documented for the site and the site will be considered ready for initiation of intrusive operations.

In the event that elevated levels of radiation are found at areas that are not currently known to have such levels, efforts will be made to:

- Investigate the cause or source of the elevated readings;
- Review and modify, as necessary, the proposed intrusive investigation methodology and sample collection methodology;
- Review and modify, as necessary, the handling and placement of Investigation Derived Waste (IDW) and/or of excavated materials.

9.3.2 Real-Time Site Radiation Monitoring

Real-time site radiation monitoring shall be conducted in addition to the site pre-screening. Field inspectors assigned to site crews will be responsible for monitoring the real-time radiation level at the work site. This monitoring will be performed periodically during the workday and continuously when intrusive activities are in progress.

At the beginning of each day, the assigned field inspector will measure and record the background radiation level present in the designated work zone. Radiation monitoring will be conducted using a Geiger-Mueller pancake-type detector, a phoswich, or other appropriate detector identified by the RSO. Monitoring for the gross alpha, beta, and gamma radiation will be conducted in the work zone and on all samples, if deemed necessary by the RSO. The measurement will be obtained using a meter that is in proper working condition and that has been calibrated within the preceding six months. Additional background measurements will be made and recorded during the workday.

If the measured site radiation level is less than two times the background reading for the work site, work will be allowed to continue. If background radiation levels are found to be greater than two times the historic background level, work will be suspended and the RSO will be notified.

If work is allowed to continue, the field inspector will continuously monitor for an increase in radiation level. During intrusive operations such as drilling, this operation will be completed by screening soils as they are raised to the surface. In addition, soil and groundwater samples collected will also be screened as they are raised to the surface. Radiation measurements obtained from soils and groundwater will be recorded periodically on the field sheets (e.g., boring logs or inspectors daily reports).

Measurement of radiation levels at or above two times background at areas that are not currently known to have such levels will cause an immediate cessation of all work area activity. This condition will be immediately reported to the site RSO.

Once informed of an increase in radiation level, the RSO will be responsible for assessing and evaluating the radiological conditions. The RSO will independently confirm the validity of the reading to determine if the reading represents a real or false-positive measurement. If the reading is verified, the RSO will suspend intrusive work at the proposed location pending further evaluation. After this assessment is performed, the RSO may permit intrusive operations without restriction, may permit intrusive operations with additional radiological controls in place, or may recommend that the intrusive method be modified or a different method selected to minimize the potential hazard. The RSO will also prescribe or define appropriate short-term measures to control or limit the spread of radioactive materials from the immediate work location.

In the event that the recorded reading is determined to be a false positive reading by the RSO, the reasons for this determination will be documented. All pertinent facts leading to this conclusion will be recorded in the RSO's field log.

9.3.3 Personnel and PPE Exit Monitoring

If working in a potentially radiation contaminated area, all personnel and equipment shall be frisked using the Geiger-Mueller pancake-type detector prior to leaving the work area and prior to eating, smoking or drinking, Personnel shall use the following procedure for a self-frisk:

a. Verify frisker is on the x1 scale,
b. Survey hands before picking up probe,
c. Hold probe approximately 1/2 inch from the surface being surveyed and move the probe slowly over the surface (2 inches per second maximum). Take care not to touch the surface being monitored with the probe,
d. Monitor face (pause at mouth and nose),
e. Monitor neck and shoulders,
f. Monitor arms (pause at each elbow),
g. Monitor chest and abdomen,
h. Monitor back, hips and seat of pants,
i. Monitor legs (pause at each knee), and
j. Monitor shoe tops and bottoms (pause at soles and heels).

The absence of gamma readings above background should not be interpreted as the complete absence of radioactivity. Radioactive materials emitting low-energy gamma, alpha, or beta radiation may be present, but for a number of reasons may not cause a response on the instrument. Unless airborne, these radioactive materials should present minimal hazard. More thorough surveys should be conducted as site

operations continue to document the absence of radioactive materials.

Radiation survey meters must only be used by persons who have been trained in the proper interpretation of their readings. The meters require frequent calibration and checking to ensure that the readings are accurate.

10 HEAT/COLD STRESS MONITORING

10.1 INTRODUCTION

Heat/cold stress is one of the most common (and potentially serious) illnesses that affect site personnel. When site personnel are engaged in operations involving hot or cold environments, a number of physiological responses can occur which may seriously affect the health and safety of the workers. These affects can be eliminated or controlled through the use of a comprehensive heat/cold stress prevention and monitoring program.

10.2 HEAT STRESS DISORDERS

This section outlines the major heat related illness that may result from exposure to high heat environments, which include heat rash, fainting, heat cramps, heat exhaustion, and heat stroke. For the purpose of this program, reference to "liquids" will indicate the use of water or an electrolyte replacement solution, and not tea or coffee (unless it is decaffeinated) or carbonated soft drinks.

10.2.1 Early Symptoms of Heat Related Problems

Early symptoms of heat related problems include:

1. Decline in task performance
2. Lack of coordination
3. Decline in alertness
4. Unsteady walk
5. Excessive fatigue
6. Muscle cramps
7. Dizziness

10.2.2 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by wet chafing clothing. This condition can decrease a worker's ability to tolerate hot environments.

Symptoms: Mild red rash, especially in areas of the body that sweat heavily.

Treatment: Decrease amount of time in protective gear and provide powder such as cornstarch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

10.2.3 Heat Cramps

Heat cramps are caused by a profuse rate of perspiration that is not balanced by adequate fluid and electrolyte intake. The occurrence of heat related cramps are often an indication that excessive water and electrolyte loss has occurred, which can further develop into heat exhaustion or heat stroke.

Symptoms: Acute, painful spasms of voluntary muscles such as the back, abdomen and extremities.

Treatment: Remove victim to a cool area and loosen restrictive clothing. Stretch and massage affected muscles to increase blood flow to the area. Have patient drink one to two cups (16 oz.) of liquids immediately, and every twenty minutes thereafter. Consult with physician if condition does not improve. If available, an electrolyte replacement solution should be taken along with liquids.

10.2.4 Heat Exhaustion

Heat exhaustion occurs due to the large fluid and salt loss from profuse sweating. It is a state of very definite weakness or exhaustion caused by increased stress on various organs to meet increased demands to cool the body due to excessive loss of fluids from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke, but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

Symptoms: Pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. Body temperature is basically normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache, be dizzy or nauseated.

Treatment: Remove the individual to a cool, air-conditioned place, loosen clothing, elevate feet and allow individual to rest. Consult physician, especially in severe cases. Have patient drink one to two cups of liquids immediately, and every twenty minutes thereafter. Total liquid consumption should be about one to two gallons per day. If the signs and symptoms of heat exhaustion do not subside, or become more severe, immediate medical attention will be required.

10.2.5 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by failure of the heat regulating mechanisms of the body. The failure of the individual's temperature control system causes the perspiration system to stop working correctly. When this occurs, the body core temperature rises very rapidly to a point (105+ °F) where brain damage and death will result if the person is not cooled quickly.

Symptoms: The victim's skin is hot, and may or may not be red, dry and spotted, due to the fact that the individual may still be wet from having sweat while wearing protective clothing earlier; nausea; dizziness; confusion; extremely high body temperature; rapid respiratory and pulse rate; delirium; convulsions; unconsciousness or coma.

Treatment: Cool the victim immediately. If the body temperature is not brought down quickly, permanent brain damage or death may result. The victim should be moved to a shady area; he should lie down and keep head elevated. Cool the victim by either sponging or immersing the victim in very cool water to reduce the core temperature to a safe level (<102 °F). If conscious, give the victim cool liquids to drink. Observe the victim and obtain immediate medical help. Do not give the victim caffeinated or alcoholic beverages. Heat stroke is considered a medical emergency. Medical help should be summoned immediately. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH.

10.2.6 Preventive Measures

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat exhaustion, that person may become predisposed to additional heat injuries. In order to avoid heat related illnesses, proper preventive measures will be implemented whenever environmental conditions dictate the need, normally whenever the temperature reaches at least 75 °F. These preventive measures represent the minimal steps to be taken and will include the following procedures:

1. The SHSO will examine each site worker prior to the start of daily operations, and periodically throughout the day, to determine the individuals susceptible to heat induced stress. Evidence of extreme dehydration, illness or drug or alcohol use may require the SHSO to restrict the worker's activities until such time as the worker is fit for duty.
2. Personnel identified as being at high risk for heat stress who are allowed to participate in site operations will be monitored frequently by the SHSO.
3. Site workers will be trained to recognize and treat heat-related illnesses. This training will include the signs, symptoms and treatment of heat stress disorders as outlined in this SSHP.
4. In order to maintain workers' body fluids at normal levels, workers will be encouraged to drink, as a minimum, approximately sixteen ounces of liquids prior to start of work in the morning, after lunch and prior to leaving the site at the conclusion of the day's activities. Disposable four (4) to twelve (12) ounce cups and liquids will be provided on site. Liquids to be provided will include water and an electrolyte replacement solution, with the intake of each being equally divided. Liquids containing caffeine are to be avoided.

5. When ambient conditions and site workload requirements dictate, as determined by the SHSO, workers will be required to drink a minimum of 16 to 32 ounces of liquids during each rest cycle. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drank to replace lost sweat. When heavy sweating occurs, workers shall be encouraged to drink even though they may not be thirsty.

6. A shelter or shaded area will be provided where workers may be protected from direct sunlight during rest periods.

7. Monitoring of ambient or physiological heat stress indices will be conducted by SHSO to allow prevention and/or early detection of heat induced stress. Monitoring will be conducted in accordance with applicable paragraphs of this SSHP.

8. Site workers will be given time to acclimatize to site work conditions, temperature, protective equipment, and workload. Acclimatization is the adaptive process that results in a decrease of the physiological response produced by the application of a constant environmental stress. On initial exposure to a hot environment, there is an impaired ability to work and evidence of physiological strain. If the exposure is repeated on several successive days, there is a gradual return of the ability to work and a decrease in physiological strain. Acclimatization usually takes two to six days of continued work in hot environments, and allows the worker's body to become adjusted to this level and type of work. This process involves a gradual increase in the workload over the required period, the length of which depends upon the nature of the work performed, the ambient temperatures, and the individual's susceptibility to heat stress. The results of acclimatization include: subjective discomfort practically disappears; body temperature and heart rate are lower; there is a more stable blood pressure; and the sweat is more profuse and dilute.

9. Work schedules will be adjusted by SHSO as follows:
    - Modify work/rest schedules according to monitoring requirements.
    - Mandate work slowdowns as needed.
    - Rotate personnel: alternate job functions to minimize over-stress or overexertion at one task.
    - Add additional personnel to work teams.
    - Perform work during cooler hours of the day if possible.

10. Workers will be encouraged to achieve and maintain an optimum level of physical fitness. Increased physical fitness will allow workers to better tolerate and respond to hot environments and heavy workloads. In comparison to an unfit person, a fit person will have: less physiological strain; a lower heart rate and body temperature; and a more efficient sweating mechanism.

11. Alcohol should not be consumed in a hot environment because the loss of body fluids increases the risk of heat stress.

The amount and type of PPE worn directly influence reduced work tolerance and the increased risk of excessive heat stress. PPE adds weight and bulk, severely reduces the body's access to normal heat

exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following factors:

1. Anticipated work rate.
2. Ambient temperature and other environmental factors.
3. Type of protective ensemble.
4. Individual worker characteristics and fitness.

Sweating does not cool the body unless moisture is removed from the body. The use of personal protective equipment reduces the body's ability to eliminate large quantities of heat because the evaporation of sweat is decreased. The body's effort to maintain an acceptable temperature may become impaired and this may cause heat stress. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks. At most SWMUs at Seneca, Level D PPE will be utilized, thus providing minimal increase in the potential for heat stress. Level D PPE is defined as standard work clothes with long pants, hard hats (when overhead hazard is present), and safety boots (when working around heavy equipment). The selection of PPE is discussed in Section 6.

10.3 HEAT STRESS MONITORING

Because the incidence of heat stress depends on a variety of factors, all workers shall be monitored by SHSO. Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work. The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Monitoring of personnel wearing PPE should begin when the ambient temperature is 75°F or above. **Table B-9** presents the suggested frequency for such monitoring. Monitoring frequency should increase as the ambient temperature increases or as slow recovery rates are observed. A person with a current first aid certification who is trained to recognize heat stress symptoms should perform heat stress monitoring. Other methods for determining heat stress monitoring, such as the wet bulb globe temperature (WBGT) index from American Conference of Governmental Industrial Hygienist (ACGIH) Threshold Limit Values (TLV) booklet can be used.

For workers wearing permeable clothing (i.e., standard cotton work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current ACGIH Threshold Limit Values for Heat Stress (**Table B-10**). For workers in tyvek suits, work/rest schedules will be adjusted in accordance with physiological monitoring requirements.

To monitor the worker, the SHSO should measure:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.
  -If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
  -If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.
- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).
  - If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third.
  - Do not permit a worker to wear a semipermeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

10.3.1 Wet Bulb, Globe Temperature (WBGT) Monitoring

For site conditions where personnel are working in Level D PPE, and the ambient temperature is greater than 75°F, the SHSO may conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat related adverse health affects. The SHSO will take readings on a WBGT monitor throughout the day to determine the work/rest schedule to be implemented. The values outlined in this table are designed such that nearly all acclimatized, fully clothed workers with adequate water and electrolyte replacement liquids intake will be able to function without the body temperature exceeding 100.4°F.

10.4 HEAT STRESS DOCUMENTATION

The SHSO will be responsible for recording all heat stress related information. This will include training sessions and monitoring data. Training sessions will be documented on the Documentation of Training Form (Attachment B-1), and WBGT data and other information will be recorded in the Safety Log.

10.5 COLD-RELATED ILLNESS

In preventing cold stress, the SHSO must consider factors relating both to the worker and the environment. Training, medical screening, establishment of administrative controls, selecting proper work clothing, and wind-chill monitoring all contribute to the prevention of hypothermia and frostbite.

Training - Recognizing the early signs and symptoms of cold stress can help prevent serious injury. Thus, workers will be trained to recognize the symptoms of hypothermia and frostbite and have appropriate first-aid instruction. When the air temperature is below 50°F, the SHSO will inform workers of the proper clothing requirements and any work practices that are in effect to reduce cold exposure.

Administrative Controls - The SHSO will establish a work/rest schedule based upon worker monitoring. At the first sign of uncontrollable shivering the worker will be rested in a heated shelter. Work will stop when the air temperature reaches 0°F.

Clothing - Workers will be encouraged to layer clothing when air temperature is below 50°F. Clothing that has a high insulation value will be worn under protective garments. Insulated gloves will be worn when the wind chill index is below 32°F.

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

Safe work practices and engineering controls shall be implemented to comply with OSHA 29 CFR §1910.120 to limit employee exposure to hazardous substances or conditions. The use of personnel protective equipment has limitations and presents hazards of its own, such as physical stress and interference with peripheral vision, calling for the consideration and implementation of work practices and engineering controls prior to beginning site tasks and before the use of personnel protective equipment is instituted.

The safe work practices and engineering controls discussed below apply to general site procedures.

11.1 SAFE WORK PRACTICES

The following work practices are intended for use when site activities involve potential exposure to hazardous substances or conditions.

1. Certain SWMUs are known to contain various types of unexploded ordnance (UXO), explosives, or radiological hazards.
   All movement on the site shall be along cleared roads and pathways.
   ON-SITE WORKERS SHALL NOT STRAY FROM THE CLEARED PATHWAYS AND ROAD!
   ON-SITE WORKERS SHALL NOT TOUCH, KICK, OR OTHERWISE DISTURB ANY MATERIALS ON-SITE WHICH MAY BE UXOs.
2. The buddy system will be utilized at all times within the exclusion zone.
3. Entry into and exit from zones within the site must be made via the established access control points.
4. Prescribed personnel protective equipment must be worn as directed by the Site Health and Safety Office and Site Manager.
5. Assumptions will not be made concerning the nature of materials found on the site. Should any unusual situations occur (not covered by the Site Standard Operating Procedures), operations will cease and the Site Health and Safety Officer and the Site Manager will be contacted for further guidance.
6. Communication hand signals must be understood and reviewed daily.
7. Consultation with the Project Manager shall be made to avoid any uncertainties.
8. Ground fault circuit interrupters shall be used on all field electrical equipment. Improperly grounded/guarded tools shall be tagged out-of- service and the Site Manager shall be notified immediately.
9. If a piece of equipment fails or is found to be in need of repair, it will be immediately tagged out-of-service and the Site Manager shall be notified. This equipment will not be returned to service until repairs have been completed and the equipment tested by a competent individual.
10. Unsafe conditions shall be reported immediately.

11. Unusual odors, emissions, or signs of chemical reaction shall be reported immediately.
12. Workers will minimize contact with hazardous materials by:
    a. Avoiding areas of obvious contamination
    b. Using poly sheeting to help contain contaminants
    c. Avoiding contact with toxic materials
13. Only essential personnel will be permitted in the work zones.
14. Whenever possible, personnel will be located upwind during material handling.
15. At the first sign of odors detected inside the facepiece of a respirator, or if the employee begins experiencing any signs or symptoms of exposure to site toxic material (this information will be discussed during the daily meeting and can be found on the appropriate Chemical Hazard Evaluation Sheets), the employee will leave the area immediately and report the incident to the Site Health and Safety Officer and Site Manager. The work site shall be evacuated whenever evidence of a situation that could result in possible hazardous condition is identified.
16. Smoking will be allowed only in designated areas of the support zone.

11.2 SANITATION

11.2.1 Drinking Water

Only approved potable water systems shall be used for the distribution of drinking water. Tap water located in several administrative buildings (i.e., Buildings 123 and 125) at Seneca, which is treated by drinking water treatment plant at the Town of Waterloo, can be used as drinking water. The source of this water is Lake Seneca. Drinking water supplied from other sources approved by Federal, State, or local health authorities can also be used. A drinking water cooler will be provided in Building 125.

Portable containers used to dispense drinking water shall be tightly closed, and equipped with a tap. Containers will be clearly marked as their contents and shall not be used for other purposes. Water shall not be dipped from containers. Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

Outlets dispensing nonpotable water will be conspicuously posted **"CAUTION – WATER UNFIT FOR DRINKING, WASHING, OR COOKING."**

11.2.2 Toilets

When sanitary sewers are not available, one of the following facilities, unless prohibited by local codes, shall be provided: chemical toilets; recirculating toilets; combustion toilets, or other toilet systems as approved by state/local governments.

Unless mobile crews have transportation readily available to nearby toilet facilities, toilets shall be provided for the job sites according to the following:

Number of employees	Minimum facilities (per sex)
20 or less	One
21 to 199	one toilet seat and one urinal for every 40 workers
200 or more	one toilet seat and one urinal for every 50 workers

Where toilet rooms may be occupied by no more than one person at a time, can be locked from the inside, and contain at least one toilet seat, separate toilet rooms for each sex need not be provided.

Under temporary field conditions, provisions shall be made to assure that at least one toilet facility is available.

Permanent toilet facilities are available in Building 125.

11.2.3 Washing Facilities

Washing facilities will be provided at the decontamination facilities. The main decontamination facilities at the SEDA SWMU areas will be located adjacent to the support zone. These facilities will be used for vehicle, heavy equipment, and personnel decontamination. Each washing facility will be maintained in a sanitary condition and provided with water (either hot and cold running water or tepid running water), soap, brush, and individual means of drying.

11.2.4 Personal Hygiene Practices

The following personal hygiene practices will apply to field work conducted at the SEDA SWMU areas:

1. No smoking or chewing of tobacco or gum shall be allowed within the exclusion or decontamination zones.
2. No eating or drinking shall be allowed in the exclusion or decontamination zones.
3. On-site personnel shall remove protective clothing and wash face and hands prior to leaving the decontamination zones.
4. Disposable outerwear will be placed in drums located in the personnel decontamination area. Drums will be staged on-site at a central location for later disposal.

11.3 FIRE CONTROL

11.3.1 Fire Prevention

Explosions and fires not only pose the obvious hazards of intense heat, open flames, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment. Such releases can threaten both personnel on-site and members of the general public living or working nearby. Site personnel involved with potentially flammable material or operations will follow the guidelines listed below and EM 385-1-1, Section 9, to prevent fires and explosions:

- Potentially explosive/flammable atmospheres involving gases or vapors will be monitored using a combustible gas indicator;
- Prior to initiation of site activities involving explosive/flammable materials, all potential ignition sources will be removed or extinguished;
- Non-sparking and explosion-proof equipment will be used whenever the potential for ignition of flammable/explosive gases/vapors/liquids exists;
- Dilution or induced ventilation may be used to decrease the airborne concentration of explosive/flammable atmospheres;
- Smoking is prohibited at UXO work sites, or in the vicinity of, operations which may present a fire hazard, and the area will be conspicuously posted with signs stating "No Smoking or Open Flame Within 50 Feet";
- Flammable and/or combustible liquids must be handled only in approved, properly labeled metal safety cans equipped with flash arrestors and self-closing lids;
- Transfer of flammable liquids from one metal container to another will be done only when the containers are electrically interconnected (electrically bonded);
- The motors of all equipment being fueled will be shut off during the fueling operations;
- Metal drums used for storing flammable/combustible liquids will be equipped with self-closing safety faucets, vent bung fittings, grounding cables and drip pans, and will be stored outside buildings in an area approved by the SHSO.

11.3.2 Protection

The following safe work practices will be used to protect against fires:

- Flammable/combustible liquid storage areas will have at least one 4A: 20:B: C: fire extinguisher located within 25-75 feet, marked with the appropriate fire symbol and no smoking signs;
- Temporary offices will be equipped with a fire extinguisher of not less than 10:ABC;
- At least one portable fire extinguisher having a rating of not less than 20:ABC will be located at each work site.

- At least one portable fire extinguisher having a rating of not less than 20:ABC will be located at flammable storage areas and in vehicles.

11.4 WORK PERMIT REQUIREMENTS

No work permits are expected to be required for the RI/FS work or other field investigations at SEDA. Should this change, work permit requirements will be specified in the individual HSPs. Permit Required Confined Spaces (PRCS) operations or hot work are not anticipated for the RI/FS at the SEDA. Should this change, 29 CFR 1910.146 will be reviewed and a PRCS program will be specified in the individual HSPs and implemented. Hot work is not anticipated for the RI/FS at the SEDA. Should this change, work permit requirements will be specified in the individual HSPs.

11.5 CONFINED SPACE ENTRY PROCEDURES

Confined space is not expected during the RI/FS work or other field investigations at SEDA. If confined space entry becomes necessary during the implementation of the work, a confined space entry procedure will be specified in the individual HSPs and will be instituted prior to allowing any confined space entry.

11.6 SITE INSPECTIONS

Site inspections will be conducted daily by the SHSO to ensure that site work is accomplished in accordance with the approved safety plan, contract requirements and federal regulations. Daily inspections will be documented.

11.7 SAFE PRACTICES FOR EXCAVATION, DRILLING, AND TEST PITTING

11.7.1 Inspections

Daily inspections of excavations and trenches must be made by a designated competent person. If evidence of potential cave-ins, slides, or water accumulation is found, all work in the excavation or trench must cease until the necessary precautions have been taken to safeguard on-site personnel. All excavations and trenches must be inspected by a designated competent person after every rainstorm or other hazard-increasing occurrence, and safeguards against slides and cave-ins must be increased, if warranted. Relevant OSHA regulations (i.e., 29 CFR §1926.650-652) shall be used as a reference guide to angle of repose and shoring techniques used in excavations and trenches. Added measures must be taken if conditions warrant.

Any mobile equipment, including drilling rigs and earth-moving machinery, shall be operated in strict compliance with the manufacturer's instructions, specifications, and limitations, as well as any applicable regulations. The operator is responsible for inspecting the equipment daily to assure that it is functioning

properly and safely. This inspection will include all parts subject to faster than normal wear and all lubrication points. All field personnel shall recognize and avoid hazards associated with motorized equipment. Personnel that observe an equipment condition believed to be unsafe shall advise the equipment operator of the unsafe condition.

11.7.2 Utility Line Identification

The SHSO or site manager shall determine overhead and buried utility lines before excavation, drilling, or test pitting begins. The locations of any underground installations such as sewer lines and electric lines are determined before excavation, drilling, or test pitting. Utility companies must be notified of the proposed work to establish the locations of utility installations before the start of work. All such installations must be appropriately identified for the safety of persons working nearby. If any overhead or buried utility lines exist, the SHSO or site manager shall implement appropriate safety plan to protect utility lines from damage or displacement and to protect site personnel from any danger associated with the utility line. The area must be swept with a metal detector before excavation, drilling, or test pitting operation. Should any underground obstructions be encountered, the site manager or SHSO must immediately notify the USACE Project Manager and other appropriate personnel for their assistance in identification of the obstruction and its possible removal or re-routing. A pre-drilling/subsurface checklist for intrusive field work is attached in Attachment B-1.

11.7.3 Personal Protection Equipment

All site personnel must have PPE identified by the work plan. Head protection must be worn at all times near drilling equipment. Hearing protective devices must be provided and used to protect on-stie personnel from noise exposure if it is not feasible to reduce noise levels or noise exposure duration.

11.7.4 Protective Systems

Excavations 5 ft or more deep must be shored or sloped in an approved manner unless they are made entirely in stable rock. Sides of trenches above the 5-ft level may be sloped in lieu of shoring, but the slope may not be steeper than 1-1/2 H:1 V.

All protective systems for excavation sites must be designed by a registered professional engineer when it is not feasible to attain required slope configurations in accordance with 29CFR §1926.652(b)(1), (2) and (3). Sloping or benches greater than 20 ft deep must be approved by a registered engineer.

The registered professional engineer's recommended protective systems must be documented in sufficient detail to establish compliance with OSHA excavation requirements. The recommendations must be signed by the registered professional engineer, and the report must be maintained at the jobsite.

When manufactured support systems are used, the manufacturer's written specifications, recommendations, and limitations must be maintained at the jobsite.

A designated competent person must monitor the construction and maintenance of the recommended protective systems and their use in excavations.

All field personnel are required to employ defensive driving techniques, and obey all site speed limits and vehicle safety requirements.

11.7.5 General Requirements

Each trench where workers are working 3 ft deep or more must have ladders to provide safe exits. There must be no more than 25 ft of lateral travel distance to the nearest ladder. Excavated or other material must not be stored no closer than 2 ft from the edge of any excavation. Surface encumbrances that create a hazard must be moved or supported, as necessary.

No personnel are permitted under loads handled by lifting or digging equipment. When mobile equipment operates adjacent to or approaches the edge of an excavation, a warning system such as barricades, hand or mechanical signals, or stop logs must be used. The use of water control and removal equipment must be monitored by a competent person. Sloping or benching excavations greater than 20 ft deep must be designed by a registered professional engineer.

If the possibility exists in an excavation of an oxygen deficient atmosphere (less than 19.5% oxygen) or an atmosphere in excess of 20% of the lower flammable limit (or lower explosive limit) of a gas, atmospheric testing must be conducted before personnel enter the excavation. Refer to Confined Space Work (Section 11.5) and Respiratory Protection (Section 6.2) for additional guidance. Proper respiratory equipment and ventilation must be established for each excavation before personnel enter the excavation.

Walkways and bridges over excavations must be provided with standard guardrails. Adequate barriers must be provided at all excavations. All wells, pits, shafts, etc., must be barricaded or covered. Upon completion of exploration and similar operations, all wells, pits, shafts, etc., must be backfilled.

11.8 HAZARD COMMUNICATION PROGRAM

The OSHA Hazard Communications Standard (29 CFR§ 1910.1200) was promulgated to ensure that all chemicals would be evaluated and information regarding the hazards associated with these chemicals would be communicated to employers and employees. The goal of the standard is to reduce the number of chemically related occupational illnesses and injuries.

In order to comply with the OSHA Hazard Communication Standard, this written program has been established by Parsons for work at SEDA, Romulus, New York. All Parsons and subcontractor personnel working at SEDA are included in this program. Copies of this written program will be available for review by any employee at the onsite office trailer for SEDA, by contacting the Site Safety and Health Officer, or from the following person:

Edward Grunwald, CIH
Parsons
5390 Triangle Parkway
Norcross, GA 30092
678/969-2394

11.8.1 Hazardous Chemical Inventory List

The Site Manager or his/her designee must compile a list of hazardous chemical substances that Parsons employees and Parsons subcontractors bring to the site. The list shall be maintained in the Boston office and on-site. As new substances are purchased or old ones are discontinued, the inventory shall be updated to reflect these changes.

11.8.2 Material Safety Data Sheets (MSDS)

MSDSs are prepared by manufacturers or producers to provide specific information on the safety precautions and health effects of a particular chemical or mixture. The MSDS contains at a minimum the following information:

- Chemical and common names
- Physical and chemical characteristics
- Physical hazards
- Health hazards
- Primary routes of entry
- Exposure limits
- Carcinogenic potential
- Handling and protective precautions
- Control measures
- Emergency and first aid procedures

- Date of MSDS preparation
- Name and address of manufacturer

If chemicals are ordered, the Site Manager or his designee will specify on the purchase order that chemicals are not to be shipped without corresponding MSDSs. When chemicals and MSDS arrive, the Site Safety and Health Officer or his designee will review them for completeness. Should any MSDS be incomplete, a letter or FAX will be sent immediately to the manufacturer requesting the additional information, Parsons or its subcontractors will not accept at the Site any shipped chemical materials without an MSDS.

A complete file of MSDSs for all hazardous chemicals to which an employee of Parsons may be exposed will be kept in labeled files in the main office and on-site. In the event that a MSDS is missing the employee should immediately contact the SHSO.

11.9 LABELS AND SIGNS

The Hazard Communication Standard requires that hazardous chemicals be labeled by manufacturers. The label must contain the following:

- Chemical identity
- Appropriate warnings
- Name and address of manufacturer, importer, or other responsible party.

If the labels are incomplete or missing, Parsons personnel will refuse the shipment.

When chemicals are transferred from the manufacturer's container's to secondary containers, the Site Manager or SHSO will ensure that the containers are labeled with the identity of the chemicals and appropriate hazard warnings. Labels for secondary containers can be obtained from the SHSO.

The entire labeling procedure will be reviewed at least annually and changed as necessary.

Signs, tags, and labels shall be provided at the site to give adequate warning and caution of hazards and instruction and directions to on-site personnel and the public. Section 8 of the Safety and Health Requirements Manual (USACOE, 1996) shall be observed.

11.10 MATERIAL HANDLING PROCEDURES

11.10.1 Material Lifting

Many types of objects are handled in normal day-to-day operations. Care should be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials to avoid joint and back injuries:

- The size, shape and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably;
- A firm grip on the object is essential, therefore the hands and object shall be free of oil, grease and water, which might prevent a firm grip;
- The hands, and especially the fingers shall be kept away from any points that cause them to be pinched or crushed, especially when setting the object down;
- The item will be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces and pinch points, and gloves shall be used, if necessary, to protect the hands;
- The feet will be placed far enough apart for good balance and stability;
- Personnel will ensure that solid footing is available prior to lifting the object;
- When lifting, get as close to the load as possible, bend the legs at the knees, and keep the back as straight as possible;
- To lift the object, the legs are straightened from their bending position;
- Never carry a load that you cannot see over or around;
- When placing an object down, the stance and position are identical to that for lifting: with the back kept straight and the legs bent at the knees, the object is lowered;
- If needed, back support devices will be provided to aid in preventing back injury during lifting activities; and
- Materials will not be moved over or suspended above personnel unless positive precautions have been taken to protect.

When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each person, if possible, shall face the direction in which the object is being carried.

11.10.2 Material Handling

On-site personnel shall avoid contact with potential UXO/OE, radiological material, unidentified metal objects, or contaminated substances. All wastes generated during activities on-site should be disposed of as directed by the USAESCH and the work plan.

11.11 DRUM/CONTAINER HANDLING PROCEDURES AND PRECAUTIONS

The handling of HTRW drums and containers shall be kept to the minimum. Drum/container handling procedures and precautions presented in Section 28H of the Safety and Health Requirements Manual (USACOE, 1996) shall be observed.

11.12 LOCKOUT/TAGOUT

Hazardous energy (lockout/tagout) is not expected at the site. Should this changes for individual SWMUs, the process safety management will be specified in the site-specific HSPs.

11.13 GUARDING OF MACHINERY AND EQUIPMENT

Safety practices presented in Section 16.B.03 of the Safety and Health Requirements Manual (USACOE, 1996) shall be observed.

11.14 FALL PROTECTION

Work at heights is not anticipated at SEDA. If work at heights occurs, safety practices presented in Section 16.B.11 of the Safety and Health Requirements Manual (USACOE, 1996) shall be observed.

11.15 ENGINEERING CONTROLS

Engineering controls, if deemed necessary by the PHSO, will be specified in the individual HSPs and performed at the site.

11.16 PROCESS SAFETY MANAGEMENT

Process safety management is not expected at the site. Should this changes for individual SWMUs, the process safety management will be specified in the site-specific HSPs.

11.17 ILLUMINATION

Illumination requirements presented in Section 7 of the Safety and Health Requirements Manual (USACOE, 1996) shall be observed.

12 SITE LAYOUT AND CONTROL MEASURES

12.1 WORK ZONES

The support zone and command post for the field work at the SWMU areas will consist of an office trailer and storage areas at one central location for all SWMUs. The location of the support zone will be determined prior to the commencement of the field work. Exclusion zones will be established onsite. UXO exclusion zones will include all on-site areas beyond the areas flagged by contracted UXO personnel as cleared of UXOs. These exclusion zones will be set up at individual work locations when necessary.

If surface contamination is created or suspected as a result of the operations, an exclusion zone will be defined around the suspected surface contamination until the problem has been mitigated. Mobile operations, such as sediment sampling and geophysical surveying, will not have defined exclusion zones.

12.2 UTILITIES CLEARANCE

Facility maps will be obtained and consulted prior to commencing any intrusive work. Borehole sites will be positioned accordingly, marked with wooden stakes, and then cleared with SEDA. Drilling is to be done at the marked, cleared locations only. Refer to Section 11.7.2 for additional guidance. A pre-drilling/subsurface checklist for intrusive field work is attached in Attachment B-1.

12.3 SITE CONTROL

SEDA is responsible for overall site security. All Parsons site personnel and subcontractors and all equipment to be used in the field investigation shall be logged in each day at the command post prior to proceeding to other areas of the site. All persons other than work crews wishing to enter the active work areas shall first sign in at the command post.

12.4 SITE COMMUNICATIONS

There is a phone in the Parsons on-site field office located in Building 123 in the Administrative Area. On-site communications will be achieved orally with a contingency for hand signals, air horn signals, or FM two-way radio (in the absence of suspected ordnance). Routine site communications will be maintained between all work crews and the support zone with two-way radios. On-site emergency communications will be maintained by the use of hand signals, air horns, on-site two-way radios. In addition, the SHSO and site personnel may use their personal cell phones. Details of the emergency communications are contained in the Emergency Response Plan in Section 16 of this SHSP.

12.5 UNEXPLODED ORDNANCE CLEARANCE

Certain SWMUs (as listed in Table B-1) are known to contain various types of unexploded ordnance (UXO) or explosives. Only trained UXO technicians will be in the area when the initial clearing is in progress. All movement on these sites shall be along cleared roads and pathways and UXO-trained personnel will be on hand at all times to ensure that untrained personnel follow all procedures relative to UXO. Cleared roads and pathways shall be marked. **ON-SITE WORKERS SHALL NOT STRAY FROM THE CLEARED PATHWAYS AND ROAD!** UXOs found on the site may have been subjected to stresses which render them very unstable and the UXOs may detonate with even very slight disturbance. **ON-SITE WORKERS SHALL NOT TOUCH, KICK, OR OTHERWISE DISTURB ANY MATERIALS ON-SITE WHICH MAY BE UXOs.**

The contracted UXO personnel trained in the discovery and handling of UXOs shall perform all UXO clearance for the SWMUs. Cleared pathways and work areas shall be marked with red tape.

When working in cleared areas, work crews and equipment shall be positioned such that the chance for accidental movement into uncleared areas is minimized. Equipment shall be placed so as not to impede emergency escape and evacuation along the cleared pathways.

13 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination is the physical removal of contaminants from clothing and equipment or the chemical change of such contaminants to innocuous substances. Decontamination procedures will take place in the contamination reduction zone. Disposal is an available option in lieu of decontamination when decontamination is impractical.

The following decontamination procedures are intended to meet the requirements of 29 CFR §1910.120(k). No personnel or equipment shall enter the contaminated zone of the site until workers have acknowledged the decontamination procedures and operating procedures intended to minimize contamination. These procedures shall be monitored by the Site Manager to determine their effectiveness. Ineffective procedures will be corrected.

13.1 DECONTAMINATION FACILITIES

The main decontamination facilities at the SEDA SWMU areas will be located adjacent to the support zone. These decontamination facilities will be used for vehicle and heavy equipment decontamination and for personnel decontamination. Personnel decontamination must take place prior to leaving the decontamination area and prior to entering any personnel hygiene facilities or before eating, drinking, or smoking.

13.2 PERSONNEL DECONTAMINATION

Personnel decontamination will consist primarily of a segregated equipment drop, removal and disposal of any non-reusable protective equipment, and washing of hands and face. No heavy contamination of clothing is expected and disposable protective clothing will be disposed of as non-hazardous waste. However, if contamination is detected (i.e., elevated PID readings, visual evidence, or known contact with potentially contaminated liquids), personal protective equipment and cartridges from respirators will be bagged separately from daily garbage. Facilities for personnel and sampling equipment decontamination will be set up between the equipment decontamination pad and the site trailer. Personnel will not enter the office trailer without first going through decontamination, and hands and face must be thoroughly washed before eating, drinking, etc.

Upon entering the contamination reduction zone from areas with potential radiological hazards, gloves and hands, and then the rest of the body will be scanned with the Pancake G-M meter to detect any residual radiation that may be present. When completing the body scan, careful attention must be paid to the hands, the bottom of the feet, and to any areas that have touched surfaces inside the exclusion zone. The disposable gloves, and any other PPE that is being worn, will be disposed of in a bag that is exclusively for the disposal of potentially radiologically elevated PPE. At this same point, all other

equipment exiting the exclusion zone will also be scanned with the pancake G-M for the detection of residual contamination.

Level C Decontamination - The activities to be carried out at each station are described in **Table B-11**, Measures for Level C Decontamination.

Level B Decontamination - The activities to be carried out at each station are described in **Table B-12**, Measures for Level B Decontamination.

It should be noted that depending site-specific conditions, Level C or Level B PPE may not necessarily be warranted.

13.3 PREVENTION OF CONTAMINATION

In an effort to minimize contact with waste and decrease the potential for contamination, the points outlined below will be adhered to during all phases of field investigation and sampling.

1. Personnel will make every effort not to walk through puddles, mud, any discolored surface, and/or any area of obvious contamination.
2. Personnel will not kneel or sit on the ground in the exclusion zone and/or in the Contamination Reduction Zone (CRZ).
3. Personnel will not place equipment on drums, containers, vehicles, or on the unprotected ground.
4. Where appropriate, personnel will wear disposable outer garments and use disposable equipment.

14 EQUIPMENT DECONTAMINATION

As discussed in the previous section, the main decontamination facilities at the SEDA SWMU areas will be located adjacent to the support zone. Equipment and vehicle decontamination will consist of pressure washing followed by steam cleaning. Solvent and soap and water washes will be performed when required for sampling or for heavy contamination. Gross contamination, such as caked mud and dirt on augers and split spoons, will be removed at the work site and placed back in the borehole or drummed with other drilling spoils if contaminant indicators (e.g., PID readings) warrant drumming of the soils.

Refer to Attachment B-3 for the radiological decontamination of equipment, materials, and tools.

15 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

15.1 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

The support zone will have the following emergency equipment:

Self-Contained Breathing Apparatus (SCBA);
First Aid Kit;
Fire Extinguisher (A, B, C Type);
15-Minute Emergency Eyewash Station;
Air Horn;
Bolt Cutters (to cut exit gate chains);
Latex Gloves;
A CPR Mask; and
A copy of the Health and Safety Plan, which includes the emergency exits and hospital locations.

Each work crew will have at the work site the following emergency equipment:

First Aid Kit;
Fire Extinguisher (A, B, C Type);
Hand-Held Eyewash;
Air Horn;
Bolt Cutters (to cut exit gate chains);
Latex Gloves;
A CPR Mask; and
A copy of the Health and Safety Plan, which includes the emergency exits and hospital locations.

At least one vehicle at a work site will be a designated emergency escape vehicle. It will be parked at an easily accessible location, **KEYS IN THE IGNITION**, and pointed in the direction of escape. All vehicles on site will have the keys with the car so they can be located easily (on top of the vehicle for example).

15.2 SPILL CONTROL MATERIALS AND EQUIPMENT

Chemical spills are not expected to be a problem at the former Seneca Army Depot site. The only chemicals being brought into the site would be fuels and oils for equipment that would be used on the site. This will be brought onto the site in small quantity containers in the amounts needed for that day's operations. If a spill should occur while performing fueling on equipment, the spill would be a small quantity (under a gallon) and it would be cleaned up immediately. Small spill response kits (e.g., paper

towel, diaper, etc.) will be on-hand to assist in the clean up. The spill and contaminated soil would be containerized and labeled, properly manifested, and shipped to an approved hazardous waste facility.

16 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

The purpose of the Emergency Response and Contingency Procedures (ERCP) is to define procedures to protect human health and the environment both on and off site in the event of an accident or emergency during the RI/FS activities at Seneca Army Depot. The ERCP complies with 29 CFR §1910.120(l) and the guidelines given in *Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, Appendix B, Contingency Plan* (EPA, 1990). In addition, the ERCP meets the US Army Corps of Engineers requirements for the emergency response plan as presented in the Health and Safety Requirements Manual (USACE, 1996) and the Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities (USACE, 2000). The following elements are presented in this section.

- Pre-emergency planning and procedures for reporting incidents to appropriate government agencies for potential chemical exposures, personal injuries, fires/explosions, environmental spills and releases, discovery of radioactive materials.
- On-site emergencies
- Off-site emergencies
- Personnel roles and lines of authority
- Emergency communications
- Evacuation routes and procedures
- Specific procedures for decontamination and medical treatment of injured personnel
- List of emergency contacts
- Route maps to nearest pre-notified medical facility
- Accident investigation and reporting
- Emergency recognition and prevention
- Site topography, layout, and prevailing weather conditions
- Site security and control
- Critique of emergency responses and follow-up
- Emergency alerting and response procedures
- Safe distances and staging areas

Emergency equipment and first aid requirements are presented in Section 15.

This Emergency Response Plan applies to site work at Seneca Army Depot. Copies of this plan are to be kept at the site command post and support areas. The list of emergency telephone numbers and directions to the nearest exit gate and nearest hospital will be prominently posted in the command post. Copies of the directions to the nearest hospital will be kept in all site vehicles.

This emergency response plan shall be coordinated with SEDA emergency response procedures prior to the beginning of site work.

16.1 PRE-EMERGENCY PLANNING

If an emergency develops on site, the procedures delineated herein are immediately followed. Emergency conditions exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure;
- A condition occurs that is more hazardous than anticipated; and/or
- Fires, explosions, structural collapses/failures, and/or unusual weather conditions (thunderstorms, lightning, high winds, etc.) occur.

If an emergency occurs, direct voice communication is used to sound the alarm. If personnel are out of range of direct voice communication, an air horn meeting the requirements of 29 CFR §1910.165 is sounded. General emergency procedures and specific procedures for personal injury are described within this section. **Table B-13** is a list of emergency contacts. Section 16.8 presents the routes to medical facilities closest to the Seneca Army Depot site.

In case of emergency, SHSO will implement the site emergency procedures. The following procedures will be followed:

- Notify the contact listed in Table B-13 when an emergency occurs. This list is posted prominently at the site.
- Use the "buddy" system (pairs).
- Maintain visual contact between "pairs." Each team member remains close to the other to assist in case of emergencies.
- If any member of the field crew experiences any adverse effects or symptoms of exposure, the entire field crew will immediately halt work and act according to the instructions provided by the Site Manager.
- Any condition that suggests a situation more hazardous than anticipated will result in evacuating the field team and re-evaluating the hazard and the level of protection required.
- If an accident occurs, the Site Manager or SHSO is to complete an Accident Investigation Report Form, Eng. Form 3394 (Attachment B-1) within five working days and submit to USAESCH. Refer to Section 18 for additional guidelines. Follow-up action will be taken to correct the situation that caused the accident.

The SHSO is specifically responsible for the following:

- Implementing the site ERCP, including ordering site evacuations, coordinating fire-fighting efforts, and directing spill control and cleanup.
- Supervising site evacuation.
- Contacting emergency services such as the fire department, ambulance and security services, as may be required.
- Assisting in providing first aid services and medical support or evacuation for injured or exposed personnel.
- Determining the cause of the incident and ways to prevent future occurrences.
- Preparing a written incident report for submission to the Parsons and USAESCH Project Managers.

On-site personnel are responsible for reporting emergencies or conditions immediately to their supervisors, alerting other employees; helping injured personnel, and assisting as directed to mitigate the incident.

16.2 ON-SITE EMERGENCIES

On site emergencies can range from minor cuts and scrapes to explosions, fires, and the release of toxic gases. Apparently minor incidents at hazardous waste sites can have serious consequences or may indicate the presence of a previously unknown health and safety hazard. Explosions, fires, and the release of toxic gases will not only involve site workers, but may affect the neighboring populations and the environment.

All incidents will be reported as soon as possible to the Site Manager and the SHSO who will determine the appropriate steps to be taken.

When the incident is minor, the work may continue. When an incident is considered serious, work will be discontinued until the emergency situation has been brought under control, the incident has been evaluated, and any conditions which may have contributed to the emergency have been mitigated.

All site incidents, including near misses, will be investigated and documented, using the Incident Report Form and Incident Follow-Up Report Form in Attachment B-1.

16.3 OFF-SITE EMERGENCIES

In the unlikely event of a vapor release off-site, the contamination source will be secured, if possible.

Emergency response contacts will be notified in the following order:

1. SEDA Security and Environmental Office

2. Safety Officer
3. Project Manager

The phone numbers of these contacts are provided in Table B-13 and will be posted in the site trailer.

SEDA Emergency Response personnel will be utilized in all emergencies that may involve exposure to people away from the work sites. The SEDA Emergency Response Plan for the depot will be implemented when SEDA Emergency Response personnel determine it is necessary.

16.4 SITE PERSONNEL AND LINES OF AUTHORITY

A clear chain-of-command in emergency situations ensures clear and consistent communication between site personnel and, therefore, results in more effective response to the emergency situation. The duties of site personnel in emergency situations are outlined below:

The **Site Manager** will direct all emergency response operations, designate duties to other site personnel, and serve as liaison with government officials and emergency response teams.

The **Site Health and Safety Officer** will make initial contact with off-site emergency response teams (first aid, fire, police, etc.), make recommendations on work stoppage, and provide for on-site first aid and rescue.

The **Command Post Supervisor** will be designated when no one is performing this function during normal site work. This person will maintain contact with off-site response teams and notify additional agencies or offices that need to be contacted.

Decontamination personnel will stand by to perform emergency decontamination. Decontamination personnel will also assist the safety officer in rescue operations when necessary.

Field personnel will assist in rescue operations or take over for decontamination personnel when they are required for other duties.

16.5 EMERGENCY SITE COMMUNICATIONS

On-site communications will be used to communicate safety information and for other work-required communications. On-site communications will be achieved orally with a contingency for hand signals, air horn signals, or FM two-way radio (in the absence of suspected ordnance). Routine site communications will be maintained between all work crews and the support zone with two-way radios. Emergency communications will be maintained by use of air horns kept in the support areas and with each work crew. In addition, the SHSO and site personnel may use their personal cell phones. The emergency communications codes are given in **Table B-14**, On-Site Emergency Communications.

Some areas to be investigated may contain various types of unexploded ordnance (UXO). All movement on the site, **EVEN UNDER EMERGENCY CONDITIONS**, shall be along cleared roads and pathways. Cleared roads and pathways shall be marked. **ON-SITE WORKERS SHALL NOT STRAY FROM THE CLEARED PATHWAYS AND ROAD!**

Evacuation from work sites shall be along the access paths cleared to the various worksites. Equipment shall be placed so as not to impede emergency escape and evacuation along the cleared pathways. Evacuation routes from work areas shall be discussed daily for each work crew as a part of the daily safety meeting.

Figure B-3 shows best routes to SEAD exits.

16.6 EMERGENCY DECONTAMINATION AND FIRST AID

Decontamination procedures used in emergency situations will vary greatly with the severity and particulars of the situation. The SHSO will provide advice on the medical and decontamination procedures to be used in each emergency situation. General guidelines for first aid and decontamination procedures are given below.

16.6.1 Inhalation Exposure

Remove the victim from the exposure area to an area with fresh air. Attempt rescue only if proper protective gear (Level B or C) is available for the rescue team. Remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical unit arrives. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated.

16.6.2 Contact Exposure

Remove victim from area and flush affected area with water only. Be careful not to spread the contamination to other parts of the body. Remove protective clothing and flush area with water only. Consult references to determine if soap and water wash is indicated. Do not remove respirator until removal of contaminant from body is reasonably assured and the victim is well into a clean zone.

16.6.3 Physical Injury

If a physical injury occurs or worker collapses in a clean zone, first aid will be administered as indicated.

If a physical injury occurs in a contaminated zone, care must be taken to prevent contact of any contaminant with open wounds. The wound can provide easy access to the body for toxic chemicals that are not

normally a skin absorption problem. Protective clothing will be removed carefully to avoid additional injury and avoid any exposure of the wound to contaminants on the clothing.

If a worker collapses or loses consciousness in a contaminated zone, remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical units arrive. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated. The field site will have at least two persons certified in CPR and first-aid per shift.

16.7 EMERGENCY TELEPHONE NUMBERS

Emergency telephone numbers for medical and chemical emergencies are given in Table B-14, Emergency Telephone Numbers. These numbers will be displayed prominently near each site phone.

16.8 DIRECTIONS TO HOSPITAL

Directions to the nearest hospital are shown and described in **Figure B-4**, Route to Geneva General Hospital. The map will be displayed in the command post and kept in every site vehicle.

16.9 ACCIDENT INVESTIGATION AND REPORTING

In case of an accident on-site, the SHSO or Site Manager shall be notified immediately. The SHSO is responsible for initiating first aid and contacting off-site emergency-medical services, if necessary. The SHSO will initiate the site Emergency Response Contingency Plan if necessary.

Initial notification of an accident may be verbal, in person, by hand signals, or by an alarm device such as an air horn. In high-hazard areas where radio or other communications are hampered or impractical, air horns and the buddy system shall be used, as will emergency escape or self-rescue provisions for workers. Specific on-site procedures will be given at the site-specific safety meeting.

Once the initial accident report has been received by the SHSO and necessary emergency procedures are initiated, verbal reports will be given to the Parsons PM, Parsons Corporate Health and Safety Officer, and other interested parties. Personal injury reports will be completed, filed, and recorded on an OSHA 200 Log of injuries and illnesses.

Accident reporting requirements are presented in Section 18.5.2. The SHSO will be responsible for conducting an investigation of all on-site accidents involving personal injury, illness, death, or property damage on incidents that are regarded as "near misses". The investigation will consist of conducting interviews with witnesses and/or persons involved in the accidents;

inspecting the accident site and equipment involved in the accident; reviewing the operating procedures, existing site or weather conditions; and qualifications, training, and experience of the workers involved and examination of generally accepted safety procedures and regulations. The objective of the investigation is to clarify the actual events of the accident, to establish the probable cause or causes, and to determine appropriate preventative or protective measures. The SHSO will prepare a written report of his findings including recommendations for preventing future incidents. The report will be discussed in detail with Parsons and USAESCH. The conclusions reached regarding the accident and preventative measures will be included in the next tailgate safety meeting.

16.10 EMERGENCY RECOGNITION AND PREVENTION

16.10.1 Training

All field personnel receive site-specific health and safety training before starting any site activities. The SHSO is responsible for implementing and enforcing the accident prevention program. An accident prevention program identifies actual and potential site hazards so that no contractor, subcontractor, laborer, operator, mechanic, or other employee is required to work in surroundings or under conditions that are dangerous to their health and safety. This program must include frequent and regular inspection of the job site to ensure successful implementation. On a day-to-day basis, individual personnel should watch for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. The general elements of an accident prevention program are discussed in this section. Emergencies can be averted by rapid recognition of dangerous situations. Before assigning daily tasks, tailgate safety meetings will be held. Discussion should include:

- Tasks to be performed.
- Time constraints (e.g., rest breaks).
- Hazards that may be encountered, including the effects, how to recognize or monitor symptoms, and danger signals.
- Emergency procedures.
- Radio communication.

Hard hats and safety boots must be worn as a minimum within 50 feet of heavy equipment. The Site Manager or SHSO supervises the field team to ensure they are meeting health and safety requirements. If deficiencies are noted, work is stopped and corrective action is taken (e.g., retain/purchase additional

safety equipment). A report of health and safety deficiencies and the corrective action taken is forwarded to the Project Manager and SHSO.

All site workers, including subcontractors, will be trained to their level of responsibility before beginning work. In addition to the hazardous waste health and safety training required by 29 CFR §1910.120(e), workers will receive training in the operational and health and safety aspects of site work. This may include use of fire extinguishers, first aid, CPR, drum handling, heavy equipment, electrical hazards, hearing protection, and excavation. In addition, all site workers will be briefed on the hazards associated with UXO/OE or radiation, if any.

16.10.2 Fire or Explosion

Fire or explosion hazards are presented in Section 3. Fire Prevention and Protection is presented in Section 11.

16.10.3 Spill Remediation

In the event of a spill, the SHSO will be notified immediately. The important factors are that no personnel are overexposed to vapors, gases, or mists and that the liquid does not ignite. Waste spillage must not be allowed to contaminate any local water source. Small dikes will be erected to contain spills, if necessary, until proper disposal can be completed. Subsequent to cleanup activities, the site safety officer will survey the area to ensure that no toxic or explosive vapors remain.

Chemical spills are not expected to be a problem at the Seneca site. The only chemicals being brought into the site would be fuels and oils for equipment that would be used on the site. This will be brought onto the site in small quantity containers in the amounts needed for that day's operations. If a spill should occur while performing fueling on equipment, the spill would be a small quantity (under a gallon) and it would be cleaned up immediately. The spill and contaminated soil would be containerized and labeled, properly manifested, and shipped to an approved hazardous waste facility. Spill control is also presented in Section 15.

16.10.4 Traffic Control

Parsons shall utilize traffic control measures to minimize inconvenience to the site and the risk of traffic accidents and pedestrian injuries. These measures will include the use of flagmen, signs, barricades, and markings, as necessary, for the safe movement of traffic during the remediation activities.

16.10.5 Site Housekeeping

During the course of the project, scrap materials, tools, construction materials, containers, and debris shall be kept cleared from work areas, and in and around buildings or other on-site structures or equipment. Site access and egress routes for pedestrian and vehicular traffic will be kept clear. Materials will not be stored under or piled against buildings or in front of doors and exits. Work areas will be cleared and cleaned at least once per shift. However, garbage and debris shall be removed more frequently.

Metal drums used for storing flammable/combustible liquids shall be equipped with self-closing safety faucets, vent bung fittings, grounding cables and drip pans, and shall be stored outside buildings in an area approved by the SHSO.

Outdoor flammable/combustible materials storage areas will be: lined and surrounded by a dike of 12 inches in height, and of sufficient volume to contain 110% of the stored materials; located fifty feet from buildings; and kept free of weeds, debris, and other combustible materials.

16.10.6 Motor Vehicle Accident Report

All vehicular accidents will be reported immediately and investigated. The objective of the investigation is to clarify events of the accident, establish the probable cause or causes, and to determine appropriate preventative or protective measures. The SHSO will prepare a written report of his/her findings, including the recommendations to prevent future accidents. The report will be discussed with the Parsons PM. Vehicular accidents that are recordable, as defined by AR 385-40 and USACE supplement 1 to that regulation, are also to be reported to the Parsons ES and USAESCH PMs via Form ENG 3394 (See Attachment B-1). The conclusions reached regarding the accident and preventative measures will be included in the next tailgate safety meeting.

16.11 SITE TOPOGRAPHY, LAYOUT, AND PREVAILING WEATHER CONDITIONS

Site topography, layout, and prevailing weather conditions will be presented in the individual HSPs.

16.12 SITE SECURITY AND CONTROL

The purpose of site access control is to protect the public and workers from the site's hazards and prevent vandalism of the site operations. As discussed in Section 12, SEDA is responsible for overall site

security. All Parsons personnel and subcontractors and all equipment to be used in the field investigations should be logged in each day at the command post prior to proceeding to other areas of the site. All persons other than work crews wishing to enter the active work areas shall first sign in at the command post.

For individual sites, site access control will be implemented by the SHSO and will be accomplished through a program that limits movement and activities of people and equipment at the project site. Site control requires the establishment of site work zones, a communications network, an evacuation protocol, and site security. Site access control will be based on site-specific characteristics including:

1. Potential chemical, biological, physical or explosive hazards;
2. Terrain;
3. Expected weather conditions;
4. Planned site activities; and
5. Site proximity to populated areas.

Site access control will include the following unless otherwise specified in the individual site-specific HSPs:

1. Worker/visitor registration;
2. Escort of visitors;
3. PPE requirements; and
4. Posting of site/work area boundaries.

As discussed in Section 12, an exclusion zone (i.e., work zone) will be defined around the suspected surface contamination. UXO exclusion zones will include all on-site areas beyond the areas flagged by contracted UXO personnel as cleared of UXOs. These exclusion zones will be set up at individual work locations when necessary.

16.13 CRITIQUE OF RESPONSE AND FOLLOW-UP

Emergency response plans are based on site-specific needs and experience. It is important to consider previous emergency incidents in preparing an ERP. The ERP will be reviewed by Project Health and Safety Officer and project manager annually and revised accordingly. In addition, the ERP will be reviewed and revised after any emergency accidents or incidents occurred at SEDA. The Corporate Health and Safety Officer will review company-wide emergency accidents or incidents and provide critique of emergency responses. Time spent by emergency response employees reviewing incidents will be credited toward their refresher training requirements.

16.14 EMERGENCY ALERTING AND RESPONSE PROCEDURES

This section of the ERP addresses how employees will be informed that an emergency exists and how they should respond. The alarm systems must inform "all affected employees" that an emergency exists and what their immediate response should be. Depending on the size and the magnitude of the emergency "all affected employees" may include all site personnel, or just personnel from a limited area.

The following list outlines the information necessary to inform the employees of what their immediate response should be. All of these criteria may not be applicable to all site personnel, depending on the size and nature of the place of work and the preplanning efforts:

- Notification. The SHSO or Site Manager will initiate emergency notification and make the existence of the emergency situation known. The notification can be conducted using hand signals, horn, cell phone, two-way radio, and the phone in the Parsons on-site field office located in Building 123 in the Administrative Area.
- Level & Type of the required Response. Based on the extent and type of emergency, SHSO and Site Manager will determine the level and type of the required response and notify the associated personnel.
- Nature of the Response. The SHSO or Site Manager will notify relevant personnel the emergency condition (e.g., explosion, chemical spill, medical).
- Location. The SHSO or Site Manager will notify relevant personnel the location of the emergency. This is critically important in large facilities such as Seneca.
- Ambient environmental factors and conditions that influence evacuation or response procedures (wind speed and direction).

16.15 Safe Distances and Staging Areas (Safety Zones)

Figure B-5 presents the buildings at Seneca and Figure B-3 presents emergency exit routes and the buildings at Seneca. Specific on-site staging areas and procedures will be given at the site-specific safety meeting. In general, in case of an emergency, the site personnel should:

- Escape the emergency situation.
- Meet at the designated safe staging area, or when the designated staging area is in emergency situation
- Meet at the Parsons on-site field office located in Building 123 in the Administrative Area, or when the whole Seneca area is in emergency
- Exit the Seneca Site

The SHSO will conduct a head count to ensure all personnel have evacuated safely.

17 ACCIDENT PREVENTION

This section includes two subsections: safety and health inspections

Accident/incident reporting is covered under Section 18. Emergency prevention is presented in Section 16.

17.1 SAFETY AND HEALTH INSPECTIONS

Each day, the SHSO shall conduct a site inspection to ensure that operations are being performed in accordance with the HSP, USAESCH requirements, and OSHA regulations. Results of the inspections will be documented daily in the SHSO's safety logbook. Any health and safety deficiencies or potential problems discovered during the daily site inspection will be discussed at the next tailgate safety meeting. Inspections will be focused on the following areas:

- General Site Safety
  - Housekeeping
  - Sanitation
  - Communication equipment
  - Safety/warning signs/labels
  - Security
  - Illumination
  - Excavation
  - Fire hazards

- Emergency Equipment
  - Alarm systems operability/access
  - Fire extinguisher access
  - Safety shower/eyewash access/operability
  - First-aid cabinet access
  - Spill containment and control supplies access

- Hazardous Materials
  - Warning sign/labels
  - Proper hazard class segregation
  - Gas cylinder storage/use
  - Leakage/spillage protection
  - Unsafe condition/ignition source

- Equipment and Tools
  - Vehicle
  - Mechanical equipment
  - Power tools
  - Hand tools
  - Ropes, chains, and slings
  - Safety harnesses

Any problems in implementation of the HSP shall be reported immediately to the SHSO, and work shall not proceed until all deficiencies have been corrected. Violations of the HSP by workers (including subcontractors) require corrective action. As appropriate, this may include additional training, closer supervision, or disciplinary action.

17.2 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

Parsons corporate health and safety policy and compliance are attached in Attachment B-6.

18 LOGS, REPORTS, AND RECORD KEEPING

18.1 LOGS

The SHSO will keep a log recording the following aspects related to safety at the site:

- Training (initial site specific training, safety briefings, etc).
- Site visitors.
- Issues or Problems Encountered.
- Accidents.
- Emergencies.

18.2 SAFETY LOG

The SHSO will maintain a daily safety log of all safety related activities. The following information will be maintained in the Safety Log:

- Date and recorder of log;
- Safety briefings (time conducted, material discussed, etc.);
- Weather conditions;
- Significant site events relating to safety;
- Accidents;
- Stop work events related to safety;
- Safety audits; and
- Signature of the Field Supervisor indicating concurrence.

18.3 TRAINING LOG

The SHSO will maintain a training log documenting the following information:

- Date and recorder of log;
- Nature of training (personnel will complete the appropriate documentation of training form);
- Visitor training; and
- Signature of both the PM and SHSO indicating concurrence.

18.4 EQUIPMENT MAINTENANCE LOG

The SHSO will document all information related to safety equipment maintenance, calibration, and standardization in his Daily Journal.

18.5 REPORTS

18.5.1 Man-Hours and Lost Workday Reporting

Man-hours and lost workday (LWD) cases will be submitted to the Contracting Officer monthly with copy furnished the U.S. Army Engineering and Support Center, Huntsville (USAESCH), ATTN: CEHNC-ED-SY-S. The data will be submitted to arrive at the USAESCH not later than 10 calendar days after the end of each month. The information cut-off date will be the last day of each month. The monthly submission shall include the title of the report, contract number, task order number, project site, month and year for which the report is made, a point of contact listing both email address and telephone number, and number of lost workday accidents to include total days lost. If no hours are worked on the project/task, a report showing "zero (0)" is required.

18.5.2 Accident Reporting

Accidents involving personal injury/illness or property damage shall immediately be reported to the Contracting Officer or authorized representative e.g., Huntsville Center Project Manager. Accident Reports - An Engineer Form 3394 is required to prepared and submitted in reporting lost work day cases, accidents where 3 or more persons are admitted to a hospital, a fatality, or property damage $2000 or greater. The ENG Form 3394 must be submitted to the Contracting Officer or authorized representative within 5 working days following the accident in accordance with AR 385-40 and USACE Supplement 1 to that regulation. The ENG Form 3394 is prepared by the PHSO/SHSO, with original signatures shown in blocks 15c and 16 (copies/faxes are not acceptable). The remaining signature blocks, blocks 17 -19, will be completed by the Huntsville Engineering Center.

Accidents and near misses will be investigated by the SHSO and the site manager. The investigation team shall make recommendations for preventing a recurrence of the accident or incident and submit the accident report to the project health and safety officer and the office health and safety representative. The accident report shall be retained on file at the site, in the project files and in office health and safety files. All accidents or incidents that are recordable will be entered on the OSHA 200 log maintained in the Parsons office.

The office health and safety officer and the project health and safety officer shall review the accident report and approve or make additional recommendations for prevention of the future occurrence of the incident. The project health and safety officer shall ensure that remedial recommendations are carried out by the filed staff..

18.6 RECORD KEEPING

The SHSO will establish and maintain a filing system on-site for Health and Safety records, reports, and information concerning individual training, medical surveillance, etc. Sections in this filing system will include:

- Training Records -- Certificates for training required by 29 CFR§1910.120 (40-hour initial HAZWOPER, 8-hr refresher, and supervisory training) will be maintained at the site. Additionally, documentation of CPR, First Aid, and DoD ordnance training will be available at the site.
- Medical Monitoring -- Documentation of current enrollment (within last 12 months) in a medical monitoring program will be available for each employee working at the site. Documentation will consist of the employee's Health Status Report that is written and signed by the examining physician.
- Accident Reports -- Copies of any accident/incident reports and follow-up reports.
- Plan Acceptance Forms -- Copies of the Plan Acceptance Forms documenting that employees have read and understand the HSP will be maintained at the site.

Documentation of personnel credentials, site activities, and environmental monitoring will be maintained on-site. The SHSO will maintain and update these records. Documentation, at a minimum, shall include:

- Certificates for the following:
  - Initial 40-hour Hazardous Waste Operations and Emergency Response Training.
  - Applicable annual 8-hour refresher health and safety training.
  - Applicable 8-hour supervisory Hazardous Waste Operations and Emergency Response Training.
  - On-the-job training, 3-day.
- First Aid and CPR.
- DoD Explosive Training.
- OSHA Job Safety and Health Protection Poster: A copy of this poster shall be hung in the field office or in an area where employees routinely congregate.

- The OSHA 300log: This log contains the required information for recording on-site injuries and illnesses, and must be generated by each company safety contact. A copy shall be maintained on-site and posted during the month of February.
- Site sign-in sheet: This record shall contain the date, name of each individual on-site, the employer, and the time entering and leaving the site. All personnel will sign this form.
- Accident/incident/near miss reports: All accidents, safety/health incidents, and near misses shall be investigated, and investigation reports shall be maintained at the site.
- A Site Health and Safety Plan Acknowledgment form containing the date, names of the individuals, the employer, and the individuals' signature.
- The initial site-specific health and safety training record containing the date, the individuals' names and signatures, and the company they are representing.
- The Safety Meeting Record containing the date, topic discussed, individuals' names and signatures, and the company they are representing.
- Safety problem/observations: These records: 1) document unsafe behavior and initiate disciplinary action, and 2) document exemplary safety behavior.
- The health and safety inspection log completed daily to verify that site conditions and activities are in compliance with the HSP. Deficiencies will be noted and changes made immediately.
- The safety and health program plan required under 29 CFR §1910.120(b).

19 STANDARD OPERATING PROCEDURES FOR SITES WITH UNEXPLODED ORDNANCE

Some SEDA SWMU areas (as listed in Table B-1) may be contaminated with UXO components and UXOs. Basic considerations for unexploded explosive ordnance operations are provided in Attachments B-7 and B-8. This section presents standard operating procedures for the sites with potential UXO hazards.

19.1 REGULATIONS

The following regulations and references were observed to prepare the standard operating procedures for the sites with potential UXO hazards:

- EP 1110-1-18, Ordnance and Explosive Response.
- EP 75-1-2, UXO Support During HTRW and Construction Activities.
- EP 385-1-95a, Basic Safety Concepts and Considerations for OE Operations.
- EM 385-1-1, Safety and Health Requirements Manual.

19.2 RESPONSIBILITIES

UXO/OE Safety Officer (UXOSO) will be responsible for all UXO safety on site. The UXOSO has stop work authority in the event a UXO item is discovered, and for all UXO related matters.

19.3 STANDARD OPERATING PROCEDURE

All UXO contractor EOD operations will be performed in accordance with the following procedures:

1. **UXO Contractor Explosive Ordnance Disposal Services** - The specific services to be performed in support of this project are listed below. It should be noted that the services are orientated to site safety during evaluation of the applicable SWMUs.

   a. **Unexploded Ordnance Safety Training** - In accordance with 29 CFR Part 1910.120 paragraph (e), the UXO contractor will develop an Unexploded Ordnance (UXO) Safety Training class that will be provided to the prime contractor for the training of all personnel who will be working on the site. This class will include an instructional guide and handouts for workers on the site.

   b. **UXO Inspection of the Sampling Sites** - The UXO contractor will provide the personnel and equipment required to inspect the access routes and sampling sites for UXOs. The UXO contractor will physically preview the footprint with the equipment operator and/or the site manager and discuss visual observations and any area of concern. The UXO contractor will conduct an anomaly check of any areas requiring excavation with a magnetometer. All soil boring and test pit excavation activities will be continually monitored by the UXO contractor. The magnetometry equipment utilized by the UXO

contractor will be capable of detecting both ferrous and nonferrous objects however, heavy metallic contamination will greatly hinder operations on the site.

(1) **Marking Access Routes and Sampling Site Boundaries** - Dependant upon the equipment size and quantity being brought into a sampling site, a 10' to 20' wide access route will be searched for UXOs. The boundaries of the access route will be marked at 25' intervals with orange survey flags. As with the equipment considerations for the access route, the size of the sampling area may range from an area 50' x 50' in size.

(2) **Marking and Handling of UXOs** - In addition to the ordnance items disposed at some SWMUs, it can be expected that "ordnance kick-outs" from demolition can be expected to be found on site. All explosive loaded UXOs will be marked with yellow survey flags.

c. **UXO Contractor EOD Site Procedures** - The following practices are standard UXO contractor EOD procedures used on DOD installations throughout the United States. The UXO contractor EOD search team [consisting of two EOD technicians of which one will be a UXO Supervisor as described in the Work Standards for Unexploded Ordnance (UXO) Personnel (Attachment B-7) will conduct a visual surface and electronic subsurface UXO search of the access route and sampling site. In conjunction with the UXO search, the UXO contractor EOD will perform the following steps:

(1) Identify and mark the boundaries of the access route and sampling site areas that will require UXO search operations. When soil boring, the UXO contractor will check the hole with a down-hole magnetometer. The hole will be checked at a minimum of every two feet of depth. If an anomaly is discovered, the team will select an alternate, anomaly-free location to bore. Once UXO has been encountered in an excavation, no further excavation is allowed at that location until a UXO removal action has been conducted of the area.

NOTE: Hand excavation is the preferred method of excavation for buried UXOs; however, if a UXO is buried at a depth estimated to be greater than 12 inches, a backhoe will be used if necessary. Earth moving machinery will not be used to excavate within 12 inches of an UXO. When an excavation is within 12 inches of an UXO hand excavation shall be used to uncover the UXO. All excavations performed by the UXO contractor will be in compliance with 29 CFR Part 1926 and EM 385-1-1.

(2) Using visual surface locations techniques, electronic subsurface techniques and excavation as required, locate and identify UXOs within the boundaries of the

access route and sampling site.

(3) When an explosive, chemical, propellant, or pyrotechnic loaded UXO is located the following steps will be followed:

(a) Mark the UXOs location with a yellow marker flag;

(b) Select a course safely around the item and cease operations in the immediate area. If necessary, cease all operations. The site manager will be notified of any UXO discoveries, and will make the appropriate notifications;

(c) Determine the type of UXO, i.e. projectile, rocket, bomb, etc.;

(d) Determine the condition of the UXO (Armed or Unarmed); and

(e) Determine which of the following explosive/hazard categories is applicable:

1 High Explosive (HE);
2 High Explosive Anti-Tank (HEAT);
3 Armor Piercing High Explosive (APHE);
4 Improved Conventional Munition (ICM);
5 Anti-Personnel Ejection Round Special (APERS);
6 White/Red Phosphorous; and
7 Other.

(f) Determine which of the following fuzing categories is applicable:

1 Point Detonating (PD);
2 Base Detonating (BD);
3 Point Initiating Base Detonating - Lucky (PIBD-Lucky);
4 Mechanical Time (MT);
5 Electronic Time (ET);
6 Proximity (VT);
7 Powder Train Time Fuze (PTTF); and
8 All-Ways Acting (as in the 40 mm grenade system).

NOTE: If the site contains numerous UXOs, report the initial UXO located and continue search operations. Perform all of the steps outlined in paragraphs 1.c(3). through 1.c(3)(e)8. and then report the total number located at the end of the day.

(g) Report the UXO to the Contractor Representative and Government Representative with project oversight responsibility.

(4) In the event that the Contractor or Government Representative requests movement

of the UXO(s), the following is applicable for UXO contractor operations on SEDA (The Government representative may request that the UXOs be moved only if he/she is a CEHND Safety Specialist or the Government representative involves a CEHND Safety Specialists in the request):

(a) If the Contractor Representative requests that the UXO(s) be moved, refer this individual to the Government Representative having oversight of the project. The Contractor Representative does not have authority to direct the movement of UXOs on the project site.

(b) Upon request of the Government Representative (who is either a CEHND Safety Specialist or directly involves a CEHND Specialist), the UXO contractor EOD Team Leader will reevaluate the UXO(s) to determine which if any can be moved.

NOTE: Very careful evaluation of the UXO will be required. As a rule, ordnance items with attached fuzing systems which have been exposed to fire or a detonation are not to be moved and must be destroyed in place. The UXO contractor EOD Team Leader is the only person with the authority to make the decision of whether or not the UXO contractor EOD personnel will move an UXO.

(c) Unarmed/Unfired UXOs - Any UXO which has not been fired/launched or experienced any other actions (exposed to fire or detonations) required to put the UXO in an armed condition.

1 If the UXO in the unarmed/unfired condition includes any positive safety devices (safety pin/clip, electrical shunts, etc.), and these items are missing, the UXO shall be considered to be armed.

2. If the unarmed/unfired UXO has been damaged by fire or has other physical damage, it shall be considered to be armed.

(d) Armed UXO - Any UXO which has experienced the required actions to place it in an armed condition.

NOTE: Only unarmed and armed UXOs that are determined to be safe to move will be moved. Under no circumstances will any of the following UXOs be moved:

- **HEAT with a PIBD -Lucky fuzing system;**
- **Any munition with a Mechanical Time (MT) Fuze;**
- **Any munition with a fuze containing an Impact back-up (graze feature);**
- **Any munition containing an All-Ways Acting fuze (asin the 40 mm grenade system); and**
- **Any munition that you can not determine the type of fuze or if it is safe to move.**

(e) Based on the field evaluation of the UXO(s) by the UXO contractor EOD Team Leader a final decision will be made if the UXO is safe to move. If the UXO contractor EOD Team leader determines that the UXO(s) can safely be moved, the following procedures will be followed:

1. Establish an UXO explosive holding area. This area must be separate from the nonexplosive loaded ordnance component holding area;
2. This holding area will be a minimum of 100 meters from any structures, power lines, and equipment;
3. The holding area will be clearly marked with yellow flags on its four (4) corners;
4. The location of the UXO holding area will be identified to both the contractor and Government site representatives;
5. The UXO(s) will be moved one (1) at a time and in the proper attitude;
6. Except as indicated below, the UXO(s) should be moved to the holding area by hand. If required, both EOD technicians will carry the UXO(s) to the holding area;
7. Large UXOs (155 mm and above) may be transported by vehicle (backhoe, front end loader, etc.) to the holding area; and
8. A record of all UXOs placed in the explosive holding area will be maintained by the UXO contractor EOD Team Leader.

(5) Nonexplosive loaded ordnance components will be collected and stored in a designated location for pick up by SEDA Range Operations personnel at their convenience. Items in this category would include but not be limited to the following types of ordnance/residue:

NOTE: The location of items too large to be moved by hand will be reported

to the SEDA Range Operations Personnel for collection at a later date.

(a) Armor Piercing (AP) projectiles;
(b) Empty ejection munitions;
(c) Spent rocket motors (when found separated from warheads); and
(d) Nonexplosive loaded training munitions.

(6) A record of all UXOs will be maintained in a log book.

(7) Upon completion of UXO search operations, a UXO Density Report will be provided to the Contractor and Government Representatives.

2. **Sampling Operations** - During sampling operations, the UXO contractor will provide EOD services as needed. Some of the required additional EOD services normally provided on projects of this nature are listed below:

a. **Borehole Magnetometry** - For safety purposes, soil and well boreholes are normally checked with the UXO contractor's Förster Ferex® 4.021 (Mk 26 Mod 0) Ordnance Locator. This is a USACOE requirement that all boreholes in areas that are possibly contaminated with UXOs must be rechecked at 2' or 4' intervals during drilling operations.

NOTE: The requirement for rechecking the boreholes at 2' and 4' foot intervals can be eliminated if remote drilling equipment is used.

b. **Collection of Samples** - In areas of heavy UXO contamination, the UXO contractor EOD technicians can collect samples with hand augers or similar equipment. This eliminates the requirement to expose other contractor personnel in high hazard areas.

c. **Excavation Services** - In some cases excavation of trenches for a cross section study of the soil or to obtain samples may be required. Normally the trenching is accomplished with a backhoe. Because of the high level of hazards from the UXOs in the area, the UXO contractor will provide EOD operators for the backhoe. The UXO contractor's technicians are experienced in this area and are familiar with all aspects from sample collection to equipment decontamination between sampling sites.

19.4 GENERAL ORDNANCE SAFETY

- The cardinal principle to be observed involving explosives, ammunition, severe fire hazards or toxic materials is to limit the exposure to a minimum number of personnel,

for the minimum amount of time, to a minimum amount of hazardous material consistent with a safe and efficient operation.

- Consider ordnance that has been exposed to fire as extremely hazardous. Chemical and physical changes may have occurred to the contents that render it more sensitive than it was in its original state.

- If a suspected or known chemical weapons material (CWM) item is encountered, evacuate the area immediately upwind. Notify the PM, who will in turn make the appropriate notifications.

- **DO NOT** touch or move any ordnance items regardless of the marking or apparent condition.

- **DO NOT** visit an ordnance site if an electrical storm is occurring or approaching. If a storm approaches leave the site immediately and seek shelter in a building or vehicle well away from the project site but a minimum of a distance outside the MSD.

- **DO NOT** use radio or cellular phones in the vicinity of suspect ordnance items unless approved to do so by the senior UXO technician on site.

- **DO NOT** drive vehicles into a suspected OE area; use clearly marked lanes.

- **DO NOT** carry matches, cigarettes, lighters or other flame producing devices into an OE site. During operations, these materials may be stored in a central location for use during breaks conducted in authorized smoking areas.

- Always assume ordnance items contain a live charge until it can be determined otherwise.

Table B-1
SWMUs Planned for RI/FS and Other Investigations
Seneca Army Depot Activity
Romulus, New York

SWMU NUMBER	SWMU NAME	Potential Rad or UXO Hazard?	SWMU NUMBER	SWMU NAME	Potential Rad or UXO Hazard?
SEAD-1	Building 307 – Hazardous Waste Container Storage Facility	None	SEAD-52	Buildings 608 and 612 - Ammunition Breakdown Area	None
SEAD-3	Incinerator Cooling Water Pond	None	SEAD-53	Munitions Storage Igloos	None
SEAD-2	Building 301 – PCB Transformer Storage Facility	None	SEAD-54	Asbestos Storage	None
SEAD-4	Munitions Washout Facility Leach Field	None	SEAD-55	Building 357 – Tannin Storage	None
SEAD-5	Sewage Sludge Waste Piles	None	SEAD-56	Building 606 - Herbicide and Pesticide Storage	None
SEAD-6	Abandoned Ash Landfill	None	SEAD-57	Explosive Ordnance Disposal Area	UXO
SEAD-7	Shale Pit	None	SEAD-58	Debris Area Near Booster Station 2131	None
SEAD-8	Non-Combustible Fill Area		SEAD-59	Fill Area West of Building 135	None
SEAD-9	Old Scrap Wood Site	None	SEAD-60	Oil Discharge Adjacent to Building 609	None
SEAD-10	Present Scrap Wood Site	None	SEAD-61	Building 718 - Underground Waste Oil Tank	None
SEAD-11	Old Construction Debris Landfill	None	SEAD-62	Nicotine Sulfate Disposal Area Near Buildings 606 or 612	None
SEAD-12	Radioactive Waste Burial Sites	Rad	SEAD-63	Miscellaneous Components Burial Site	Rad
SEAD-13	IRFNA Disposal Site	None	SEAD-64A, B, C, D	Debris Landfill South of Storage Pad	None
SEAD-14	Refuse Burning Pits (2 Units)	None	SEAD-65	Acid Storage Areas	None
SEAD-15	Building 2207 - Abandoned Solid Waste Incinerator	None	SEAD-66	Pesticide Storage Near Building 5 and 6	None
SEAD-16	Building S-311 – Abandoned Deactivation Furnace	UXO	SEAD-67	Dump Site East of Sewage Treatment Plant No. 4	None
SEAD-17	Building 367 – Existing Deactivation Furnace	UXO	SEAD-68	Building S-335 – Old Pest Control Shop	None
SEAD-18	Building 709 - Classified Document Incinerator	None	SEAD-69	Building 606 - Disposal Area	None
SEAD-19	Building 801 – Classified Document Incinerator	None	SEAD-70	Building 2110 - Fill Area	None
SEAD-20	Sewage Treatment Plant No. 4	None	SEAD-71	Alleged Paint Disposal Area	None
SEAD-21	Sewage Treatment Plant No. 715	None	SEAD-72	Building 803 - Mixed Waste Storage Facility	None
SEAD-22	Sewage Treatment Plant No. 314	None	SEAD-119A	Building 2409 Sewage Spill	None
SEAD-23	Open Burning Ground	UXO	SEAD-120A	50 Area Dumpling Areas	None
SEAD-24	Abandoned Powder Burning Pit	None	SEAD-120B	Ovid Road Small Arms Range	UXO
SEAD-25	Fire Training and Demonstration Pad	None	SEAD-120C	Building 813-817 Paints and Solvents Disposal Areas	None
SEAD-26	Fire Training Pit and Area	None	SEAD-120D	MP Refueling Island in the Q	None
SEAD-27	Building 360 – Steam Cleaning Waste Tanks	None	SEAD-120E	Near Building 2131, Possible DDT Disposal	None
SEAD-28	Building 360 – Underground Waste Oil Tanks	None	SEAD-120F	Munitions Burial Sites, South End of the Main Depot	None
SEAD-29	Building 732 - Underground Waste Oil Tanks (2 units)	None	SEAD-120G	Mounds at the Duck Pond	None
SEAD-30	Building 118 – Underground Waste Oil Tank	None	SEAD-120H	Building 810	None

Table B-1
SWMUs Planned for RI/FS and Other Investigations
Seneca Army Depot Activity
Romulus, New York

SWMU NUMBER	SWMU NAME	Potential Rad or UXO Hazard?	SWMU NUMBER	SWMU NAME	Potential Rad or UXO Hazard?
SEAD-31	Building 117 – Underground Waste Oil Tank	None	SEAD-120I	Building 819, A0101, and A0102	None
SEAD-32	Building 718 – Underground Waste Oil Tanks	None	SEAD-120J	Farmer's Dump	None
SEAD-33	Building 121 – Underground Waste Oil Tanks	None	SEAD-121A	USCG Halon Discharge	None
SEAD-34	Building 319 – Underground Waste Oil Tank	None	SEAD-121B	Building 325 PCB Oil Spill	None
SEAD-35	Building 718 - Waste Oil-Burning Boilers (3 units)	None	SEAD-121C	DRMO Yard	None
SEAD-36	Building 121 – Waste Oil Burning Boilers (2 units)	None	SEAD-121D	Building 306 and 308 Hazardous Materials Release	None
SEAD-37	Building 319 – Waste Oil Burning Boilers (2 units)	None	SEAD-121E	Building 127 UST Petroleum Release	None
SEAD-38	Building 2079 - Boiler Plant Blowdown Leach Pit	None	SEAD-121F	Building 135 Stained Oil	None
SEAD-39	Building 121 – Boiler Plant Blowdown Leach Pit	None	SEAD-121G	Rumored Coal Ash Disposal Area	None
SEAD-40	Building 319 – Boiler Plant Blowdown Leach Pit	None	SEAD-121H	Rumored Coal Disposal Area	None
SEAD-41	Building 718 - Boiler Plant Blowdown Leach Pit	None	SEAD-121I	Rumored Cosmoline Oil Disposal Area	None
SEAD-42	Building 106 – Preventative Medicine Laboratory	None	SEAD-122A	Skeet/Trap Range	UXO
SEAD-43	Building 606 - Old Missile Propellant Test Laboratory (Related to SEAD-56)	None	SEAD-122B	Building 2302 Small Arms Range	UXO
SEAD-44A	Quality Assurance Test Laboratory - West of Building 616	UXO	SEAD-122C	Near Building 2311 Conex with Unknown Contents	None
SEAD-44B	Quality Assurance Test Laboratory - Brady Road	None	SEAD-122D	Hot Pad Spill	None
SEAD-45	Demolition Area	UXO	SEAD-122E	Deicing Planes	None
SEAD-46	Small Arms Range	UXO	SEAD-123A	Building 744 Indoor Firing Range	None
SEAD-47	Building 321 and 806 – Radiation Calibration Source Storage	None	SEAD-123B	Building 716 and 717 Petroleum Releases	None
SEAD-48	Pitchblend Storage Igloos	Rad	SEAD-123C	Building 747 HM Spills	None
SEAD-49	Building 356 – Columbite Ore Storage	None	SEAD-123D	Area West of Building 715	None
SEAD-50	Tank Farm	None	SEAD-123E	Rumored DDT Burial at Ice Rink	None
SEAD-51	Herbicide Usage Area – Perimeter of High Security Area	None	SEAD-123F	Mound North of Post 3	None

SWMU list obtained from SWMU Classificaiton Report (Parsons, 1994) and Investigation of Environmental Baseline Survey Non-Evaluated Sites (Parsons, 1999).

Table B-2
SEDA Contaminants and Characterization
Seneca Army Depot Activity
Romlus, New York

Contaminants of Concern	Range of Maximum Concentrations[1]	Media	SWMUs Where Maximums Were Observed in the Listed Range
METALS			
Antimony	52 - 285 mg/kg	Soil	SEAD-11, SEAD-17
Arsenic	56 - 151 mg/kg	Soil	SEAD-24, SEAD-50
	12.2 - 17.8 mg/kg	Sediment	SEAD-25, SEAD-26, SEAD-57
Cadmium	12.1 - 24 mg/kg	Soil	SEAD-63 and SEAD-71
	28.6 mg/kg	Sediment	SEAD-57
Chromium	60.7 - 3820 mg/kg	Soil	SEAD-4 and SEAD-50
Copper	35.2 - 2930 mg/kg	Soil	SEAD-4, SEAD-11, SEAD-13, SEAD-16, SEAD-17, SEAD-24, SEAD-26, SEAD-46 SEAD-50, SEAD-57, SEAD-71
	44.4 - 1160 mg/kg	Sediment	SEAD-12, SEAD-26, SEAD-57
Lead	522 - 140,000 mg/kg	Soil	Ash Landfill, SEAD-11, SEAD-17, SEAD-26, SEAD-46, SEAD-57, SEAD-71
Mercury	0.37 - 11.4 mg/kg	Soil	SEAD-16, SEAD-17, SEAD-50, SEAD-59, SEAD-64, SEAD-71
	1.7 mg/kg	Sediment	SEAD-12
Zinc	152 - 14,600 mg/kg	Soil	SEAD-11, SEAD-12, SEAD-16, SEAD-17, SEAD-24, SEAD-50, SEAD-57, SEAD-59, SEAD-71
	487 - 2760 mg/kg	Sediment	SEAD-12 and SEAD-57
VOCs			
Trichloroethene	46 - 42,000 ug/kg	Soil	Ash Landfill, SEAD-11
	599 - 1600 ug/L	Groundwater	Ash Landfill, SEAD-12
cis-1,2-dichloroethene	47 ug/kg	Soil	Ash Landfill
	67 ug/L	Groundwater	Ash Landfill
Vinyl Chloride	28 ug/kg	Soil	Ash Landfill
	81 ug/L	Groundwater	Ash Landfill
BTEX	151,810 ug/kg	Soil	SEAD-25
	6220 ug/L	Groundwater	SEAD-25
SVOCs			
Total Carcinogenic PAHs			
	57,330 - 570,000 ug/kg	Soil	SEAD-11, SEAD-26, SEAD-71
	179 - 90,000 ug/kg	Sediment	SEAD-16, SEAD-17, SEAD-25, SEAD-26, SEAD-50
RADIATION			
Investigations are ongoing at SEAD-12, SEAD-63, and SEAD-48.			

Note:

1. Range of Maximum Concentrations - Range of maximum concentrations observed at the specified Solid Waste Management Units (SWMUs).

   Data values were taken from Table 1 in a report prepared for New York State Electric and Gas (NYSEG) (Parsons, January 2002).

TABLE B-3

ACTIVITY HAZARD ANALYSIS

Seneca Army Depot Activity
Romulus, New York

Activity: GENERAL RI/FS ACTIVITIES INCLUDING TEST PIT EXCAVATION, SOIL BORING AND MONITORING WELL INSTALLATION, AND SOIL AND GROUNDWATER SAMPLING

Principal Steps	Potential Hazards	Controls
General Site Activities	Site Hazardous Material Exposure	Training and safety awareness of potential exposure to contaminants at the site. Training of personal decontamination procedure. Appropriate PPE. Monitoring of VOCs, air particulates, or other chemicals if warranted.
	Cold and Heat Stress Injuries	SHSO to implement heat stress/cold injury control program in accordance with the work plan.
	Tripping Hazards	Personnel awareness of potential slippery surfaces and tripping hazards. Inform field coordinator or SHSO of any slip, trip, or fall hazards.
	Biological Hazard (ticks, bees, snakes, spiders, etc.)	Personnel awareness of potential exposure to biological hazards. Use tick spray before entering the exclusion zone. Appropriate clothing (hat, long pants, gloves, and boots).
	Motorized/Pedestrian Traffic	Personnel exercise caution while working in the vicinity of a street and near vehicular traffic. Working area shall be blocked off from vehicles and pedestrians.
	Injury from Material Lifting	Personnel awareness of potential hazards from day-to-day material lifting.
	Injury from Hand Tool Operation	Personnel awareness of potential hazards from hand tool operation. SHSO will ensure that all tools used on site are in proper working order and are in good condition. Personnel to inform SHSO or project manager if tools require repair or replacement. Requirements outlined in EM385-1-1 Section 13 will be observed.

Principal Steps	Potential Hazards	Controls
Test Pit Excavation, Soil Boring and Groundwater Monitoring Well Installation	Injury from Heavy Equipment or Equipment Roll Over	Operation of heavy equipment in accordance with the work plan. Spotter and equipment operator will maintain close communication. Spotter will ensure that his actions are clear to the operator at all times. Provide warning systems such as mobile equipment, barricades, hand or mechanical signals, or stop logs, to alert operators of the edge of an excavation. Use hardhat (as required). Personnel will generally remain 3 to 5 feet away from the test pit excavation or drilling operation areas except when samples are being collected. Personnel will remain watchful of activities in the area immediately surrounding the drill rig.
	Site Hazardous Material Exposure	Training and safety awareness of potential exposure to contaminants at the site. Training of personal decontamination procedure. Appropriate PPE. Monitoring of VOCs, air particulate, or other chemicals if warranted.
	Injury from Power Tool Operation	Personnel awareness of potential hazards from power tool operation. Power tools will be inspected prior to use and will be maintained and adjusted by qualified personnel. Personnel to inform SHSO if tools require repair or replacement. Operations will be conducted by authorized and trained personnel. Other personnel shall stay away from the operation area. Requirements outlined in EM385-1-1 Section 13 will be observed.
	Fire Hazards	Personnel awareness of potential fire hazards. EM385-1-1 Section 9 will be observed.
	Motorized/Pedestrian Traffic	Personnel exercise caution while working in the vicinity of a street and near vehicular traffic. Test pits will be blocked off from general traffic to prevent hazards.
	Noise	Hearing protection will be worn in hazardous noise areas.

Principal Steps	Potential Hazards	Controls
Soil and Groundwater Sample Collection	Injury from improper use of sampling instruments.	SHSO will ensure that all tools used on site are in proper working order and are in good condition. Personnel to inform SHSO or project manager if tools require repair or replacement.
	Sample Preservative Exposure	Training and safety awareness of potential exposure to corrosive or flammable sample preservatives. Appropriate PPE (safety glasses, gloves, and boots).
	Soil and Groundwater Hazardous Material Exposure	Training and safety awareness of potential exposure to contaminants in soil and groundwater. Training of personal decontamination procedure. Appropriate PPE. Monitoring of VOCs, air particulates, or other chemicals if warranted.
Excavated Soil and Expelled Groundwater Loading In Drums	Noise	Hearing protection will be worn in hazardous noise areas. Requirements outlined in EM385-1-1 Section 5 will be observed.
	Injury from Heavy Equipment or Equipment Roll Over	Operation of heavy equipment in accordance with the work plan. Spotter and equipment operator will maintain close communication. Spotter will ensure that his actions are clear to the operator at all times. Provide warning systems such as mobile equipment, barricades, hand or mechanical signals, or stop logs, to alert operators of the edge of an excavation. Use hardhat (as required).

Principal Steps	Potential Hazards	Controls
Radiological Hazard Exposure (Potential radiological hazard exposure exits in all the principal steps listed in this table at sites with potential radiological hazard.)		Training and safety awareness of radiological hazards during site-specific training. All personnel will be required to complete the Radiation Safety Training prior to being allowed to work on site. The training class will be refreshed annually. All field inspectors will be provided training in the use of hand-held radiation meters prior to their assignment as lead representative on a survey crew. Surface pre-screening the area will be conducted to determine radiation levels that are present before allowing any site work. The proposed investigation methodology will be reviewed and modified in the event that elevated levels of radiation are found. When intrusive activities are in progress, field inspector will measure and record the radiation level present in the designated work zone at the beginning of each day and periodically during the workday. Work will be suspended if radiation levels exceed two times background. All personnel will wear personal radiation dosimeters during the work at the sites with potential radiological hazard. Radiological monitoring of soils and groundwater raised to the ground surface during the well installation, soil boring, and sampling will be performed and recorded periodically. All personnel and equipment shall be decontaminated and frisked using the Geiger-Mueller pancake-type detector prior to leaving the work area and prior to eating, smoking, or drinking. Personnel will wear TLDs
Unplanned Detonation (unplanned detonation hazard exposure exits in all the principal steps listed in this table at sites with potential UXO hazard.)		UXO awareness training provided by SSHO or PSHO. Personnel within the exclusion zone will observe EP 385-1-95a, Basic Safety Concepts and Consideration for OE, dtd Jun 01. Only UXO technicians will handle OE/UXO/Demolition material. Personnel, in the immediate vicinity of the operations, will be kept to the minimum necessary for safe operations. Dig team or SSHO will stop all operations when **non-essential** personnel are in the exclusion zone.

Equipment/Materials to be Used: The following equipment/materials or other equipment/materials will be used if deemed appropriate: backhoe, drill rig, excavator, shoring tools, hand tools, split spoons, low-flow sampling pumps, photoionization detector, Geiger-Mueller pancake-type detector, Phoswich Alpha/Beta Detector, thermoluminescent dosimeter.

Inspection Requirements: Personnel will conduct a daily inspection of PPE and equipment. Equipment will be inspected prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, it is to be turned in for repair/replacement. All safety guards designed on equipment will remain in place. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced. During site set-up, equipment-generating noise will be monitored by the SHSO to determine whether or not hearing protection is required.

Training Requirements: All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). All persons performing UXO operations will be graduates of the U.S. Navy EOD School and approved by USAESCH. Before entering a confined space, all personnel will show proof of confined space training to the SSHO. Personnel will be trained in the safe use of required equipment and in the required PPE. All personnel operating heavy equipment will provide proof of competency with the equipment to the SHSO prior to operating the equipment.

APPROVED BY: Edward [illegible]
Corporate Health and Safety Officer

Table B-4
Health Hazard Qualities of Hazardous Substances of Concern
SENCA Army Depot, Romulus, New York

Compound	PEL [a] (ppm)	TLV [b] (ppm)	IDLH [c] (ppm)	Odor Threshold [d] (ppm)	Ionization Potential [e] (eV)	Physical Description/Health Effects/Symptoms
Metals						
Antimony	0.5mg/m3	0.5mg/m3	50mg/m3	NA	NA	Metal :Silver-white, lustrous, hard, brittle. Symptoms: irritation eyes, skin, nose, throat, and mouth
Arsenic	0.01mg/m3	0.01mg/m3	5mg/m3	NA	NA	Metal: Silver-gray or tin-white, brittle, odorless solid. Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, and hyperpigmentation of skin. Potential occupational carcinogen
Cadmium	0.005mg/m3	0.002mg/m3	9 mg/m3	NA	NA	Metal: Silver-white, blue-tinged lustrous, odorless solid. Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache. Possible carcinogen
Chromium III	0.5mg/m3	0.5mg/m3	25mg/m3	NA	NA	Appearance and odor vary depending upon the specific compound. Irritation eyes; sensitization dermatitis
Lead	0.05mg/m3	0.05mg/m3	100mg/m3	NA	NA	Heavy, ductile, soft, gray metal. Symptoms: weakness, lassitude , and insomnia
Mercury (metal)	0.1mg/m3 (ceiling)	0.025mg/m3	10mg/m3	NA	NA	Metal: Silver-white, heavy, odorless liquid. Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, and irritability
Nickle (elemental)	1.0mg/m3	1.5mg/m3	10mg/m3	NA	NA	Metal: Lustrous, silvery, odorless solid.Sensitization dermatitis, allergic asthma, pneumonitis; Potential carcinogen
Selenium (elemental)	0.2mg/m3	0.2mg/m3	10mg/m3	NA	NA	Amorphous or crystalline, red to gray solid. Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), and bronchitis.
VOCs						
Benzene	1ppm	0.5 ppm	500 ppm	97	9.24	Class IB Flammable Liquid. Symptoms-Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, and lassitude (weakness, exhaustion). Human carcinogen
Petroleum distallates	500 ppm	NA	1,100ppm	NA	ND	Colorless liquid with a gasoline- or kerosene-like odor. Flammable liquid. Symptoms-Irritation eyes, nose, throat; dizziness, drowsiness, headache,and nausea;
Toluene	200ppm	50ppm	500ppm	11	8.82	Colorless liquid with a sweet, pungent odor. Flammable liquid. Symtoms-Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, and headache
Xylene	100ppm	100ppm	900ppm	5.4 (ortho)	8.56	Colorless liquid with an aromatic odor. Class IC Flammable Liquid. Symptoms-Symptoms Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, and staggering gait
Trichloroethene	100ppm	100ppm	1000ppm	ND	9.45	Colorless liquid with a chloroform-like odor. Symptoms: irritation eyes, skin; headache,and vertigo.
cis-1,2-dichloroethene	200ppm	200ppm	1000ppm	ND	9.65	Colorless liquid with a slightly acrid, chloroform-like odor. Class IB Flammable Liquid. Symptoms:irritation eyes, respiratory system; central nervous system depressant/depression
Vinyl Chloride	1ppm	1ppm	ND	ND	9.99	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations.Flammable Gas. Symptoms: weakness; abdominal pain, gastrointestinal bleeding, and enlarged liver. Carcinogen
Semi-Volatiles						
PCBs (54% Chlorine)	0.5mg/m3	0.5mg/m3	5mg/m3	ND	ND	Colorless to pale-yellow, viscous liquid or solid.Symptoms-Irritation eyes, chloracne; liver damage; reproductive effects; Potential carcinogen
Coal tar pitch volatiles (PAHs)	0.2mg/m3	0.2mg/m3	80mg/m3	NA	NA	Black or dark-brown amorphous residue. Symptoms: dermatitis and bronchitis. Potential carcinogen
Ionizing Radiation	1.25 REM [f]	5REM [g]				refer to radiation protection section

a. PEL = Permissible Exposure Limit. OSHA-enforced average air concentration to which a worker may be exposed for an 8-hour workday without harm. Expressed as parts per million (ppm) unless noted otherwise. Some states (such as California) may have more restrictive PELs. Check state regulations.

b. TLV = Threshold Limit Value - Time-Weighted Average. Average air concentration (same definition as PEL, above) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), *2003 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*

c. IDLH = Immediately Dangerous to Life or Health. Air concentration at which an unprotected worker can escape without debilitating injury or health effects. Expressed as ppm unless noted otherwise. IDLH values are published in the *NIOSH Pocket Guide to Chemical Hazards*, 2000.

d. Geometric Mean values published in *Patty's Industrial Hygiene Volume 1, 2000*.

e. Ionization Potential, measured in electron volts (eV), used to determine if field air monitoring equipment can detect substance. Values are published in the *NIOSH Pocket Guide to Chemical Hazards*, 2000.

f. 1.25 Rems per calender quarter whole body exposure (refer to 1910.1096)

g. 5 Rems per year whole body exposure

mg/m3 = milligrams per cubic meter. NA = Not available. ND = Not determined.

Table B-5
Snake Identification Features

Feature	Poisonous	Non-Poisonous
Eye Pupils	Elliptical, or cat-like	Round
Sensing Pits	Pit between the eyelids and nostrils	No pit between the eyelids and nostrils
Teeth	Two enlarged teeth (fangs) in front of the upper jaw	All teeth are approximately the same size
Scales	Form a single row on the underside and below the tail	Arranged in a double row on the underside of the tail
Head	Head much wider than the neck	Head slightly wider than the neck
Tail	Single anal plate	Divided anal plate

TABLE B-6
RESPONSIBILITIES OF ON-SITE PERSONNEL

Title	General Description	Responsibility
Project Manager	Reports to upper-level management. Has authority to direct response operations. Assumes total control over site activities.	• Prepares and organizes the background review of the situation, the Work Plan, the Site-Specific Health and Safety Plan, and the field team. • Coordinates activities with appropriate officials. • Ensures that the Work Plan is completed and on schedule. • Briefs field team on their specific assignments. • Uses the SHSO/UXOSO/RXO to ensure that safety and health requirements are met. • Prepares the final report and support files on the response activities.
Project Health and Safety Officer	Advises the Project Manager, SHSO, UXOSO, and RSO on all aspects of health and safety.	• Approves final SHSP. • Confirms each Parsons team member's suitability for work based on physician's recommendation. • Conducts field safety and health audits to ensure Health and Safety Plan conformance and Parsons policy compliance. • Certifies that all workers have proper training as per 29 CFR §1910.120(e). Ensures that Parsons' and all subcontractors' protective clothing and equipment are properly stored and maintained.

TABLE B-6 (CONTINUED)
RESPONSIBILITIES OF ON-SITE PERSONNEL

Title	General Description	Responsibility
Site Health and Safety Officer (SHSO)	Reports to the PHSO on all aspects of Safety and Health on site. Performs day-to-day H&S tasks. Stops work if any operation threatens worker or public health and/or safety.	• Establishes work zones and controls access to these zones with UXOSO and RSO. • Controls entry and exit at the Access Control Points. • Confirms all contractor and field personnel's suitability for work, based upon OSHA and site specific medical and training requirements. • Conducts site-specific safety training prior to initiation of field activities. • Conducts daily safety meetings. • Investigates accidents/incidents and "near misses". • Enforces the "buddy" system. Maintains and calibrates safety monitoring equipment, and document calibration data in the monitoring or safety log. • Restricts site personnel from site activities if they exhibit symptoms of alcohol or drug use or illness. • Ensures personnel are monitored for signs of stress, such as cold exposure, heat stress, fatigue, and chemical exposure. • Implements the SHSP. • Knows emergency procedures, evacuation routes, and telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.

TABLE B-6 (CONTINUED)
RESPONSIBILITIES OF ON-SITE PERSONNEL

Title	General Description	Responsibility
Site Health and Safety Officer (SHSO) [continued]		• Coordinates decontamination procedures/provisions for medical care with U.S. Army Corps of Engineers (USACE) personnel. • Notifies USACE of emergency conditions. • Ensures that all required equipment is available. • Advises medical personnel of potential exposures and consequences. • Notifies emergency response personnel by telephone or radio in the event of an emergency. • Maintains logbook for site workers and visitors. • Acts as spokesperson if OSHA inspector arrives on site. • Conducts on-site training concerning pertinent H&S issues and new concerns. • Reports all accidents or H&S incidents to the PHSO and USACE. • Maintains the site safety and monitoring logs. • Acts as the On-Scene-Incident-Commander (OSIC) in the event of an emergency, notifies and coordinates off-site emergency and medical response agencies. • Coordinates with the local fire department and emergency medical services.

TABLE B-6 (CONTINUED)
RESPONSIBILITIES OF ON-SITE PERSONNEL

Title	General Description	Responsibility
UXOSO	Advises the Project Manager on all aspects of health and safety on site. Stops work if any operation threatens work or public health or safety.	• Implements and enforces the UXO/OE components of the SSHP. • Has STOP WORK authority for safety and health reasons. • Establishes work zones and controls access to these zones with SHSO and RSO.
Radiation Safety Officer (RSO)	Responsible for radiation safety during field activities	• Assures compliance with radiation protection standards • Determine radiation-monitoring procedures, prepares radiation training program, and selects appropriate PPE for ionizing radiation hazard.
Site Manager	Responsible for field team operations and safety	• Manages field operations. • Executes the Work Plan and schedule. • Has STOP WORK authority for safety and health reasons. • Coordinates with the UXOSO/RSO/PHSO in determining PPE level. • Enforces site control. • Serves as liaison with public officials. • Inspects personal protective equipment prior to, during and after each use.
Work Team	The work party must consist of at least two people	• Safely completes the onsite tasks required to fulfill the Work Plan. • Complies with the SHSP. • Notifies UXOSO, RSO, SHSO, or Site Manager of suspected unsafe conditions. • Inspects PPE prior to, during, and after each use.

TABLE B-7
DESCRIPTION OF PERSONAL PROTECTIVE EQUIPMENT
AND LEVELS OF PROTECTION

LEVEL D

- Standard work clothes with long pants;
- Hearing protection (when working around heavy equipment);
- Safety glasses when an eye hazard exists;
- Steel-toed boots when working around heavy equipment;
- Hard hat (when overhead hazard is present);
- Disposable Nitrile Gloves (Sampling operations)
- Leather gloves (drilling operations)

LEVEL C

- full-face air purifying respirator with organic vapor / P-100 cartridges
- Tyvek® coveralls with hood;
- Inner coveralls or other work clothes;
- Inner surgical gloves (Nitrile);
- Outer neoprene-rubber gloves;
- Steel-toed boots;
- PVC boot covers;
- Hard hat (as required when adjacent to heavy equipment);
- Hearing protection (as required when near heavy equipment);and
- Two-way radio

LEVEL B

- 30-minute SCBA with airline attachment
- Tyvek® coveralls with hood;
- Inner coveralls or other work clothes;
- Inner surgical gloves (Nitrile);
- Outer neoprene-rubber gloves;
- Steel-toed boots;
- PVC boot covers;
- Hard hat (as required when adjacent to heavy equipment);
- Hearing protection (as required when near heavy equipment);and
- Two-way radio

*OTHER MATERIALS MAY BE SPECIFIED TO PROVIDE BETTER PROTECTION WHEN WORKING WITH CERTAIN TYPES OF CHEMICALS.

TABLE B-8
ACTION LEVELS FOR CHANGES IN RESPIRATORY PROTECTION AND SITE EVACUATION

INSTRUMENT	LEVEL D	LEVEL C	LEVEL B	PROCEED WITH CAUTION	EVACUATE SITE
HNU (ppm)	<10	10-100	100-500		>500
OVA (ppm)	<10	10-100	100-500		>500
OXYGEN (%)	19.5-23	19.5-23	19.5-23		>23
LOWER EXPLOSIVE LIMIT (%)	<10	<10	<10	10< LEL<25	>25
RADIATION METER (mR/HR)	<0.5	<0.5	<0.5	0.5 mR<10	>5
AEROSOL MONITOR (mg/m3)	<1.0	1.0-10	10-50		>50

Volatile concentrations should be monitored at breathing height (5-5.5 ft) and the threshold levels are applicable to stable readings (e.g., readings that last more than 5 minutes).

TABLE B-9
SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATED WORKERS[a]

ADJUSTED TEMPERATURE[b]	NORMAL WORK ENSEMBLE[c]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-28.1°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)

[c] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

TABLE B-10
PERMISSIBLE WBGT HEAT EXPOSURE THRESHOLD LIMIT VALUES

Work – Rest Regimen	*WORK LOAD*		
	Light*	**Moderate**	**Heavy**
Continuous work	86 (30.0)	80 (26.7)	77 (25.0)
75% Work - 25% Rest, each hour	87 (30.6)	82 (28.0)	78 (25.9)
50% Work - 50% Rest, each hour	89 (31.4)	85 (29.4)	82 (27.9)
25% Work - 75% Rest, each hour	90 (32.2)	88 (31.1)	86 (30.0)

* Consult the ACGIH TLV booklet for definitions of Light, Moderate and Heavy workloads. Values are given in °F and (°C) WBGT, and are intended for workers wearing single layer summer type clothing. Use of semi or totally impermeable clothing require monitoring IAW the OES Heat Stress Prevention Program. As workload increases, the heat stress impact on a nonacclimated worker is exacerbated. For nonacclimated workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5°C.

TABLE B-11
MEASURES FOR LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2:	Outer Garment, Boots and Gloves Wash and Rinse	Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boots and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask	If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Outer Garment Removal	Remove outer garment. Place on plastic for further cleaning or in barrel for disposal.
Station 6:	Face Piece Removal	Facepiece is removed. Avoid touching face with fingers, Facepiece deposited on plastic sheets.
Station 7:	Inner Boot and Glove Removal	Boots and inner gloves removed an deposited in separate containers lined with plastic.
Station 8:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

TABLE B-12
MEASURES FOR LEVEL B DECONTAMINATION

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2:	Outer Garment, Boots	Scrub outer boots, outer gloves and splash suit and Gloves Wash and Rinse decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boots and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	If worker leaves exclusive zone to change air tank, this is the last step in the decontamination procedure. Worker's canister air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	SCBA Removal	SCBA backpack and facepiece is removed. Avoid touching face with finger. SCBA deposited on plastic sheets.
Station 6:	Outer Garment Removal	Remove outer garments. Place on plastic for further cleaning or in barrel for disposal.
Station 7:	Inner Boot and Glove Removal	Boots and inner gloves removed and deposited in separate containers lined with plastic.
Station 8:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

TABLE B-13
EMERGENCY TELEPHONE NUMBERS

CONTACT	NAME	PHONE
State Police, Fire, Ambulance		911
Corporate Health and Safety Officer	Edward Grunwald	1-678-969-2394
Program Manager	Todd Heino	1-617-457-7905
Site Health & Safety Coordinator	TBD	
Client Contact	Randy Battaglia	1-607-869-1523
State Spill Number		1-585-226-2466
Fire Department	Romulus	1-607-869-9611
Police Department	Interlaken	1-607-532-4466
National Response Center		1-800-424-8802
Poison Control Center		1-800-962-1253
Occupational Physician	Dr. Mitchell	1-800-874-4676 x 111
Regional USEPA Emergency Response		
Parsons 24-Hour Emergency #		1-800-883-7300
Parsons Boston H&S Representative	Jessica Moore	1-617-457-7874

TABLE B-14
ON-SITE EMERGENCY COMMUNICATIONS

AIR HORN SIGNAL	ACTION
ONE LONG BLAST	RETURN TO NEAREST SUPPORT ZONE
TWO SHORT HORN/SIREN BLASTS	CONDITION UNDER CONTROL, RETURN TO SITE
THREE SHORT BLASTS	SHUT DOWN EQUIPMENT, STAND BY RADIO
CONTINUOUS LONG BLASTS	EVACUATE SITE BY BEST, FASTEST ROUTE

HAND SIGNALS	MEANING
HAND GRIPPING THROAT	OUT OF AIR, CAN'T BREATHE
GRIP PARTNER'S WRIST	LEAVE AREA IMMEDIATELY; NO DEBATE
HANDS ON TOP OF HEAD	NEED ASSISTANCE
THUMBS UP	OK; I'M ALL RIGHT; I UNDERSTAND
THUMBS DOWN	NO; NEGATIVE
POINTING TO EAR(S)	CAN'T HEAR, DON'T UNDERSTAND
POINTING TO EYES THEN POINTING TO A PERSON/OBJECT	WATCH PERSON/OBJECT CLOSELY

PARSONS

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

SENECA SITE-WIDE
HEALTH AND SAFETY PLAN

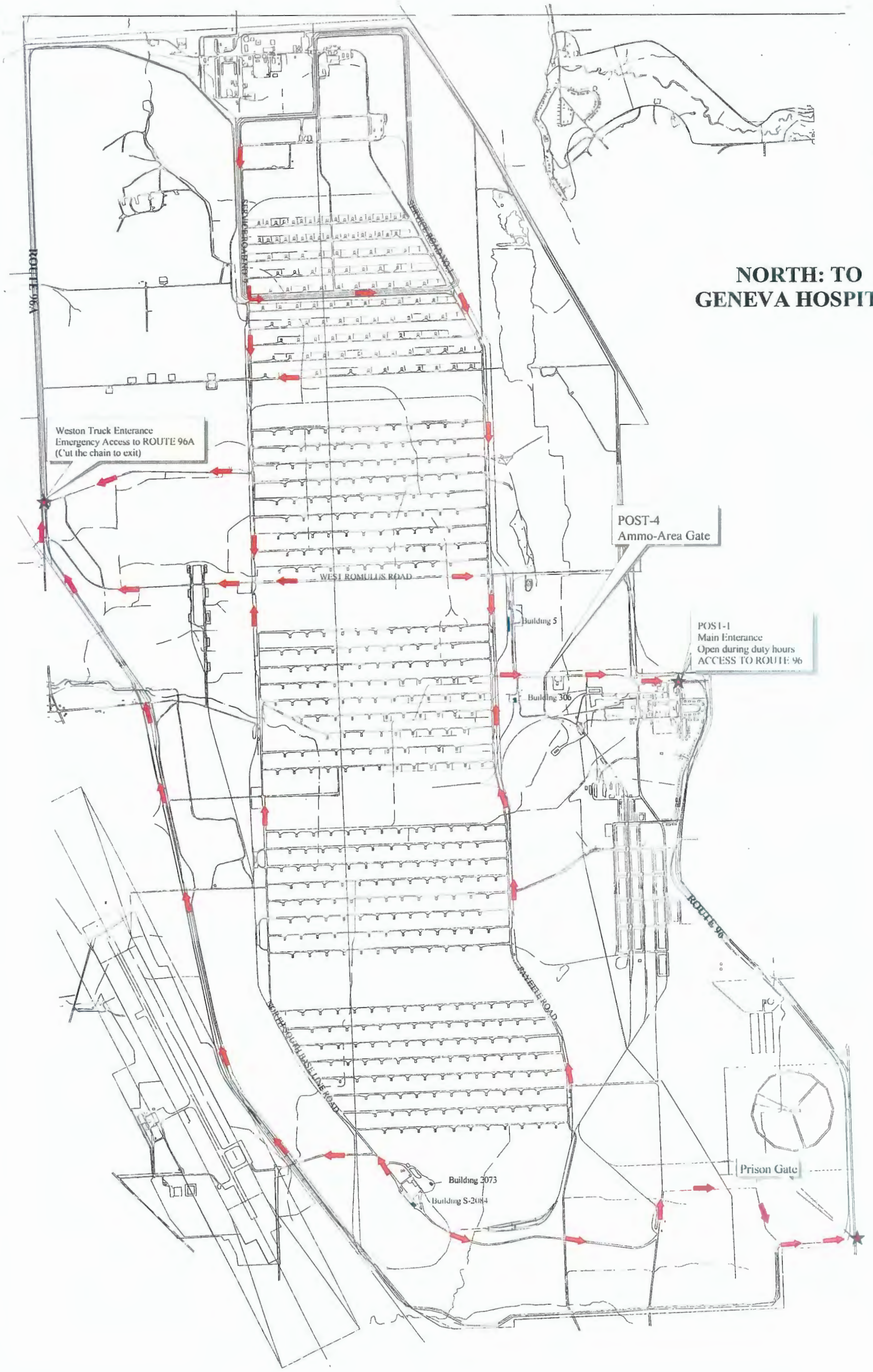
DEPT: ENVIRONMENTAL ENGINEERING | DWG NO:

FIGURE B-1

SENECA ARMY DEPOT MAP

SCALE: 1" = 2000' | DATE: SEPTEMBER 2003

R:\PROJECT-GRAPHICS\SENECA\BASEMAP\FINBASE.CDR(CVM)



LEGEND

Recommended Path for Emergency Exit from Depot

NOTE:
UNLESS IT IS AN EMERGENCY, EXIT FROM POST-1.
IF EMERGENCY- EXIT FROM THE CLOSEST GATE.
USE WIRE CUTTERS IF NECESSARY.

2500 0 2500
(feet)

PARSONS

SENECA ARMY DEPOT ACTIVITY

SENECA SITE-WIDE
HEALTH & SAFETY PLAN

FIGURE B-3
LOCATION OF EMERGENCY
EXIT GATES

SCALE	DATE	REV
1:2500	SEPT 2003	SHEET 1 OF 1

O:\Seneca\h&s\plan\workplan.apr

FIGURE B-4

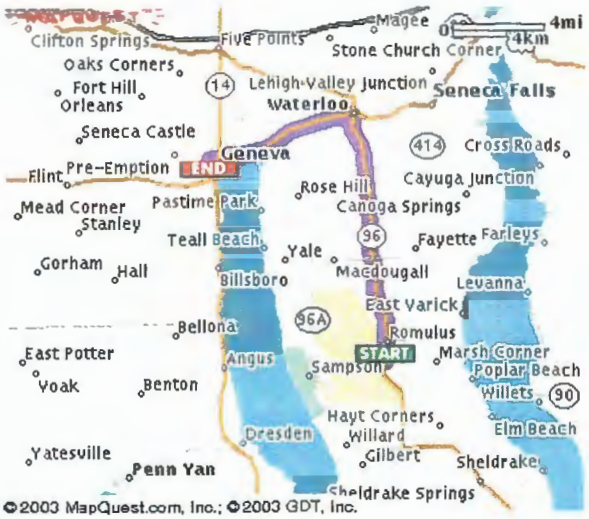
MAP AND DIRECTIONS TO GENEVA HOSPITAL

Hospital Address:	196 North Street Geneva, NY 14456
Telephone Number:	1-315-787-4000
Distance to Hospital:	18.7 miles

Directions to Geneva Hospital (See Attached Map):

Take left onto Route 96 North. Turn left onto NY-5/US-20. Turn right onto CR-110. CR-110 becomes CR-110/E North Street. CR-110/E North Street becomes NY-14.

Map showing route from Seneca Army Depot, Main Gate to Geneva General Hospital - Primary Hospital



Close Up map of Hospital

Attachment B-1

Forms and Checklists

List of Forms and Checklists:

1. Plan Acceptance Form
2. Safety Meeting Attendance Log
3. Accident Report Form
4. Accident Report Follow-Up
5. Respirator Qualitative Fit Test Form
6. Pre-drilling/Subsurface Checklist for Intrusive Fieldwork
7. Site-Specific Training
8. Site-Specific Training Form

Attachment B-1
Forms and Checklists

Plan Acceptance Form

Project Health and Safety Plan

Plan Acceptance Form

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the Site Health and Safety Officer (SHSO).

SITE NAME:

LOCATION: Romulus, NY

PROJECT NUMBER:

I understand, and agree to comply with, the provisions of the HSP for the above-referenced site. I agree to report any injuries, illnesses or exposure incidents to the Site Health and Safety Officer (SHSO).

PRINTED NAME	SIGNATURE	DATE

Attachment B-1
Forms and Checklists

Safety Meeting Attendance Log

Safety Meeting Attendance Log

Date:	Time:	Contract Number:
Delivery Order Number:	Location: Seneca Army Depot, Romulus, NY	
Weather Conditions: (Low/High Temp, Wind/Speed/Dir) (Severe Weather)		
Safety Meeting Topic (Briefly describe)		
Attendees:		

Name	Signature	Company

Attendees:		
Name	**Signature**	**Company**

XXXXXXXXXXXXX
Site Health and Safety Officer

Attachment B-1
Forms and Checklists

Accident Report Form

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

1. ACCIDENT CLASSIFICATION

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

2. PERSONAL DATA

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

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

3. GENERAL INFORMATION

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

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

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

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

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

a. SEVERITY OF ILLNESS/INJURY (CODE) #	B. ESTIMATED DAYS LOST	C. ESTIMATED DAYS HOSPITALIZED	D. ESTIMATED DAYS RESTRICTED DUTY

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

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

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

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE ☐☐ TRUCK ☐☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	B. OWNERSHIP	C. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT (CODE) #	b. TYPE OF COLLISION/MISHAP (CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

See attached page.

11. **CAUSAL FACTOR(S)** *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. **TRAINING**

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. **FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES** *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

See attached page.

b. INDIRECT CAUSE(S)

See attached page.

14. **ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).**

DESCRIBE FULLY:

See attached page.

15. **DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.**

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS _____ CONTRACTOR _____	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL

16. **MANAGEMENT REVIEW** *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. **MANAGEMENT REVIEW** *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. **SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW**

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. **COMMAND APPROVAL**

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10.	ACCIDENT DESCRIPTION *(Continuation)*

13a.	DIRECT CAUSE *(Continuation)*

13b.	INDIRECT CAUSES *(Continuation)*

14.	ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

GENERAL. Complete a separate report for each person who was *injured, caused,* or *contributed* to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the descretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

INSTRUCTIONS FOR SECTION 1— ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable.)*

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.
   (1) INJURY/ILLNESS/FATALITY—Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.
   (2) PROPERTY DAMAGE—Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).
   (3) VEHICLE INVOLVED—Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
   (4) DIVING ACTIVITY—Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.
   (1) INJURY/ILLNESS/FATALITY—Mark if accident resulted in any contractor lost-time injury/illness or fatality.
   (2) PROPERTY DAMAGE—Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).
   (3) VEHICLE INVOLVED—Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
   (4) DIVING ACTIVITY—Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.
   (1) INJURY/ILLNESS/FATALITY—Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).
   (2) VOID SPACE—Make no entry.
   (3) VEHICLE INVOLVED—Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" is marked.
   (4) VOID SPACE—Make no entry.

INSTRUCTIONS FOR SECTION 2—PERSONAL DATA

a. NAME—(MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE—Enter age.

c. SEX—Mark appropriate box.

d. SOCIAL SECURITY NUMBER—(FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE—(FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6; E-7; WG-8; WS-12; GS-11; etc.

f. JOB SERIES/TITLE—For *government civilian employees* enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For *contractor employees* enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc.,

g. DUTY STATUS—Mark the appropriate box.
   (1) ON DUTY—Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.
   (2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.
   (3) OFF DUTY - Person was not on official business at time of accident

h. EMPLOYMENT STATUS—(FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3—GENERAL INFORMATION

a. DATE OF ACCIDENT—Enter the month, day, and year of accident.

b. TIME OF ACCIDENT—Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT—Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME
   (1) PRIME—Enter the exact name (title of firm) of the prime contractor.
   (2) SUBCONTRACTOR—Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER—Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT—Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW)—Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4—CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY—Select the *most appropriate* construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION
2. SITE PREPARATION
3. EXCAVATION/TRENCHING
4. GRADING (EARTHWORK)
5. PIPING/UTILITIES
6. FOUNDATION
7. FORMING
8. CONCRETE PLACEMENT
9. STEEL ERECTION
10. ROOFING
11. FRAMING
12. MASONRY
13. CARPENTRY
14. ELECTRICAL
15. SCAFFOLDING/ACCESS
16. MECHANICAL
17. PAINTING
18. EQUIPMENT/MAINTENANCE
19. TUNNELING
20. WAREHOUSING/STORAGE
21. PAVING
22. FENCING
23. SIGNING
24. LANDSCAPING/IRRIGATION
25. INSULATION
26. DEMOLITION

b. TYPE OF CONSTRUCTION EQUIPMENT – Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER
2. DRAGLINE
3. CRANE (ON VESSEL/BARGE)
4. CRANE (TRACKED)
5. CRANE (RUBBER TIRE)
6. CRANE (VEHICLE MOUNTED)
7. CRANE (TOWER)
8. SHOVEL
9. SCRAPER
10. PUMP TRUCK (CONCRETE)
11. TRUCK (CONCRETE/TRANSIT MIXER)
12. DUMP TRUCK (HIGHWAY)
13. DUMP TRUCK (OFF HIGHWAY)
14. TRUCK (OTHER)
15. FORKLIFT
16. BACKHOE
17. FRONT-END LOADER
18. PILE DRIVER
19. TRACTOR (UTILITY)
20. MANLIFT
21. DOZER
22. DRILL RIG
23. COMPACTOR/VIBRATORY ROLLER
24. OTHER

INSTRUCTIONS FOR SECTION 5 – INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI NO INJURY
FAT FATALITY
PTL PERMANENT TOTAL DISABILITY
PPR PERMANENT PARTIAL DISABILITY
LWD LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA RECORDABLE FIRST AID CASE
NRI NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST – Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED – Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY – Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED – Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the *most* appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating—powered
3. Boating—unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION—Mark appropriate box.

c. SEAT BELT—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8—PROPERTY/ MATERIAL INVOLVED

a. NAME OF ITEM—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP—Enter ownership for each item listed. (Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR: PRIVATE)*

c. $ AMOUNT OF DAMAGE—Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9 — VESSEL/ FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT — Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/ floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL, BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP — Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEPT DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10 — ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT — Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11 — CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN — Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE — Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION — Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES — Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES — Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS — Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS — Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS — Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.,), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) OFFICE FACTORS — Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS — Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc?

(11) PERSONAL PROTECTIVE EQUIPMENT — Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL — Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS — Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *If one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12 — TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? — For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING — Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened.

c. DATE OF MOST RECENT TRAINING — Enter the month, day, and year of the last *formal* training completed that covered the activity-task being performed at the time of the accident.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY — OTHER (EXCEPT DISEASE, ILLNESS)

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which doses not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC—OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/ oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle..
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

INSTRUCTIONS FOR SECTION 13—CAUSES

a. DIRECT CAUSES—The direct cause is that single factor which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

a. BEGIN DATE—Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE—Enter the date when the corrective action(s) identified in Section 14 will be completed.

c. TITLE AND SIGNATURE—Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED—Enter the month, day, and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME—For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. OFFICE SYMBOL—Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc, are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

Attachment B-1
Forms and Checklists

Accident Report Follow-Up

PARSONS

PARSONS INFRASTRUCTURE & TECHNOLOGY

ACCIDENT REPORT FOLLOW-UP

Employee: _____ Date of injury or illness: _____

ANALYSIS – What caused the accident. Why did it happen:

Primary cause:

_____

_____

_____

_____

_____

Contributing factors:

_____

_____

_____

_____

_____

PREVENTIVE/CORRECTIVE ACTION – State what will be done to prevent reoccurrence.

Immediate action:

_____

_____

_____

_____

_____

Who is responsible: _____ Completion date(s): _____

Long-term action:

_____

_____

_____

_____

_____

Who is responsible: _____ Completion date(s): _____

Closed by: _____

3. Facility Health and Safety Representative Date

Attachment B-1
Forms and Checklists

Respirator Qualitative Fit Test Form

PARSONS

PARSONS INFRASTRUCTURE & TECHNOLOGY

RESPIRATOR FIT TEST LOG

Employee: _____ Date of test: _____

Fit test administrator: _____ Date of last physical: _____

RESPIRATOR

Manufacturer: _____ Model: _____

Size: _____ I.D. number: _____

TEST RESULTS

Test protocol

Pressure fit check:

_____ positive

_____ negative

Test atmosphere:

_____ isoamyl acetate

_____ stannic oxychloride

Comfort

comfortable: _____

intolerable: _____

needs prescription inserts: _____

_____

_____ fit _____ no fit

Date of next fit test: _____

Remarks: _____

_____

_____

_____

_____

_____

_____

Attachment B-1
Forms and Checklists

Pre-drilling/Subsurface Checklist for Intrusive Fieldwork

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

Site Name: _____ **Job Number:** _____
Site Phone Number: _____
Site Address: _____ **County:** _____
Client Proj. Mgr.: _____ **Phone:** _____
Site Manager Contacted Date: _____ **By:** _____
Site Drawings (yes / no / NA) _____ (please attach) **Historical Drawings (yes / no / NA)** _____
Third Party Construction/Redevelopment Plans (Yes/No/NA)

***ATTACH SITE FIGURE WITH PROPOSED BORING LOCATIONS

Subcontractor's (drillers, concrete, etc...) **Company** _____
Subcontractor's Contact Person _____ **Phone** _____
Meeting / Start Date _____ **Time** _____

1) **Health and Safety Signoff Form Completed? (Yes/No)** **Date** _____

2) **Utility Protection Services (Minimum 48 Hrs. Advance Notice, State Specific Notification Period Supercedes)**
Called: Date _____ **Time** _____ **Initials** _____
Reference # _____
Proposed Drilling Locations Premarked for Locating Service. Y / N

3) **Private or In-House Utility Locating Service Performed?** Y / N _____
Called: Date _____ **Time** _____ **Initials** _____
Name of Locating Service: _____
Telephone #/ contact: _____
Name of Supplier Locating Technician: _____
Type of sensing equipment used: _____
Proposed Drilling Locations Premarked Y / N

4) **Other Potential Underground Structures**
Name of City Engineer/Utility Representative: _____
Telephone #: _____
Date Notified _____ **Maps:** Y / N
Cleared: Y / N

5) **COMPLETED SITE WALKOVER W/ SITE MANAGER/DESIGNEE OR OWNER/TENANT REP.** Y / N
Name of Site Manager: _____
Name of Property Owner/Tenant Representative: _____
Cleared: Yes / No
Building Utility Service Line Connections Identified: Y / N
(Hand sketch on site map w/proposed boring locations and most likely utility trench locations)

6) **Utility Inventory:** Y / N

Utility	Name	Depth (ft) (If Available)	Phone	Notified - Date	Marked
Above Ground Services					
Electric		NA		Y / N	Y / N
Telephone		NA		Y / N	Y / N
Cable		NA		Y / N	Y / N
Overhead Supports		NA		Y / N	Y / N
Traffic light cables		NA		Y / N	Y / N

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

6) Utility Inventory Continued:

Below Ground Services:

Electric				Y / N		Y / N
Telephone				Y / N		Y / N
Cable				Y / N		Y / N
Gas				Y / N		Y / N
Water				Y / N		Y / N
UST System				Y / N		Y / N
Storm				Y / N		Y / N
Sanitary				Y / N		Y / N
Steam				Y / N		Y / N
Pipeline Companies				Y / N		Y / N

Other:

				Y / N		Y / N
				Y / N		Y / N
				Y / N		Y / N

7) Site-Specific Emergency Contingency Plan Incorporated in Health & Safety Plan Y / N

8) Drilling Locations Approved by Client Project Manager Named Above? Y / N

9) Signature of Parsons' Project Mgr. (required to begin fieldwork):

Name of Project Manager	Signature of Project Manager
Name of Parsons Field Personnel	Signature of Field Personnel

(This document to be included with the site H&S Plan and should be available upon request.)

ADDITIONAL COMMENTS / NOTES:

Attachment B-1
Forms and Checklists

Site-Specific Training

Site-Specific Training
Non-Intrusive/Mobilization
Seneca Army Depot Activity
Romulus, New York

Topics Covered:	**Completed/Initials**
Personnel responsible for health and safety • – Site Safety&Health Officer • – CEHNC On Site Safety • – USA SUXOS (for sites with UXO hazards) • – RSO • – Project Manager • – Site Manager	_____
Heat Injuries • Heat Stress • Exhaustion • Stroke	_____
Slips, trips, falls • Animal Burrows • Steep Inclines • Partially buried fencing/barbed wire • Muddy/Wet Surfaces	_____
Health and safety procedures	_____
Safe work practices • Equipment Spotters • Recognized hand signals	_____
Engineering controls	_____
Emergency procedures/Rally Point • Emergency Signal (3-5sec blasts) • Rally Point (Site Compound)	_____
Biological Hazards • Poison Ivy/Oak/Sumac • Snakes (Rattlers) • Bees/Wasps	_____
Radios/GPS • Channel Frequency (USA Environmental) • GPS (loaded with proper Sectors) • Communications Checks (Twice all site elements)	_____
Vehicle/Heavy Equip traffic • Use of Seat Belts • Sound Horn prior to backing vehicles without warning device • Vehicle speeds on the roads	_____
MSDS Logs/Records • Located at Operations	_____

Topics Covered:	**Completed/Initials**
Personnel Protective Equipment	_____

- Safety Glasses
- Leather Work Gloves
- First Aid Kit (per vehicle)
- Fire Extinguisher (per vehicle)
- Maps and Grid Sheets
- Remote Operations/First Aid Handout

Hospital/Routes

- **All Site Related Injuries**

Team will transport to closest Medical Facility

- List those facilities/phone numbers/provide maps
  - **After Hours – Site personnel will go to XXXX**

Today's operations (-Site Manager's) _____

_____
SHSO's Signature/Date

Attachment B-1
Forms and Checklists

Site-Specific Training Form

Site Specific Training Form

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the safety manager.

I have attended and been briefed on the Site Specific Training for the following project:

Site Location: Seneca Army Depot, Romulus, New York

Contract Number:

Print Name: _____

Company: _____

Signature: _____

Date: _____

Return to:

On Site Health and Safety Officer

Attachment B-2

Pictures of Poison Ivy, Snakes, Spiders, and Ticks

POISON IVY/POISON OAK/POISON SUMAC

Poison Ivy	Poison Oak	Poison Sumac
		

SNAKES

Copperhead

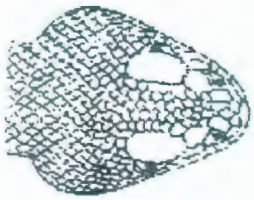
Closeup of head

24-36", up to 53"

The copperhead is a venomous snake with a broad triangular head, vertically elliptical pupils and a heat sensitive pit between each eye and nostril. The body is pinkish to grayish brown with brown or reddish-brown crossbands that are narrow on the back and widest on the sides. Small dark spots commonly occur between crossbands on the back. The unpatterned head is dull orange, copper or rusty-red. Body scales are keeled and the belly is pink or light brown with dark blotches along the sides. When young, a copperhead has a yellow-tipped tail.

SNAKES

Timber Rattlesnake



Closeup of head

36-60", up to 74"

Head and body are pinkish-gray to yellowish-brown with a pattern of dark bands on the back and a grayish-white belly. The tail is black with a rattle.

SNAKES

Eastern Diamondback Rattlesnake

33-72", up to 96"

The snake has a large head and a bulky body. It has a row of large dark diamonds with brown centers and cream borders down its back. The ground color of the body ranges from olive, to brown, to almost black. The tail is usually a different shade, brownish or gray, and banded with dark rings. At the end of the tail is a well-developed rattle. The head has a light bordered dark stripe running diagonally through the eye. The pupil is vertical (catlike). There is a large pit between the nostril and eye. The young are similar to the adults in color pattern. The tip of the tail of a newborn diamondback ends in a button, which is the first segment of the future rattle. Male and female rattlesnakes look alike.

SPIDERS

Brown Recluse
0.25-1.0"

Black Widow
0.12-0.75"

TICKS

Larvae

Female Deer Tick with Dime for Size Comparison

Deer Tick Nymph with Dime for Size Comparison

Attachment B-3

Corporate Radiation Protection Manual

(Appendix E of Corporate Health and Safety Manual)

APPENDIX E
RADIATION PROTECTION

E.1 OBJECTIVE

Radioactive material is typically not present at most work sites. However, radioactive materials may be encountered in drums, lab packs, and buried in landfills found as either solids or liquids. Departments of Energy (DOE) and Defense sites should be particularly suspect of having ionizing radiation hazards. Also sites which have, or once had Atomic Energy Commission (AEC) or Nuclear Regulatory Commission (NRC) licenses may contain sources of ionizing radiation hazards. This appendix provides personnel with an understanding of the types of ionizing radiation and the hazards they pose. Methods for detection of ionizing radiation will be discussed in addition to procedures that should be utilized for protection against a radioactive hazard. This appendix will also provide guidance on the location and content of the applicable regulatory requirements.

Sites regulated by the NRC are typically regulated under 10 CFR part 20 and any applicable license requirements (typically issued by the NRC under 10 CFR part 51 or 10 CFR part 70). However, many states are agreement states and have taken over the regulatory responsibility from the NRC. These states have their own specific regulations, which will be similar to 10 CFR part 20. DOE site regulations may include 10 CFR part 835, 10 CFR part 834 (when issued), the DOE Radiological Control Manual (U.S. DOE, 1992), DOE Order 5480.11, and DOE Order 5400.5. OSHA has adopted the NRC regulatory limits for workers in 29 CFR part 1910.96. NIOSH's "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" (NIOSH, 1985) provides guidance for implementation of radiological controls at hazardous waste sites regulated under 29 CFR part 1910.120. Finally, state regulations establish the requirements for X-ray machines, accelerators, and naturally occurring radioactive material (NORM) (Rogers, 1994). EPA under the Clean Air Act has established limits for release of radioactive material to the air in 40 CFR 61 which currently includes uranium mines, phosphorus plants, NRC facilities, and DOE facilities. The EPA establishes drinking water and surface water radionuclide limits in the Clean Water Act implementation (40 CFR part 141) and the applicable National Pollution Discharge Elimination System (NPDES) permit, if applicable.

E.2 TYPES OF IONIZING RADIATION

When particulate or electromagnetic radiation has an energy greater than about 30 electron volts (eV) it is able to strip an electron from a molecule in the process of ionization. Injury to living matter by ionizing radiation is a result of the transfer of energy to molecules in the region through which the radiation passes. These large energy transfers can easily break strong chemical bonds. For example, the energy associated with a C=C bond commonly found in the body is 4.9 eV. The ability to cause disruption of molecular structure can affect the normal functioning of a cell resulting in cell injury or death.

Radioactive decay results primarily in five different types of ionizing radiation: alpha particle, beta particle, gamma ray, X-ray, and neutron. Alpha, beta, X-ray, and gamma radiation are the most frequently encountered at sites. Types of radiation are distinguished by physical characteristics such as mass, electrical charge, and path length of range. X-ray and gamma radiation are simply photon radiation (i.e., X-ray typically has lower energies) and the only difference is that the X-ray originates in the electron cloud outside the nucleus of the atom and gamma radiation originates within the nucleus. For purposes of radiation protection, X-rays and gamma radiation are the same and only gamma radiation will be addressed throughout the balance of this appendix.

E.2.1 Alpha Particle

The alpha particle is an energetic helium nucleus consisting of two protons and two neutrons. Compared to a beta particle (see below) it is 7,300 times heavier and has double the charge. Alpha particles are commonly emitted in the radioactive decay of heavy nuclei, those that have an atomic number greater than 83. Alpha particles have characteristic specific energies based on the radionuclide emitting the alpha particle. Examples of naturally occurring alpha emitters are uranium, thorium, radium, and polonium. Man-made alpha emitters such as plutonium may be present at some Department of Energy (DOE) and Department of Defense (DOD) sites. Older medical facilities may have used radium-226. Current research facilities and medical facilities may use Ra-226 or Am-241. Many of the radionuclides associated with natural occurring radioactive materials (NORM) are also alpha emitters (e.g., Th-232, U-238, Ra-226, and Th-230).

Alpha particles emitted by these nuclei possess kinetic energy levels ranging from 4 MeV to 9 MeV. Alpha particles are released at velocities much less than the velocity for a beta particle which is released from the nuclei at speeds approaching that of light. Because of their slower speeds, alpha particles spend more time than beta particles residing in the vicinity of the atoms they pass and exert much greater effect on orbital electrons and the charge particles in the nucleus of the atoms. The effect on orbital electrons is increased more because the alpha particle has a +2 charge, twice that of a beta particle. As a result, of these effects the alpha particles impart energy to the medium along their path at a much higher rate than a beta particle.

Alpha particles have had the reputation for being especially dangerous. They are the main source of energy from radium and thorium isotopes which produced bone cancer in persons painting radioluminescent dials, and from radon gas associated with lung cancer in miners. However, alpha particles have a very short range and cannot penetrate through the epidermis layer of the skin and thus does not constitute an external hazard. Damage occurs only when alpha-emitting radionuclides are injected (e.g., enter the body through a cut), ingested, or inhaled and the particles are consequently emitted immediately adjacent to or inside living tissue. They are of more concern within the body since the large mass and charge resulting in deposition of most of their energy in a very localized area.

E.2.2 Beta Particle

Carbon-14, strontium-90, sulfur-35, phosphorus-32, and tritium are a few of the most common beta emitting radioisotopes used in research and medical facilities. For a medical facility the beta emitting radionuclides might also include sodium-22, iodine-131, tin-113, and gold-195. Many of the DOE facilities (e.g., Hanford, Savannah River, Oak Ridge) have a wide assortment of beta emitters with the highest activity normally associated with strontium. There are a significant number of beta emitters associated with NORM radioactivity.

Beta particles are high speed electrons which are emitted by nuclei of atoms as a result of energy released in a radioactive decay process involving the transformation of a neutron to a proton. Beta particles are emitted from the nucleus with a characteristic spectrum of energies. The average energy of the beta particle is about two-third of the maximum kinetic energy that the parent radionuclide could emit. As a result of the transformation, the maximum energies for beta particles range from 0.018 MeV for tritium to 2.24 MeV for strontium-90. The electron emitted as a result of the nuclear decay has a charge of -1 and a range in air from 0.02 to 29 feet. (The beta particles do not penetrate beyond their maximum range.) The ranges of beta particles tells a lot about the hazards of the various radionuclides as external sources of radiation. Tritium is stopped by only 5 mm of air. These particles cannot penetrate the epidermis of the skin. Tritium can produce injury only when it is ingested or inhaled. In contrast, phosphorus-32 emits a highly energetic particle which can penetrate as much as 8 mm into the body. However, the greatest concern is the absorption (typically associated with tritium), injection, ingestion, or inhalation of beta emitters.

E.2.3 Gamma Ray

Gamma radiation is associated with most radioactive decays and may be found anywhere radioactive material may have been present. When radioactive decay results in the emission of a particle from the nucleus the nucleus is left in an excited state. The excited nucleus releases the excess energy as gamma rays (photons or wave packets of electromagnetic radiation) until the ground state of the nucleus is obtained. Sometimes the energy is emitted in a single jump; other times it is emitted in a series of jumps. The number and energy of gamma rays emitted following particle emission is characteristic of a given radionuclide. Gamma rays have energies from a few thousand electron volts to several million electron volts. Unlike beta particles, which slow as they lose energy and finally become attached to atoms, gamma rays of all energies travel at the speed of light and only lose energy through chance encounters that result in the ejection of electrons from atoms or through interactions with the nucleus. There is no range associated with gamma radiation rather there is an exponential decrease in the flux characteristic of the energy of the radiation and the material it passes through. Gamma rays are a major source of indirect ionization. A gamma ray can liberate an electron from an atom which will proceed to ionize in a manner similar to the beta particle. Thus, gamma rays liberate direct ionizing particles deep within the medium, much deeper than the direct ionizing particles could reach from the outside.

E.2.4 Neutrons

Neutrons are simply free neutrons, ejected from a nucleus. Neutrons are characterized by their energy (e.g., thermal neutrons, fast neutrons). Neutron radiation can activate or change the nature of matter when they are absorbed. In some cases the material that absorbs a neutron may become radioactive. Neutrons primarily react with material by transferring energy (typically resulting in the release of electrons and x-rays) by collision with matter. Like alpha particles they may deposit significant amounts of localized energy but unlike alpha particles they easily penetrate the body. Neutron emission is normally associated with the fission (e.g., plutonium, uranium) process although they can be generated in accelerators and certain types of nuclear interactions (e.g., the plutonium beryllium source within an alpha particle interacts with the beryllium nucleus to generate neutrons). Radiological protection and controls associated with neutrons are not addressed further in this discussion since situations where they would be generated are very specialized and such projects must be under the direct supervision of a Health Physicist. Specialized training would be provided to the personnel involved.

E.3 UNITS RELATED TO RADIATION

When addressing radiation specific units are used. These units address the quantity of radiation emitting material (i.e., radioactivity) and the dose or dose rate to an individual from a flux of radiation entering the body. These units are summarized in table E-1. Note, the common and the equivalent standard international (SI) units are both given. (If SI units are listed outside of this table they will be given in parenthesis after the units commonly used in the U.S.)

The units of radiation are commonly used in conjunction with prefixes to indicate the power of ten to which these number should be multiplied. Some common prefixes used with radiological units are summarized in table E-2:

Table E-1
Radiological Units

Value	Common Unit	Equivalent SI Unit	Basic Unit	Description
Radioactivity	Curie (Ci)	3.7 X 10^{10} Becquerels (Bq)	3.7 X 10^{10} Disintegrations/ sec	The amount of a material that emits 3.7 X 10^{10} Disintegrations /sec
Dose	rad	0.01 Gray (Gy)	100 ergs/gram of tissue	The radiation flux that deposits 100 ergs of energy in one gram of tissue
Dose Equivalent	rem	0.01 Sievert (Sv)	Dose that does the damage in tissue equivalent to one rad of gamma radiation	Measure of potential damage done to tissue.
Body Burden	Annual Limit of Intake (ALI)	ALI	µCi (X 3.7 X 10^{4} Bq)	The amount of radioactivity in the body to produce the annual dose limit specified in Table E-4.
Allowed Airborne Concentrations	Derived Air Concentration (DAC)	DAC	µCi/ml (X 1.3 X 10^{14}Bq/m^3)	The radioactivity concentration in the air that will result in inhalation of one ALI by Standard Man (see ICRP 23).

Table E-2
Common Radiological Units Prefixes

Prefix	Multiplier	Example
m (milli)	X 10-3	mrem or mrad
μ (micro)	X 10-6	μCi, μrad/hr
n (nano)	X 10-9	nCi
p (pico)	X 10-12	pCi

Radiation dose is measured in rads (grays); however, the biological impact of this dose is dependent on the type of radiation. The unit rem (seivert) corrects dose in rads to reflect the biological detriment of the radiation. The relationship between rad and rem is:

Dose Equivalent (rem) = W_R * Absorbed Dose (rad)

where the value of W_R is shown in table E-3 (see ICRP, 1978 and ICRP, 1987). For purposes of radiation protection roentgen (R) is assumed to be essentially equivalent to rad for gamma and x-rays.

Table E-3
Radiation Weighting Factors

R	Type
1	Gamma and X-ray
1	Beta
20	Alpha
10[a]	Neutrons of Unknown Energy
10[a]	High-energy Neutrons
2[a]	Thermal Neutrons

[a] If the specific energy distribution is known see 10 CFR 20.1004 or 10 CFR 835.2.

E.4 EFFECTS OF RADIATION

The effects of radiation are largely based on the ionization that occurs when the energy of the radiation is absorbed in matter. The different types of radiation show different degrees of absorption which is biologically significant. Alpha particles are heavy, slow moving, and expend their energy over a short distance. Alpha particles therefore show a high linear energy transfer (i.e., a large number of ionization per unit length). Gamma rays have a low specific ionization (i.e., ionization is spread out over a long path required for complete adsorption). Beta particles are intermediate.

Only a fraction of the gamma ray's initial energy will dissipate as it passes through the body. The energy dissipated is the absorbed dose delivered to the body or portion of the body.

Beta emitters may be external or internal hazards. Many beta emitters will penetrate the outer tissue. There is a risk of skin malignancies (carcinogenesis) associated with the external exposure to beta radiation. Exposure to beta particles at levels well above the allowed limit may result in damage to the lens of the eye (e.g., cataracts). The external effects of extremely high doses (i.e., well beyond the doses likely to occur in common Parsons I&T activities) have been radiation burns. Internally, beta particles are also a hazard. Alpha particles, as mentioned earlier, are not an external concern but they are a considerable internal hazard.

Beta or alpha particles that enter the body tend to localize in different organs. For example, strontium and calcium typically deposits in the bones, iron in the red blood cells, and iodine in the thyroid. It is important to recognize that the deposition pattern for a radionuclide is dependent on various other factors such as the pathway of entry, chemical form, and particle size. This means that the radioactive dose is concentrating its effects on a relatively small area. It should also be understood that certain organs of the body are more radiosensitive than others. The lining of the bronchi is the primary site of many lung cancers attributed to inhaling radioactive material. The more rapidly the cells are reproducing the higher the probability of radiation damage to the cell that significantly affects cell behavior (i.e., cell death, mutation, carcinogenesis). In general, a cell in the process of division (mitosis) is highly radiosensitive. Therefore, a person is more sensitive to radiation during the growing years than as an adult. The most radiosensitive period for human is in the fetal stage, particularly the first few weeks of life.

The radiation dose parameter *total effective dose equivalent (TEDE)* (ICRP, 1978 and ICRP, 1987) is the sum of the internal and external doses. The TEDE contains weighting factors (see table E.3) for internal organ doses to reflect the impact of the radiation on the organ and the impact of any damage to the organ of reference man (ICRP, 1975). The TEDE also calculates the doses that will be received by the body for the next 50 years from the radionuclides remaining in the body (i.e., material not removed by the natural exchange of chemicals in the body) and includes this in the value for the TEDE for the year of intake. Thus the TEDE is a measure of the effective (current and future) detriment to the body of radiation received and any intake of radioactive material. The TEDE is specified in the units of sieverts and is assumed to be proportional to risk.

E.4.1 Chronic and Low Dose Exposures

The primary effects of radiation at levels likely to be encountered by Parsons I&T personnel are:

1. The potential of an increase in the probability of the occurrence of certain types of cancers. The National Academy of Sciences estimates that the risk from radiation is less than 0.0000008 (i.e., 2 to 8 X 10^{-7} cancers/mrem) (see BEIR, 1988; BEIR, 1990; United Nations Scientific Committee on the Effects of Atomic Radiation, 1988). This presumes that there are twice as many cancers as cancer fatalities (National Cancer Institute, 1989).

2. The potential for an increase in the genetic mutation rate. The National Academy of Sciences estimates that the increase in the rate of significant genetic disease in the first generation is less than 0.00000004 for males and 0.00000002 for females (i.e., 4 to 2 X 10^{-8} mutations/mrem) (see BEIR, 1988, United Nations Scientific Committee on the Effects of Atomic Radiation, 1988).

In addition to the effects discussed above serious effects occur at dose orders of magnitude above the legal limit. Currently such doses do not appear feasible, even in accident conditions,

for activities conducted by Parsons I&T. Such doses would normally be associated with large radiotherapy sources, large X-ray or accelerator devices, DOE facilities handling high level waste, large industrial *X-ray* sources, reactors, or unplanned criticalities (i.e., situations where the neutron production rate exceeds the neutron absorption and loss rate) in a weapons or reactor facility. Doses are typically expressed in rem or mrem (0.001 rem) when addressing impacts.

Dose-equivalent limits for controlling occupational exposure to ionizing radiation have been established by the Nuclear Regulatory Commission (NRC) in 10 CFR part 20 and the Department of Energy (DOE) in 10 CFR part 835 (and eventually in 10 CFR part 834 when issued). OSHA adopted the NRC standards in 29 CFR Part 1910.96.

Both DOE and NRC emphasize that dose-equivalent (ICRP, 1978) in their radiation limits. These limits are upper bounds and every effort must be made to keep exposures below these limits and avoid unnecessary radiation exposure. This principle is strongly emphasized (i.e., mandated) in federal regulations as the As Low As is Reasonably Achievable (ALARA) philosophy.

Exposure standards fall into several categories: occupational exposures, occasional exposures, prenatal exposures, emergency exposures, and nonoccupational exposures. These standards and Parsons I&T control and actions level are summarized in table E-4. The limits specified for radiation worker are only applicable if the minimum training and qualification requirements established in DOE or NRC regulations, orders, notices, and guidance are met by the worker. Hazardous waste site workers or training programs established by Parsons I&T or other organizations that do not meet these criteria do **not** qualify a worker as a radiation worker. Thus, hazardous waste site workers that have not received the DOE, NRC, or equivalent radiation worker training shall not be exposed to radiation levels above the public exposure limit specified in table E.4.

Occupational radiation exposure standards are presented in table E.4. Occupational exposure to ionizing radiation is that resulting from military or civilian activities that directly support the use of radioactive material or equipment capable of producing ionizing radiation. An occupationally exposed individual is one whose work is performed in a radiation or controlled area who might be exposed to more than 5 percent of the limits given in table E.4.

E.4.2 Acute and High Dose Exposures

This discussion will address acute high dose exposures, since the data in the U.S. and western Europe does not include any significant amount of experience in chronic high dose exposures, except in animal experiments. The experience in eastern Europe indicates that chronic high dose rate exposures produce impacts similar to acute exposure impacts on the blood and immune system. Note, all the chronic effects addressed previously are also associated with acute effects and appear linearly proportional to dose. The fetal impacts are similar to those discussed for chronic exposure except the level of impact is much greater. Table E.5 summarizes the potential effects of an acute whole-body exposure in relation to dose, and table E.6 shows the effect of partial body irradiation in selected organs. Note, these values relate to the impact of exposure with no medical intervention and are highly variable based on the radiosensitivity of the individual receiving the exposures and the presence of non-radiological trauma (i.e., non-radiological trauma typically increases the radiosensitivity of an organism). Whole-body irradiations have more impact than partial body exposures. The acute exposure levels in tables E.5 and E.6 should never be reached based on the projected normal and accident conditions associated with current Parsons I&T activities. If Parson's activities do expand to include

Table E-4
Dose Limits

Organ	Dose Limits [1]		Parsons I&T Administrative Controls [1] where the applicable regulatory authority is:	
	NRC	DOE	NRC	DOE
Radiation Worker				
Whole Body	5 rem/yr--TEDE	5 rem/yr--TEDE	2.5 rem/yr--TEDE	2.5 rem/yr--TEDE
Organ or Tissue (except lens of the eye)	50 rem/yr --DDE+CEDE	50 rem/yr --DDE+CEDE	25 rem/yr --DDE+CEDE	25 rem/yr --DDE+CEDE
Lens of the Eye	15 rem/yr--Annual	15 rem/yr--Annual	7.5 rem/yr--Annual	7.5 rem/yr--Annual
Skin and Extremities	50 rem/yr--SDE	50 rem/yr--SDE	25 rem/yr--SDE	25 rem/yr--SDE
Soluble uranium uptake	10 mg/week	NA	NA	NA
Internal Contributions to TEDE must be determined	2000 DAC hours of potential exposure or 10% of the ALI is credible	NA	2000 DAC hours of potential exposure or 10% of the ALI is credible	2000 DAC hours of potential exposure or 10% of the ALI is credible

Table E-4 (Continued)
Dose Limits

Organ	Dose Limits [1]		Parsons ES Administrative Controls [1] where the applicable regulatory authority is:	
	NRC	DOE	NRC	DOE
Radiation Worker				
External Dosimetry Required	Potential Exposures exceed 10% of the limit or work may occur in High Radiation Areas or Very High Radiation Areas	Potential Exposure • >0.1 rem/yr TEDE, • >5 rem/yr SDE, • > 1.5 rem/yr to the lens of the eye, • 5 rem/yr DDE to any organ, • or a declared pregnant worker >10% of the limit, • for minors or member of the public >50% of the limit, • for individual who enter High or Very High Radiation Areas	Potential Exposure • >0.1 rem/yr TEDE, • >2.5 rem/yr SDE, • > 0.75 rem/yr to the lens of the eye, • 2.5 rem/yr DDE to any organ, • or a declared pregnant worker >5% of the limit, • for minors or member of the public >25% of the limit, • for individual who enter High or Very High Radiation Areas	Potential Exposure • >0.1 rem/yr TEDE, • >2.5 rem/yr SDE, • > 0.75 rem/yr to the lens of the eye, • 2.5 rem/yr DDE to any organ, • or a declared pregnant worker >5% of the limit, • for minors or member of the public >25% of the limit, • for individual who enter High or Very High Radiation Areas

Table E-4 (Continued)
Dose Limits

Organ	Dose Limits [1]		Parsons ES Administrative Controls [1] where the applicable regulatory authority is:	
	NRC	DOE	NRC	DOE
Radiation Worker				
Internal Dosimetry Required	Potential Internal Exposures exceed 10% of the limit for adults or 0.05 rem/yr for minors and declared pregnant women	If the air concentration data does not provide the required accuracy.	Potential Internal Exposures exceed 10% of the limit for adults or 0.05 rem/yr for minors and declared pregnant women	If the air concentration data does not provide the required accuracy.
Non-Uniform Exposure of the skin	See NRC guidance.	Assessment, addition to the SDE, and inclusion in records is **not** required if <2% of the dose limit. Need not be added to the if the area of contamination is less than 10 cm^2 . Calculate as described in 10 CFR part 835.205.	Assessment, addition to the SDE, and inclusion in records is **not** required if <2% of the dose limit. Need not be added to the SDE if the area of contamination is less than 10 cm^2 . Calculate as described in 10 CFR part 835.205.	Assessment, addition to the SDE, and inclusion in records is **not** required if <2% of the dose limit. Need not be added to the SDE if the area of contamination is less than 10 cm^2 . Calculate as described in 10 CFR part 835.205.
Planned Special Exposure Limit[3]	25 rem/career-past exposures in excess of the limits--TEDE	25 rem/career-past exposures in excess of the limits--TEDE	25 rem/career-past exposures in excess of the limits--TEDE	25 rem/career-past exposures in excess of the limits--TEDE

Table E-4 (Continued)
Dose Limits

Organ	Dose Limits [1]		Parsons I&T Administrative Controls [1] where the applicable regulatory authority is:	
	NRC	DOE	NRC	DOE
Embryo/Fetus				
Whole Body[4]	0.5 rem/gestation period--DDEM+ TEDEF+DFFRM	0.5 rem/gestation	0.25 rem/gestation	0.25 rem/gestation
Non-Radiation Workers At Regulated Facilities or Areas				
Whole Body	See Public Exposure	0.1 rem/yr TEDE	0.05 rem/yr TEDE	0.05 rem/yr TEDE
Public Exposure				
Whole Body[2]	0.1 rem/yr TEDE	0.1 rem/yr TEDE	0.05 rem/yr TEDE	0.05 rem/yr TEDE
Whole Body	0.002 rem/hr	NA	0.001 rem/hr	0.001 rem/hr
Whole Body to an individual member of the public[3]	0.5 rem/yr TEDE	NA	NA	NA

Table E-4 (Continued)
Dose Limits

Organ	Dose Limits [1]		Parsons I&T Administrative Controls [1] where the applicable regulatory authority is:	
	NRC	DOE	NRC	DOE
Action Level requiring support of a Health Physicist or a formalized Health Physics Program	Specified in the applicable licensing requirements (e.g., 10 CFR part 51 for byproduct material and 10 CFR part 70 for special nuclear material)	If the contract is covered by 10 CFR part 835 or if specified in the contract.	Specified in the applicable licensing requirements (e.g., 10 CFR part 51 for byproduct material and 10 CFR part 70 for special nuclear material)	If the contract is covered by 10 CFR part 835 or if specified in the contract.
Action Level requiring Health Physics Support Under 29 CFR part 1910.120 (e.g., Occupational Safety and Health Guidance manual for Hazardous Waste Site Activities)	At hazardous waste sites: • >2 mrem/hr above background obtain health physicist's assessment before continuing.	At hazardous waste sites: • >2 mrem/hr above background obtain health physicist's assessment before continuing.	At hazardous waste sites: • >1 mrem/hr above background obtain health physicist's assessment before continuing.	At hazardous waste sites: • >1 mrem/hr above background obtain health physicist's assessment before continuing.

Table E-4 (Continued)
Dose Limits

Organ	Dose Limits [1]		Parsons I&T Administrative Controls [1] where the applicable regulatory authority is:	
	NRC	DOE	NRC	DOE
Action Level for NORM contamination only	Established by the applicable state. If at a licensed facility may be controlled consistent with the applicable facility license.	Not addressed as separate issue.	Further action required if the dose rate from the item exceed 50 µrad/hr (i.e., consult a health physicist for further actions).	Further action required if the dose rate from the item exceed 50 µrad/hr (i.e., consult a health physicist for further actions).

Notes:
[1] TEDE is Total Effective Dose Equivalent. DDE is deep dose equivalent. CEDE is committed dose equivalent. SDE is shallow dose equivalent. DDEM is deep dose equivalent of the mother. TEDEF is TEDE of the embryo/fetus. DFFRM is TEDE to the embryo/fetus from the radionuclides in the mother.

[2] Does not include dose from radioactive waste disposal in the sanitary sewer.

[3] Requires justification of need and authorization from the regulatory authority.

[4] Applicable to declared pregnant workers only.

situations where such exposures could occur this activity and its implications will be discussed in detail in the applicable site/project health and safety plan.

E.4.3 Contamination

Contamination is not a type of radiation but an understanding of this term is essential in addressing radiological protection. Unless neutrons are present, exposure to radiation does not make personnel, the environment, or equipment radioactive. However, the source of radiation can be attached to personnel or equipment or be released to the environment. In other words they would be contaminated. Contamination is radioactive material in a location where it is not wanted. Radioactive contamination on personnel, equipment, or the environment it may be present as:

- particles (e.g., dust),
- chemical reacted so it is an integral part of the original material, or
- simple material (e.g., gas or liquid) adhering to the surface of personnel, equipment, or portions of the environment.

Table E-5
Dose Effect Relationship for Acute Whole Body Exposure

Acute Dose (DDE) (rad)	Syndrome	Effects
0-5	None	No detectable chemical effects.
5-25	None	Detectable levels of chromosome aberration in the blood. No other detectable short-term affects.
25-100	Hematopoietic	Transient reduction in lymphocytes; delayed effects possible.
100-200	Hematopoietic	Nausea and fatigue; reduction in lymphocytes and neutrophils with delayed recovery; delayed effects may shorten life expectancy in 1 percent of cases.
200-300	Hematopoietic	Nausea and vomiting on first day; latent malaise, sore throat, diarrhea, and emaciation; recovery in about 3 months
300-800	Hematopoietic	Nausea, vomiting, diarrhea first hours; latent period as long as a week followed by loss of appetite, malaise, epilation, hemorrhage, inflammation of mouth and throat, and emaciation; some death in 2 to 6 weeks. Possible eventual death to 50 percent of individuals.
500-2000	Gastrointestinal	Loss of appetite, lethargic, depressed, nausea vomiting, diarrhea, dehydration, and hemoconcentration.. Normal flood and fluid intake depressed and absorption through the GI tract reduced. Abdomen distended and peristalsis is absent, typically above 1000 rads results in death within about 1 week.
2000-100,000	Central Nervous System	All gastrointestinal syndrome affects. Disorientation, loss of coordination of muscular movement, respiratory distress, convulsive seizures, coma, and death within 24 hours to a week.
>100,000	Molecular Death	Death during or shortly after irradiation.

Based on:

- Basic Radiation Protection Criteria, National Council on Radiation Protection and Measurement, NCRP 39.
- Radiation Safety at Superfund Sites, U.S.E.P.A., Office of Emergency and Remedial Response, 1983.
- Shleien, Bernard, 1992. The Health Physics and Radiological Health Handbook, Scinta, Inc.
- Casarett, Alison , 1968. Radiation Biology.

Table E-6
Dose Effects Relationship for Acute
Partial Body Irradiation

Acute Dose (rem)	Organ	Effect in Relevant Organs
50	Testis	Temporary sterility
200	Bone Marrow	Hematopoiesis
200	Ovary	Sterility, Temporary amenorrhea
500	Skin	Temporary reddening and loss of hair
800	Testis	Permanent sterility
2,000	Liver	Hepatitis
2,500	Skin	Temporary ulceration and permanent loss of hair
2,200	Lung	Pneumonitis, fibrosis

Based on:

- Basic Radiation Protection Criteria, National Council on Radiation Protection and Measurement, NCRP 39.
- Radiation Safety at Superfund Sites, U.S.E.P.A., Office of Emergency and Remedial Response, 1983.
- Shleien, Bernard, 1992. The Health Physics and Radiological Health Handbook, Scinta, Inc.
- Casarett, Alison , 1968. Radiation Biology.

Regulatory agencies have established contamination limits for the uncontrolled release (i.e., public access) of items, persons, and areas. The release limits are based on assurance of compliance with

- The applicable dose limits discussed previously
- Implementation of ALARA
- The Clean Air Act
- The Clean Water Act
- Other applicable regulations and guidance

These contamination limits are summarized in table E.7. Fixed (versus removable) contamination refers to activity that can**not** be removed by swiping the surface with absorbent cloth or paper (as will be discussed later) is does not mean material that cannot be removed by other means. If personnel exceed these limits efforts shall be made to decontaminate them, if

Table E-7
Contamination (Airborne, Liquid-borne, and Surface) Level Limits[1]

Activity Type	NRC Criteria		DOE Criteria	
	Removable	Total	Removable	Total
Personnel Release Limits				
Beta, Gamma and X-ray Emitters	ANCDLA	ANCDLA	ANCDLA	ANCDLA
Alpha Emitters	ANCDLA	ANCDLA	ANCDLA	ANCDLA
Uncontrolled Release of Liquids				
Water release to a Sanitary Sewer	NA	Monthly Average Concentrations from 10 CFR 20 Appendix A Table 3	NA	• 5 Ci/yr alpha emitters; • 1 Ci/yr C-14; • 1 Ci/yr all other radionuclides[2]
Liquid Effluent	NA	Monthly Average Concentrations from 10 CFR 20 Appendix A Table 1	NA	Annual Average Concentrations from 10 CFR 834 Appendix A Table 1a

Table E-7 (Continued)
Contamination (Airborne, Liquid-borne, and Surface) Level Limits[1]

Activity Type	NRC Criteria		DOE Criteria	
	Removable	Total	Removable	Total
Drinking Water Aquifer	NA	• 4 mrem/yr; • Ra-226 plus Ra-228 < 5 pCi/L; • Gross alpha 15 pCi/L; • tritium 20,000 pCi/L; • Sr-90 8 pCi/L	NA	• 4 mrem/yr; • Ra-226 plus Ra-228 < 5 pCi/L; • Gross alpha 15 pCi/L (excluding Ra and U); • tritium 20,000 pCi/L; • Sr-90 8 pCi/L
Effluent	NA	Applicable NPDES Permit Requirements	NA	Applicable NPDES Permit Requirements
Settable Solids	NA			• 5 pCi/g alpha emitters; • 50 pCi/g beta/gamma emitters[3]
Dose to Aquatic Animals	NA	NA	NA	1 rad/day[3]

Table E-7 (Continued)
Contamination (Airborne, Liquid-borne, and Surface) Level Limits[1]

Activity Type	NRC Criteria		DOE Criteria	
	Removable	Total	Removable	Total
Airborne Effluent				
Airborne Concentration	NA	Monthly Average Concentrations from 10 CFR 20 Appendix A Table 1	NA	Annual Average Concentrations from 10 CFR 834 Appendix A Table 1a
Clean Air Act Airborne Pathway Limit[2]	NA	10 mrem/yr (with no more than 3 mrem/yr from iodine)--EDE	NA	10 mrem/yr (with no more than 3 mrem/yr from iodine)--EDE
Radon Release Rate where Ra-226 exists for storage or disposal	NA	NA	NA	20 $pCi/m^2/sec$
Clean Air Act Airborne Pathway Limit[2]	NA	10 mrem/yr (with no more than 3 mrem/yr from iodine)--EDE	NA	10 mrem/yr (with no more than 3 mrem/yr from iodine)--EDE
Radon Release Rate where Ra-226 exists for storage or disposal	NA	NA	NA	20 $pCi/m^2/sec$

Table E-7 (Continued)
Contamination (Airborne, Liquid-borne, and Surface) Level Limits[1]

Activity Type	NRC Criteria		DOE Criteria	
	Removable	Total	Removable	Total
Soil Contamination				
Radon Release	NA	NA	NA	3 pCi/L at a facility and an increase of <0.5 pCi/l above Background
Soil Contamination Ra-226 and Ra-228[3]	NA	ANCDLA and RUD	NA	• RUD in conjunction with NRC and EPA • 5 pCi/g in the top 15 cm of soil; • 15 pCi/g below 15 cm; • annual average ambient radon <0.02 WL above background in structures; • radon <0.03 WL including background in structures
General[3]	NA	ANCDLA	NA	ALARA and risk management based.

Table E-7 (Continued)
Contamination (Airborne, Liquid-borne, and Surface) Level Limits[1]

Activity Type	NRC Criteria		DOE Criteria	
	Removable	Total	Removable	Total
Contamination Values for Release of Items				
Natural Uranium, U-235, U-238, and associated decay products	ANCDLA	ANCDLA	1000 α (dpm/100 cm^2)	5000 α (dpm/100 cm^2)
Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-129, and Transuranics	ANCDLA	ANCDLA	20 α (dpm/100 cm^2)	500 α (dpm/100 cm^2)
Natural Thorium, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-125, I-126, I-131, I-133	ANCDLA	ANCDLA	200 α or β (dpm/100 cm^2)	1,000 α or β (dpm/100 cm^2)
Beta/Gamma/X-ray emitters not otherwise addressed	ANCDLA	ANCDLA	1,000 β or γ (dpm/100 cm^2)	5,000 β or γ (dpm/100 cm^2)

Table E-7 (Continued)
Contamination (Airborne, Liquid-borne, and Surface) Level Limits[1]

Activity Type	NRC Criteria		DOE Criteria	
	Removable	Total	Removable	Total
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	ANCDLA	ANCDLA	10,000 (dpm/100 cm^2)	10,000 (dpm/100 cm^2)

Notes:

[1] ANCDL means as needed to ensure compliance with dose limits and ALARA.
NA not applicable.
RUD means Regulations under development.

[2] Does not include Rn-222 and progeny.

[3] These values are based on the draft of 10 CFR 834 and DOE Order 5400.5.

these efforts are unsuccessful the individual's contaminated area should be contained (e.g., covered with a bandage) and then the individual referred to a medical professional for further action. Equipment that cannot be decontaminated to the contamination limits shall be considered potentially radioactive waste or controlled equipment. Public access to the contaminated area or equipment must be precluded.

When contamination is found on the skin or protective clothing the dose associated with this contamination must be estimated and included in the individuals exposure records if it exceeds the limits specified in table E.4. To allow assessment of skin dose the following information is needed:

- The type of radiation and the energy of the radiation. Note, alpha contamination would not typically cause a recordable skin dose. If this information is not known keep the de-contamination materials, which can be analyzed later to determine this information, if needed.
- The amount of activity present (in units of dpm, Ci, or Bq if feasible; other cpm) and the area contaminated.
- The identification (i.e., type, model, and serial number) of the instrument used in determining the activity present and the calibration data for the instrument.
- If the contamination is not directly on the skin the material and the thickness of the material between the contamination and the skin (including air gaps). In characterizing materials density is important.
- The time the contamination may have been present on the skin.
- The activity remaining on the skin after decontamination.

This data can be used by a professional health physicist to estimate dose. Failure to determine dose can be as important as failure to use dosimeters. The calculation method used by Parsons I&T will be consistent with the assumptions addressed in 10 CFR part 835.205.

E.5 RADIATION MEASUREMENT

The measurement of radiation for the purpose of protection requires both the proper instruments and the proper techniques of using them.

E.5.1 Radiation Instrumentation

There are two major types of instruments for measuring radiation. These are the field survey instruments used for analysis at the site and the laboratory instruments which require the collection of a sample that is transported to the laboratory for analysis. The focus of this section will be with the selection of field instruments for surveys. Field instruments can be segregated into two categories: Portable survey instruments and field measurement instruments. Field measurement instruments are usually very expensive and will be addressed briefly. Portable survey instruments are the instruments normally used by Parsons I&T personnel. There are also devices that can be placed in the field and evaluate later in the laboratory to assess the radiation fields [e.g., environmental TLDs (beta, gamma, and X-ray), EPERMS (radon concentrations)].

Field measurement instruments include equipment like the *in situ* gamma spectroscopy systems which allow for the field identification and possible quantification of radionuclides present in the ambient environment. Continuous air monitors are available which constantly monitor the buildup of radionuclides (i.e., alpha, beta, and gamma emitters) on a collection filter.

Continuous radon monitors can assess the radon or associated radon progeny concentration or working level hours. Also available are field portable scalar counting systems for alpha and beta activity collected on smears or air filters.

Portable survey instruments (Knoll, 1979) used for detecting radiation should be selected based upon the type, energy, and intensity of the radiation that is anticipated to be encountered. In addition (as discussed in EPA QA/G-4, draft 1994) the data quality objectives (i.e., the required accuracy, sensitivity, and reproducibility of the measurement) should also be considered and appropriate training and proceduralized controls are necessary for use of this equipment.

Most portable survey meters are count rate or exposure rate instruments [i.e., record a pulse rate, with readouts in counts per minute (CPM), mrad/hr, mrem/hr, or milliroentgen per hour (mR/h)]. All survey meters are small, rugged, and lightweight. It must be remembered that some accuracy and precision is sacrificed to provide the lightweight and small size for a portable instrument. For measurements of very low levels of activity or for measurements requiring a high degree of accuracy, laboratory equipment or field measurement equipment should be used; except for the measurement of ambient radiation fields. Survey instruments frequently incorporate a meter display and an aural output, using earphones or a speaker. For surveying areas, equipment, or personnel, the aural output and the meter display should be used, however, the aural circuitry responds more rapidly to radiation than does the meter. Small radioactive sources can be located more readily by sound than by observing the meter movement. Additionally, the aural circuitry typically does not fail if the device becomes saturated and the meter reads zero.

Portable instruments which are used in measuring exposure or exposure rate are generally small, ionization chambers or scintillation counters.

As radiation passes through a gas, it gives energy to orbital electrons causing ionization and excitation of the gas atoms. Gas ionization detectors use the process of ionization to detect the presence of radiation. The most frequently used detectors are ion chambers, proportional counters, and Geiger-Muller counters.

Ionization Chamber - The portable ionization chamber is used to survey beta and gamma radiation. The instrument comes in various forms, the most common being the pistol-shaped, portable rate meter called the "cutie pie" (CP). These instruments are thin-windowed and often have a removable shield over the window end of the chamber. When the shield is removed, the instrument detects both gamma and beta radiation, but when the shield is in place gamma is primarily detected. Ion chambers are often used to measure high energy fields which cannot be measured by a Geiger-Muller (GM) counter (see below). In addition, with proper use and calibration an ionization chamber can be used to measure dose, where as a GM counter can only be used as an indicator of the presence of activity.

Proportional Counter - Proportional counters are gas ionization detectors. The proportional counters used today are either gas flow or sealed. Field measurement portable scalar counting systems for alpha and beta activity typically use this type of detector. In a gas flow proportional counter, gas travels through the counting chamber at a low flow, removing the degraded gas and contaminants. Sealed proportional counters have a finite life because the radiation eventually causes the degradation of the gas until the detector loses its effectiveness. However, the chamber can be emptied and refilled with new counting gas.

Windowless or very thin windowed gas flow proportional counters are used to monitor alpha and beta radiation. Because alpha particles have a higher linear energy transfer than beta particles, the large pulses created by the alpha interaction with the fill gas can be distinguished

from the small pulses from beta particles by adjusting the operating voltage of the instrument. This instrument is especially useful when surveying alpha contamination in an area where there is high beta or gamma radiation levels.

Sealed proportional counters are used to measure neutrons. These instruments are often referred to as rem meters and have the advantage of being insensitive to other types of radiation. Small pulses produced by gamma rays are easily discriminated electronically.

Geiger-Mueller (GM) Counter - Perhaps the most frequently used survey meter is the GM counter. This is a gas ionization detector that can be used to monitor alpha, beta, and gamma radiation. The most popular GM survey meters use a "pancake" (i.e., mica window) tube. This detector is a flat round cylinder with a large thin window which is able to detect alpha radiation above 3 MeV and beta particles above 40 keV. Gamma rays are reduced by the coating of tungsten over the surface of the probe except at the window. For measuring X-ray or gamma in very rugged environments a GM survey instrument with a tube encased in a stainless-steel housing that contains a window is often used. The window can be opened to allow both beta and gamma radiation to enter or can be closed to admit only gamma. This allows the operator to determine the range of the beta contribution of a radioactive field.

GM counters are inexpensive, easy to operate, sensitive, and reliable, however, they have limitations. GM counters are much more efficient in detecting the directly ionizing beta particles than the indirectly ionizing gamma rays. The signals from a GM counter are all constant size, independent of the kinds of particles detected or their energies. Thus a GM tube is purely a radiation-event counter and its output signal will not provide information on the radiation that triggers it as would a ionization chamber or proportional counter. Therefore, a GM counter can only be used to locate radioactive material and as a means for comparing radiation levels to background. The use of a GM counter in a high radiation field requires caution because the counter becomes saturated. The radiation enters the detector tube at such a rate that it is in a state of perpetual discharge, and the count rate circuit fails to function properly. The result is a meter that responds for an instant but falls back to zero. A person entering a high radiation area will not realize it due to the instrument's failure. **It is always essential to assume that the instrument you are using may saturate in high fields (i.e., provide a false zero indication). The instrument must be in operation prior to entering radioactive area so that the operator will be able detect the high field prior to instrument saturation.**

Scintillation Detector - Certain materials fluoresce when struck by radiation. These materials are referred to as phosphors or scintillators. Scintillation detectors were among the earliest detectors used to measure ionizing radiation and continue to be widely used today. Portable scintillation meters are simply rate meters or counters that respond to a specific type of radiation. The selection of the type of radiation response depends on the choice of salt crystal in the probe. (Sodium iodide crystals are used to detect gamma and X radiation. Zinc sulfide crystals measure heavy charged particles, such as alpha.)

The output current from scintillation dose-rate instruments is hundreds of times greater than that from ionization chambers of the same volume, these instruments are not used widely for radiation monitoring. Alpha contamination is typically detected using a scintillation counter (i.e., zinc sulfide scintillator). When measuring ambient radiation near ambient background a microR survey meters, which uses a NaI crystal scintillator is often used. Note, these microR (μR) meter are actually measuring dose typically in μrad/hr rather than the μR/hr specified by its name. Historically, the μR meter used a different detection method.

E.5.2 Radiation Surveys

Parsons I&T personnel must perform radiation surveys whenever they work at a site where radiation sources are used or where their previous use or storage is suspected. Surveying is a method used to monitor radiation exposure to personnel in real time. This information is used to maintain exposure levels within applicable dose-equivalent limits.

Preparation for a survey should begin with the gathering of information concerning the radiation sources that were used or stored in the past or are currently used. This information may be obtained by interviewing personnel or by examining records and written procedures. Examples of information that should be incorporated into the Project Health and Safety Plan include the following:

- Chemical composition and physical form of radioactive material
- Expected type(s) of radiation (e.g., alpha, beta, gamma)
- Potential for release or dispersion of radioactive materials during site operations
- Location of radiation areas (if available)
- Previous survey records (if any)
- Types and numbers of sources (e.g., sealed sources, unsealed sources, etc.)
- Types and energies of radiation produced by source
- Natural background levels.

After evaluating what type of radiation can be expected, the surveyor must select what radiation detection and measurement equipment is best suited for the task.

Area surveys are carried out with a survey instrument sensitive to the radiation present. General area surveys for beta and gamma are performed best by holding the probe away from the body at about 0.5 to 1 inch above the surface and tracing a systematic path through the area, noting any rise in radiation level marking these locations with spray paint or chalk. Locations must be diagrammed in the logbook. Survey for ambient dose gamma rates (e.g., µrad/hr, mrad/hr) follow the same survey techniques except that the instrument is typically held about waist high (i.e., ≈ 1 m above the surface).

Surface contamination from alpha or weak beta emitters is performed by slowly moving a suitable detector over a systematic path covering the ground, floor, or working surface. The detector probe should be held within 6 mm of the surface. It is useful to have an audio signal, such as from earphones or loudspeaker, since small increases in radiation above background are detected easily by listening to the increase in clicks. It is also easier to pay attention to the surface being monitored if the meter does not require constant viewing. Areas potentially contaminated by alpha emitters or indicating contamination well above background may be checked by a wipe test. In addition, wipe tests are required for compliance with specific regulatory requirements such as uncontrolled release of items or for shipping containers. A piece of filter paper is wiped over an area of approximately 100 cm^2 and then counted with a 50-mm diameter "pancake" probe for alpha and weak beta. A shielded-end window GM detector may be used for counting gamma and high energy beta. Counting may also be performed by inserting the filter paper into a liquid scintillation vial. The vial is sent to the laboratory and counted on a liquid scintillation counter. (Note, the filter paper would typically be dissolved and then place in a scintillation cocktail at a laboratory for liquid scintillation counting.) These instruments have a much greater sensitivity than field survey instruments and are used to identify the particular radionuclide in the sample.

The Project Health and Safety Plan should establish permissible radiation levels based upon the anticipated dose received above that attributed to the radiation that is normally present. If the projected dose rate is anticipated to exceed 1 mrem/hr above background, a Health Physicist should be consulted. Background radiation levels are variable and must be considered when surveying. It is best to measure background radiation at a location away from the work area. Readings on survey instruments ranging from 0.01 to 0.02 mR/h are common. Slightly higher readings may occur in geographical areas where large deposits of naturally occurring radioactive elements are found. A doubling of the background counting rate might be considered a positive indication of contamination. The permissible radiation ceiling for most Parsons I&T projects is set at 1 mrem/h unless a Health Physicist has established a task specific ceiling limit. Above the ceiling limit, work is stopped and a Health Physicist or the Corporate Health and Safety Manager is contacted. For work to continue control methods must be used to reduce exposure to acceptable limits. A controlled area must be established if work is to be performed in any area where the dose is 5 mrem/h or not in excess of 100 mrem/wk. Controlled areas must be conspicuously marked with the postings illustrated in figure E-1. These signs bear the purple or magenta radiation symbol on a yellow background. Note, international requirements may vary from those specified in this appendix. Access to these areas will be controlled for people and equipment by utilizing warning signs and barricades designed to prevent inadvertent exposure to contaminated materials.

The performance and accuracy of radiation detection and measurement instruments depend upon their proper calibration and reliability checks made during use. Portable survey meters should be sent in for calibration biannually to the instrument's manufacturer or a vendor offering commercial calibration service. Vendors offering calibration services should follow American National Standards Institute methodology (ANSI Publication N323) and ensure that calibration sources are National Bureau of Standard certified. In the field, the survey instrument response should be verified by placing the probe next to a "check" source and noting a change in meter deflection. Checks should be performed daily. Records of instrument calibration and the performance and accuracy checks must be maintained in accordance with section 7 of this manual.

E.5.3 Personnel Monitoring

OSHA requires employers to monitor each employee who works in an area where they are likely to receive a dose in any calendar quarter in excess of 25 percent of the applicable standard shown in 29 CFR part 1910.26 table G-18. The NRC and DOE requirements are specified in table E.4. A dosimeter measures the dose accumulated over an extended period. Personnel monitoring equipment includes: thermoluminescent dosimeters (TLDs), pocket chambers,

Figure E.1 Postings

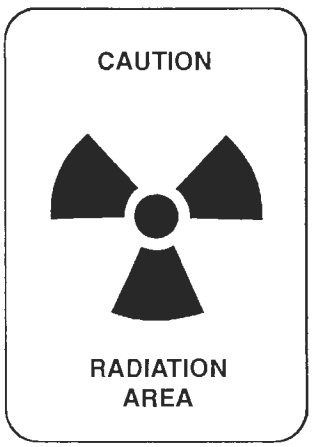
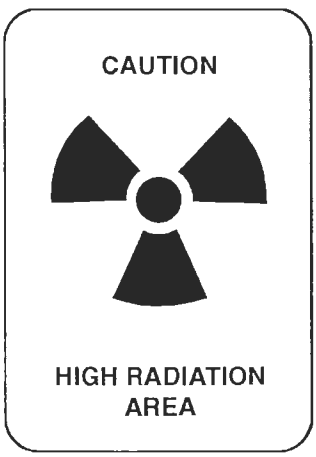
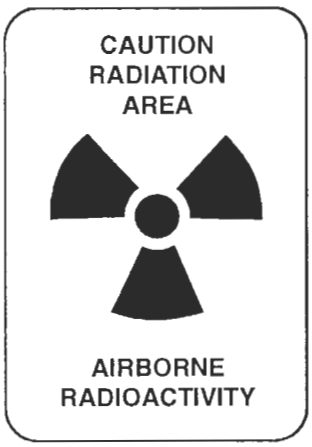
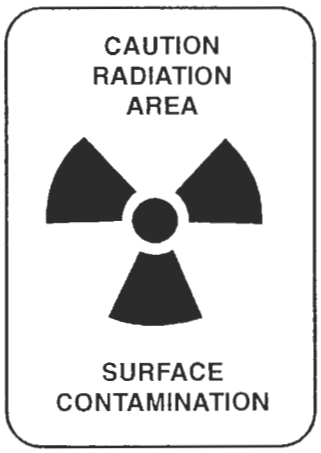
Posting	Criteria
	**Radioactive Materials Area** Areas where radioactive material is present or stored, but is not otherwise posted. This can also be put on a container rather than an area. Typically when placed on a container the activity in the container is indicated.
	**Radiation Area** Dose Rates at least 5 mrem/hr and less than 100 mrem/hr at 30 cm from the source of the radiation or the surface it penetrates.
	**High Radiation Area** Dose Rate at least 100 mrem/hr at 30 cm from the source of the radiation or the surface it penetrates and less than 500 rad/hr at 1 m from the source of the radiation or the surface it penetrates. ***A Very High Radiation Area posting also exists but is not typically required for Parsons activities.***

Figure E.1 Postings(Continued)

Posting	Criteria
	**Airborne Radioactivity Areas** Airborne concentration likely to exceed more than 10% of a DAC.
	**Contamination Area** Contamination levels exceeds the surface contamination limits specified in Table E.7 but is less than 100 times the surface contamination limits.
	**High Contamination Area** Contamination levels exceeds 100 times the surface contamination limits specified in Table E.7.
Note, if the site has an existing posting system it is probably more appropriate to use the existing postings to avoid confusion.	

integrating electronic dosimeters, survey instruments with integration functions, and film badges. The personnel record dosimeter must be supplied and processed by an organization which is qualified under DOE's DOELAP or NRC's NVLAP accreditation program. The accreditation of the program must be consistent with the projected radiation fields that will be encounter at the work site. This justification (i.e., the technical basis) must be addressed if the health and safety plan for any site requiring the use of personnel dosimetry.

Thermoluminescent Dosimeter - The "TLD" detectors are suited to general personnel and environmental monitoring of beta, neutron, X-ray, and gamma radiation. (Note, environmental dosimeter must comply with the applicable ANSI or ANS standards and regulatory guidance.) The principal of operation is that energy absorbed from radiation raises the molecules of the detector material to excited states. They remain in these excited states until they are heated to a temperature that will cause the material to return to its normal state with the emission of light. The amount of light emitted is proportional to the amount of energy absorbed. TLDs have a wide dose-response range and a very low energy dependence. Other advantages of a TLD are that it is small, rugged, and unaffected by environmental variables (unlike film badges). TLDs are very accurate. TLDs are typically used to record external dosimetry.

Since personnel dosimeters record only the dose they have received, it is important that personnel be trained in their proper use.

Pocket Ionizing Chamber - The direct reading pocket ionization chamber consists of a small capacitor charged prior to use and connected to a glass fiber electroscope. These dosimeter provide continuous data but are typically only useful for X-rays and gamma rays with energy greater than 60 keV. Exposure to ionizing radiation results in a loss of charge proportional to the amount of exposure and a corresponding deflection of the fiber. The deflection is viewed directly by mean of a lens and scale built into the instrument. This instrument is particularly useful for keeping a running account of radiation exposure during work in high dose-rate areas. Although pocket ionization chambers are convenient to use they must be handled carefully. Rough handling, shock, or impact to the dosimeter can give erroneous results. Exposure to moisture causes leakage across the insulator resulting in a deflection of the fiber and spurious readings.

Electronic Integrating Dosimeters - The electronic integrating dosimeter, like the pocket ionizing chamber, provides continuous information on radiation dose. In addition, these dosimeters typically provide an audible indication of dose rate and alarm at established doses/dose rates. These devices are typically less likely to give erroneous results. The behavior and response is similar to that of a pocket ionizing chamber.

Survey Instruments with Integration Functions - This is essential a survey instrument with the sensitivity and response of the survey instrument; however it also provides the capability to measure integrated dose like an electronic dosimeter and may have programmable alarm features.

Film Badge - Photographic film is measurably darkened by radiation and can provide an estimation of personnel exposure. The film response depends upon the type, energy, and amount of radiation. The film is incorporated into a film cassette or badge. The badge is designed so radiation can reach the film either through an open window, or through filters. Thin filters of low atomic weight, such as aluminum, are used to distinguish between gamma rays and high energy beta radiation. Most film wrappers will stop radiation with an energy less than 140 keV. Therefore, film badges are not to be used for monitoring exposures to low energy emitters such as tritium or carbon-14. Limitations to the use of these dosimeters are that the film degrades with age and the photographic image fades with humidity or high temperatures. This dosimeter is not typically used outside of medical health physics or university settings.

E.5.4 Personnel Dosimetry Program

As stated earlier, the Nuclear Regulatory Commission, Department of Energy, and OSHA require employers to provide appropriate personnel monitoring equipment to employees who work in a restricted area and will receive or are likely to receive a dose in any calendar quarter in excess of established values. It is Parsons I&T policy to place individuals on a monitoring program whenever there is the likelihood for exposures to exceed 100 mrem/yr or 10 percent of the dose limit (whichever is a more conservative value). Additionally, a personal dosimetry program may be instituted at the discretion of the Project Health and Safety Officer. The monitoring program is developed by the Project Health and Safety Officer with exposure records being forwarded to the Facility Health and Safety Representative and medical oversight contractor for archiving. Personnel monitoring equipment may include use of any of the devices discussed above.

The primary dosimeter used by Parsons I&T for monitoring whole-body external radiation dose should be a thermoluminescent dosimeter or film badge. In high radiation fields, a direct reading dosimeter such as a pocket ionization chamber or electronic dosimeter should be used to supplement the TLD or film badge. This allows the individual to track their exposure when in the field. Direct-reading dosimeters should be used when an individual is likely to receive 5 mrem in 1 hour and must be used in high radiation areas where the dose rate may exceed 100 mrem/h. In high dose rate areas electronic dosimeters are preferred as they provide an audible indication of dose and alarm at an established integrated dose.

The procedures outlined below are an example of a personnel exposure monitoring program that will provide documentation of individual radiation exposure:

1. Personnel who anticipate working in an area containing ionizing radiation shall sign a letter requesting previous radiation exposure history (figure E.2). This letter requests that previous employers supply radiation exposure information so that the worker's total ionizing radiation exposure history can be known.
2. Field workers will be issued a dosimeter by the Project Health and Safety Officer. All personnel shall turn in their dosimeters to the Project Health and Safety Officer at the end of each work day and will receive back the same badge at the beginning of their next shift.
3. Dosimeter badges can be obtained from a vendor (e.g., Landauer, Victoreen, etc.).
4. The dosimeter badges are collected from field personnel and exchanged for new badges at the end of a calendar quarter (or completion of project if field operations are conducted in less 3 months).
5. When the exchange of dosimeters is complete, the used TLDs or badges shall be shipped by the Project Health and Safety Officer to the vendor or radiation laboratory.
6. When not being worn or shipped back to the vendor or laboratory for reading, dosimeters will be stored in an area of lowest practicable radiation level (usually in a lead container, "pig").

Figure E.2
Letter Requesting Disclosure of
Radiation Exposure History

(date)

(Name of Company)
(Address of Company)
Attention: Dosimetry Department

I request that you release to Parsons Infrastructure & Technology any internal or external radiation exposure history which you may have on file for me during the period I was employed at your facility.

_____
(Employee's name, typed or printed)

Social Security Number: _____
Periods of Exposure: _____

Please send this information to:
Parsons Infrastructure & Technology
(Address of Employee's Office)
Attn: Facility Health and Safety Representative
Please reply immediately.

Thank you,

(Employee's Signature)

---

7. Upon receipt of dose readings, individual exposure records shall be updated (see figure E.3). If an issued dosimeter is lost or damaged, the Project Health and Safety Officer, in consultation with the Field Team Leader and the employee, shall estimate the dose the individual received during the exposure period. Survey readings, hours worked, and exposure readings from individuals working in the same area will be used to estimate dose.
8. The dosimeter shall be worn on the front of the body between the neck and waist outside the protective clothing when whole body exposure is to be measured.

Figure E.3
Record of Radiation Exposure

Dosimeter Number	Assigned to (Name)	Exposure Period (Dates)	Dose (rem)

Return Form to Facility Health and Safety Representative after Completion of Project

E.6 CONTROL AND REDUCTION OF EXTERNAL RADIATION

External radiation exposure is exposure from a source outside the body. The hazards presented by external radiation and the methods for control are dependent upon the penetrating ability of the radiation and the dose-rate encountered.

The primary methods of reducing external radiation are the use of time, distance, and shielding. These control procedures are most effective when Parsons I&T personnel are performing tasks on or near sources, such as drums of mixed wastes or laboratory packs containing radioactive tracers. Each task involving radioactive material should be carefully evaluated by the Project Health and Safety Officer to determine which control procedures are appropriate. If the projected or actual dose rate for this activity exceeds 2 mrad/hr or 50 mrem/yr (above background) then the associated health and safety plan must have the concurrence of a Health Physicist. If the projected dose rate occurring during the task exceeds 1 rem/hr or the projected exposure from the task (limit to an individual year) exceeds 1 rem the health and safety plan for this task requires the concurrence of a Senior Health Physicist and would typically have a health physics technician onsite when the task is being conducted.

E.6.1 Time

The longer the time spent working in a radiation field, the higher the dose received. A person's working time can be reduced if the work is planned and the individual is proficient in performing the task. For certain tasks, the Project Health and Safety Officer should encourage dry runs or specific training to be performed in nonradioactive areas prior to any work with radioactive materials. Any modifications that could result in a decreased exposure time must be explored. The time spent in a radiation area must be controlled by the use of a timekeeper (this can be the Project Health and Safety Officer). If the dose-rate in a given area is known from instrument readings, then the maximum allowable residence time can then be calculated using the equation below:

$$T = \frac{D}{D_1}$$

T = maximum allowable residence time in radiation area
D = maximum dose to be received
D_1 = dose-rate of area

The personnel not directly involved in the task, such as the supervisor and timekeeper, should stand in the support area within sight of the individual(s) in the control area. When the specific time has elapsed, the timekeeper must notify the individual(s) to leave the area immediately.

E.6.2 Distance

Often the time spent near a radiation source or area cannot be reduced. Personnel must then either work farther away from the contamination or place shielding between them and the source. Distance is very effective in reducing radiation incident on the body. The actual relationship follows the inverse square law; that is, for point sources, the intensity varies inversely as the square of distance from the source. The equation for the inverse square law is:

$$D_2 = D_1 \times \frac{(S_1)^2}{(S_2)^2}$$

D_1 = dose rate at distance 1
D_2 = dose rate at distance 2

S_1 = distance 1
S_2 = distance 2

The inverse square law should be used for small radiation sources (e.g., source where the distance to the source is at least 5 times the largest diameter of source). For large sources, such as a uniformly contaminated tank or drum, a working estimate maybe made by assuming the dose is inversely proportional to the distance. The doses from beta source would be severely over-estimated by either of these approaches if the distance from the source is a significant portion of the range of the beta activity. Consult a Health Physicist when estimates of beta doses are needed. The range of the alpha particles typically found on earth outside of accelerator facilities have a range in air on the order of an inch or less and thus do not represent a direct exposure problem.

The Project Health and Safety Officer should carefully evaluate each task to determine what procedures can be used to increase the distance between personnel and the source. Procedures for the reduction of radiation exposure can include remote operations in addition to work distant from the source(s).

E.6.3 Shielding

Shielding is the use of barriers or absorbers placed between an individual and a source to prevent or reduce the radiation from reaching and exposing the individual. Alpha particles are absorbed by a few centimeters of air. Beta particles are stopped by a few millimeters of Plexiglass or aluminum. A gamma shield always allows a fraction of the gamma photon to pass through. The fraction decreases, of course, as the thickness or density of the shielding material increases. It is important to remember with gamma photons a shield that is just thick enough to provide protection for one emitter may not be thick enough for another emitter with significantly higher energy.

The protection offered by a shield must always be evaluated in terms of the source strength. No shield should be trusted until its adequacy has been verified for the source to be shielded. Rarely will Parsons personnel encounter a situation where shielding will be necessary. The determination of shielding material and thickness is a complex operation that should be left to a professional Health Physicist.

E.7 CONTROL OF INTERNAL EXPOSURE

Considerable effort should be expended to prevent radiation exposure resulting from the introduction of radioactive materials into the body through inhalation or ingestion. Because of the internal radiation hazard posed by airborne contamination or the accidental ingestion of surface contamination, every means of preventing the spread of contamination should be exercised. If there is a credible potential for significant internal dose (see table E.4), a baseline (i.e., prior to potential exposure) bioassay or in-vivo count (as appropriate) result should be obtained. After completion of the task, or at termination of employment, a final bioassay or in-vivo count (as appropriate) should be obtained. The concurrence of a professional Health Physicist is required for the health and safety plans associated with any activity where a significant internal dose may occur. If an internal dose in excess of 50 mrem/yr may occur a Senior Health Physicist's concurrence must be obtained.

The following approaches should be utilized for the control of internal radiation:

- routine surveys for surface contamination

- decontamination of contaminated people or objects
- use of protective clothing and equipment
- administrative guidelines or safe work practices

E.7.1 Surveys for Surface Contamination

Routine surveys for surface contamination should be conducted with a frequency dependent upon the radiotoxicity of the material(s) (if known) and relative ease of spreading or aerosolizing the contamination. Surveys of personnel should be conducted during the course of work in the controlled area and as each person departs to unrestricted areas (e.g., support zone). Surveys shall verify that personnel, equipment, and areas released to the public meet the criteria specified in table E.7. The appropriate survey instrumentation must be identified in the health and safety plan.

E.7.2 Decontamination of People and Equipment

Contaminated personnel and objects must be decontaminated to a safe level prior to removal from the contamination reduction zone (CRZ) or radiation contamination area (see figure E.1). Decontamination procedures for both personnel and objects are described below.

E.7.3 Use of Protective Clothing and Equipment

The purpose of protective apparel is to place a barrier between the radioactive material and the individual. It must be remembered that this barrier has negligible shielding characteristics; its purpose is to prevent contamination of the skin and inhalation of airborne materials.

Protective clothing at a hazardous waste site is selected based upon chemical hazards. Similarly, this protocol should be followed when selecting clothing for mixed waste sites. The only exception is that level D clothing in a radioactive area must always incorporate the use of coveralls, gloves, and boot covers. Clothing materials should not easily puncture or tear. Protective clothing should be disposable. After decontamination any clothing still contaminated in excess of the release criteria (see table E.7) must be disposed of as radioactive waste or sent to a regulated laundry. Equipment that does not meet the release criteria (see table E.7) after practicable decontamination must either be controlled and handled as radioactive or disposed of as radioactive waste.

Respirators should be selected in accordance with the office's written respiratory program. Note that the maximum use concentration of a respirator in a radioactive environment is determined by multiplying the protection factor of the mask by the value specified for the airborne radioactive material in table 1, column 1 of 10 CFR part 20, appendix B and 10 CFR part 835 appendix A. Thus, the maximum use concentration of the mask should always be greater than the air concentration of the contaminant. As a minimum, full-facepiece air purifying respirators shall be used to protect against airborne radioactive materials.

E.7.4 Safe Work Practices

To maintain a strong safety awareness and enforce safety practices, a list of administrative guidelines or standing orders should be developed and posted at the site [e.g., a radiation work procedure (RWP)]. This will aid in reducing the intake of radioactive materials. A partial listing of standing orders should include the following items:

- Smoking, eating, and drinking shall not be allowed in controlled areas.
- Upon the completion of decontamination, each individual shall survey hands, shoes, and other areas of the body or clothing. Contamination should be removed when found and shall be removed before the individual leaves the CRZ. If significant levels of personnel contamination are found, or if the contamination cannot be readily removed, the Project Health and Safety Officer shall be contacted.
- Frequent radiation surveys shall be performed around controlled areas.
- Radioactive warning labels, tape, signs, etc., shall not be used for purposes other than those for which they are intended.
- Equipment or apparatus that has come in contact with radioactive materials shall not be used for other purposes until it is demonstrated to be free of contamination.
- Work should be planned ahead; whenever possible, a dry run to test the procedure should be done first.
- The buddy system must always be enforced in controlled areas.
- Access to controlled areas must be restricted.
- Ensure appropriate signs are posted in radiation areas.

E.8 DECONTAMINATION

Decontamination has three purposes: (1) to prevent uptake of radioactive material into the body; (2) to limit external radiation exposure; and (3) to prevent the spread of contamination. Decontamination procedures must be established for both personnel and equipment. The specific decontamination method selected for a particular circumstance depends upon the type and extent of contamination.

The CRZ or radiation contamination area should be organized in accordance with the project health and safety plan. The CRZ or radiation contamination area should be posted and barriers established along its perimeter to limit access and prevent the spread of contamination. Personnel working in the CRZ or radiation contamination area must be protected against contamination by the use of protective clothing and equipment. For example, for decontamination operations involving tritium, organic solvents, or other wet substances, impervious clothing should be selected to prevent absorption. Respiratory protection must be used when highly contaminated articles or equipment are being decontaminated. The decontamination process should minimize aerosolizing loose contamination.

E.8.1 Personnel Decontamination

To prevent harmful materials from being transferred into clean areas and exposing unprotected workers, personnel exiting a controlled area will undergo decontamination. Unlike decontamination for hazardous waste operations where washing and rinsing are performed with a sequential doffing of clothing, personnel decontamination at radioactive sites involves only the removal of contaminated clothing. No washing or rinsing should be performed.

The last step in the contamination reduction corridor before the individual enters an unrestricted area is to determine the extent and magnitude of any residual skin contamination using personnel survey techniques. If skin contamination is discovered, removal of the contamination with adhesive tape is generally the best initial approach. This can be followed by

harsher methods when necessary, such as mild abrasive soap; complexing solution; and mild organic acids. Table E.8 lists basic methods for personnel decontamination.

Any potential contamination of wounds or injection of radioactive material into the body shall be evaluated by a Senior Health Physicist to determine if medical intervention is appropriate. If the methods of decontamination discussed in this section fails to achieve the required results, or there appears to be the potential for creating an opening in the skin, contain the contamination (e.g., bandage the area) and contact a Senior Health Physicist and a doctor for further assistance.

Table E.8
Personnel Decontamination Methods

Method[a]	Common Agents	Action
Tape	Adhesive tape, masking tape	Removes by adhesion of contamination to tape
Flushing	Water	
Mild soap and water	Bar soap, liquid soap	Emulsifies and dissolves contaminant
Detergent and water	Household laundry detergents	Emulsifies, dissolves, and abrades
Chemical complexing	10% EDTA solution	Chelates (bonds to contaminant)
Oxidizing agents	Household bleach, potassium permanganate, and sodium bisulfite	Dissolves contaminant absorbed in the epidermis

Personnel with open wounds (i.e., breaks in the skin) are not allowed to work in contaminated areas.

If extensive washing is required or harsh methods are used, the chapping or cracking of the skin must be avoided. Chapping or cracking of the skin from repeated washing or abrasion may result in the intake of radioactivity through minor cuts. Lukewarm water should be used for all washing and rinsing. Hot water will cause the pores to open, driving the contamination deeper into the skin.

E.8.2 Equipment Decontamination

As part of your ALARA program, minimize the amount of equipment taken in to a radiation contamination area. Equipment exiting a controlled area must be decontaminated to reduce the spread of contamination and the potential for exposure to personnel. Decontamination should be performed as soon as site activities are completed. Materials that cannot be easily cleaned or cost-effectively decontaminated should be evaluated for limited use in restricted areas. Porous items of low replacement cost such as wood handled tools may have to be disposed of. Expensive instrumentation (i.e., air monitoring equipment) should be wrapped in plastic before transporting into heavily contaminated areas.

Equipment decontamination involves removing radioactivity by cleaning, abrasive, chemical, and electrochemical processes. Cleaning methods are nondestructive, but if the contamination is extensive may require the partial disassembly of equipment for maximum effectiveness. Cleaning includes manual (e.g., wiping, tape patches, vacuuming) and the less frequently used mechanical (e.g., water jet, ultrasonic cleaning, etc.) techniques. Abrasive methods are destructive involving

the progressive removal of contaminated material. Examples of abrasive decontamination are sand blasting and grinding. The problem with abrasive decontamination is that it tends to generate airborne contaminants. Chemical methods involve both nondestructive techniques (e.g., use of detergents and complexing agents that remove contaminants through emulsification and ion exchange) and destructive techniques (e.g., the use of caustics and acids which dissolve and corrode contamination). Chemical methods are most effective when nonporous surfaces are to be decontaminated. Electrochemical methods are destructive, electrolytically removing contamination and some of the base material. Electropolishing, for instance, is highly efficient at decontaminating small tools and parts. All materials must be surveyed prior to release into nonrestricted areas.

E.9 TRAINING

The foundation of any safety program is training. Parsons I&T personnel who perform activities at sites where they are likely to encounter radioactive materials must receive a site specific training that incorporates radiation protection. Basic radiation protection training shall cover three major areas: (a) precautions or procedures that will be used to minimize exposure; (b) radioactive measurements, monitoring techniques and instruments to be used; and (c) biological effects of radiation. Site specific training is to be performed by the Project Health and Safety Officer before beginning site operations. This training must be documented. Additionally, personnel working at the site must have documentation of applicable initial and refresher training (e.g., 40-hour hazardous waste operations training, 8-hour hazardous waste operations refresher training, etc.).

This training must be documented. Additionally, personnel working at the site must have documentation of applicable initial and refresher training (e.g., 40-hour hazardous waste operations training, 8-hour hazardous waste operations refresher training, etc.).

If the occupational exposure limits are applied to workers, then these workers must be qualified as radiation workers. Completion of the 40-hour hazardous waste operations training typically does **NOT** qualify an individual as a radiation worker. Criteria for qualification of personnel as radiation workers may be found in DOE and NRC guidance documents. This training and qualification criteria guidance must be fully implemented if the radiation worker exposure limits are applied to control of worker exposures. These limits are based on informed consent. Further individuals designated as health physics technician shall be the substantive requirement criteria guidance for qualification of these technician, at a minimum.

E.10 RECORDS

All records related to the documentation of the implementation of radiological control requirements are considered radiological safety records. This would include:

- Dosimetry results and investigation results;
- Radiation inventory and survey records;
- Health and Safety Plans;
- Training documentation;
- Calibration and accuracy check records; and

- Other supporting documentation necessary to verify Parsons I&T compliance with applicable regulations, orders, standards, guidance, and industry practices to ensure safety of workers and the public and to protect the environment.

These records will be maintained, as appropriate, by the Facility Health and Safety Representative, or a designate records repository (medical oversight contractor) shall maintain these records in a manner consistent with the requirements of this manual.

glossary

ALARA: An acronym for "as low as reasonably achievable"; refers to an operating philosophy in which occupational exposures are reduced as far below specified limits as is reasonably achievable.

ALPHA PARTICLE: A charged particle that is emitted from the nucleus of an atom and that has a mass and charge equal in magnitude to those of a helium nucleus, i.e., two protons and two neutrons.

ATOM: The smallest unit of an element that is capable of entering into a chemical reaction.

ATOMIC NUMBER: The number of protons in the nucleus of an atom of a nuclide.

BETA PARTICLE: A charged particle emitted from the nucleus of an atom, with a mass and charge equal in magnitude to those of the electron.

CALIBRATION: The determination of a measuring instrument's variation from a standard, to ascertain necessary correction factors.

CALENDAR QUARTER: Any 3-month period as specified in 29 CFR Part 1910.96[b][4].

CHRONIC EXPOSURE: Radiation exposure of long but not necessarily continuous duration.

COMMITTED EFFECTIVE DOSE EQUIVALENT (CEDE): The dose equivalent calculated to be received by a tissue or organ over a 50-year period after the intake of a radionuclide into the body.

COUNT (RADIATION MEASUREMENTS): The external indication of a device to enumerate ionizing events. It may refer to a single detected event or to the total number registered in a given period of time. The term is often used erroneously to designate a disintegration, ionizing event, or voltage pulse.

DECAY, RADIOACTIVE: The disintegration of the nucleus of an unstable nuclide by the spontaneous emission of charged particles and/or photons.

DECONTAMINATION: The reduction or removal of radioactive contamination from any given surface.

DEEP DOSE EQUIVALENT (DDE): The dose equivalent derived from external radiation at a depth of 1 cm of tissue.

DETECTOR, INTEGRATING: A detector that measures a total accumulated radiation quantity (such as exposure or dose) rather than the rate of accumulation of the radiation. Devices that accumulate and hold charges (e.g., electrometers) and that indicate measures proportional to the total dose are of this type. Examples of integrating detectors are electrometers, electronic dosimeter, film badges, pocket dosimeters, and neutron activation detectors.

DETECTOR, SCINTILLATION: A radiation detector whose response is a light signal generated by the incident radiation and a scintillating medium. The light signal is transformed into an electronic signal through an adjacent, optically coupled, photo-sensitive device such as a photomultiplier tube.

DIRECTLY IONIZING RADIATION: Radiation removes electrons from the atoms of the absorbing media directly by charge particle interaction.

DOSE: A general term denoting the quantity of radiation or energy absorbed. For special purposes, the term must be appropriately qualified. If unqualified, it refers to absorbed dose.

DOSE, ABSORBED: The amount of energy imparted to matter in a volume element by ionizing radiation, divided by the mass of irradiated material in that element. Also called dose. The common unit of absorbed dose is the rad, which is equal to 100 ergs of absorbed energy per gram of material (or 0.01 J/kg). The SI unit of absorbed dose is the gray, which is equal to 100 rad or to 1 joule of absorbed energy per kilogram of material.

DOSE, WHOLE BODY: The average uniform absorbed dose or dose equivalent received by a person whose whole body is exposed to ionizing radiation from an external source.

DOSE EQUIVALENT: The product of the absorbed dose, the quality factor, and other modifying factors necessary to evaluate the effects of irradiation received by exposed persons. This unit of measure takes into account the particular characteristics of the exposure. The common unit of dose equivalent is the rem. The SI unit is the sievert. Absorbed doses of different types of radiation are not additive, but dose equivalents are, because they express a common scale the amount of damage incurred.

DOSIMETER: An instrument to detect and measure accumulated radiation exposure. In common usage, a pencil sized ionization chamber with a self-reading electrometer, used for personnel monitoring.

DOSIMETER, PERSONAL: A dosimeter of small size carried by a person to determine the exposure, absorbed dose, and/or dose equivalent received during the carrying time. Also called personal exposure meter.

DOSIMETER, POCKET: A dosimeter the shape and size of a fountain pen with a clip, to be worn in the pocket like a fountain pen.

DOSIMETER, THERMOLUMINESCENT: An integrating detector that utilizes a phosphor sensitive to ionizing radiation. The phosphor stores the energy of the ionization within itself and releases it as low-energy photons (light) when heated. The total amount of light released is proportional to the total absorbed dose.

ELECTRON VOLT: A unit of energy equivalent to the energy gained by an electron in passing through a potential difference of 1 volt. Larger multiple units of the electron volt are frequently used: KeV for thousand or kilo-electron volts; MeV for million or mega-electron volts. 1 eV = $1.6 * 10^{-12}$ erg.

EXPOSURE: (1) The incidence of radiation upon inanimate or living matter by intent or accident. (2) For x or gamma radiation tests, the sum of the electrical charges of all the ions of one sign produced in air when all electrons liberated by photons in a suitable small volume of air are completely stopped in air, divided by the mass of air in the volume.

EXPOSURE RATE: (1) The exposure divided by the time over which it was accumulated. (2) The increment of exposure during a suitably small interval of time, divided by that interval of time. The usual unit of exposure rate is roentgens per hour (R/h).

GAMMA RADIATION: Electromagnetic radiation releases as the result of nuclear decay. Gamma radiation is the most penetrating of all radiation.

GEIGER-MUELLER COUNTER: A highly sensitive, gas-filled radiation measuring device. It operates at voltages high enough to produce avalanche ionization.

INDIRECTLY IONIZING RADIATION: Radiation which results in interactions that remove electrons from the atoms of the absorbing media by deposition of energy in the atom.

IONIZATION CHAMBER: An instrument designed to measure a quantity of ionizing radiation in terms of the charge of electricity associated with ions produced within a defined volume.

ISOTOPES: Nuclides that have the same number of protons in their nuclei, hence the same atomic number, but that differ in the number of neutrons and therefore in the mass number. Isotopes of a particular element have almost identical chemical properties. The terms should not be used as a synonym for nuclide.

LINEAR ENERGY TRANSFER (LET): The linear rate of loss of energy (locally over distance by an ionizing particle moving in a material medium. The usual unit of LET is keV/um.

PIG: A container, usually lead, used to store radioactive materials.

PROFESSIONAL HEALTH PHYSICIST: A health physicist (as defined by the National Health Physicist) with at least 5 years of experience at least 2 of which should be in operational health physics (minimum 1 year) or dosimetry.

PROPORTIONAL COUNTER: A gas-filled radiation detector tube operated in that range of applied voltage in which the charge collected per isolated count is proportional to the charge liberated by the original ionizing event. The range of applied voltage depends upon the type and energy of the incident radiation.

RAD: The unit of absorbed dose equal to 0.01 J/kg in any medium.

RADIATION AREA: An area where the dose rate at 30 cm from the source of radiation or any surface it penetrates through is at least 5 mrem/hr and less than 100 mrem/hr.

RADIATION, DIRECT: Radiation reaching a given location directly from an emitting source without collision or energy degradation. Also called unscattered or uncollided radiation.

RADIATION, INDIRECT: Radiation reaching a given location after having been scattered at least once. Also called scattered radiation.

RADIATION WEIGHTING FACTOR (QF): The factor dependent on linear energy transfer by which absorbed doses are multiplied to obtain (for radiation protection purposes) a quantity that expresses the effect of the absorbed dose on a common scale for all ionizing radiations. The weighting factor for Gamma, X-ray, and Beta radiation is 1. The weighting factor for Alpha radiation is 20. Radiation weighting factor used to be called quality factor.

RADIATION WORKER: A trained and qualified individual who meets the substantive criteria and guidance established by DOE and/or the NRC.

REM: A special unit of dose equivalent. The dose equivalent in rems is numerically equal to the absorbed dose in rads multiplied by the quality factor and any other necessary modifying factors.

ROENTGEN: One roentgen is the quantity of charge liberated by x or gamma radiation and is equal to $2.58 * 10^{-4}$ coulombs per kilogram of dry air. It is equivalent to the energy absorption of x or gamma radiation of 87.7 ergs/g of air or 96.5 ergs/g of tissue (0.00877 J/kg and 0.00965 J/kg).

SENIOR HEALTH PHYSICIST: A professional health physicist certified by the ABHP (preferred) or a professional health physicist with 10 years of experience at least 2 of which should be in operational health physics (minimum 1 year) or dosimetry.

SHIELD: A body of material used to prevent or reduce the passage of particles or radiation.

SHALLOW DOSE EQUIVALENT: The dose equivalent derived from external radiation at a depth of 0.007 cm in tissue.

TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE): The sum of the effective dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposures).

Attachment B-4

Radiation Survey Procedures: Decontamination of Equipment, Materials, and Tools

ADDENDUM III

1.0 PURPOSE

This procedure establishes the requirements for the decontamination of equipment, material, and tools that become contaminated with radioactive material.

2.0 SCOPE

The purpose of this procedure is to provide general instruction for decontaminating equipment, material, and tools. Each decontamination operation is unique; thus, this procedure provides general, effective decontamination techniques and guidelines to be utilized by field personnel. This document applies to all personnel involved in the decontamination process.

3.0 REFERENCES

1. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Final, December 1997.
2. Regulatory Guide 1.86, Termination of Operating Licenses For Nuclear Reactors.
3. Task-Specific Health and Safety Plan.
4. Procedure RAD-1, Gamma Radiation Rate Instrument Operation, Parsons ES
5. Procedure RAD-2, Beta-Gamma Surface Radiation Instrument Operation, Parsons ES
6. Procedure RAD-7, Alpha Surface Radiation Instrument Operation, Parsons ES

4.0 DEFINITIONS

1. Survey Area - An area where radioactive materials or contamination are or may be present. Survey areas include areas where samples/smears (which may contain radioactivity) are being screened.

5.0 GENERAL REQUIREMENTS AND LIMITATIONS

5.01 Only qualified and trained personnel are allowed to decontaminate equipment.

5.02 All decontamination of contaminated tools or equipment shall be performed in accordance with the direction of the RCT providing the job coverage in accordance with this Procedure and the Radiological Work Permit (RWP).

5.03 Decontamination activities shall be performed within a designated area.

5.04 Controls to contain the spread of loose contamination during the decontamination activity shall be determined prior to the decontamination of equipment, material, and tools.

5.05 Protective clothing, including respiratory protection, worn by the personnel involved in decontamination activities shall be determined by the Health and Safety Manager in conjunction with the Project Health Physicist and stipulated in the RWP.

5.06 Decontamination cleaning solvents/solutions shall only be used in accordance with the directions and limitations listed on the manufacturer supplied MSDS. Solvents/solutions requiring a pH adjustment shall be modified prior to use.

5.07 Every effort will be made to avoid re-contamination of decontaminated materials. Contamination controls shall always be observed throughout a decontamination operation.

6.0 RESPONSIBILITIES

6.01 Project Health Physicist is responsible for:

(a) Training the Radiological Control Technicians (RCTs) in the implementation of this procedure.

(b) Establishing the personal protective equipment requirements for performing the decontamination activities.

6.02 Radiological Control Technicians are responsible for:

(a) Performing the decontamination in accordance with this procedure and the applicable training.

(b) Reporting any unsafe or unusual conditions to the Field Supervisor.

7.0 PROCEDURES

7.01 General

(a) A radiological survey shall be performed on any object which is to be removed from a Radiological Control Area (RCA) that may be contaminated.

(b) If a survey indicates that decontamination is required, the item shall be bagged, wrapped, or contained, and tag the item "Requires Decontamination."

7.02 Establishing a Decontamination Area

(a) The Field Supervisor and RCT shall determine a location for set-up of the decontamination area.

(b) The following materials may be required for decontamination:

- Safe, sturdy work stations with contamination resistant surfaces.
- Adequate supply of approved cleaning solutions and solvents.
- Light duty decontamination equipment such as paper wipes, paper towels, masslinn towels, etc.
- Medium duty decontamination equipment such as scrub pads, wire brushes, steel wool, files, sandpaper, etc.
- Radioactive material storage bags, stickers, etc.
- Buckets, barrels or drums for the storage of contaminated liquids, sludges or slurries, if applicable.
- Blotter paper or absorbent material such as oil dry.
- Storage drums/bags for the storage of contaminated protective clothing.
- Adequate supply of personal protective clothing.
- Step-off pad or double step-off pad in accordance with the provisions of the RWP.
- A designated area within the decontamination area for the segregation of and monitoring of radioactive waste.

(c) Once the decontamination area has been established and stocked for operation, the bagged or wrapped contaminated equipment can be placed in the decontamination work area.

7.03 Decontamination

(a) The preparation for decontaminating a particular tool, material, or piece of equipment shall be performed as follows:

- Position the wrapped item so that the written in formation on the wrapping is visible.
- The item shall be removed from the wrapping in such a manner (rolling plastic wrapping inside out, etc.) to control the spread of contamination.
- An item that is highly contaminated with removable contamination should be misted with an approved liquid. The water vapor will wet down the particulate contamination and help prevent the possibility of airborne contamination.

- Once the item has been removed from the wrapping and has been properly positioned, discard the wrapping as radioactive waste.

(b) General decontamination considerations

- Any contaminated equipment with inaccessible areas shall be dismantled so that all surfaces are accessible for decontamination and for survey.
- Decontamination shall be performed in a safe, effective manner.

(c) Considerations for decontaminating items with removable contamination.

- Moisten the surface of the item with an approved liquid
- Fold a paper or cloth wipe into sections, using one surface of the wipe, gently wipe contamination off in ONE direction AWAY from the body to reduce the possibility of personnel contamination.
- Re-fold the paper or cloth wipe so that a CLEAN surface is available (this should prevent cross-contamination) and continue until the item is ready for survey.
- For some materials, duct tape will effectively remove contamination. Wrap the duct tape loosely around the gloved hand, ADHESIVE side OUT. Roll the tape over the contaminated area.

(d) Considerations for abrasive hand decontamination techniques.

- Remove as much removable contamination as possible as indicated in Paragraph 7.03(c).
- Moisten the surface of the item to be decontaminated.
- Use an abrasive cleaning tool (e.g. sandpaper, steel wool, steel brush, etc.) to loosen fixed contamination. Clean in one direction ONLY and clean AWAY from the body to prevent personnel contamination.
- Continue to moisten the surface of the items to contain contamination.
- Periodically remove as much removable contamination as possible in accordance with Paragraph 7.03(c).
- Survey the surface per Paragraph 7.03(e).to determine the effectiveness of the decontamination process.
- Continue abrasive process until the item is decontaminated or three abrasive cycles have been attempted.

(e) Items are to be scanned for radioactive contamination in accordance with appropriate procedures (Refs. 4, 5, and 6). If the readings are below the baseline survey for the item or 2X background, the item is considered to be decontaminated.

(f) If contamination remains after attempting to decontaminate the item, contact the Project Health Physicist for further direction.

(g) Items that cannot be effectively or economically decontaminated, will either be managed as radiological waste or sent to a decontamination vendor.

(h) After all decontamination operations have been completed, survey the decontamination area to ensure that no residual contamination remains.

7.04 Personnel Decontamination

7.04.01 Personnel decontamination methods are addressed in the Task-Specific Health and Safety Plan.

NOTE: NO WOUND SHALL BE DECONTAMINATED IN THE FIELD. MEDICAL ATTENTION MUST BE OBTAINED FOR DECONTAMINATING WOUNDS.

8.0 RECORDS

8.01 Use a field notebook to record decontamination notes.

Attachment B-5

Generic Respiratory Protection Program

(Appendix H of Corporate Health and Safety Manual)

APPENDIX H
GENERIC RESPIRATORY PROTECTION PROGRAM

H.1 OBJECTIVE

The objective of this Respiratory Protection Program is to provide employees with sufficient information and guidance to adequately protect themselves from potential inhalation hazards during field operations. The use of respirators to protect personnel from inhalation hazards is permitted by OSHA under 29 CFR 1910.134 when other more positive methods of protection, such as engineering controls (e.g., ventilation) or work practices (e.g., substitution) are not feasible.

H.2 NEED FOR RESPIRATORY PROTECTION

OSHA and ACGIH have established occupational exposure limits for various airborne contaminants. If there is the potential for workers to be exposed to airborne contaminants above occupational exposure limits, than feasible engineering controls and administrative measures should be instituted. If engineering controls are not feasible, employers are required to provide respirators for employee protection. Traditional industrial hygiene engineering controls are often not feasible for site work, hence, respirators must be relied upon as the primary means for respiratory protection during field investigations. All respiratory protection practices shall comply with this program.

H.3 MINIMUM REQUIREMENTS OF AN ACCEPTABLE RESPIRATOR PROGRAM

The requirements for an acceptable respiratory protection program are outlined in 29 CFR 1910.134. An OSHA acceptable program includes the following elements:

- Procedures for selecting respirators for use in the workplace.
- Training of employees on the proper selection, use, and limitations of respirators.
- Procedures for proper maintenance, cleaning, storage, inspection and repair of respirators.
- Fit testing procedures for tight-fitting respirators.
- Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators.
- Medical screening of employees to determine if they are physically able to perform their assigned work using respiratory protective equipment.
- Procedures for regularly evaluating the effectiveness of the program.

H.4 ESTABLISHMENT OF THE RESPIRATOR PROGRAM

Personnel with specific responsibilities for the implementation of the program include the following:

H.4.1 Facility Health and Safety Representative

The Facility Health and Safety Representative is responsible for:

- Administering the respiratory protection program.
- Setting up and conducting training.
- Ensuring the office has the necessary respiratory protective equipment for the work performed by that office.
- Scheduling and conducting respirator fit testing.
- Maintaining fit test and medical records.
- Ensuring that respirators are properly stored and maintained in the office.
- Maintaining respirator repair records.
- Distributing respirators to field team members.
- Evaluating and updating the office respiratory protection program.

H.4.2 Project Health and Safety Officer (PHSO)

All hazardous waste and industrial field investigations should have assigned to it a PHSO. The PHSO is responsible for:

- Ensuring that field team members assigned to wear respirators are trained in proper respirator selection and use.
- Performing site specific respiratory protection training.
- Evaluating the respirator requirements for each field task.
- Verifying that all field team members assigned to wear respirators have received appropriate fit-testing and are medically certified to wear the class of respirator assigned to them.
- Developing a project health and safety plan that specifies respiratory protection requirements for each anticipated site task.
- Ensuring that respirators are maintained and stored properly at the work site.
- Maintaining an adequate supply of cartridges when air purifying respirators are used and ensuring that Grade D or better breathing air is used to supply self-contained breathing apparatuses and airline respirators.

H.4.3 Project Staff

All project team members must read and conform to the Project Health and Safety Plan. In the field, employees are responsible for performing daily inspections and cleaning of their assigned respirator and for storing them in a clean and sanitary location. Workers must report any problems with respiratory equipment to their PHSO immediately.

H.5 FACTORS TO CONSIDER WHEN SELECTING A RESPIRATOR

Proper respirator selection is a complex process that takes into consideration a variety of factors. The workplace must be thoroughly evaluated prior to selecting a respirator. This evaluation must include a reasonable estimate of employee exposure to respiratory hazards and an identification of the contaminant's chemical state and physical form. Additionally, work

factors such as exposure time, temperature, relative humidity, and expected physical work effort must be evaluated when selecting a respirator.

H.5.1 Hazard Determination

Identifying and evaluating potential respiratory hazards is key to proper respirator selection. In the project health and safety plan the respiratory hazards for each anticipated operation should be determine. Once the nature of the respiratory hazard or hazards present have been identified, the PHSO must evaluate the magnitude of the hazard to determine the potential exposure of each employee and the extent to which respirators of various types can reduce the harm caused by exposure. The steps for hazard determination are as follows:

1. Determine what contaminants may be present at the site (review site history or past environmental sampling data; know contaminants that are released from operation [welding fumes]).
2. Determine whether there are occupation exposure limits (OSHA permissible exposure limits or ACGIH threshold limit values) for the identified contaminants.
3. Determine if there is a comprehensive health standard (e.g., asbestos, lead) for the contaminant(s). If so, there may be specific respirators required that will influence the selection process.
4. Determine the IDLH levels for the contaminants (refer to section H.5.2).
5. Evaluate if the operation involves entry into a potentially oxygen deficient environment.
6. Estimate the concentration of contaminants (use historical exposure sampling data or calculate exposure estimates using environmental sampling data).
7. Determine the physical state of the contaminants (are contaminants fumes, mists, vapors, or gases). If the contaminants are aerosols, estimate particle size based on whether the contaminants are fumes, mists, or dusts. If contaminants are vapors or gases, evaluate cartridge or canister efficiency in removing the contaminants.
8. Determine whether the contaminants are eye irritants.

Clearly, personal exposure monitoring data is the most reliable approach for assessing how much and what type of respiratory protection is required in a given circumstance. Parsons I&T has extensive personal monitoring data for UST removals, asbestos abatement, and lead paint removal operations that can be used by PHSOs to evaluate respiratory protection needs for employees assigned to similar operations. For hazardous waste and industrial field investigations, site specific exposure monitoring data may not be available, however results from previous environmental sampling investigations conducted at the site may be accessible. If available, review results of the sampling data to assess volatile contaminant(s) that may be encountered during anticipated operations. From this information calculate the potential for exposure above occupational exposure limits based on substance(s) concentration, vapor pressure, and solubility. Models for calculating airborne exposure levels of contaminants based on the concentrations of the contaminants in soil and water may be found in Attachment H-1 at the end of this Appendix.

Many substances are not volatile (metals, PAH, PCBs, etc.), thus knowledge of the anticipated operation becomes critical in determining the need for respiratory protection. For example, high concentrations of lead in soil by itself is not justification for wearing a respirator. The anticipated operation must create a dust hazard (such as the excavation of soil) for inhalation to occur. As mentioned above, knowledge of the particle size is important for determining proper respirator selection. If the contaminant is an aerosol with a particle size greater than 2 μm mass median

aerodynamic diameter (MMAD), an air purifying respirator with any filter type (95, 99, or 100) may be used (refer to section H.6.1.2). If the contaminant is an aerosol with an unknown particle size or a particle size less than 2 μm MMAD, than only a series 100 filter may be used.

The identification and evaluation of contaminants and operations provides the basis for the initial selection of a respirator. Once a level of respiratory protection has been selected the PHSO can change the respirator selection based on real-time air monitoring and professional judgment (refer to section H.7 of this Appendix).

H.5.2 Immediately Dangerous to Life or Health (IDLH)

The definition of IDLH provided in 29 CFR 1910.134(b) is as follows:

> Immediately Dangerous to Life or Health means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape without injury or irreversible health effects in the event of failure of the respiratory protective equipment. Only the following respirators may be permitted in an IDLH atmosphere:

- A full face-piece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes; or
- A combination full face-piece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.

All oxygen-deficient atmospheres shall be considered IDLH environments. IDLH values for specific chemicals can be obtained from the *NIOSH Pocket Guide to Chemical Hazards*. Note OSHA states in 29 CFR 1910.134(c) that in "instances where the employer cannot identify or reasonably estimate the employee exposure, the employer shall consider the atmosphere to be IDLH." Thus, the sampling of an unknown drummed waste must be considered an IDLH operation.

H.5.3 Assigned Protection Factor and Maximum Use Concentration

The assigned protection factor (APF) is the minimum anticipated protection provided by a properly functioning respirator or class of respirators to a given percentage of properly fitted and trained users. An APF of 10 for a respirator means that a user could expect to inhale no more than one tenth of the airborne contaminant present. It should be noted that APFs are based solely on laboratory fit testing and should be viewed and applied with particular caution. APFs are not based on measurements of actual field (workplace) performance. The protection factors listed in Table H-1 are from the OSHA cadmium standard.

Protection factors are used to calculate the maximum use concentration (MUC) of a respirator for a particular substance. The APF of a given respirator for a specific user multiplied by the PEL or TLV for a given substance is the maximum use concentration of that substance for which the respirator may be used. For example, if the APF for a half face air purifying respirator is 10 and substance X has a PEL (or TLV) of 10 ppm, the half-face mask respirator will provide protection up to 100 ppm.

On a given site, individual exposures may vary widely between workers, during a workshift, and between days. The range of potential exposures should be appropriately determined for all workers and for all circumstances that can be reasonably anticipated. The highest anticipated exposure for each respirator wearer should be used to compute the protection factor required for each wearer.

Table H-1
Assigned Respirator Protection Factors

Type of Respirator	OSHA Cadmium Standard
Air Purifying	
Filtering face-piece	10
Half-mask	10
Full-face	50
Powered Air Purifying	
Half-mask	50
Full face-piece	250
Loose fitting face-piece	25
Hood or helmet	25
Air Line	
Half-mask (demand)	10
Half-mask (continuous)	50
Half-mask (pressure demand)	1000
Full face-piece (demand)	50
Full face-piece (continuous flow)	250
Full face-piece (pressure demand)	1000
Self Contained Breathing Apparatus	
Demand	50
Pressure Demand	>1000

H.5.4 Eye Irritation

The decision of whether to use a full-face, half-face or quarter-face respirator is often made by considering the chemical's potential for producing eye irritation or damage. The following guidelines should be used for selecting the proper mask. Any eye irritation is considered unacceptable for routine work activities. Therefore, only full face-piece respirators are permissible in contaminant concentrations that produce eye irritation. Some eye irritation is permissible when using an escape respirator if it is determined that such irritation would not inhibit escape and such irritation is reversible.

In instances where quantitative eye irritation data cannot be found in literature references and theoretical considerations indicate that the substance should not be an eye irritant, half face piece

respirators are allowed. In cases where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, full face-piece respirators should be used.

H.5.5 Service Life Information

Because human senses are not foolproof in detecting gases and vapors and because many gases and vapors found in the workplace do not have adequate warning properties (low odor thresholds), OSHA only permits the use of air purifying respirators for protection against vapors and gases when:

- The respirator is equipped with an end-of-service life indicator (ESLI) certified by NIOSH or
- The employer establishes a change out schedule for cartridges or canisters that will ensure that the cartridges or canisters are changed out before breakthrough.

To date, only five contaminant-specific ESLIs have been granted by NIOSH. Thus for most projects the PHSO will have to establish a cartridge or canister change out schedule to prevent contaminant breakthrough. Change out schedules may be established through a review of breakthrough test data or from recommendations provided by the respirator cartridge or canister manufacturer or supplier.

OSHA emphasizes that a conservative approach is recommended when evaluating service life testing data. Temperature, humidity, air flow through the sorbent, the work rate, and the presence of other potential interfering chemicals in the workplace all can have a serious effect on the service life of an air-purifying cartridge or canister. In establishing a schedule for cartridge replacement, it is important that the PHSO base the schedule on worst-case conditions. Assuming worst-case conditions will provide the greatest margin for safety in using air-purifying respirators for protection against gases and vapors.

Table H-2 provides breakthrough times for 42 chemicals at various concentrations. These breakthrough times were derived from the Gerry O. Wood math model (Wood, G.O., Estimating Service Lives of Organic Vapor Cartridges, American Industrial Hygiene Association Journal, 55:11-15, 1994). Note the table uses the following standard conditions to calculate breakthrough times:

- Flow rate is 53.3 liters per minute
- Sorbent mass per cartridge is 26 grams
- Relative humidity is <50%
- Temperature is 72°F

If site conditions are significantly different from the standard conditions, the PHSO will need to make appropriate corrections to the times presented in Table H-2.

H.6 RESPIRATOR TYPES

The basic purpose of any respirator is, simply, to protect the respiratory system from inhalation of hazardous atmospheres. Respirators provide protection either by removing contaminants from the air before it is inhaled or by supplying an independent source of respirable air. The principal classifications of respirator types are based on these categories.

Table H-2
Estimate of Breakthrough Times

Chemical	Concentration 50 ppm	Concentration 100 ppm	Concentration 500 ppm
Aromatics			
Benzene	Work Shift	Limited to 50 ppm for negative pressure APR	Limited to 50 ppm for negative pressure APR
Toluene	1018	562	135
Ethylbenzene	1133	604	135
m-Xylene	1143	608	136
Cumene	1122	586	126
Alcohols			
Methanol	Compound is not applicable to this calculation	Compound is not applicable to this calculation	Compound is not applicable to this calculation
Ethanol	123	105	60
Isopropanol	425	286	101
Propanol	551	364	123
Butanol	1073	615	156
2-Pentanol	1091	601	143
Monochlorides			
Vinyl chloride	Refer to vinyl chloride standard 1910.1017	Refer to vinyl chloride standard 1910.1017	Refer to vinyl chloride standard 1910.1017
Ethyl chloride	Not applicable, boiling point below ambient temperature	Not applicable, boiling point below ambient temperature	Not applicable, boiling point below ambient temperature
2-Chloropropane	224	150	54
Chlorobenzene	1327	709	160
1-Chlorohexane	993	530	119
1-Chloroheptane	930	492	56
Dichlorides			
Dichloromethane	Refer to Methylene chloride standard 1910.1052	Refer to Methylene chloride standard 1910.1052	Refer to Methylene chloride standard 1910.1052

Table H-2 (Continued)
Estimate of Breakthrough Times

Chemical	Concentration 50 ppm	Concentration 100 ppm	Concentration 500 ppm
1,1-Dichloroethane	234	157	57
Dichlorides (Cont'd)			
Cis 1,2-Dichloroethylene	356	236	82
1,2-Dichoroethane	482	310	101
1,2-Dichloropropane	776	452	121
Trichlorides			
Chloroform	409	263	87
Methyl chloroform	618	366	102
Trichloroethylene	749	441	122
1,1,2-Trichloroethane	976	558	143
Tetrachloriddes			
Carbon tetrachloride	677	398	109
Perchloroethylene	1106	609	145
Ketones			
Acetone	118	92	44
2-Butanone	423	271	88
2-Pentanone	729	424	113
4-Methly-2-Pentanone	884	448	117
Cyclopentanone	1020	589	153
3-Heptanone	1061	561	123
Cyclohexanone	1257	683	157
Alkanes			
Pentane	332	581	136
Hexane	585	334	87
Heptane	769	420	99
Nonane	907	470	100
Decane	902	461	95
Amines			
Ethylamine	Not applicable, boiling point below ambient temperature	Not applicable, boiling point below ambient temperature	Not applicable, boiling point below ambient temperature
Proplamine	226	117	46

A respirator that removes contaminants from the ambient air is called an air-purifying respirator. A respirator that provides air from a source other than the surrounding atmosphere is an atmosphere-supplying respirator. Both types of respirators are described below.

H.6.1 Air Purifying Respirators (APRs)

The air purifying device cleanses the contaminated atmosphere. Ambient air passes through a cartridge or canister that removes specific gases or vapors, aerosols, or a combination of these contaminants. An APR is limited to use in environments where there is sufficient oxygen to support life (>19.5% by volume), where contaminant levels are below IDLH levels, and the MUC for the specific respirator is not exceeded.

H.6.1.1 APR Configurations

APRs are made of flexible molded rubber, silicone, neoprene, or other materials. Present designs incorporate rubber or woven elastic headstraps that are attached at two to six points.

Face-pieces are available in three basic configurations. The first, called a "quarter mask," covers the mouth and nose, and the lower sealing surface rests between chin and mouth. Good protection may be obtained with a quarter mask, but it is more easily dislodged than other types. Quarter mask APRs may only be used at Parsons I&T sites for protection against nuisance dusts.

A second type, the "half mask," fits over the nose and under the chin. Half masks are designed to seal more reliably than quarter masks, so they are preferred for use against more toxic materials. Half mask APRs may be used for protection against low levels of vapors, gases, and aerosols, provided that these substances are not eye irritants.

A third type, the "full face-piece," covers from roughly the hairline to below the chin. On the average they provide the greatest protection, usually seal most reliably, and provide eye protection as well. Full face-piece respirators are designed for use in higher concentrations of toxic materials than are quarter or half mask respirators. Because of their additional protection, most Parsons I&T operations requiring APRs are performed using full face-piece respirators.

H.6.1.2 Aerosol Removing Respirators

Aerosol removing respirators offer protection against airborne particulate matter, including dusts, mists, and fumes. All aerosol filtering APRs use fibrous material (a filter) to remove the contaminant. As a particle is drawn onto or into the filter, it is trapped by the fibers. Currently, there are nine classes of filters (three levels of filter efficiency, with three categories of resistance to filter efficiency degradation). The three levels of filter efficiency are 95%, 99%, and 99.97% (series 95, 99, 100). The three categories of resistance to filter efficiency degradation are labeled N (Not resistant to oil), R (Resistant to oil), and P (oil Proof). These certification categories apply only to non-powered, air-purifying, particulate-filter respirators. Powered air-purifying respirators (PAPRs) for particulates are approved only with high-efficiency filters.

The selection process for using aerosol removing APRs is outlined below:

- The selection of N-, R-, and P-series filters depends on the presence or absence of oil particles, as follows:
  - If no oil particles are present in the work environment, use a filter of any series (i.e., N-, R-, or P-series).
  - If oil particles (e.g., lubricants, cutting fluids, glycerine, etc.) are present, use only R- or P-series filters.
  - If oil particles are present and the filter is to be used for more than one work shift, use only a P-series filter.

- Selection of filter efficiency (i.e., 95%, 99%, or 99.97%) depends on how much filter leakage can be accepted. Higher filter efficiency means lower filter leakage. As stated earlier, if the contaminant is an aerosol with an unknown particle size or one with a MMAD less than 2 *u*m, the highest efficiency filter must be used (N-, R-, or P-100 series filters). Always use a 100 series filter for protection against radioactive dust, metal fumes, asbestos, or when the substance specific standard specifies the use of HEPA or series 100 filters.

- The choice of face-piece depends on the level of protection needed-that is, the assigned protection factor (APF) required.

H.6.1.3 Gas and Vapor Removing Respirators

These air purifying respirators protect against certain gases and vapors by using various chemical filters to purify the inhaled air. They differ from aerosol filters in that they use cartridge or canisters containing sorbents to remove harmful gases and vapors. The cartridges may be replaceable or the entire respirator may be disposable. Sorbents are granular, porous materials that interact with the gas or the vapor molecule to clean the air. In contrast to aerosol filters, which are effective to some degree no matter what the particle, sorbent cartridges are designed for protection against specific contaminants (mercury vapor or ammonia gas) or classes of contaminants (such as organic vapors or acid gases).

The basic difference between cartridges and canisters is the volume of sorbent. Cartridges are vapor and gas removing elements that may be used singly or in pairs on quarter and half masks and on full face-pieces. The sorbent volume of a cartridge is small, about 50–200 cm^3 so its useful lifetime is usually short, particularly in high gas or vapor concentrations. Canisters have a larger sorbent volume (1000–2000 cm^3) and can be used in higher vapor and gas concentrations (up to the IDLH level) than cartridges. Limitations to the use of sorbent cartridge or canister respirators include:

- A canister or cartridge respirator shall not be used when there is reason to suspect that the sorbent does not provide adequate efficiency against the removal of a specific contaminant(s) that may be encountered at the site.

- Where there is reason to suspect that a sorbent has a high heat of reaction with a substance present at the site.

- Where there is reason to suspect that a substance sorbed onto the surface of a cartridge or canister is shock sensitive.

H.6.2 Atmosphere Supplying Respirators (ASRs)

Atmosphere supplying devices are the class of respirators that provide a respirable atmosphere to the wearer independent of the ambient air. The breathing atmosphere is supplied from an uncontaminated source. The air source for an ASR must as a minimum conform to grade D requirement as specified in the Compressed Gas Association Standard *G-7.1*. ASRs may be classified into two groups: air-line respirators and self-contained breathing apparatus.

H.6.2.1 Air-Line Respirator

Air-line respirators deliver breathing air through a supply hose connected to a face-piece or head enclosure (welding helmet). Either a compressor or compressed air cylinders supply the breathing air. When air is supplied by a compressor it must be equipped with specific safety devices in accordance with OSHA requirements. For example, all compressors must have an alarm to indicate overheating and compressor failure. If the compressor is oil lubricated, a carbon

monoxide alarm must be installed. All air-line respirators must comply with the following requirements:

- The maximum permissible inlet pressure is 125 psi.
- The hose length must be between 25 and 300 feet (review certification for specific respirator).
- Flow rates can not be less than 115 liters per minute (lpm) or greater than 425 lpm (tight fitting face-piece)

Air-line respirators are available in demand, pressure-demand, and continuous-flow configurations.

Demand. Demand air-line respirators are equipped with either half or full face-pieces. They deliver airflow only upon inhalation. Due to their design, a negative pressure is created in the face-piece upon inhalation. These respirators shall not use by Parsons I&T employees.

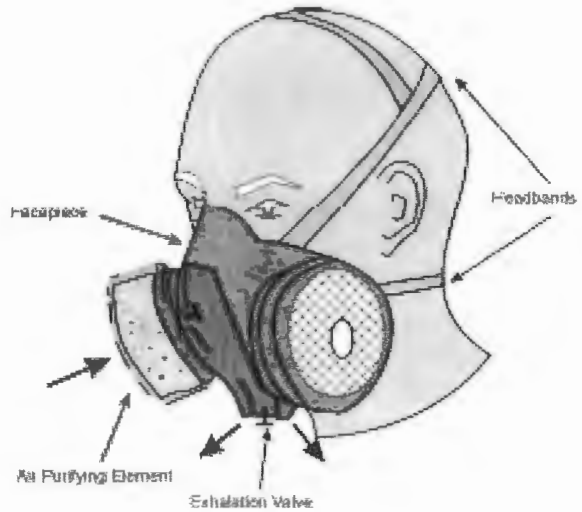
Pressure demand. Pressure demand respirators are similar to demand respirators except that because of their design the pressure inside the face-piece is generally positive with respect to the outside air pressure during both inhalation and exhalation. The positive pressure means that when a leak develops in the face seal the leakage of air would be outward. Thus, these respirators provide a higher degree of protection to the user than air-line respirators that operate in the demand mode. Most Parsons I&T hazardous waste operations that require atmosphere supplying respirators use pressure demand air-line respirators because of their high degree of protection and long use time. When a pressure demand air-line respirator is equipped with an auxiliary SCBA, it may be used in IDLH environments. The auxiliary air supply can be engaged in the event that the primary air supply fails, allowing the worker to escape from the IDLH atmosphere.

Continuous flow. A continuous flow respirator has a regulated amount of air delivered to the face-piece or head enclosure and is normally used where there is an ample air supply such as that provided by an air compressor. These respirators may be equipped with either tight fitting or loose fitting head enclosures. For tight fitting face-pieces, the air flow must be at least 115 lpm. For loose fitting hoods or helmets, the minimum flow is 170 lpm. Parsons I&T operations that involve the use of continuous flow air-line respirators include welding and abrasive blasting.

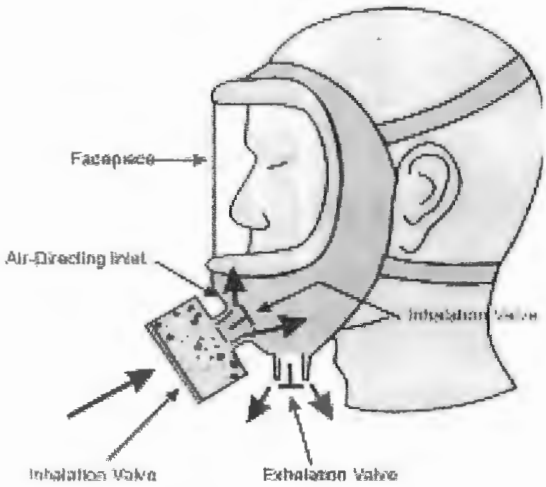
H.6.2.2 Self-Contained Breathing Apparatus (SCBA)

The SCBA provides respiratory protection against gases, vapors, particulates and oxygen deficient environments. The wearer is independent of the surrounding environment because the breathing air is carried by the wearer. Pressure demand SCBAs may be used in IDLH and oxygen deficient environments either as escape only devices or for short-term entry. A full face-

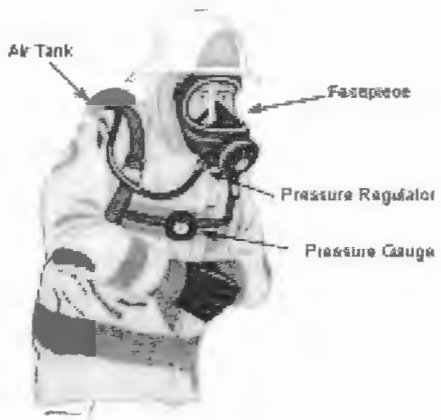
Figure H-1
Types of Respirators



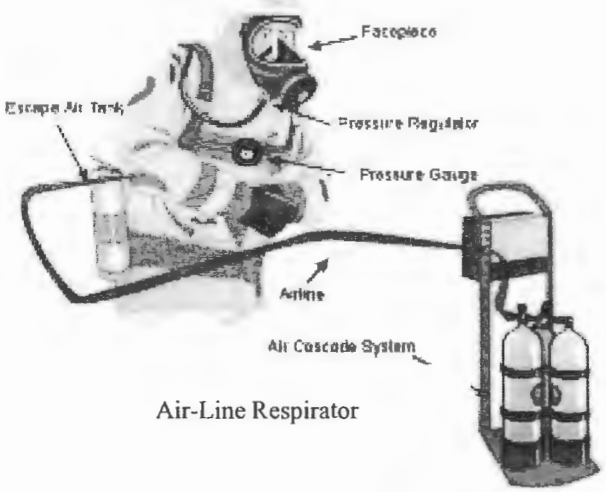
Half-Face Air Purifying Respirator



Full-Face Air Purifying Respirator



Self Contained Breathing Apparatus



Air-Line Respirator

piece is most commonly used with SCBAs. There are two major types of SCBAs: closed circuit and open circuit. Parsons I&T only uses open circuit pressure demand SCBAs.

In an open circuit SCBA the exhaled air is exhausted to the environment rather that being recirculated (a closed circuit SCBA). A cylinder of high pressure (2000–4500 psi) compressed air supplies air to a regulator that reduces the pressure for delivery to the face-piece. Most open-circuit SCBAs have a service life of 30 minutes to 60 minutes based on NIOSH breathing machine tests. However, a service life of 30 or 60 minutes is rarely obtained during field operations. The PHSO should plan for operations to be completed with no less than 20% of the air remaining in the tank.

H.7. Selection of Respirators Using Real-Time Measurements

The identification and evaluation of contaminants at a site provide the basis for the initial selection of a respirator. Once a level of respiratory protection has been selected it can be modified based on real-time air monitoring, supplemented with background information and professional judgment.

Below are the allowed modifications. Please note the qualifiers.

- **ASR (Level B) to No respirator (Level D):** This modification may be made by the PHSO when there is a sustained absence of volatiles or aerosols as measured on real-time equipment. A level D ensemble cannot be used in an oxygen deficient environment.
- **APR (Level C) to No Respirator (Level D):** Same as Level B to Level D
- **Level D to Level B:** May be made at the direction of the PHSO based on the magnitude of the measurements and action level requirements specified in the project health and safety plan.
- **Level C to Level B:** Permissible at the direction of the PHSO in instances where volatiles or aerosol measurements exceed the preset level B action level specified in the project health and safety plan. Level B (or engineering controls) shall be used when an oxygen deficient environment exists.
- **Level D to Level C:** Permissible at the direction of the PHSO when volatiles or aerosols exceed the preset action level specified in the project health and safety plan. (Contaminants must be known in order to wear an air purifying respirator).
- **Level B to Level C:** May be made at the direction of the PHSO only when the contaminants and their concentrations are known. This modification should not be made without knowledge of the chemicals on-site, their expected concentrations, and ability of the cartridges to absorb or filter out the chemicals.

H.7 TRAINING

H.7.1 Worker Training

Selecting the respirator appropriate for a given hazard is important, but equally important is using the selected device properly. Parsons I&T provides initial respiratory protection training for workers that are assigned to activities requiring respirator use.

H.7.1.1 Initial Training

Employees must receive training in proper respirator selection and use prior to assignment to operations requiring respiratory protection. Initial respirator training may be provided by the

Corporate H&S Staff (as part of the 40-hour HAZWOPER training class), the Facility H&S Representative, or the PHSO (as part of a site-specific training). In each case the following topics must be presented:

- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator.
- The limitations and capabilities of the respirator.
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.
- The proper donning and doffing of the respirator.
- Procedures for inspecting and checking the respirator before donning.
- Procedures for the proper maintenance, cleaning, and storage of the respirator.
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.
- A general review of the OSHA Respiratory Protection Standard.

Training must involve classroom lecture and "hands-on" practice with the respirator. Training must be documented.

H.7.1.2 Re-Training

Retraining shall be administered annually, and when the following situations occur:

- Changes in the workplace render previous training obsolete.
- Changes in the types of respirators used render previous training obsolete.
- Inadequacies in an affected employee's knowledge or use of an assigned respirator indicates that the employee has not retained the requisite understanding or skill.

Annual training shall be provided by the Facility H&S Representative or designee.

H.7.2 PHSO Training

PHSOs that oversee site operations involving respirator use should have a comprehensive knowledge respiratory protection practices. Their training should include, but not necessarily be limited to, knowledge of the following:

- Initial worker training and instruction (see section H.7.1.1);
- Basic respiratory protection practices;
- Selection and use of respirators to protect workers from the respiratory hazards to which they may be exposed;
- Factors that must be considered in establishing respiratory protection action levels for the project health and safety plan.
- Proper use of air monitoring equipment;
- The nature and extent of the respiratory hazards to which workers may be exposed; and
- The structure and operation of the entire respiratory protection program.

H.8 Respirator Fit Testing

All respirators that rely on a mask-to-face seal need to be checked with either qualitative or quantitative methods to determine whether the mask provides an acceptable fit to a wearer. The qualitative fit test procedures rely on a subjective sensation (taste, irritation, smell) of the respirator wearer to a particular test agent while the quantitative test uses instruments to measure face seal leakage. The relative workplace exposure level determines what constitutes an acceptable fit and which fit test procedure is required. Qualitative fit testing may be used to fit test negative pressure air-purifying respirators, if they will be used in atmospheres less than ten times the PEL (Table H-3). If exposures are anticipated to be greater than 10 times the PEL, quantitative fit testing must be used. The reason for this is because the qualitative fit test protocols established by OSHA are only valid to achieve a fit factor of 100 (an assigned protection factor of 10). When quantitative fit testing is used, all full face-piece respirators must meet or exceed a fit factor of 500, while quarter - and half-mask respirators must meet or exceed 100. For positive pressure, atmosphere-supplying respirators, either qualitative or quantitative fit testing may be used. The fit testing of tight-fitting atmosphere supplying respirators and tight-fitting powered air-purifying respirators shall be accomplished by performing the fit test in the negative pressure mode. In all instances the employee must be fit tested with the same make, model, style, and size of respirator that will be used in the field.

Fit testing must occur prior to initial respirator use, whenever a different respirator face-piece (size, style, model or make) is used, and annually thereafter. The Facility H&S or his or her designated representative is responsible for performing fit testing in accordance with OSHA accepted protocol. Accepted protocols for qualitative and quantitative fit testing are presented in attachment H-2.

Table H-3
Acceptable Fit Test Methods

Respirator Type	Qualitative Fit Test	Quantitative Fit Test
Half-face, negative pressure, APR (<100 fit factor)	Yes	Yes
Full-face, negative pressure, APR (<100 fit factor) used in atmospheres up to 10 times the PEL	Yes	Yes
Full-face, negative pressure, APR (>100 fit factor)	No	Yes
Supplied-air respirators (SAR), or SCBA used in negative pressure mode (demand mode) (>100 fit factor)	No	Yes
Supplied-air respirators (SAR), or SCBA used in positive pressure mode (pressure demand mode)	Yes	Yes

H.8.1 General Requirements

The employee shall evaluate respirator fit using the following procedures:

- The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes. (By providing several sizes and models the subject is likely to find a respirator that fits correctly and is comfortable.)

- Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator.
- The test subject shall be informed that he or she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
- The test subject shall be instructed to hold each chosen face-piece up to the face and eliminate those that obviously do not give an acceptable fit.
- The more acceptable face-pieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to evaluate comfort.

After the subject has determined the respirator of greatest comfort, that person shall conduct a negative and positive pressure fit check (section H.9) or other fit checks recommended by the respirator manufacturer. Another face-piece shall be selected and re-tested if the test subject fails the fit checks.

Qualitative or quantitative fit testing shall not be conducted if there is any hair growth between the skin and the face-piece sealing surface, such as stubble beard growth, mustache, or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed. If the subject exhibits difficulty in breathing, the test shall be discontinued and the medical oversight contract (MOC) physician shall be contacted.

After the successful completion of the fit checks, the respirator fit shall be tested using the applicable method from attachment H-2. No matter which test protocol is used, the employee shall be given a description of the fit test protocol and their responsibility during the test procedure. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit (ear muffs). The following test exercises must be performed during all fit testing methods prescribed in attachment H-2:

- Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.
- Deep breathing, as during heavy exertion.
- Side-to-side and up-and-down head movements. These movements should not be exaggerated, but should approximate those that take place on the job.
- Talking. This is most easily accomplished by reading a prepared text (e.g., Rainbow Passage) loudly enough to be understood by someone standing nearby.
- Grimace. The test subject shall grimace by smiling or frowning. (this applies only to quantitative testing, it is not performed for qualitative fit testing).
- Bending over. The test subject shall bend at the waist as if to touch his or her toes.
- Normal breathing (repeat of first bullet)

Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the Facility H&S Representative or designee regarding the comfort of the respirator upon completion of the protocol. If the respirator is uncomfortable, another model respirator shall be tried. The respirator

shall not be adjusted once the fit test begins. Any adjustment voids the test, and the process must be repeated. After the fit test has been successfully completed, a fit test log (see Appendix A) will be issued to the test subject. A copy of the log shall be maintained by the Facility Health and Safety Representative in accordance with section 7.6 of this manual.

H.9 DAILY QUALITATIVE FIT CHECKS AT THE SITE

In the field, each employee is responsible for performing daily qualitative fit checks of their assigned APR respirator prior to entry into a hazardous atmosphere. The daily determination of fit will consist of a negative and positive pressure fit checks as described below.

H.9.1 The Negative Pressure Check

In this test, the user closes off the inlet of the canister, cartridge, or filter by covering it with the palm of their hand; inhales gently so that the face-piece collapses slightly; and holds their breath for about 10 seconds. If the face-piece remains slightly collapsed and no inward leakage is detected, the respirator is probably functioning correctly.

H.9.2 The Positive Pressure Check

This test is conducted by closing off the exhalation valve and exhaling gently into the face-piece. The fit is considered satisfactory if slight positive pressure can be built up inside the face-piece without any evidence of outward leakage.

H.10 RESPIRATOR INSPECTION, CLEANING, MAINTENANCE, AND STORAGE

Respirator inspection is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all. The employee wearing a defective device thinks they are protected when, in reality, they are not. Emergency escape devices are particularly vulnerable to poor maintenance since they are generally used infrequently and often in the most hazardous and demanding circumstances. The possible consequences of wearing a defective emergency escape and rescue device are lethal.

The OSHA standards strongly emphasize the importance of an adequate maintenance program, but permit its tailoring to the type of working conditions and hazards involved. However, all programs are required to include at least:

- Inspection for defects (including a leak check)
- Cleaning and disinfecting
- Repair, and
- Storage.

A proper maintenance program ensures that the worker's respirator remains as effective as when it was new.

H.10.1 Inspection for Defects

The Facility H&S Representative is responsible for inspecting respirators prior to assignment to individuals and upon receipt of the respirator after completion of field operations. Results of the inspection shall be recorded on form HS07-06 (Appendix A). In the field, the employee is responsible for inspecting his or her APR respiratory every day before and after use. The PHSO is responsible for performing daily inspections of actively used ASRs (air-line or SCBA) and for the monthly inspection of emergency escape respirators.

H.10.1.1 Inspection of Air Purifying Respirators

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

- Examine the face-piece for:
  - Excessive dirt;
  - Cracks, tears, holes, or distortion from improper storage;
  - Inflexibility (stretch and massage to restore flexibility);
  - Cracked or badly scratched lenses;
  - Incorrectly mounted full face-piece lens or broken or missing mounting clips; and
  - Cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s) (if required).
- Examine the head-straps or head harness for:
  - Breaks;
  - Loss of elasticity; and
  - Broken or malfunctioning buckles and attachments, and excessively worn serrations on the head harness which might permit slippage.
- Examine the exhalation valve for:
  - 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 face-piece;
  - 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.
- Examine the air-purifying elements for:
  - Incorrect cartridge, canister, or filter for the hazard;
  - Incorrect installation, loose connections, missing or worn gaskets, or cross-threading in holder;
  - Expired shelf-life date on cartridge or canister;
  - Cracks or dents in outside case of filter, cartridge, or canister; and
  - Evidence of prior use of sorbent cartridge or canister, indicated by absence of sealing material, tape, foil, etc., over inlet.

H.10.1.2 Inspection of Atmosphere Supplying Respirators

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

- If the device has a tight-fitting face-piece, use the procedures outlined above for air-purifying respirators, except those pertaining to the air-purifying elements. 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 for cracks or breaks or impaired vision due to rebounding abrasive particles.
  - Make sure that the protective screen is intact and secured correctly over the face-shield of abrasive blasting hoods and blouses.
- Examine the air supply system for:
  - Integrity and good condition of air supply lines and hoses, including attachments and end fittings, and
  - Correct operation and condition of all regulators and valves.
- Self-contained breathing apparatuses must be inspected by the PHSO before initiating field operations. The results of the initial inspection must be documented on form HS07-07 (Appendix A). Each worker is responsible for inspecting his or her individual face-piece assembly for defects (e.g., frayed or cut hoses or straps) prior to use each day. Infrequently used respirators, such as emergency escape packs, must be inspected monthly. Inspection must include the following:
  - Examine air supply (ensure tank is fully charged).
  - Examine hood integrity (no cracks).
  - Ensure that the respirator is clean.
  - Examine air delivery hose for cuts and cracks.
  - Examine harness integrity.

H.10.2 Cleaning and Storage

The Facility H&S Representative or designee is responsible for inspecting and cleaning all respirators returning from the field. Cleaning is accomplished by using the procedures presented in Attachment H-3. After cleaning, sanitizing and inspecting the respirator, the Facility H&S Representative will repackage and store the respirator in an area protected against dust, sunlight, heat, extreme cold, excessive moisture or damaging chemicals. Respirators must be packed and stored so that the exhalation valve will rest in a normal position. When a respirator is used in the field, it must be cleaned each day by the respirator user.

H.10.3 Maintenance

Continued usage of respirators will require periodic repair or replacement of component parts. Replacement of parts and repair of air purifying respirators, in most cases, present few problems. Replacement parts for respiratory protective devices **must** be those from the manufacturer of the equipment. Substitution of parts from a different brand or type of respirator will void the respirator's NIOSH approval. An SCBA is more difficult to maintain than an APR primarily because of the SCBA's valve and regulator assembly. For this reason, SCBA repairs and

adjustments must be performed by a certified technician. Respirator maintenance must be documented.

H.11 MEDICAL ASPECTS OF RESPIRATOR USE

No employee will be permitted to wear a respirator without clearance from the MOC physician. The diagnostic protocol for a fit-to-work classification includes an assessment of the worker's ability to wear an air purifying respirator, an airline respirator, and a SCBA. The Facility Health and Safety Representative shall not assign a worker to perform a task requiring respirator use unless he or she has received the medical report from the MOC physician that states that the employee has no limitation in wearing the assigned respirator.

H.12 EVALUATION OF THE RESPIRATOR PROGRAM

The respirator program will be periodically evaluated by the Facility Health and Safety Representative and modified as appropriate. The auditing of respirator practices will be used to assess whether respirators are being selected and worn properly. Examination of respirators in use and in storage will indicate how well the equipment is being maintained. The results of periodic audits will be used to assess the effectiveness of the program and aid the Facility Health and Safety Representative in identifying areas that need improvement.

ATTACHMENT H-1
EXPOSURE CALCULATIONS

ATTACHMENT H-1
EXPOSURE CALCULATIONS

CALCULATING EXPOSURE ESTIMATES FROM VOLATILES IN WATER AND SOIL

Vapor concentrations can be measured through the use of a photoionization detector, flame ionization detector, infrared spectrometry, or other techniques. Exposure levels can also be estimated using the following calculations.

Calculating Saturation Vapor Pressure

Contaminants that have high vapor pressures are more likely to be present in the atmosphere as vapors. The potential exposure to volatile contaminants can be estimated if the soil or water concentration and vapor pressure of the contaminants are known. The concentration of a vapor in a workspace can not exceed its saturation concentration. If the vapor pressure (in torr or mm of Hg) multiplied by 1316 ppm/torr is less than the exposure limit of the contaminant, than the breathing air can not contain vapor concentrations above that limit.

PPM= Vapor pressure of contaminant x 1316 ppm/torr

Estimating Exposure Concentration for Volatiles in Water

Pressure Over Solutions Using Raoult's Law

If the vapor from a contaminant is water soluble and the concentration of the contaminant in water is known, an estimate of the maximum air concentration for that contaminant can be obtained using Raoult's law. Raoult's law relates vapor pressure to concentration as follows:

P_A= Partial pressure of contaminant A in gas phase

Y_A= Mole fraction of contaminant A in liquid phase

P_{AVAP}= Vapor pressure of pure contaminant A

Raoult's law is more accurate for concentrated solutions (>0.5mol/liter).

Raoult's law is more accurate for soluble contaminants (>1 mol/liter).

Example:

Methyl ethly ketone (MEK) is present in surface water at 5,000mg/liter. Because MEK is soluble in water (3 moles/liter), Raoult's law can be use. The vapor pressure of pure MEK is 90.6 mm of Hg and the molecular weight is 72.1 g/mol. P_A can be calculated as follows:

$$P_A = \frac{90.6\ mm\ of\ Hg \times 5\ g/l}{72.1\ g/mol \times 55.5\ mol/l} = 0.113\ torr \times 1{,}316\ ppm/torr = 148\ ppm$$

Pressure Over Solutions Using Henry's Law

If the contaminant has a low solubility in water, an estimate of the contaminant's maximum vapor concentration can be made using Henry's Law. Henry's law relates vapor pressure to concentration as follows:

P_A= Partial pressure of contaminant A in the gas phase

H= Henry's law constant

Y_A= Mole fraction of A in the liquid phase

Henry's law constants are published in environmental sources like Howard's *Handbook of Environmental Fate and Exposure Data*. These sources often provide the constant in inconvenient units like atm–m^3/ mole. An estimate of the Henry's law constant, in more useful units, can be derived by dividing the solubility of the compound in water by its pure state vapor pressure. This estimate can be used for compounds with limited solubility (< 1 mol/ liter)

Example:

Methyl chloroform is present in water at 6 ppm. Since methyl chloroform has a low solubility use Henry's law to calculate the vapor pressure of the contaminant. To derive the vapor pressure of the methyl chloroform contaminant the Henry's law constant can be calculated by knowing the saturation vapor pressure (124 mm of Hg) and water solubility (4,400mg/l) of methyl chloroform.

$$H = \frac{124\ mm\ of\ Hg}{4.400\ mg/l} = \frac{0.028\ torr}{mg/l} \times \frac{1{,}316\ ppm}{torr} = 37\ \frac{ppm}{mg/l}$$

$$P_A = 6 mg/l \times 37\ ppm/(mg/l) = 222\ ppm \quad (64\%\ of\ the\ OSHA\ PEL)$$

Calculating Exposure Estimates for Volatiles in Soil

The rate at which volatile chemicals from contaminated soil enter the air depends on the chemical, its concentration, moisture in the soil, and the clay or organic carbon faction (f_{oc}) of the soil. To calculate the air concentration for volatiles in soil use the following formula:

$$C_{air} = (1316 C_{soil} \times P_{sat}) / (C_{sat} \times f_{oct} \times K_{oc})$$

Where the units are as follows:

C_{air} = Concentration of contaminant in air, parts per million by volume

C_{soil} = Concentration of contaminant in soil, milligrams per kilogram (from results of previous sampling investigation)

P_{sat} = Saturation vapor pressure, torr or mm of Hg (from chemical reference handbook)

C_{sat} = Saturation water solubility, milligrams per liter (from chemical reference handbook)

f_{oc} = Organic carbon content, dimensionless ratio (from soil science reference)

K_{oc} = Organic carbon partition coefficient, dimensionless ratio (from risk assessment reference manual)

Similar to the calculation for volatiles in water, the above approach for calculating air concentrations from contaminated soil is very conservative. If the calculated contaminant concentration is less than the occupational exposure limit, than a respirator would not be required.

Calculating Exposure Limits for Mixtures

When two or more substances which act upon the same organ system are present, their combined effect shall be given primary consideration. In the absence of information to the contrary, the effects of the different hazards should be considered additive. To evaluate if the exposure limit for a mixture will be exceeded, use the following formula.

$C_1/T_1 + C_2/T_2 + \ldots C_n/T_n$

C= The calculated concentration for contaminant

T= The occupational exposure limit for contaminant

If the sum exceeds unity, then the exposure limit for the mixture is exceeded and a respirator should be donned. An exception to the rule may be made when there is good reason to believe that the chief effects of the different harmful substances are not additive but are independent. In such cases the exposure limit is exceeded when any one component of the mixture (C_1/T_1 or C_2/T_2) has a value that exceeds unity.

ATTACHMENT H-2
FIT TEST PROTOCOLS

ATTACHMENT H-2
FIT TEST PROTOCOLS

QUALITATIVE FIT TEST (QLFT) PROTOCOLS

General

The Facility H&S Representative administering the QLFT must be able to prepare test solutions, calibrate equipment, perform the tests properly, recognize invalid tests, and ensure that the test equipment is working properly. QLFT equipment must be kept clean and well maintained so it operates within the parameters for which it was designed

Isoamyl Acetate Protocol

This protocol is appropriate for the fit testing of respirators with organic vapor cartridges or canisters.

Odor Threshold Screening

Odor threshold screening is performed without the subject wearing a respirator. The screening is intended to determine if the subject can detect the odor of isoamyl acetate at low levels.

1. Three 1 liter glass jars with metal lids are required.
2. Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions.
3. The isoamyl acetate (IAA) (also known at isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 mls of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.
4. The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.
5. The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 mls of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.
6. A test blank shall be prepared in a third jar by adding 500 mls of odor-free water.
7. The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.
8. The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight,

then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the Facility Health and Safety Representative which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.
10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.
11. If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

Isoamyl Acetate Fit Test

1. The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.
2. Each respirator used for the fit test shall be equipped with organic vapor cartridges or an organic vapor canister.
3. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room.
4. A copy of the test exercises (section H.8.1) and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.
5. Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA.
6. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.
7. Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. At this time the Facility Health and Safety Representative should explain the fit test exercises.
8. If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.
9. If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure. The process continues until a respirator that fits has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before re-testing. Odor sensitivity will usually have returned by this time.

10. If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

11. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator. The respirator to be tested must be equipped with a P-, R, or N- 100 series filter. An enclosure shall not be used for this test. The smoke can be irritating to the eyes, lungs, and nasal passages, thus the Facility H&S Representative shall take precautions to minimize the test subject's exposure to the irritant smoke by performing the test in a well-ventilated area.

Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

1. The Facility Health and Safety Representative shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute or an aspirator squeeze bulb. The Facility Health and Safety Representative shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury to the subject from the jagged end of the smoke tube.

2. The Facility Health and Safety Representative shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his or her eyes closed while the test is performed.

3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he or she can detect the irritating properties of the smoke. The Facility Health and Safety Representative shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he or she can detect it.

Irritant Smoke Fit Test Procedure

1. The person being fit tested shall don the respirator without assistance, and perform the required negative and positive pressure fit check(s).

2. The test subject shall be instructed to keep his or her eyes closed.

3. The Facility Health and Safety Representative shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The Facility Health and Safety Representative shall begin at least 12 inches from the face-piece and move the smoke stream around the whole perimeter of the mask. The Facility Health and Safety Representative shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

4. If the person being tested has not had an involuntary response to the irritant smoke, proceed with the test exercises.
5. The exercises identified in section H.8.1 shall be performed by the test subject while the respirator seal is being continually challenged by the smoke. Smoke shall be directed around the perimeter of the respirator at a distance of six inches.
6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being tested must repeat the entire sensitivity check and fit test procedure.
7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check. This check involves squeezing a small smoke stream from the tube after the respirator has been removed. If the test subject fails to evoke a response, the fit test is voided.
8. If a response is produced during this second sensitivity check, then the fit test is passed.

QUANTITATIVE FIT TEST (QNFT) PROTOCOL

General

The Facility H&S Representative administering the QNFT must able to calibrate equipment, perform the tests properly, recognize invalid tests, and ensure that test equipment is working properly. QNFT equipment must be kept clean and well maintained so it operates within the parameters for which it was designed.

Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol.

The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount TM) protocol quantitatively fit tests respirators by collecting samples from the inside of the mask. To perform the quantitative fit test a respirator with a sampling probed is used. The probed respirator has a special sampling device that allows the probe to sample air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing using the employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a negative pressure half-mask respirator and a minimum fit factor pass level of at least 500 is required for a negative pressure full face-piece respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

Portacount Fit Test Requirements

1. Check the respirator to make sure the sampling probe and line are properly attached to the face-piece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test per manufacturer's instruction.
2. Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable.
3. Check the following conditions for the adequacy of the respirator fit: Chin properly placed; Adequate strap tension, not overly tightened; Fit across nose bridge; Respirator of proper size to span distance from nose to chin; and Tendency of the respirator to slip.

4. Have the person wearing the respirator perform negative and positive fit checks. If leakage is detected, determine the cause. If leakage is from a poorly fitting face-piece, try another size respirator.
5. Follow the manufacturer's instructions for operating the Portacount and proceed with the test.
6. The test subject shall be instructed to perform the exercises in section H.8.1 of this Appendix.
7. After the test exercises, the test subject shall be questioned by the Facility Health and Safety Representative regarding the comfort of the respirator upon completion of the protocol. If the respirator has become uncomfortable, another model should be used.

Portacount Test Instrument

The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The pass or fail message will indicate whether or not the test was successful. If the test was passed, the fit test is over. Since the pass or fail criterion of the Portacount is user programmable, the Facility H&S Representative shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance (fit factor of 100 for half face mask, fit factor of 500 for full face mask). A record of the test needs to be maintained in accordance with section 7.6 of this manual. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; the fit test operator's name, and the date of testing.

ATTACHMENT H-3
CLEANING PROTOCOL

ATTACHMENT H-3
CLEANING PROTOCOL

These procedures are provided for use when cleaning respirators. They are general in nature, and should be used as an alternative to the procedures provided by the manufacturer of the respirator.

- Remove filters, cartridges, or canisters. Disassemble face-pieces by removing speaking diaphragms, demand and pressure- demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm (43 deg. C [110 deg. F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.
- When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
  - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); or,
  - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 deg. C (110 deg. F); or,
  - Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
- Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized since detergents or disinfectants that dry on face-pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
  - Components should be hand-dried with a clean lint-free cloth or air-dried.
  - Reassemble face-piece, replacing filters, cartridges, and canisters where necessary.
  - Test the respirator to ensure that all components are working properly.

Attachment B-6

Parsons Health and Safety Policy

(Sections 1 and 2 of Corporate Health and Safety Manual)

1.0 PARSONS INFRASTRUCTURE & TECHNOLOGY'S HEALTH AND SAFETY POLICY

Parsons Infrastructure & Technology (Parsons I&T) performs work in the fields of construction management and environmental engineering throughout the world. The nature of this work may expose Parsons I&T employees to risk at one time or another. For example, construction often requires personnel to work at heights or adjacent to heavy equipment. Investigations of hazardous waste sites sometimes involve the risk of contact with hazardous materials. Even the normal office environment contains hazards that result in a significant number of injuries. The risks inherent in our work can always be minimized by care, training, adherence to health and safety rules and procedures, and the proper use of safety and protective equipment.

1.1 HEALTH AND SAFETY POLICY

It is the policy of Parsons I&T to

- Provide a safe and healthful work environment.
- Minimize the risk of human and economic losses resulting from accidents.
- Comply with all applicable safety and health laws and regulations.
- Protect the environment from degradation.
- Satisfy the requirements of its clients.

This manual provides rules and procedures necessary for the safe performance of duties carried out by Parsons I&T personnel. The manual should be used to address health and safety concerns. All employees should be aware of the Parsons I&T health and safety policy and should be familiar with at least the portions of this manual that relate to their work.

The success of the health and safety program requires the effort of both Parsons I&T management and Parsons I&T operational personnel. It is the responsibility of the Parsons I&T Division, Regional, and Branch Office Managers to assure that work done within their profit centers is in compliance with this program. The company management will provide the resources and training necessary to implement the health and safety program; the staff must use the resources properly, follow the work procedures and requirements, and aid management by pointing out and helping to correct unsafe conditions.

1.2 HAZARD IDENTIFICATION

Unsafe and unhealthful conditions in Parsons I&T work places are identified through one or more of the following:

- Review of federal, state, and local laws and regulations

- Review of workers' compensation records and facility accident reports
- Inspection and observation of work areas and work practices, looking for present or potential health and safety problems
- Evaluation of employee suggestions or complaints

The various types of work performed by Parsons I&T are summarized in Figure 1.1. All Parsons I&T employees work at one time or another in an office environment, so all employees, not just clerical and administrative staff, must be fully conversant with and participate in the health and safety program related to controlling the hazards found in the normal office environment. Within the office environment, certain employees may be exposed to additional hazards (e.g., the hazards related to intensive work at computer terminals or the manual lifting of heavy objects). In addition to receiving the regular office safety training, these employees must have training to reduce their potential to musculoskeletal injury related to manual lifting and repetitive motion tasks (refer to Section 8.5.2).

A large number of Parsons I&T projects involve work outside the office where employees may be exposed to a variety of hazards. This manual contains health and safety policies and procedures for each type of work Parsons I&T performs.

1.3 ORGANIZATION OF THE MANUAL

The manual is divided into 15 sections and 8 appendices. Sections 2 through 7 contain material related to overall health and safety matters. Section 8 discusses health and safety in the general office environment. Sections 9 through 15 contain discussions and procedures specific to the following types of work:

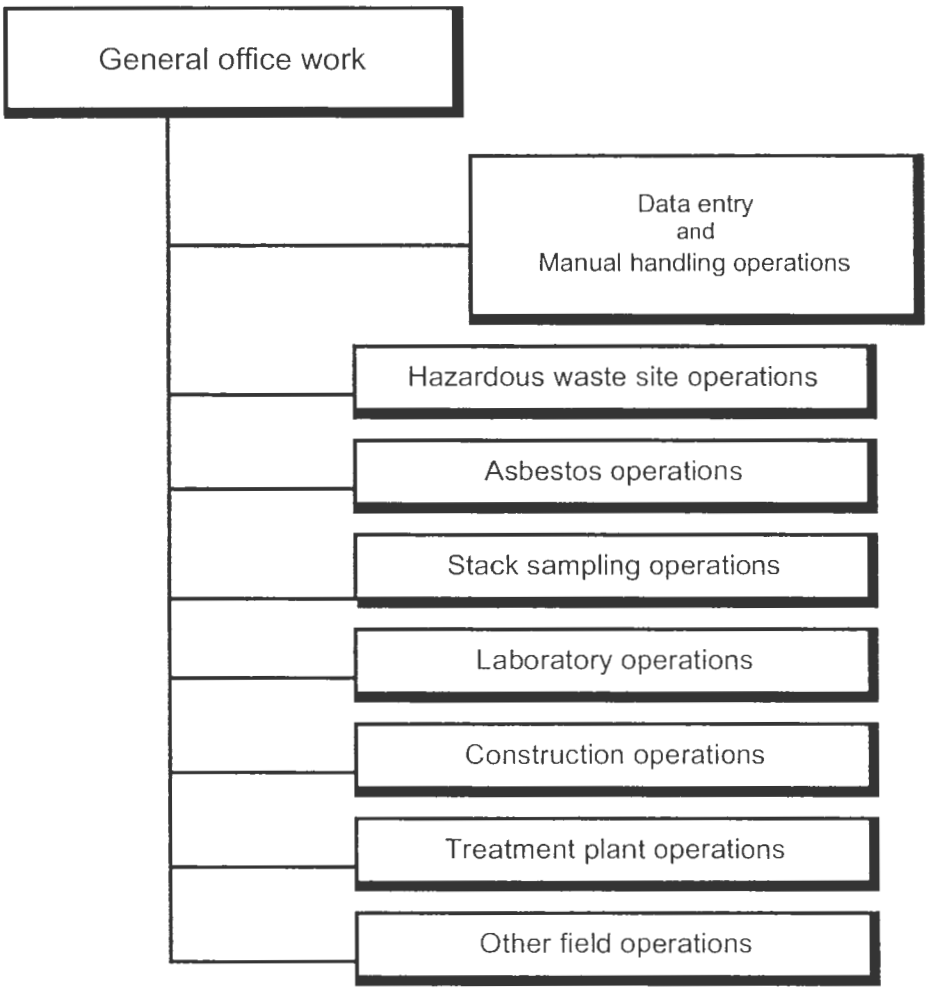
- Laboratory operations [Section 9]
- Hazardous wastes investigations [Section 10]
- Industrial field operations [Section 11]
- Asbestos abatement [Section 12]
- Construction activities [Section 13]
- Treatment plant health and safety [Section 14]
- Stack sampling [Section 15]

Appendix A provides frequently used health and safety forms. Appendix B describes the medical examination protocols offered by Parsons I&T and the criteria for selecting the correct protocol based upon employee job assignment. Appendix C is the Parsons I&T Bloodborne Pathogen Program.

Appendices D and E provide general requirements and procedures for the safe conduct of field activities where unexploded ordnance or radioactive waste are anticipated. Appendix F describes procedures for the proper handling, storage, and transport of compressed gases. Appendix G outlines procedures for project health and safety plan development and review. Appendix H presents a generic respiratory protection program.

These appendices do not contain every procedure necessary for the safe conduct of every type of field activity, they must be supplemental with project specific plans and procedures.

Figure 1.1 Parsons I&T Job Safety Groups



2.0 PROGRAM RESPONSIBILITIES

The success of the health and safety program depends ultimately on the efforts and cooperation of everyone in Parsons I&T. However, certain personnel have responsibility for implementing specific parts of the program. Their responsibilities are described in the following subsections.

2.1 CORPORATE HEALTH AND SAFETY MANAGER

The Corporate Health and Safety Manager reports to the Manager of Technical Direction and is responsible for the following activities:

- Administer the corporate health and safety program.
- Develop training programs.
- Conduct audits to ensure compliance with the health and safety program.
- Provide assistance to project and management personnel on health and safety issues.
- Update the health and safety program to meet new requirements and technologies.
- Maintain program records.
- Review and approve project health and safety plans for certain hazardous operations (e.g., Levels A and B activities, drum opening operations, etc.).

At the discretion of the Corporate Health and Safety Manager, a portion of the above responsibilities may be performed by an assistant.

2.2 FACILITY HEALTH AND SAFETY REPRESENTATIVES

Each Parsons I&T facility (i.e., office, plant, and laboratory) will have a Health and Safety Representative. This person will be the Cost Center Manager or his or her designee.

The Facility Health and Safety Representative reports directly to the Corporate Health and Safety Manager for all health and safety matters. The responsibilities of the Facility Health and Safety Representative include the following:

- Maintain health and safety records (e.g., accident report and accident investigation files, records of actions correcting unsafe or unhealthful conditions, the Occupational Safety and Health Administration (OSHA) No. 200 form, respirator fit-test records, instrument calibration and maintenance logs, and training and medical surveillance records).
- Select a local medical clinic.
- Develop and implement facility-specific health and safety programs (e.g., respirator protection, hazard communication, permit confined space, chemical hygiene, fire and emergency response, etc.).

- Develop and implement facility-specific health and safety training.
- Schedule medical appointments for employees.
- Obtain and promptly post material safety data sheets for all hazardous substances used in the work place.
- Ensure the adequacy of project health and safety plans and procedures.
- Ensure the availability of necessary health and safety equipment.
- Prepare and submit the required monthly health and safety reports to the Corporate Health and Safety Manager.
- Perform project audits to verify that activities are conducted safely.
- Biannually, review with the Profit Center Manger the safety training and medical monitoring needs of each employee.

2.3 DIVISION AND REGIONAL MANAGERS

Division and Regional Managers are responsible for ensuring that the resources and support are available for full implementation of the health and safety program. Division and Regional Managers will work with Facility Health and Safety Representatives to make certain that all activities are performed in conformance with the program.

2.4 PROFIT CENTER AND COST CENTER MANAGERS

Profit Center and Cost Center Managers (i.e., office and laboratory managers as well as managers of corporate or other groups of people) are responsible for ensuring the proper implementation of the Parsons I&T health and safety program for employees and areas under their control. More specifically, they or their designees shall be responsible for the following activities:

- Investigate accidents, near misses, and reported unsafe or unhealthful conditions
- Ensure the correction or mitigation of unsafe or unhealthful conditions in the areas under their control
- Implement a program to ensure that all employees understand and follow Parsons I&T health and safety policy and procedures

2.5 PROJECT AND CONSTRUCTION MANAGERS

Project and Construction Managers are responsible for ensuring that work at their sites are being performed in compliance with applicable safety policies, procedures, and regulations. The specific responsibilities of the Project or Construction Manager include:

- Ensure that field managers and other designated supervisors are sufficiently trained to carry out their responsibilities in implementing safety policies and procedures.
- Provide safety leadership and direction.
- Review and approve project health and safety plans (where applicable).
- Assign responsibility, authority, and accountability for implementing the safety program for the project.

- Ensure that the project budget is adequate for the necessary health and safety procedures and equipment.
- Select safe contractors (refer to Form HS07-19)

2.6 PROJECT HEALTH AND SAFETY OFFICERS

All hazardous waste field investigations shall have a Project Health and Safety Officer. (A Project Health and Safety Officer may be assigned to nonhazardous waste field projects that require more than ordinary attention to health and safety.)

The Project Health and Safety Officer shall be a field team member responsible for assuring that the project is performed in strict conformance with the project health and safety plan. This person shall have the authority to stop work if actions are judged unsafe or not in conformance with the project health and safety plan.

Specific responsibilities include the following activities:

- Prepare a project health and safety plan before the investigation or response, and ensure that the plan satisfies all federal, state, and local statutes, regulations, and ordinances concerning health and safety.
- Ensure that site-specific training is performed before site activities begin.
- Implement the project health and safety plan.
- Conduct on-site safety briefings, as necessary.
- Assure that any team member conducting a field investigation is qualified by training and experience and has the equipment to conduct the investigation safely.
- Determine the degree of personnel protection required.
- Select and provide appropriate health and safety apparel.
- Assess local capabilities (medical, fire protection, police, and government agencies) to assist in dealing with emergency situations and planning procedures for activating this response capability when required.
- Monitor the work parties for signs of stress and exposure.
- Complete any necessary health and safety forms (e.g., accident reports and instrument calibration and maintenance logs).
- Verify that Parsons I&T's subcontractors are complying with applicable safety regulations.

2.7 PROJECT STAFF

All project team members involved in projects for which a health and safety plan is in effect are responsible for reading and conforming to that plan. No employee shall perform a project activity that he or she believes may endanger his or her health and safety or the health and safety of others.

2.8 EMPLOYEE RESPONSIBILITIES

Parsons I&T employees are expected to play a major role in implementing the Parsons I&T health and safety policies and procedures. Employees are encouraged to report any unsafe or unhealthful situation or condition to their Department or Office Manager or to the Facility Health and Safety Representative. No employee will be reprimanded or punished for such reporting. Employees may, if they prefer, and if the health and safety concern is not an emergency, report such concern anonymously to the Corporate Health and Safety Manager.

Attachment B-7

Safety Concepts and Basic Consideration for UXO Operations

(Appendix D of Corporate Health and Safety Manual)

APPENDIX D
SAFETY CONCEPTS AND BASIC CONSIDERATIONS FOR UNEXPLODED EXPLOSIVE ORDNANCE OPERATIONS

The material in this appendix was prepared by the U.S. Army Corps of Engineers for general information and guidance of persons who may be associated with operations involving unexploded ordinance.

It is not a how-to-do-it manual.

PARSONS INFRASTRUCTURE & TECHNOLOGY PERSONNEL ARE NOT PERMITTED TO ENGAGE DIRECTLY IN THE OPERATIONS DESCRIBED IN THIS APPENDIX.

Rev 16 Dec 92

U.S. ARMY CORPS OF ENGINEERS, HUNTSVILLE DIVISION SAFETY CONCEPTS AND BASIC CONSIDERATIONS FOR UNEXPLODED EXPLOSIVE ORDNANCE (UXO) OPERATIONS

INTRODUCTION

There is no "safe" procedure for dealing with UXO, merely procedures which are considered least dangerous. However, maximum safety in any UXO operation can be achieved through adherence to applicable safety precautions, a planned approach and intensive supervision. Only those personnel absolutely essential to the operation shall be allowed in the restricted area/exclusion zone during UXO activities(DoD 6055.9-sTD). Safety must become a firmly established habit when working with UXO. Safety is the leading edge of quality.

1.GENERAL SAFETY CONCERNS.

a. Care must be observed in searching for, probing for, excavating, moving, and handling UXO. Operations on the UXO should be conducted only after the establishment of a complete plan for the operation involved and careful preparation to insure its implementation. Plans shall be based upon the minimum number of essential personnel, for a minimum amount of time, to the minimum amount of UXO consistent with efficient operations and maximum safety.

b. Only UXO qualified personnel shall be involved in UXO procedures. UXO procedures consist of gaining access (manual excavation) to subsurface UXO, identification, transportation, storage, and disposal of UXO. All personnel engaged in UXO operations shall be thoroughly trained in explosive safety and be capable of recognizing hazardous explosive exposures. Only personnel who have graduated from the US Naval EOD School, Indian Head MD are authorized to handle UXO and perform UXO procedures. Hazardous Devices Technicians who have graduated from the Hazardous Devices School, Redstone Arsenal AL are not trained nor qualified to handle military UXO and will not be involved in UXO operations on a CE project.

c. The use of electroexplosive devices (EED) susceptible to EMR devices in the radio frequency (RF) range, that is, radio, radar, and television transmitters, has become almost universal. Radio frequency electromagnetic radiation consists of waves of electrical energy at radio transmission frequencies. These waves are radiated in a line-of-sight from the antennas of electronic devices that transmit radio, radar, television, or other communication or navigation radio frequency signals. The energy is usually equally radiated in all directions; however, certain types of antennas focus the energy, transmitting it in a single direction or sector only. EMR (RF) can also be reflected from large metallic surfaces or objects into areas not directly reached by the line-of-sight-radiated electric energy.

(1) Under highly undesirable conditions, enough of the energy may be picked up by portions of the EED, associated

circuitry, or related objects acting as receiving antennas to initiate the EED.

(2) Since the strength of the radiation decreases as the distance from the transmitter increases, the further away the ordnance item is, the less hazardous the situation. The energy can pass directly through materials that do not conduct electricity, such as wood or plastic. Therefore, using these materials as a barrier is of little value. The factors to be considered when evaluating the degree of hazard that the EMR (RF) energy represents are: 1) the strength of the field, that is, its power; 2) the nature of the frequencies transmitted; 3) the distance from the transmitter antenna to the ordnance; and 4) the amount or type of protection available.

d. Some ordnance is particularly susceptible to EMR (RF) emission. This susceptibility is usually caused by the design of the ordnance item or the type of EED that is used. HERO categories have been established under which ordnance is classified as safe, susceptible, and unsafe. A knowledge of ordnance that is normally unsafe in the presence of EMR (RF) is important so that preventive steps can be taken if the ordnance is encountered in a suspected EMR (RF) field.

(1) In general, all ordnance items, even those normally safe when intact, are hazardous when extensively damaged. The damage may expose components, trailing wires, or breaks in shielding integrity that permit the entrance of EMR (RF) energy into the ordnance item and then into the EED.

(2) The presence of antennas, communication and radar devices should be a point of interest on initial site visits and preliminary assessments.

(3) The site shall be surveyed for electromagnetic radiation (EMR) radio frequency (RF) transmitters and appropriate action taken. Minimum safe distances between mobile RF transmitters, TV, and FM broadcasting transmitters and electric UXO demolition procedures are listed in Tables 2-3 and 2-4, TM 9-1375-213-12.

(4) Do not wear outer or undergarments made of wool, silk, or synthetic textiles such as rayon and nylon while working on UXO. These materials can generate sufficient static charge to ignite fuels or initiate explosives. Any person coming in contact with a UXO shall ground himself prior to touching EEDs. This must be done to discharge any electrostatic charge accumulation from the body.

2. SITE CHARACTERIZATION

a. Make every effort to identify the UXO. Carefully examine the item for markings and other identifying features such as shape, size, and external fittings. However, do not move the item to inspect it. If an unknown UXO is encountered, photographs shall be taken and express-mailed to CEHND-ED-SY which has access to the TM 60-Series publications.

b. Foreign UXO were returned to the United States for exploitation and disposal. Records search should indicate the possibility of foreign UXO being on the site.

c. If the records search indicates UXO containing military toxic chemical agents may be on the site, a decontamination plan shall be approved prior to entry onto the site. Any time a suspected chemical UXO is encountered, the 2-man concept is immediately implemented and notification shall be made through proper channels. The UXO shall be secured until the military arrives and assumes ownership.

d. UXO which penetrates the earth to a depth where the force of the explosion is not enough to rupture the earth's surface forms an underground cavity called a camouflet. Camouflets will be filled with the end product of the explosion, carbon monoxide gas. Camouflet detection and precautions must be considered if records search indicates the site was used as an impact area.

e. Avoid inhalation of, and skin contact with smoke, fumes, and vapors of explosives and related hazardous materials.

f. Consider UXO which has been exposed to fire and detonation as extremely hazardous. Chemical and physical changes may have occurred to the contents which render it much more sensitive that it was in its original state.

g. Do not rely on the color coding of UXO for positive identification of contents. Munitions having none, incomplete, or improper color coding have been encountered.

h. Avoid the area forward of the nose of a munitions until it can be determined that the item is not a shaped charge and High Explosive Anti-tank (HEAT) UXO. The explosive jet can be fatal to great distances forward of the longitudinal axis of the item. Assume any shaped charge munition to contain a piezoelectric (PZ) fuzing system until the fuzing is otherwise identified. A PZ fuze is extremely sensitive, can fire at the slightest physical change, and may remain hazardous for an indefinite period of time.

i. Examine a projectile for the presence or absence of an unfired tracer.

j. Approach an unfired rocket motor from the side. Ignition will create a missile hazard and hot exhaust.

(1) Do not expose electrically fired rocket motors within 25 feet of any exposed electronic transmitting equipment or exposed antenna leads.

(2) If an unfired rocket motor must be transported, it shall be positioned in the direction which offers the least exposure to personnel in the event of the accidental ignition.

k. Consider an emplaced landmine armed until proven otherwise. It may not be possible to tell. or it may be intentionally rigged to deceive.

(1) Many training mines contain firing indicator charges capable of inflicting serious injury.

(2) Exercise care with wooden mines that have been buried for a long time. Because of soil conditions, the wood deteriorates and the slightest inadvertent pressure on top may initiate the fuze.

l. Assume a practice UXO contains a live charge until it can be determined otherwise. Expended pyrotechnic/practice devices may contain red/white phosphorus residue. Due to incomplete combustion, phosphorus may be present and reignite spontaneously if subjected to friction or if the crust is broken.

m. Do not approach a smoking white phosphorus (WP) UXO. Burning WP may detonate the burster or dispersal explosive charge at any time.

n. The detection and identification of suspect explosive materials shall be accomplished IAW Chapter 13, TM 9-1300-214, "Military Explosives".

3. ORDNANCE RELATED HTRW ACTIVITIES.

a. 29 CFR 1926.100(a) requires personnel to wear protective helmets in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock or burns. During field activities on ordnance projects, hardhats need not be worn unless a head injury threat is present.

b. Soil samples, test pit excavation, and/or monitoring well installation are sometimes conducted in areas where subsurface UXO may be found. These intrusive activities must be preceded by a magnetometer survey to assure the safety of the sampling crews.

c. Prior to the drilling rig coming on site, a magnetometer and a hand-held auger shall be utilized to assure the drilling spot is clear of sub-surface UXO.

(1) After finding an area the magnetometer indicates is clear of detectable UXO, the hand-held auger should be used to start the drill hole. At not more than 2-foot depth, the hand-held auger shall be withdrawn and the magnetometer probe shall be lowered into the auger hole. This procedure will ensure small UXO items (20mm projectiles and grenades), undetectable from the surface, are now detectable. This procedure shall be repeated until the maximum depth of the hand-held auger.

(2) Borehole monitoring shall continue at 2-foot intervals until virgin soil is encountered.

4. RESTRICTED AREA/EXCLUSION OPERATIONS.

a. Do not allow unauthorized or unnecessary personnel to be present in the vicinity of UXO. During the timeframe that UXO procedures are being accomplished, only necessary UXO personnel shall be within the restricted area/exclusion zone. When non-UXO personnel enter the restricted area/exclusion zone, all UXO procedures will cease. Limit personnel exposure time. UXO operations will always be based upon minimum exposure consistent with efficient operations.

(1) Plan for, provide, and know the measures to be taken in the event of an accident.

(2) Provide a designated emergency vehicle in the area in case of an accident or other emergency.

(3) Coordination with the appropriate airspace representative shall be conducted and the appropriate notification procedures arranged.

b. Before any movement of an UXO, the fuze condition must be ascertained. If the condition is questionable, consider the fuze armed. The fuze is considered the most hazardous component of an UXO, regardless of type or condition.

(1) In general, the condition of a BD fuze in an unexploded projectile cannot be determined through examination of its external features. When there is evidence that the projectile has been fired, the BD fuze is considered to be in the armed condition.

(2) Arming wires and popout pins on unarmed fuzes should be secured by taping in place prior to movement.

(3) Perform any initial movement of an armed fuze remotely and avoid any unnecessary movement of an armed BD fuze.

c. Personnel working with explosives and explosive ordnance shall comply with the following:

(1) Do not carry fire or spark-producing devices on-site.

(2) Do not smoke, except in authorized areas.

(3) Do not have fires for heating or cooking, except in authorized areas.

(4) Do not conduct operations without approved Standing Operating Procedures (SOP) and proper supervision.

(5) Do not become careless by reason of familiarity with ammunition.

(6) Do not conduct explosive operations during electrical, sand, dust or snow storms.

(7) Do not conduct explosive operations between sunset and dawn.

d. When multiple search teams are operating on a site, the teams shall not work immediately adjacent to each other. A safe separation distance shall be established between each search team. This distance shall be based on the type of UXO expected to be encountered, but the distance shall never be less than 50m.

e. Perform initial movement of an embedded projectile remotely. First movement of an embedded projectile may cause fuze functioning. During this remote operation, precautions shall be taken for a high-order detonation

(1) DO NOT dismantle, strip, or subject any UXO to unnecessary movement, except in response to a valid requirement.

(2) Do not depress plungers, turn vanes, or rotate spindles, levers, setting rings, or other external fittings on the UXO. Such action may arm, actuate or function the UXO.

(3) Do not subject a mechanical time fuze to any unnecessary movement.

(4) Do not unscrew a fuze from a fuze well that does not contain a fuze cavity liner. High explosives may be on the threads.

f. Expended pyrotechnic/practice devices may contain red/white phosphorus residue. Due to incomplete combustion, red and white phosphorus may be present and reignite spontaneously if subjected to friction or if the crust is broken.

g. Do not undertake the handling or disposal of liquid propellant fuels or oxidizers if not familiar with the characteristics of the material.

h. Civil War projectiles shall be treated as any other UXO, especially projectiles with uncut Bormann time fuses and projectiles with percussion fuses, brass in particular. These have generally provided a watertight seal, even if they have been in the ground over one hundred years. No projectile should be exposed to excess heat, the ignition point of black powder, used as a bursting charge in all Civil War projectiles is 457 degrees F. Under no circumstances should an attempt be made to drill a hole in a projectile, either through the fuse or the body of the projectile.

i. Extra care shall be taken when uncovering a buried UXO, if records search indicated WP munitions were fired or destroyed in the area. A buried WP munition may be damaged and when exposed to air, may start burning and detonate. An ample supply of water and mud shall be immediately available if excavation reveals a WP UXO. Appropriate protective equipment (leather gloves, face shield, and flame-retardant clothing) and first aid shall also be immediately available.

5. STORAGE.

a. UXOs, UXO-components, packing materials or empty boxes will not be stored in magazines containing explosives.

b. A fire plan for the storage of explosives shall be prepared and coordination with the nearby fire department shall be conducted.

6. EXCAVATION OPERATIONS.

a. The usual method for uncovering buried UXO is to excavate by hand. Hand excavation is the most reliable method for uncovering UXO, but unless the UXO is very near the surface, hand excavation exposes more people to the hazard of detonation for a longer period of time than any other method. Hand excavation will be accomplished only by UXO personnel.

b. Earth moving machinery (EMM) may be used to excavate for buried UXO, if the UXO is estimated to be deeper than 12 inches. EMM shall not be used to excavate within 12 inches of an UXO. When excavation gets within 12 inches of an UXO, hand excavation shall be used to uncover the UXO. EMM may be operated by non-UXO personnel, under the direct supervision of UXO personnel.

(1) If more than one EMM will be used on the same site, they will be separated by at least 100m during excavation.

(2) During excavation operations, only those personnel absolutely necessary for the operation shall be within the restricted area/exclusion zone.

(3) Excavation and trenching shall comply with the provisions of 29 CFR 1926 subpart P.

7. DISPOSAL OPERATIONS.

a. As a general rule, UXO will be detonated in place when the situation allows. All detonation-in-place should be conducted by electrical means to assure maximum control of the site, except in extreme sandy soil which creates a static electricity hazard. Non-electrical means can be used when the situation dictates.

(1) Do not allow one person to work alone in disposal operations. At least one person shall be available near the disposal site to give warning and assist in rescue activities in the event of an accident. Only UXO-qualified personnel shall be involved in on-site disposal operations.

(2) Initiating explosives include lead azide, mercury fulminate, lead styphnate, and tetracene. They manifest extreme sensitivity to friction, heat, and impact. When involved in a fire, they can be expected to detonate without burning. In storage, initiating explosives shall be kept wet with water or water/alcohol mixture. Every effort shall be made to prevent the liquid from freezing; frozen explosives material will not be handled. Lead azide shall not be allowed contact with copper,

zinc, or alloys containing any concentration of such metals because of the likely formation of other azides that are more sensitive than the original lead azide. Likewise, mercury fulminate shall not be allowed contact with aluminum, magnesium, zinc, brass or bronze.

(3) If loose, bulk explosives are to be disposed of by detonation, detonate only one kind of explosive in any one given shot.

(4) Exercise extreme care in handling and preparing high explosives for detonation. They are sensitive to detonation by heat, shock, and friction.

(5) Keep initiating explosives in a water-wet condition at all times until ready for final preparation for detonation. The sensitivity of these explosives is greatly increased when dry.

(6) Do not pack a bomb fuze well with explosives unless it can be positively confirmed that the fuze well does not contain any fuze components.

(7) Photoflash bombs must be handled with the same care as black powder, and with even greater care than explosive-loaded bombs.

(8) Some practice bombs do not contain any positive safety features. Positively identify and review all safety precautions prior to handling practice bombs.

(9) WP UXO shall not be detonated into the ground. The UXO shall be counter-charged on the bottom-center-line.

(10) Photoflash powder will react with moisture and generate hydrogen gas, and this reaction may generate sufficient heat or pressure to detonate the UXO. Do not look directly at photoflash UXO during detonation.

b. When disposing of high explosives by detonation, do not approach the disposal site for at least 30 minutes in the event of a misfire.

(1) Carry blasting caps in approved containers and keep them out of the direct rays of the sun.

(2) Do not handle, use, or remain near explosives during the approach or progress of an electrical storm. All persons should retire to place of safety.

(3) Do not use explosives or accessory equipment that are obviously deteriorated or damaged. They may detonate prematurely or fail completely.

(4) Always point the explosive end of blasting caps, detonators, and explosive devices away from the body during handling. This will minimize injury should the item explode.

(5) Use only standard blasting caps of at least the equivalent of a commercial No. 8 blasting cap.

(6) Use electric blasting caps of the same manufacture, whenever possible, for each demolition shot involving more than one cap.

(7) Keep blasting caps in approved containers, located at least 25 feet from other explosives, until they are needed for priming.

(8) Do not bury blasting caps. Use detonating cord to position blasting caps above the ground. Buried blasting caps are subject to unobserved pressures and movement which could lead to premature firing or misfires.

(9) Test electric blasting caps for continuity at least 25 feet downwind from any explosives prior to connecting them to the firing circuit. Upon completion of testing, the lead wires will be short-circuited by twisting the bare ends of the wires together. The wires will remain shunted until ready to connect to the firing circuit.

c. A post-search of the detonation site shall be conducted to assure a complete disposal was accomplished.

d. If the situation dictates, protective measures to reduce shock, blast, and fragmentation damage shall be taken. Army Technical Manual (TM) 5-855-1, Fundamentals of Protective Design for Conventional weapons and associated software program "CONWEPC", contains data on blast effects, groundshock, cratering, ejecta, and fragmentation.

(1) For non-fragmenting explosive materials, evacuation distance should be a minimum of 1250 feet.

(2) For fragmenting explosive materials, evacuation distance should be a minimum of 2500 feet. For bombs and projectiles with caliber 5-inch or greater, use a minimum evacuation distance of 4000 feet.

(3) Items with lugs and/or strongbacks and nose and/or tail plate sections should be oriented away from personnel locations.

e. Consideration shall be given to tamping the UXO to control fragments, if the situation warrants. Fragments shall be minimized not only to protect personnel but property such as buildings, trees, etc.

f. Open burning of explosives and smokeless powder or chemical decomposition of explosives shall not be accomplished without prior approval of the contracting officer.

(1) Do not inhale the smoke or fumes of burning pyrotechnic or incendiary materials. The fumes and dust from many of these materials are irritating and/or toxic if inhaled.

(2) Do not use water on incendiary fires. Water may induce a violent reaction or be completely ineffective, depending on the mixture.

(3) Bury incendiary-loaded munitions in sand when transporting them. This will smother any fire which should start until other corrective action can be taken.

(4) Anticipate a high-order detonation when burning pyrotechnics or incendiary-loaded UXO. Safety measures for personnel and property must be based on this possibility.

g. Inert UXO will not be disposed of or sold for scrap until the internal fillers have been exposed and unconfined. Heat generated during a reclamation operation can cause the inert filler, moisture and air to expand and burst sealed casings. Venting or exposure may be accomplished in any way necessary to preclude rupture due to confined pressure.

8. TRANSPORTATION.

a. If UXO must be transported off-site for disposal, the provisions of 49 CFR 100-199, TM 9-1300-206, and state and local laws shall be followed.

b. When transporting a possible armed fuze, position the fuze in the most neutral orientation possible.

c. Do not transport a WP munition, unless it is immersed in water, mud or wet sand

d. If loose pyrotechnic, tracer, flare, and similar mixtures are to be transported, they shall be placed in #10 mineral oil or equivalent to minimize fire and explosion hazard.

e. If an unfired rocket motor must be transported, it shall be positioned in the direction which offers the least exposure to personnel in the event of an accident ignition.

f. If base-ejection type projectiles must be transported to a disposal area or collection point, the base shall be oriented to the rear of the vehicle and the projectile secured, in the event the ejection charge functions in route.

g. If an OEW, with exposed hazardous filler (HE, etc.), has to be moved to a disposal area, the item shall be placed in a heavy duty plastic bag to prevent migration of the hazardous filler. Padding should also be added to protect the exposed filler from heat, shock, and friction.

ORDNANCE AND EXPLOSIVE WASTE
CONSIDERATIONS DURING GEOTECHNICAL OPERATIONS

1. OBJECTIVE: To assure all personnel are aware of the policies and procedures relating to Ordnance and Explosive Waste when performing geotechnical field functions.

2. BACKGROUND. Until the mid-1970's land burial of OEW was an authorized method of disposal. Ammunition items that were unserviceable, for whatever reason, were buried in trenches. It was much cheaper to dig a trench and bury ammunition than it was to destroy it by burning or detonation. Generally, disposal trenches were not annotated on installation maps. It was much easier to discard unneeded ammunition into a pond or lake than fill out the required paperwork and return it to the ammunition supply point. Firing ranges were used for other purposes years later. Generally speaking, subsurface clearances were not conducted on past range clearances.

3. REFERENCES:

a. ER 1110-3-109, *Corps-Wide Centers of Expertise Assigned to Major Subordinate Commands and Districts,* dated 15 July 1992.

b. CEHND 1104-3-9, *Management Plan for Ordnance and Explosive Waste (OEW) Mandatory Center of Expertise (MCX) and Design Center,* dated 10 August 1992.

c. U.S. Army Corps of Engineers, Huntsville Division, *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO) Operations,* dated 16 December 1992.

d. EM 385-1-1, *Safety and Health Requirements Manual,* dated 1 October 1992.

4. DEFINITIONS:

a. Mandatory Center of Expertise (MCX) is defined as a major subordinate command (MSC) or district command which currently possesses a demonstrated, credible technical capability in a specialized subject area applicable to military construction and beneficial to other USACE commands. All using commands will coordinate with and use the expertise and services of the MCX to satisfactorily accomplish their mission. The Huntsville Division is the Corps of Engineers MCX for Ordnance and Explosive Waste (OEW).

b. Ordnance and Explosive Waste (OEW) is an umbrella term to include anything related to munitions designed to cause damage to personnel or material through explosive force, incendiary action, or toxic effects, such as bombs, guided and ballistic missiles; artillery, mortar, and rocket ammunition; small arms ammunition; antipersonnel and antitank landmines, demolition charges; pyrotechnics; grenades, torpedoes and depth charges;

containerized and uncontainerized high explosives and propellants; depleted uranium projectiles; toxic military chemical agents; and all similar or related items or components in nature or otherwise designed to cause damage to personnel or material. Soils with explosive constituents will be considered 0zi if the concentration is sufficient to present an imminent safety hazard.

(1) Unexploded ordnance (UXO) is an item of OEW which has been primed, fuzed, armed, or otherwise prepared for action, and which has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to friendly operations, installations, personnel or material and remains unexploded either through malfunction or design or for any other cause.

(2) Chemical Warfare Material (CWM) are those items of explosive ordnance that contain toxic military warfare agents, such as incendiary agents, such as thermite and magnesium; smokes such as white phosphorus and the colored signal smokes; riot control agents such as tear gas and vomiting agents; blood and choking agents; nerve, mustard, and lewisite agents.

(3) Chemical Surety Material (CSM) are those items of explosive ordnance that contain nerve, mustard, and lewisite agents. Only members of the U.S. Army's Technical Escort Unit are authorized to handle, package, and ship CSM items.

c. Explosive ordnance disposal (EOD): The detection, identification, field evaluation, rendering-safe, recovery, and final disposal of OEW.

d. EOD Specialist: An active duty military EOD person who has attended the US Naval EOD School, Indian Head MD.

e. UXO Specialist: A former EOD Specialist; a civilian contractor.

5. POLICY.

a. It is Department of Defense policy to provide the maximum possible protection to personnel and property from the damaging effects of potential accidents involving ammunition and explosives.

b. No person shall be required or instructed to work in surroundings or under conditions which are unsafe or dangerous to his health.

c. Any USACE command involved with a project that includes, or is associated with Army Ranges and Training Land, and Hazardous, Toxic, and Radioactive Waste (HTRW) activities to include surveying, intrusive investigative activities such as boil sampling, trenching, monitoring well installation and

construction will coordinate with and use the services of the OEW MCX.

d. No intrusive activities, of any type, will be conducted on a site which is listed in the FUDS inventory as OEWCSM.

e. Only trained explosive ordnance disposal personnel will handle OEW/UXO.

6. PROCEDURES.

a. OEW has to be considered and planned for on all formerly used defense sites (FUDS) and active installations.

b. The surface danger zone of a range (active or inactive), the target area, impact area, ricochet area and the secondary danger zones will be contaminated with UXO. UXO is that ammunition which has failed to function as designed, i.e., a dud. UXO will be found on the surface and subsurface. The varying types of ammunition, angle of fire, and soil types preclude the accurate estimation of the depth of subsurface UXO.

c. Any type of survey activities, foot or vehicular movement, or intrusive work within the surface danger zone, forward of the firing line, should be preceded by a surface and subsurface clearance of UXO.

(1) Footpath and/or vehicular lanes should be cleared, if ordnance cannot be avoided, and conspicuously marked. No personnel should be allowed outside these cleared areas. This limited clearance should entail both surface and subsurface. Subsurface is necessary to find that UXO that is lying just below the surface that may be encountered after rain and vehicular traffic. Depending on the type of ammunition involved, it is possible a vehicle running over a UXO, will cause the item to detonate. Depending on the size of the UXO, personal injury and property damage can be expected.

(2) Subsurface clearance, when necessary, is particularly important when intrusive activities will be used to take soil samples, install monitoring wells, dig test trenches, dig cable trenches, excavate berms and relocate targets. A limited subsurface clearance of the intrusive work area is necessary to preclude equipment operators from being needlessly exposed to UXO. It is possible that a UXO struck by a drill bit, hand auger, cable trencher, backhoe, bulldozer, etc., will detonate. Depending on the size of the UXO, personal injury and property damage can be expected.

(3) Surface and subsurface clearance of UXO will be done only by EOD or UXO Specialists. Generally, UXO Specialists are contracted to provide UXO Support, which includes magnetometry.

d. UXO Support will be site specific. One, two, or more UXO-persons may be required, depending on the tasks to be performed.

(1) Generally, a two person UXO Team is required to provide UXO sweeps, magnetometry support, and site safety.

(2) During investigative activities, the UXO Team is generally not tasked to perform disposal activities. If UXO is encountered that cannot be avoided and/or requires disposal, the USACE representative shall request military EOD support. Military EOD will not respond to requests for EOD support from contractor personnel.

(3) Magnetometer sweeps of the intrusive activity sites is required. If the magnetometer indicates a subsurface magnetic anomaly, an alternative site should be selected. This could be just a few feet in any direction. During investigative activities, there is no justification to needlessly expose personnel to excavating magnetic anomalies to determine their identification, when an adjacent area, which is free of magnetic anomalies can be used.

(4) After finding an area the magnetometer indicates is free of magnetic anomalies, the UXO Team will use a hand-held auger to start a drill hole. At not more than 2-foot depth, the hand-held auger should be withdrawn and the magnetometer probe lowered into the auger hole. This procedure will ensure small UXO items (20mm projectiles and grenades, etc.), undetectable from the surface, are now detectable. This procedure should be repeated until the maximum depth of the hand-held auger.

(a) While the UXO Team is hand-augering and checking the area for UXO, no other personnel should be allowed in the area.

(b) If a magnetic anomaly is not detected during this process, the drill rig and/or other equipment and personnel can be allowed on site.

(5) If an UXO is uncovered during a test trench excavation, all operations will cease. The UXO Team will determine the condition of the UXO. If disposal action is required, the. USACE representative will request EOD support. Once UXO has been encountered in a test trench, no further excavation of that trench is allowed. The trench will be filled and the applicable report shall indicate UXO was encountered and the trenching activity was abandoned.

(6) During UXO related activities, the UXO Team shall not wear safety shoes or other footwear which would cause the magnetometer to present a false indication.

(7) During UXO related activities, the UXO Team will not be required to wear protective helmets (hard hats) unless, based on a hazard analysis, a head threat injury is present.

(8) Magnetometry will not detect subsurface bulk explosives. If subsurface bulk explosives is anticipated based or the site history, the UXO Team may be required to explosively perforate all projected intrusive investigation sites.

e. The UXO Team shall prepare a work and safety plan to supplement the prime contractor's or the USACE site plan. The UXO plan should indicate the specific magnetometer the UXO personnel are going to use and the procedures the UXO Team shall follow during the accomplishment of the job. This plan does not need to be comprehensive as it is a supplement to the site plan.

f. The following are the minimum, non-waiverable qualifications for UXO personnel:

(1) UXO Team Leader (UXO Supervisor) is a graduate of the U.S. Naval EOD School, Indian Head MD with at least ten years active duty military EOD experience.

(2) UXO Team member(s) (UXO Specialist) is a graduate of the U.S. Naval EOD School, Indian Head MD with at least three years of active duty military EOD experience.

g. All specifications/scopes of work requiring UXO Support should be forwarded to the OEW MCX for review. All work and safety plans involving HTRW investigations, when UXO Support is a requirement, should be forwarded to the OEW MCX for review

OEW Generic Statement of Work
(For UXO Avoidance)

1. GENERAL: The contractor shall provide a two person Unexploded Ordnance (UXO) team to provide on-site UXO support during all sampling activities. This includes soil sampling and the drilling of monitoring wells. The UXO team will not destroy any UXO encountered. The UXO team will report all UXO to *(Range Control Officer, local COE representative, or other appropriate officer* – the point of contact to report UXO or CWM is dependent on the site specific conditions and arrangements. Work on an active installation will normally require reporting UXO to the Range Control Officer, Facility Engineer or Post headquarters. work on Formerly Used Defense Sites will require prior coordination to determine the point of contact. It could be the local or state law enforcement agency, or the local emergency management agency, and the contracting officer who will in turn notify the Huntsville Division, Corps of Engineers. The Government will contact the local EOD Unit for disposition of the OEW or UXO.

2. DEFINITIONS:

a. ORDNANCE AND EXPLOSIVE WASTE (OEW): Bombs and warheads, guided and ballistic missiles, artillery, rocket and mortar ammunition, small arms ammunition, anti-personnel and anti-tank mines, demolition charges, pyrotechnics, grenades, containerized and uncontainerized explosives and propellants, military chemical agents and all similar and related items or components, explosive in nature or otherwise designed to cause damage to personnel or material. Soils with explosive constituents are considered to be OEW if the concentration is sufficient to be reactive and present an imminent safety hazard.

b. UNEXPLODED ORDNANCE (UXO): An item of explosive ordnance that has failed to function as designed or has been abandoned, discarded or improperly disposed of and is still capable of functioning and causing damage to personnel or material.

c. INERT ORDNANCE: An item that has functioned as designed, leaving an inert carrier. An item manufactured to serve a specific training purpose. Fragments from UXO.

d. EXPLOSIVE ORDNANCE DISPOSAL (EOD) PERSONNEL: Active duty military EOD personnel.

e. UXO PERSONNEL: Former EOD personnel.

f. CHEMICAL WARFARE MATERIAL (CWM): Any CWM in a munition(s) or container(s). Any dirt or scrap that has been potentially contaminated with a chemical compound designed for military

operations to kill, seriously injure or incapacitate persons through its chemical properties.

g. CHEMICAL EVENT: Discovery of an actual or suspected chemical agent or container that may require emergency transportation or disposal.

3. UXO TEAM COMPOSITION AND QUALIFICATIONS: UXO Teams shall consist of two members with the following qualifications:

a. UXO Team Leader: This is the individual who has the direct responsibility and is the technical lead for all UXO operations on the site. This individual shall have documented experience in supervising range clearance operations and supervising personnel. This individual shall be a graduate of the U.S. Naval Explosive Ordnance School at Indian Head, Maryland and have at least 10 years of active duty EOD experience.

b. UXO Team Member: Be a graduate of the U.S. Naval Explosive Ordnance School at Indian Head, Maryland. Have at least 3 years of active duty EOD experience.

4. RESPONSI8ILITIES AND AUTHORITY: The UXO Team will provide the explosive ordnance recognition, location and safety function for the prime contractor. The UXO team leader has the final authority for on site personnel regarding all matters concerning UXO.

5. WORK AND SAFETY PLANS: The UXO team will assist in the development of the contractor's site safety and health plan and the work plan. The UXO team leader will conduct UXO safety briefings for all site personnel and visitors.

6. ACCESS ROUTES TO SAMPLING LOCATIONS:

a. Prior to sampling or well drilling crews going on site, the UXO team shall conduct a reconnaissance of the sampling area. The reconnaissance shall include locating a clear path for the sampling crews, vehicles and equipment to approach the site. The approach path, at a minimum will be twice the width of the widest vehicle. The contractor will clearly mark all boundaries of the cleared approach path prevent personnel from straying into uncleared areas. No personnel shall be allowed outside the cleared paths.

b. If UXO is encountered on the surface, divert the approach path around the UXO, clearly mark the area and report the UXO.

c. A magnetometer shall be used to insure there is no subsurface UXO within the approach path. If a magnetic anomaly is encountered and identified as UXO, divert the path around the UXO. Only minor excavation will be done to identify or confirm UXO. If the anomaly is more than one foot deep, assume it to be UXO and divert the approach path. Only UXO personnel shall handle UXO and operate the magnetometer.

7. SOIL SAMPLING AND WELL DRILLING SITES:

a. The UXO team shall locate magnetic anomaly free areas for soil samples and well drilling. If a pre-selected area indicates magnetic anomalies, a new sampling/drilling site will be chosen.

b. The contractor will clearly mark the boundaries of the cleared soil sampling or well site. Personnel will not go outside the cleared area. As a minimum, the cleared area will be a square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment to be brought on site.

c. Prior to drilling equipment being moved to the proposed well location, the UXO team shall locate a magnetic anomaly free site. This shall be accomplished using a magnetometer with downhole monitoring capabilities. The UXO team shall start the borehole with a hand auger. At not more than a two foot depth, the hand auger will be withdrawn and the magnetometer will be lowered into the borehole. This procedure will be used to insure that smaller items of UXO, undetectable from the surface can be detected. If no magnetic anomalies are found, the procedure will be repeated at two foot intervals to the maximum depth of the hand auger, no less than 6 feet. If the proposed well site is still free of magnetic anomalies, the drilling equipment may be brought on site and utilized. Borehole monitoring with the magnetometer shall continue at two foot intervals, until virgin soil is reached. This determination shall be made by the on site geologist.

8. CHEMICAL WARFARE MATERIALS:

a. If suspected CWM is located at any time, all work will cease immediately. Site workers will withdraw along cleared paths from the area containing the CWM. The contractor will clearly mark the area containing the CWM, and report the chemical event to the designated point of contact (POC) as determined in Paragraph 1, and the contracting officer. The report of discovery of suspected CWM will be made within one hour of the discovery. The POC will make the final determination as to the actual presence of CWM.

b. If the POC confirms the presence of CWM, the government person in charge will report the chemical event to the appropriate agencies.

c. When contacting the POC about suspect CWM, the contractor will provide the following information listed in Figure 1. Contact with the POC will not be delayed due to lack of information. The suspected CWM report will follow the format in Figure 1.

(1) Date and local time of event.
(2) Location.
(3) Quantity and type of munitions(s) or container(s) and chemical agents involved.
(4) Description of what has happened.
(5) Description of property damage.
(6) Personnel casualties and/or injuries.
(7) Whether medical services or facilities were required.
(8) Assistance required.
(9) Any other pertinent information.
(10) UXO team leaders assessment of the situation

Figure 1, Sample Suspected CWM Data Report

Attachment B-8

Work Standards for Unexploded Ordnance

SUBJECT: Ordnance and Explosive Waste (OEW) Mandatory Center of Expertise (MCX) Work Standards for Unexploded Ordnance (UXO) Personnel

1. The enclosed work standards are established to provide the safety limits under which UXO personnel will be expected to work on projects involving ordnance investigations and clearance actions.

2. Standards for contractor personnel defined in the enclosure are for the most part currently used in existing contracts. New standards will be incorporated into contract documents as new contracts are developed.

3. This guidance should be distributed to all personnel involved in OEW contracting, management, design and execution.

FOR THE DIRECTOR OF PROGRAMS
AND PROJECT MANAGEMENT:

C. DAVID DOUTHAT, P.E., CSP
Chief, Safety Division

Encl

DISTRIBUTION:
PM-OT(all)
PM-SO(all)
ED-CS(Geo/EPUS/Site Dev.)
ED-SY(Torres)
ED-ES(Estimating)
CT
OC(Simmons)
PA

WORK STANDARDS FOR CEHND SAFETY SPECIALISTS

1. SAFETY SPECIALIST QUALIFICATIONS. Any individual involved in the execution, supervision, or oversight of ordnance related activities shall be a graduate of the U.S. Naval Explosive Ordnance Disposal (EOD) School, Indianhead, MD and have been awarded the Master EOD Skill Badge. In addition the individual must have experience in planning, executing, and supervising multiple-team operations. Since most of our clearance actions occur on land, the individual must also have experience managing range clearance operations. This experience is characteristic of an individual with approximately 15 years of active duty military EOD experience.

2. SAFETY SPECIALIST ON-SITE RESPONSIBILITIES. A Safety Specialist shall be on site at the start of all OEW projects to observe contractor operations during all UXO intrusive or demolition activities.

a. The specialist is on hand to ensure that the contractor establishes the appropriate daily safety routines from the outset of the project, to verify employee UXO qualifications, to advise the contractor on questionable procedures, and to contact the appropriate offices when EOD response is needed. These are the minimum safety responsibilities, and do not include potential responsibilities of Quality Assurance oversight, Contracting Officer's Representative, coordination with the Life Cycle Project Manager and CEHND project manager, and other non-safety related responsibilities.

b. The on-site presence requirement can be relaxed once the project is in routine operation, with the written approval of CEHND-PM-SO. Such approval shall reflect that the on-site Safety Specialist is satisfied that the contractor is comfortable with and proficient in executing the UXO related tasks. The Contracting Officer must also be consulted to determine if on-site presence is needed for administrative reasons.

c. Safety Specialists stationed at CEHND should be rotated back to the home office after two weeks at a site, and should spend at least one week in the home office before cycling back to the field. When replacing a Safety Specialist at an on-going removal action, new Safety Specialists shall have at least two days of overlap with the veteran Specialist in order to receive proper orientation.

3, CONTRACTOR UXO QUALIFICATIONS. All Contractor UXO personnel shall be graduates of the U.S. Naval Explosive Ordnance Disposal (EOD) School, Indianhead, MD. USNAVEOD also requires that EOD personnel be U.S. citizens due to the need for access to the TM-60 series publications which are marked NOFORN (NO FOReign Nationals). No UXO personnel shall have been removed from an EOD position due to problems over reliability. Federal military or civilian employees cannot be employed by Contractors for contract work. Credit for EOD experience in National Guard or Reserve units will be based on the documented actual time spent on active duty, not on the total time of service.

a. Senior UXO Supervisor. This individual has direct responsibility for all UXO operations on the site and should therefore be able to demonstrate experience in dealing with the types of ordnance expected to be encountered. The individual shall have experience supervising multiple-team operations and, since most of our clearance actions occur on land, shall have supervised range clearance operations. The individual shall have at least 15 years active duty military EOD experience. Three years of civilian contractor UXO experience may be substituted for 3 years of active duty military EOD experience, but 12 years active duty military EOD experience is not waiverable.

b. UXO Supervisor. This individual supervises a UXO sweep team. This individual shall have experience in range clearance operations. At least ten years combined active military ECD and contractor UXO experience is required for this position. Three years active duty military ECD experience is an absolute requirement.

c. UXO Specialist. This individual shall have more than three years active duty military EOD experience. The UXO specialist may also be a UXO Assistant with at least 5 years combined military ECD and contractor UXO experience.

d. UXO Assistant. This individual has less than three years active duty military ECD experience or may be a graduate of the EOD Assistant Course at Redstone Arsenal, AL or Eglin AFB, FL. An EOD Assistant shall not perform a UXO task without the direct supervision of a UXO supervisor.

e. Quality Control (QC) Specialist. This individual has the responsibility of enforcing the contractor's QC Plan, and shall have the same minimum prerequisites as the UXO supervisor.

f. Site Safety and Health Officer (SSHO). This individual has the responsibility of enforcing the contractor's Site Safety and Health Plan (SSHP), and therefore must be in the field

whenever possible observing operations. This individual shall have the same minimum prerequisites as the UXO supervisor. In addition, the SSHO shall have the specific training, knowledge and experience necessary to implement the SSHP and verify compliance with applicable safety and health requirements.

g. Magnetometer or Heavy Equipment Operator. This individual need not be a UXO person, but shall have the necessary training and experience to properly operate the assigned equipment.

4. WORK WEEK.

a. Contractor employees involved in performing unexploded ordnance related tasks shall be limited to a 10-hour day and a 40-hour work week. This limitation is deemed necessary to ensure that UXO personnel receive ample opportunity for rest so that they can remain alert during UXO operations. Exceptions to this 10-hour day/40-hour week shall be granted by CEHND-PM-SO only when public safety is at imminent risk and if the added risk to the UXO personnel has been evaluated and judged to be acceptable. Two consecutive work weeks shall be separated by 48 hours of rest.

b. CEHND-PM-SO Safety Specialists will work basically the same schedule as the contractor. The specialist is subject to the same restrictions as the contractor regarding UXO related tasks.

(1) Overtime. The Safety Specialist is expected to keep current with project paperwork during the Contractor's scheduled work week, and overtime should not be requested for such purposes. If other work is assigned which cannot be accomplished during the scheduled work week, the Safety Specialist shall submit an overtime request. This request shall identify and justify the additional work. Overtime work must be accomplished at the worksite.

(2) Overtime Pay During Travel Status. Contract schedules are under the Government's administrative control, and therefor overtime cannot be paid to a Government employee for traveling on holidays or weekends in support of a contract.

(3) Hazardous Duty Pay. Mere presence on a site containing ordnance or explosive waste does not qualify as hazardous duty. An individual can claim hazardous duty pay if

accomplishing or observing the accomplishment of UXO related tasks within the work exclusion zone. In order to justify HDP, the first Safety Specialist assigned to a site must complete an Explosive Ordnance Site-Specific Hazard Determination form (Appendix A).

5. UXO TEAM COMPOSITION AND ROLES. Depending upon the mission, the number of teams, size, and makeup of UXO teams will vary.

a. UXO Investigations or Clearance Actions. Where the mission calls for ordnance discovery or removal, team composition should use the following guidelines.

(1) Each team should consist of one UXO Supervisor and six or less team members. The team should have at least two UXO-qualified personnel.

(2) Teams should not be less than three personnel, including the UXO Supervisor and a UXO Specialist or UXO Assistant.

(3) The UXO Supervisor may supervise tasks and teams other than UXO teams, such as brush-clearing or surveying crews. On the other hand, task limitations imposed upon magnetometer operators and laborers may drive the contractor to assign these tasks to UXO personnel.

(4) The Senior UXO Supervisor should not supervise more than ten UXO Supervisors.

(5) A separate SSHO should be used when six or more UXO teams are working a site. The SSHO should report to the Senior UXO Supervisor. When less than six teams are operating, a UXO Supervisor may act as the SSHO. However, the Site Safety and Health Officer position demands that the SSHO spend at least 50 percent of his time in the field observing UXO operations. If the UXO Supervisor cannot meet the 50 percent field observation criteria, a separate SSHO shall be appointed.

(6) A Quality Control Specialist is not required during investigations, but should be used during removal actions, when the Government must determine that a clearance has been effective. The QC Specialist's responsibilities may not constitute a full-time on-site position, depending on size and complexity of the project, number of teams, and amount of UXO encountered. The QC Specialist must maintain high quality in the removal action without compromising safety. Therefore, QC should not be dual-hatted as a SSHO, nor should he be involved in OEW removal tasks.

(7) The UXO Assistant is authorized to operate the magnetometer, investigate anomalies and assist in disposal operations, all under supervision of a UXO-qualified individual. The UXO Assistant shall not determine if a UXO item is safe to move.

(8) The position of magnetometer operator has been created to take some of the burden from UXO Specialists who in the past were required to operate magnetometers, mark anomalies, and excavate the anomalies. Non-UXO qualified magnetometer operators shall not excavate to identify magnetic anomalies nor handle UXO. They can only operate the equipment and flag the anomalies. With this restriction it is not always wise to specify the magnetometer operator for a project, unless it can be determined that work efficiency will be gained in the process.

b. UXO Avoidance. When an HTRW or a construction project is anticipated in areas with potential OEW problems, UXO support shall be present for the purpose of avoiding ordnance. The UXO team will normally consist of two personnel; a UXO Supervisor and a UXO Specialist or UXO Assistant. The team will usually operate without on-site Safety Specialist oversight.

6. ADVERSE WEATHER CONDITIONS. Since most of the Government contracts for OEW projects are cost-reimbursable, the Government should absorb the cost of work delays caused by adverse weather. The OEW contractor is willing to work in all kinds of weather in order to keep his employees steadily occupied, and is reluctant to stop work during inclement weather. The CEHND Safety Specialist should be aware of the physical and psychological effects of adverse weather. If he determines that weather conditions create an unacceptable level of risk, the CEHND Safety Specialist shall suspend all UXO related tasks and coordinate with the Contracting Officer and the project manager regarding schedule impacts. The following factors should be considered (in addition to the requirements of EM 385-1-1) in determining whether the level of risk is acceptable.

a. Range clearance operations should not be conducted at UXO sites when the ground is covered with snow, unless a surface clearance has already been conducted. Snow cover severely limits visibility of surface UXO.

b. Performance of UXO related tasks may be unsafe in cold weather. Some procedures may require UXO personnel to remove their gloves, exposing their hands to cold injury. The additional layers of clothing required may affect other UXO operations which require manual dexterity, and thus may affect their ability to safely perform the tasks.

c. Some UXO related tasks must be performed in personal protective equipment that is heavy, cumbersome, or restricted in airflow. During hot weather such PPE will have a detrimental physical and psychological effect on the individual, and he should be closely observed for signs of heat stress.

7. ACCIDENT REPORTS. When a contractor lost-time injury or accident occurs, accident reports shall be processed as follows:

a. When the geographic District has no on-site presence, the Safety Specialist shall review and coordinate on all ENG Form 3394 "Accident Reports".

b. When the geographic District has an on-site presence, the Safety Specialist shall review and coordinate on all ENG Form 3394s for accidents within the work exclusion zone. Outside the exclusion zone the geographic District is responsible for the review and coordination.

c. The geographic District will be responsible for the administrative aspects of processing and recording all accident reports for the project on the Corps of Engineers Safety Information Management System.

8. SITE CONTROL. The Safety Specialist will be responsible for safety oversight within the work exclusion zone established for an OEW site. He must limit the exposure of a minimum number of persons, for a minimum time, to the minimum amount of OEW consistent with safe and efficient operations. The following procedures shall be followed when visitors require access to the site:

a. If the visitor is EOD qualified, a safety briefing is required, after which the visitor should be escorted to the points of interest. UXO-related operations need not be interrupted during the visit.

b. If the visitor is not EOD qualified, a safety briefing is required, after which the visitor must be escorted to the points of interest. UXO-related operations must be discontinued until the visitor exits the exclusion zone.

c. If the visitor is a foreign representative, the visit must have been coordinated through CEHND-SL (Sue Baber) prior to admittance into the exclusion zone.

STATEMENT OF WORK GUIDANCE
FOR CONTRACTS NEEDING
AN OEW AVOIDANCE SUPPORT CLAUSE

1. The following Statement of Work (SOW) is a typical addendum that can be added to a larger SOW for a Hazardous, Toxic or Radiological Waste (HTRW), Preliminary Assessment, Site Investigation, or Remedial Investigation /Feasibility Study. This SOW should be used when there is a possibility of contact with Ordnance and Explosive Waste (OEW) during the before mentioned field operations. The goal of this SOW is OEW AVOIDANCE ONLY! If there is known OEW on the site, contact the Huntsville Division Corps of Engineers, and do not use this SOW.

2. If time and resources permit, the Ordnance and Technical Programs Division of the Huntsville Division, Corps of Engineers, will assist in the drafting of SOW verbiage for your specific site and conditions.

3. This SOW does not contain provisions for a record search by the AE firm to determine what types and where ordnance might be encountered. Districts should consider completing a record search to determine the potential for contact with ordnance and the potential types and quantities before using this SOW.

4. Background:

a. OEW sites are manned by either single or multiple UXO teams depending on the action being undertaken. Multiple UXO teams are commonly used on sites involving large removal actions or for major UXO sampling during in depth investigations. During multiple UXO team operations, a Senior UXO Supervisor (who has a minimum of 15 years of EOD/UXO experience) directs all UXO teams (including the team leaders). This SOW does not cover multiple team operations.

b. Single UXO teams are normally used for simple site investigations, UXO avoidance actions (such as soil sampling and monitoring well installation) or small removal actions. For single team operations, experience levels are adjusted to insure the team has adequate experience for the job. Typically, the UXO team leader on a single team site will be more experienced than a team leader (UXO Supervisor) on a multiple team site.

c. An UXO Team will normally consist of one UXO team leader (UXO Supervisor) and one to six team members (UXO specialists or assistants). The maximum UXO team size is limited to six members (one leader to six members) for safety reasons. This OEW Avoidance SOW assumes one UXO team consisting of a team leader and one or two team members.

5. Statements of Work, resultant Work Plans (WP), and Site-specific Safety and Health Plans (SSHP) containing Unexploded Ordnance (UXO) provisions will be reviewed and approved by the Huntsville Division, Corps of Engineers (IAW CEHND 1105-3-9, Management Plan for Ordnance and Explosive Waste (OEW) Mandatory Center of Expertise (MCX) and Design Center, 10 Aug 92) Please allow a minimum of two weeks from receipt for review unless prior coordination

has been made. Items for review can be mailed to:

U.S. Army Corps of Engineers, Huntsville
P.O. Box 1600
ATTN: CEHND-PM-OT
Huntsville, Alabama 35807-4301

The street address for express mail is:

U.S. Army Corps of Engineers, Huntsville
4820 University Sq.
Huntsville, Alabama 35816-1822

6. Items in the bold print in the SOW require coordination for a specific point of contact for notification of unexploded ordnance or the location of suspected chemical warfare materials.

7. The Ordnance and Explosive Wastes Mandatory Center of Expertise at Huntsville Division stands ready to assist you with OEW issues. If you have any questions, give us a call. Programmatic, Regulatory and general information questions should be directed to the Mandatory Center of Expertise at (205) 895-1507. Safety related and technical UXO questions should be directed to the OEW Safety Office at (205) 895-1580.

8. See the attached enclosure for a sample of an OEW generic statement of work for UXO Avoidance.

OEW GENERIC STATEMENT OF WORK
(FOR UXO AVOIDANCE)

1. GENERAL: The contractor shall provide a two person Unexploded Ordnance (UXO) team to provide on-site UXO avoidance support during all sampling activities. This includes soil sampling and the drilling of monitoring wells. The UXO team will not destroy any UXO encountered. The UXO team will report all UXO to (Range Control Officer, local COE representative, or other appropriate office -- the point of contact to report UXO or Chemical Warfare Materials (CWM) is dependent on the site specific conditions and arrangements. Work on an active installation will normally require reporting UXO to the Range Control Officer, Facility Engineer or Post Headquarters. Work on Formerly Used Defense Sites will require prior coordination to determine the point of contact. It could be the local or state law enforcement agency, or the local emergency management agency), and the contracting officer, who will in turn notify the Huntsville Division, Corps of Engineers. The Government will contact the local EOD Unit for disposition of the OEW or UXO.

2. DEFINITIONS:

a. ORDNANCE AND EXPLOSIVE WASTE (OEW): Bombs and warheads, guided and ballistic missiles, artillery, rocket and mortar ammunition, small arms ammunition, anti-personnel and anti-tank mines, demolition charges, pyrotechnics, grenades, containerized and uncontainerized explosives and propellants, military chemical agents and all similar and related items or components, explosive in nature or otherwise designed to cause damage to personnel or material. Soils with explosive constituents are considered to be OEW if the concentration is sufficient to be reactive and present an imminent safety hazard.

b. UNEXPLODED ORDNANCE (UXO): An item of explosive ordnance that has failed to function as designed or has been abandoned, discarded or improperly disposed of and is still capable of functioning and causing damage to personnel or material.

c. INERT ORDNANCE: An item that has functioned as designed, leaving an inert carrier. An item manufactured to serve a specific training purpose. Fragments from UXO.

d. EXPLOSIVE ORDNANCE DISPOSAL (EOD) PERSONNEL: Active duty military EOD personnel.

e. UXO PERSONNEL: Former EOD personnel.

f. CHEMICAL WARFARE MATERIAL (CWM): Any CWM in a munition(s) or container(s). Any dirt or scrap that has been potentially contaminated with a chemical compound designed for military operations to kill, seriously injure or incapacitate persons through its chemical properties.

g. CHEMICAL EVENT: Discovery of an actual or suspected chemical agent or container that may require emergency transportation or disposal.

3. UXO TEAM COMPOSITION AND QUALIFICATIONS: UXO Team members shall have

the following qualifications;

a. UXO Team Leader: This is the individual who has the direct responsibility and is the technical lead for all UXO operations on the site. This individual shall have documented experience in supervising range clearance operations and supervising personnel. This individual shall be a graduate of the U.S. Naval Explosive Ordnance School at Indian Head, Maryland and have at least 10 years of active duty EOD experience.

b. UXO Team Member: Be a graduate of the U.S. Naval Explosive Ordnance School at Indian Head, Maryland. Have at least 3 years of active duty EOD experience.

4. **RESPONSIBILITIES AND AUTHORITY:** The UXO Team shall provide the explosive ordnance recognition, location and safety function for the prime contractor. The UXO team leader has the final authority for on site personnel regarding all matters concerning UXO.

5. **WORK AND SAFETY PLANS:** The UXO team shall assist in the development of the contractor's site-specific safety and health plan (SSHP) and the work plan (WP). The UXO team leader shall conduct UXO safety briefings for all site personnel and visitors.

6. **ACCESS ROUTES TO SAMPLING LOCATIONS:**

a. Prior to sampling, site investigation or well drilling crews going on site, the UXO team shall conduct a reconnaissance of the areas to be sampled or investigated. The reconnaissance shall include locating a clear path for the investigating, sampling crews, vehicles and equipment to approach the site. The approach path, at a minimum will be twice the width of the widest vehicle. The contractor shall clearly mark all boundaries of the cleared approach path to prevent personnel from straying into uncleared areas. No personnel shall be allowed outside the cleared paths.

b. If UXO is encountered on the surface, the UXO contractor shall divert the approach path around the UXO, clearly mark the area and report the UXO.

c. The UXO contractor shall use a magnetometer with the capabilities that can insure there is no subsurface UXO within the approach path. If a magnetic anomaly is encountered and identified as UXO, divert the path around the UXO. Only minor excavation shall be done to identify or confirm UXO. If the anomaly is more than one foot deep, assume it to be UXO and divert the approach path. Only qualified UXO personnel shall approach UXO items and operate the magnetometer.

7. **SOIL SAMPLING AND WELL DRILLING SITES:**

a. The UXO team shall locate magnetic anomaly free areas for soil samples and well drilling. If a pre-selected area indicates magnetic anomalies, a new sampling/drilling site shall be chosen.

b. The UXO contractor shall clearly mark the boundaries of the cleared soil sampling or well sites. Personnel shall not go outside the cleared area. As a minimum, the cleared area will be a square, with a side

dimension equal to twice the length of the largest vehicle or piece of equipment to be brought on site.

c. Prior to drilling equipment being moved to the proposed well location, the UXO team shall locate a magnetic anomaly free site. This shall be accomplished using a magnetometer with downhole monitoring capabilities. The UXO team shall start the borehole with a hand auger. At not more than a two foot depth, the hand auger will be withdrawn and the magnetometer will be lowered into the borehole and the borehole checked for magnetic anomalies. This procedure will be used to insure that smaller items of UXO, undetectable from the surface can be detected. If no magnetic anomalies are found, the procedure will be repeated at two foot intervals to the maximum depth of the hand auger, no less than 6 feet. If the proposed well site is still free of magnetic anomalies, the drilling equipment may be brought on site and utilized. Borehole monitoring with the magnetometer shall continue at two foot intervals, until virgin soil is reached. This determination shall be made by the on site geologist.

8. CHEMICAL WARFARE MATERIALS (CWM):

a. If suspected CWM is located at any time, all work will cease immediately. Site workers will withdraw along cleared paths from the area containing the CWM. The UXO contractor shall clearly mark the area containing the CWM, and report the chemical event to the designated point of contact (POC) as determined in Paragraph 1, and the contracting officer. The report of discovery of suspected CWM will be made within one hour of the discovery. The POC will make the final determination as to the actual presence of CWM.

b. If the POC confirms the presence of CWM, the government person in charge will report the chemical event to the appropriate agencies.

c. When contacting the POC about suspect CWM, the contractor will provide the following information listed. Contact with the POC will not be delayed due to lack of information. The suspected CWM report will follow the following format.

Sample Suspected CWM Data Report

(1) Date and local time of event.
(2) Location
(3) Quantity and type of munitions(s) or container(s) and chemical agents involved.
(4) Description of what has happened.
(5) Description of property damage.
(6) Personnel casualties and/or injuries.
(7) Whether medical services or facilities were required.
(8) Assistance required.
(9) Any other pertinent information.
(10) UXO team leader's assessment of the situation.

U. S. ARMY ENGINEER DIVISION HUNTSVILLE — CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS

PROJECT: Seneca "Appendix B SSSHP" — CN 06-317-03

☐ SITE DEV & GEO ☐ MECHANICAL ■ SAFETY ☐ SYSTEMS ENG
☐ ENVIR PROT& UTIL ☐ MFG TECHNOLOGY ☐ ADV TECH ☐ VALUE ENG
☐ ARCHITECTURAL ☐ ELECTRICAL ☐ ESTIMATING ☐ OTHER
☐ STRUCTURAL ☐ INST & CONTROLS ☐ SPECIFICATIONS

REVIEW: 1st Review dated June 1995
DATE: 8 July 2003
NAME: Kellie Williams / ED-SY-S/ 256-895-1584-

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1.	General	CEHNC-ED-SY-S has reviewed this document and has the following comment(s).	The responses to the comments are as follows.
2.	General	It is my understanding that the concept at Seneca is to have a site-wide SSHP for all of Seneca and then smaller site specific SSHPs for each SWMU. Also, the document titled "Appendix B Site-Specific Safety and Health Plan" is supposed to be the site-wide plan. Recommend that the name of this document be changed if this is the case. It is not a site-specific plan.	Agreed. The title of Appendix B has been changed to "Seneca Site-Wide Health and Safety Plan". The text of the plan has been changed to reflect that this is a site-wide health and safety plan.
3.	General	Plan is required to be signed by the corporate CIH. Please submit a signed copy for the next submittal.	Agreed. A signed copy has been included in the submittal.
4.	Date	The date of this document is June 1995. Recommend that the site-wide plan be reviewed by the corporate CIH and CEHNC on an annual basis for any updates and changes.	Acknowledged. The document will be reviewed by Parsons Health and Safety Officer on an annual basis and will be revised accordingly if necessary.
5.	Date	The plan should be reviewed and updated by the project or program manager and the corporate safety and health director prior to the next submittal. Section 2.2 states that the planned site activities include mostly UXO. The site-specific plans submitted with this plan have tasks other than UXO.	Acknowledged. The document has been reviewed by corporate Health and Safety Officer and has been revised accordingly. Section 2.2 has been revised to include general site activities. Health and safety plan for general site tasks has been presented in the plan.
6.	UXO	It appears that there is a potential of encountering UXO at Seneca. There are a lot of UXO avoidance and safety precautions written in the plan. Recommend that the plan be reviewed by a OE safety specialist.	Noted and referred to Army PM.

ACTION CODES
A - ACCEPTED/CONCUR
D - ACTION DEFERRED
W - WITHDRAWN
N - NON-CONCUR
VE - VE POTENTIAL/VEP ATTACHED

U. S. ARMY ENGINEER DIVISION HUNTSVILLE — CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS — PROJECT: Seneca "Appendix B SSSHP" — CN 06-317-03

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REVIEW: 1st Review dated June 1995
DATE: 8 July 2003
NAME: Kellie Williams / ED-SY-S/ 256-895-1584-

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
7.	General	Recommend that the contractor review Appendix C of ER 385-1-92 and ensure that all of the elements required in this regulation have been covered in this plan. For example, I did not see an Activity Hazard Analysis (see EM 385-1-1 for a sample format) nor did I see a section on toilets or drinking water.	Acknowledged. An Activity Hazard Analysis summary table is included in the plan. Sections on toilets, drinking water, and decontamination have been included in the plan. In addition, radiation safety is covered in the plan.
8.	Page B-13	Heat and Cold Stress. Recommend revising this section to include the signs and symptoms of cold and heat stress or referring the reader to the location of the signs and symptoms. Attachment B-2 is a Draft document. Please include the final version of this document and ensure that the requirements of heat and cold stress monitoring are included. Please do not just provide recommendations, provide what is required onsite, who is responsible for the monitoring and when it will begin and how often it will take place.	Acknowledged. Heat and Cold Stress Section has been revised as requested. Site Health and Safety Officer will be responsible for heat or cold stress monitoring. Site Health and Safety Officer will use wet bulb glove thermometer to monitor heat threat during the working period or will monitor heat stress (e.g., heart rate and temperature) at the beginning and end of each work cycle. It should be noted the Heat and Cold Stress is presented in Section 5 of the plan.
9.	Biological	Recommend including pictures of poisonous plants, spiders and snakes in the document for visual tool.	Acknowledged. Pictures of poisonous plants, spiders, and snakes that might be encountered at Seneca (i.e., brown recluse spider, black widow spider, poison ivy, poison oak, poison sumac, copperhead snake, timber rattlesnake, and eastern diamondback rattlesnake) are included in the plan.
10.	Page B-14	Recommend providing what is required onsite to prevent tick bites. The document presently provides recommendations.	Acknowledged. The plan provides recommendations to minimize tick bites.

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U. S. ARMY ENGINEER DIVISION HUNTSVILLE — CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS PROJECT Seneca "Appendix B SSSHP" CN 06-317-03

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REVIEW 1st Review dated June 1995
DATE 8 July 2003
NAME Kellie Williams / ED-SY-S/ 256-895-1584-

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
11.	Page B-15	Radiation Hazards. Please provide a list of the SWMUs that have the potential of having radiation hazards.	Acknowledged. A list of SWMUs that have potential radiation hazards is included in the plan.
12.	Page B-20	UXO. Please provide a list of the SWMUs that have UXO as a potential site contaminant.	Acknowledged. A list of SWMUs that have potential UXO hazards is included in the text.
13.	Page B-21	State who (or what job title) is responsible for checking for underground utilities. Provide a checklist or procedure for this process.	Acknowledged. The text has been revised as requested. Project manager will be responsible for checking for underground utility lines. A checklist is included in the plan.
14.	Page B-23	Table B-2. State the type of cartridges to be utilized and who will determine the type to be used on each site.	Acknowledged. Project Health and Safety Officer will determine the type of cartridges to be used at each site. The type of cartridges to be used at each site will be specified in the individual Health and Safety Plan.
15.	Page B-24	Table B-3. Define BKGD. State whether the level obtained is instantaneous or sustained for a certain length of time, is the monitoring at ground level or in the breathing zone. State how often the monitoring will be preformed. Clarify the actions to be taken and clarify what level of PPE will be used when the same reading is under several different PPE levels.	Acknowledged. The table has been revised to specify whether the level is instantaneous or sustained for certain length of time and whether the monitoring is at ground level or in the breathing zone. PPE level will be specified in the individual Health and Safety Plan.
16.	General	Recommend including hand tool and excavation safety. These appear to be potential hazards but are not covered in the plan.	Acknowledged. Hand tool and excavation safety are included in the text.

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REVIEW 1st Review dated June 1995
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NAME Kellie Williams / ED-SY-S/ 256-895-1584-

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
17.	Page B-27	State the criteria to evacuate the work site. On line 12 of this page it states that if signs of chemical reactions are noticed it shall be reported. Will the site be evacuated in this case?	Acknowledged. The text has been revised to indicate that the work site shall be evacuated whenever evidence of a situation that could result in possible hazardous condition is identified.
18.	Page B-28	Section 7.4. Fire Control. Recommend including the location of fire extinguishers at flammable storage areas and in vehicles.	Acknowledged. The text has been revised as requested.
19.	Page B-28	Section 7.5. Include the spill control equipment to be used onsite.	Acknowledged. The text has been revised as requested. As only small amount of chemicals (e.g., sample preservatives, gasoline, etc.) will be stored at the site, any spill will be cleaned up using a spill control kit (e.g., paper towel, diaper, etc.).
20.	Page B-29	Section 7.9. Accident reporting and record keeping. Recommend including the following in the plan: 7.4 Man-hours and Lost Workday Reporting. Man-hours and lost workday (LWD) cases will be submitted to the COR monthly with copy furnished the U.S. Army Engineering and Support Center, Huntsville (USAESCH), ATTN: CEHNC-ED-SY-S. The data must be submitted to arrive at the USAESCH not later than 10 calendar days after the end of each month. The information cut-off date will be the last day of each month. The monthly submission must include the title of the report i.e., Accident Exposure Data Report, contract number, task order number, project site, month and year for which the report is made, a point of contact listing both email address and telephone number, and number of lost workday accidents to include total days lost. If no hours are worked on the project/task, a report showing "zero (0)" is required.	Acknowledged. The text has been revised as requested.

ACTION CODES
A - ACCEPTED/CONCUR
D - ACTION DEFERRED
W - WITHDRAWN
N - NON-CONCUR
VE - VE POTENTIAL/VEP ATTACHED

U. S. ARMY ENGINEER DIVISION HUNTSVILLE — CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS — PROJECT: Seneca "Appendix B SSSHP" — CN 06-317-03

☐ SITE DEV & GEO ☐ MECHANICAL ■ SAFETY ☐ SYSTEMS ENG
☐ ENVIR PROT& UTIL ☐ MFG TECHNOLOGY ☐ ADV TECH ☐ VALUE ENG
☐ ARCHITECTURAL ☐ ELECTRICAL ☐ ESTIMATING ☐ OTHER
☐ STRUCTURAL ☐ INST & CONTROLS ☐ SPECIFICATIONS

REVIEW: 1st Review dated June 1995
DATE: 8 July 2003
NAME: Kellie Williams / ED-SY-S/ 256-895-1584-

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		7.4.1 Accident Reporting. Accidents involving personal injury/illness or property damage shall immediately be reported to the Contracting Officer or authorized representative e.g., Huntsville Center Project Manager. 7.4.2 Accident Reports - An Engineer Form 3394 is required to prepared and submitted in reporting lost work day cases, accidents where 3 or more persons are admitted to a hospital, a fatality, or property damage $2000 or greater. The ENG Form 3394 must be submitted to the Contracting Officer or authorized representative within 5 working days following the accident in accordance with AR 385-40 and USACE Supplement 1 to that regulation. The ENG Form can be accessed via the internet at: www.hnd.usace.army.mil/engrdir/organization/systems-eng/Safety/safety2.htm The ENG Form 3394 is prepared by the contactor, with original signatures shown in blocks 15c and 16 (copies/faxes are not acceptable). The remaining signature blocks, blocks 17 -19, will be completed by the Huntsville Engineering Center .	
21.	Page B-36	List of SWMUs is not included in Section 1 as stated in this section. B-2 does not identify the 15 SWMUs, it is just a general site map.	Acknowledged. A list of SWMUs has been included in the plan. Locations of the SWMUs will be presented in individual Health and Safety Plans.

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REVIEW 1st Review dated June 1995
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ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
22.	DECON	Decontamination is not included in this SSHP.	Acknowledged. Decontamination has been included in this site-wide Health and Safety Plan.
23.	Page B-40	Section 9.6.1. What is the proper PPE rescues. Is it level B as seen in Table B-4? Please be specific.	Acknowledged. The text has been revised to reflect that proper protective gear shall be selected based on the site condition in accordance with the site-specific health and safety plan.

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