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RADIOLOGICAL HEALTH AND SAFETY PLAN FOR RADIOLOGICAL EXTERIOR CHARACTERIZATION SURVEY AT THE ENGELHARD CORPORATION AT PLAINVILLE, MASSACHUSETTS

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RADIOLOGICAL HEALTH AND SAFETY PLAN

FOR RADIOLOGICAL EXTERIOR CHARACTERIZATION SURVEY

AT THE

ENGELHARD CORPORATION SITE

AT

PLAINVILLE, MASSACHUSETTS

PREPARED BY

ENSERCH ENVIRONMENTAL

AUGUST 1994

REVISION:0

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1.0 APPROVALS

By their signature the undersigned Enserch employees certify that this Radiological Health and Safety Plan (RADHASP) will be utilized at the Engelhard Corporation Site at Plainville, Massachusetts.

Steve Graham
Project Manager

_____ _____
Signature Date

Adrian Gill
Field Operations
Lead

_____ _____
Signature Date

Jim Mayberry, CHP
Health Physicist

_____ _____
Signature Date

Mike McSherry, CIH
Health and
Safety Manager

_____ _____
Signature Date

Jayanti Chatterjee
Radiation
Safety Officer

_____ _____
Signature Date

2.0 GENERAL

This Radiological Health and Safety Plan (RADHASP) has been prepared in conformance with the Enserch Environmental Health and Safety Program. It addresses all those activities associated with the radiological characterization survey activities at the Engelhard Corporation Site (Site) located at Plainville, Massachusetts. Compliance with this RADHASP is required of all workers and third parties who enter this Site. Assistance in implementing this RADHASP can be obtained from the Enserch Environmental Health and Safety Manager (HSM). The content of this RADHASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the technical scope of the work. Any changes proposed must be reviewed by the Radiation Safety Officer (RSO) and are subject to approval of the HSM. The Field Change Request Form provided in Appendix A may be used to initiate such changes.

2.1 SCOPE OF WORK

The purpose of this project is to conduct additional radiological characterization survey of the Site, in order to supplement the radiological data base previously compiled by the Scoping Survey in the environmental media external to the Plant so as to be able to define remedial alternatives. The following activities will be performed to support this objective:

- Collection and analysis of surface and subsurface soil samples for U_{238}, U_{235} and U_{234} concentrations from the regions of the Site south of the main building complex building, under and adjacent to the Building 12 and Building 3 floor pads, and the location of components of the subsurface liquid waste disposal system (piping, leach pits, etc.) south and east of the south end of the building.

- Collection and analysis of groundwater samples for gross activity, U_{238}, U_{235} and U_{234} concentrations from certain of the existing groundwater monitoring wells and (as necessary) from additional wells installed in regions of elevated soil concentrations.

- Certain well(s) and soil samples will also be analyzed for Th_{238}, Pu_{238} and Pu_{239}.

- Collection and analysis of sediment samples for U_{238}, U_{235} and U_{234} concentrations from the shoreline of Turnpike Lake adjacent to the south end of the Site.

- Collection and analysis of certain building roof and drain pipe samples for U_{238}, U_{235} and U_{234} concentrations.

- Collection and analysis of air samples.

3.0 ENSERCH ENVIRONMENTAL HEALTH AND SAFETY STAFF

The following briefly describes the health and safety designations and general responsibilities that will be employed during field activities at the Site. Appendix B has resumes of the designated staff.

3.1 PROJECT MANAGER

The Project Manager has the overall responsibility of implementing the health and safety procedures outlined in this RADHASP and to ensure that all Site work is executed in a safe manner. He is responsible for providing adequate resources to the Site personnel in order to properly implement the provisions of this RADHASP.

3.2 FIELD OPERATIONS LEAD (FOL)

The FOL will be responsible for implementing the health and safety procedures outlined in this RADHASP with assistance from the RSO. In the event of an emergency, the FOL will also implement Site evacuation procedures, including the shutting down of appropriate equipment, removing equipment and coordinating emergency services on site.

3.3 RADIATION SAFETY OFFICER (RSO)

The Enserch Environmental RSO has the responsibility to assist project management personnel in implementing this RADHASP in accordance with the Enserch Environmental Corporate Health and Safety Program and consistent with the health and safety requirements of the Nuclear Regulatory Commission (NRC) and Engelhard. The RSO will execute appropriate monitoring techniques to ensure adequate protection for Site personnel and conduct on-site inspections to identify potential safety and health hazards. He will investigate all accidents and incidents occurring on this Site and will conduct safety briefings and site-specific training for all on-site personnel. The RSO together with appropriate Engelhard Corporation personnel will accompany all NRC, Occupational Safety and Health Administration (OSHA), Massachusetts Department of Environmental Protection (MDEP) and other government agency representatives visiting the Site in response to health and safety issues. The RSO is responsible for modifying existing and/or developing new procedures, after consultation with the Enserch Environmental Health & Safety Manager, if Site or environmental conditions change or new operations are instituted.

The RSO has stop-work authorization if an imminent hazard or potentially dangerous situation exists during the course of on-going Site activities. Authorization to again proceed with work will be verified by the Enserch Environmental Health & Safety Manager.

3.4 HEALTH & SAFETY MANAGER (HSM)

The HSM ensures that all personnel designated to work at the Engelhard Corporation project Site are qualified according to Enserch Environmental Medical Surveillance and Health and Safety training requirements. The HSM is responsible for authorizing the appropriate monitoring, safety equipment and other resources necessary to implement this RADHASP.
In the event a stop-work order is issued by the RSO the HSM or his designee will be contacted immediately. The RADHASP and significant changes to the RADHASP must be approved by the HSM. The HSM has the authority to resolve outstanding health and safety issues that arise during Site operations.

3.5 HEALTH PHYSICIST (HP)

The Enserch Environmental Health Physicist (HP) has the primary responsibility for assisting the RSO and Site personnel in implementing the radiological policies and procedures of this RADHASP. The HP is also responsible for evaluation of the degree of radiological hazard at the Site and design of effective control measures so that radiation exposure to personnel will be As Low As Reasonably Achievable (ALARA). The ALARA philosophy requires that efforts be made to keep all radiation exposures below guidance or action levels. The Enserch Environmental HP ensures that all personnel designated to work at the Engelhard Corporation project Site are qualified according to Enserch Environmental radiological policies and procedures. The Enserch Environmental HP is responsible for authorizing the appropriate radiological monitoring, and providing direction and guidance to the Site RSO to assist in the implementation of this RADHASP.

In the event radiological action levels are exceeded, the Enserch Environmental HP or his designee will be contacted immediately by the Site RSO or designee. The RADHASP and significant changes to this RADHASP must also be approved by the HP. The HSM will consult with the HP to resolve potential health and safety issues relating to radiological contamination and control that arise during Site operations.

3.6 SITE PERSONNEL

It is the responsibility of all Site personnel to report unsafe or potentially hazardous conditions to their supervisor. They should maintain knowledge of the information, instructions, and emergency response actions contained in this RADHASP and will be required to read and acknowledge the requirements of this RADHASP by signature. They shall also comply with rules, regulations and procedures set forth in this RAHASP and revisions which are instituted and prevent admittance of unauthorized personnel to the Site.

4.0 SITE BACKGROUND INFORMATION

D.E. Makepeace Division of Engelhard Industries, Inc. at its Plainville, Massachusetts plant located on Route 152, manufactured fuel elements from 1957 until 1962 when these operations ceased. Manufacturing operations involved the use of natural, enriched and depleted uranium. The fuel element manufacturing operations were completely segregated from the non-nuclear manufacturing and other operations.

Buildings 1 and 2 were the only buildings that existed at the time when nuclear fuel manufacturing operations were ongoing at the Site. The interior of the building and equipment used for these operations were decontaminated and a final radiological survey performed by Engelhard Industries in 1963. Based on the results of the survey, validation that the residual contamination and exposure levels in the building interior were within then-established regulatory limits, and a confirmatory inspection conducted of the building interior and equipment by the AEC, the facility licenses were terminated based on this satisfactory inspection. The decontaminated equipment was subsequently removed from the plant and sold to the Government of Italy. Subsequently, the area used for nuclear fuel manufacturing was converted to other non-nuclear metal fabrication operations.

As part of a multi-phase Site assessment initiated by Engelhard Corporation to identify any potential areas of environmental concerns, a radiation survey was conducted of the plant building in July 1988. Based on historical documentation review, the interior areas of the plant where nuclear material was handled and processed were identified as the principal areas of interest for the survey.

The July, 1988 radiation survey indicated that the gamma radiation levels in certain areas of the plant building exceeded current exposure criteria. Alpha radiation measures of surface wipes and strippable coatings confirmed that certain surfaces and recesses contained material that could have produced the elevated gamma levels. A decontamination plan for the building interior was submitted, approved and will be executed under a separate program.

Based on information from interviews with the Plant Engineer and the Health Physicist conducted by Berlin et al, 1993, it was revealed that all radiologically contaminated solid waste produced in the nuclear operations were collected on site, placed into 55-gallon drums, and trucked off site to an AEC-approved disposal location. The potential location of this storage area has been identified as the region west of Building 2.

An incinerator was constructed and operated on site from approximately March 1960 to presumably through cessation of nuclear operations in 1962. The incinerator was located south west of Building 2 as established from an aerial photograph of the Site and drawings in NRC files. The ashes of the incinerated uranium contaminated wood, papers and absorbent materials, rags etc., were stored in steel drums. Presumably these drums were stored in the courtyard with or close to the solid waste drums. It is not known where the drums with ashes were disposed of but it is thought to be likely that they were shipped to the same AEC-approved disposal Site as the solid waste drums.

A subsurface liquid waste disposal system to handle nuclear process waste water was installed at the Plant in 1957. No drawings showing the as-built location of the components of this system has been found. However, the 1957 proposed system specified that the subsurface disposal system would be located approximately 30 feet east of the south end of the building. It was proposed that the liquid waste disposal system would be constructed of large concrete cesspool blocks with an inside diameter of 12 feet and an effective depth of 5 feet with an effective estimated diameter of approximately 18 feet. The bottom of the pit was proposed to be paved with 12 inches of filter sand. The liquid waste disposal system was

monitored to assure that radionuclide concentrations in the discharge to the leach field were within the then AEC release standards in 10 CFR Part 20.

In January 1960, Engelhard Industries requested the Massachusetts Department of Public Health approval for expansion of the liquid waste disposal system by addition of another leaching pit. In February 1960, approval was granted.

In August 1961, during a Department of Public Health inspection of the plant it was noted that liquid wastes containing radioactive material overflowed to the surface of the ground when a load was applied to the system. This problem which resulted from blocking of one of the pits by a scum from the waste, was apparently corrected by the addition of sulphuric acid. A high water alarm was also installed. There is no indication that there were any further problems with the system. Use of the system for nuclear waste water disposal ended with the cessation of nuclear operations in 1962. The system may have continued to be used for non-nuclear wastewater disposal until 1972 when industrial wastewater was diverted to a new treatment system or until 1976 when remaining shower and sink wastes were diverted to a sanitary system.

The final radiological survey conducted by Engelhard Industries in 1963 subsequent to performing decontamination operations as a basis for requesting license termination and the AEC inspector's validation survey, appear to have been limited to the building interior, facilities and equipment. No data is available from this survey on radioactivity in the environmental media external to the building or on the outside facility surfaces. The licenses were terminated in the Fall of 1963 based on recommendations from the AEC Compliance Division.

In 1986, Engelhard Corporation initiated a multi-phase Site assessment to identify areas of environmental concern at the facility in response to a Request for Information from the United States Environmental Protection Agency (USEPA) regarding prior waste handling practices at the Plainville facility. Among the analyses conducted were gross alpha and beta levels in groundwater from a series of onsite monitoring wells, sediments and surface water in Turnpike Lake, and surface and subsurface soil samples from areas in the vicinity of the prior nuclear waste water disposal system and downhill areas that may have been affected by overflows. Results of the survey disclosed indications of potential presence of radioactive materials in the environmental media external to the plant buildings. Based on this and the history of past waste management and disposal practices at the Site, a radiological characterization survey will be implemented at the Plainville Site in order to comprehensively delineate the contaminated areas on site.

5.0 HAZARD ASSESSMENT

The following sections discuss the hazards which could potentially be encountered on site.

5.1 RADIOLOGICAL HAZARDS

The primary hazard at the Site is from uranium. Uranium exhibits both chemical toxicity and radiotoxicity, depending on its solubility. Uranium oxide compounds (UO_2 and U_3O_8), the compounds associated with nuclear fuels, are relatively insoluble[1]. The hazards associated with insoluble uranium is radiotoxicity.

Radiation and radioactive material pose two distinct hazards. In radioactive decay, some radionuclides, including uranium-234, uranium-235, and uranium-238 and their daughter products, emit gamma radiation. This radiation poses a hazard when the radioactive material is outside the body.

U-234, U-235, and U-238 also emit alpha radiation. Alpha radiation is a hazard only if the radioactive material is taken into the body. This material can be taken into the body by breathing contaminated dust or ingesting contamination transferred from a worker's hands or clothes.

Finally, decay products of U-235 (Th-231) and U-238 (Th-234 and Pa-234m) will be in equilibrium with the parent radionuclide. These radionuclides emit gamma radiation (discussed above) and beta radiation. Beta radiation is a hazard both inside and outside the body.

5.2 PHYSICAL HAZARDS

A variety of physical hazards may be present during Site activities. The most common hazards are slips, trips, falls, cold and heat stress and noise effects. The weather related stress and noise effects are often not obvious, and are therefore discussed below. Other physical hazards are due to the use of hand and power tools and handling and storage of solvents and fuels.

These hazards are not unique and are generally familiar to decontamination workers. Additional specific hazards may be covered during safety briefings at the project Site.

5.2.1 HEAT RELATED ILLNESSES

If Site activities are conducted in the summer, there is a potential for personnel suffering from heat related illnesses. Additionally, the use of personal protective equipment increases the potential even further. Heat Stress is a significant potential hazard, associated with the use of protective equipment in hot weather environments. The following sections briefly discuss the heat related illnesses and emergency response actions.

5.2.1.1 Heat Cramps

Heat cramps are brought about by long exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat cramps are as follows:

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[1]International Commission of Radiological Protection, 1979. "*Limits of Intakes of Radionuclides by Workers*", Annals of the ICRP, Publication 30, Part 1, Pergamon Press, Oxford, England.

- Severe muscle cramps, usually in the legs and abdomen
- Exhaustion, often to the point of collapse
- Dizziness or periods of faintness

First aid treatment consists of providing shade, rest and fluid replacement. Normally, the individual should recover within 30 minutes. If the individual does not recover within 30 minutes, the individual should be transported to a hospital for medical attention.

5.2.1.2 Heat Exhaustion

Heat Exhaustion usually occurs in an individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual begins to fail as blood collects near the skin in an effort to relieve the body of excess heat. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing
- Weak pulse
- Cold and clammy skin with heavy perspiration
- Pale skin
- Fatigue and weakness
- Dizziness
- Elevated body temperature

First aid treatment consists of cooling the victim, elevating the feet and replacing fluids. If the individual has not recovered within 30 minutes, the individual should be transported to a hospital for medical attention.

5.2.1.3 Heat Stroke

Heat Stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a medical emergency, requiring immediate cooling of the patient and transport to a hospital. The signs and symptoms of heat stroke are as follows:

- Dry hot red skin
- Body temperature approaching or above 105°F
- Large (dilated) pupils
- Loss of consciousness - the individual will go into a coma

First aid treatment consists of cooling the patient and transport to a hospital immediately.

Working with personal protective equipment in hot weather environments may produce circumstances which will require restricted work schedules in order to protect employees. Should work remediation activities proceed into the summer a Wet Bulb Globe Temperature (WBGT) Index will be used to establish a work/rest cycle during hot climate.

If the measured WBGT exceeds 86°F (76°F when workers are semi-impermeable or impermeable clothing), the work/rest cycle given in Table 5-1 will serve as a guideline. The use of work/rest cycle and training on signs and symptoms of heat related illnesses should prevent them from occurring.

5.2.2 COLD STRESS

If work continues during winter months, then workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include hypothermia and frostbite, physical conditions which gradually result over time of exposure and which result often in personnel employing poor judgment and taking short cuts, as well as involving the physical hazards of slips, trips and falls on icy surfaces.

Progressive clinical symptoms of hypothermia include:

Core Temperature (°F)	Symptoms
98.6	Normal rectal temperature
96.8	Metabolic rate increases
95.0	Maximum shivering
93.2	Victim conscious and responsive
91.4	Severe hypothermia
89.6 - 87.8	Consciousness clouded, blood pressure difficult to obtain, pupils dilated but react to light, shivering ceases
86.0 - 84.2	Progressive loss of consciousness, muscular rigidity increases, pulse and blood pressure difficult to get, respiratory rate decreases
78.8	Victim seldom conscious
64.4	Lowest accidental hypothermia victim to recover

TABLE 5-1

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(Values are given in °F WBGT)

Work/Rest Regimen	Work Load Light	Moderate	Heavy
Continuous Work	86	80	77
75% work - 25% rest, each hour	87	82	78
50% work - 50% rest, each hour	89	85	82
25% work - 75% rest, each hour	90	88	86

- When workers are wearing semi-impermeable or impermeable clothing, subtract 10°F from the WBGT value in the above table.
- Rest means minimal physical activity. Rest should be accomplished in the shade. Any activity requiring only minimal physical activity can be performed during rest periods.

In order to minimize the risk of the hazards of working in cold environments, workers will be trained and periodically reinforced in the recognition of the physiologic responses of the body to cold stress. In addition, the use of insulated work clothing, warm shelters and work/warm regimens may be used to minimize the potential hazards of cold stress. Also, special attention will be paid to equipment warm-up time and freeze protection for vessels, piping, equipment, tools and walking/working surfaces. The current ACGIH TLV's for cold stress found in Appendix C will be used as a guideline.

5.2.3 NOISE

During Site activities, equipment such as drill rigs and compressors will be used which may require the use of ear protection due to elevated noise levels. Disposable ear plugs or other hearing protection will be required when working with or around drill rigs and compressors.

5.3 BIOLOGICAL HAZARDS

During the course of the project, there is potential for personnel to come into contact with certain biological hazards including insects and plants while on site.

5.3.1 INSECTS

Insects such as mosquitoes, ticks, bees and wasps may be present at the Site during certain times of the year. Workers will be trained during site-specific training and as part of a daily safety briefing to recognize and to minimize contact with these insects.

Workers will be encouraged to use insect repellant when working in areas where insects may be present. If insects present a potential problem, efforts will be made to further protect workers and/or remove them.

Any worker that is allergic to bee/wasp or other insect stings must inform the RSO of the medical condition prior to starting work. The medical staff at the hospital will be informed of the condition and steps taken to prepare for this type of medical emergency.

Ticks can transmit micro-organisms that can cause several diseases, including Lyme Disease and Rocky Mountain Spotted Fever. Ticks adhere tenaciously to the skin or scalp. There is some evidence that the longer an infected tick remains attached, the greater the chance it will transmit the disease.

5.3.1.1 Lyme Disease

Lyme disease is caused by infection from a deer tick that carries a spirochete. During the painless tick bite, the spirochete may be transmitted into the bloodstream which could lead to the worker contracting Lyme disease.

Lyme disease may cause a variety of medical conditions which can be treated successfully if the symptoms are recognized early and medical attention received. Treatment with antibiotics has been successful in preventing more serious symptoms from developing. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve or heart problems as well as a disabling type of arthritis.

Symptoms can include a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. This flu-like illness is out of season, commonly happening between May and October when ticks are most active. A large expanding rash usually develops around the area of the bite. More than one rash may occur. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. It's easy to miss the rash and the connection between the rash and a tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be an early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes from other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

Lyme disease can affect the nervous system. Symptoms include stiff neck, severe headache, and fatigue usually linked to meningitis. Symptoms may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease may also mimic symptoms of multiple sclerosis or other type of paralysis.

The disease can also cause serious but reversible heart problems, such as irregular heartbeat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Often, the effects of Lyme disease may be confused with other medical problems.

It is recommended that personnel check themselves when in areas that could harbor deer ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetated areas. If a tick is found biting an individual, the RSO should be contacted immediately. If personnel feel sick or have signs similar to those above, they should likewise notify the RSO immediately.

5.3.2 PLANTS

Plants such as poison ivy and poison oak may be present at the Site during certain times of the year. Workers will be trained during site-specific training and as part of a daily safety briefing with periodic reinforcement to recognize these plants and to minimize contact with them.

5.4 CONTROL MEASURES FOR PHYSICAL HAZARDS

Control measures for the physical hazards identified in Section 5.2 are described below.

- Drill Rig Operations

  - Conduct pre-work inspections of all parts of the equipment
  - Use in accordance with the Operator's Manual/Manufacturer's Specifications
  - Remove/replace broken/damaged parts
  - Use the designated personal protective equipment for the task
  - Ensure minimum of 10 feet of clearance from overhead power lines.

- Hand and Power Tools

  - Conduct pre-work inspections of all parts of the equipment
  - Use in accordance with the Manufacturer's Operations and Maintenance Manual
  - Remove/replace broken/damaged parts
  - Use the designated personal protective equipment for the task
  - Use the tool for its intended purpose
  - Ensure that all electrical tools are grounded
  - Use ground fault interrupters

- Slips/Trips/Falls

  - Pay careful attention to walking surfaces, especially when they are wet or icy
  - Clear water, ice or spills as quickly as possible off walking surfaces or in high traffic areas
  - Do not take short cuts over fences or walls
  - Do not jump over excavations
  - Any platform area higher than 4 feet will have standard guard railings and toeboard
  - Use non-slip surfaces when constructing platform, if possible
  - Use safety lanyards for work higher than 5 feet of potential free-fall

- Lifting

  - Perform limbering exercises prior to lifting loads
  - Obtain help for heavy weights and bulky objects
  - Communicate with other workers
  - Face object, plant feet at shoulder length apart, use the best hand holds, keep back straight and lift with the center of strength in the legs not in the back
  - Do not twist while handling the load
  - Use caution when manually shoveling heavy material, move small loads and follow the proper lifting procedures

- Fire Protection

  - No smoking in work areas
  - At least one fire extinguisher rated at least 1A, 10:BC will be located in each work area

- Inspect all fire extinguishers monthly by Site personnel and annually by licensed personnel

◆ Motors and Pumps

- All electric motors will have ground fault interrupters (GFI) in place
- All rotating parts, gears or chains will be properly guarded
- All pumps shall have pressure relief devices

◆ Electrical Equipment

Any work involving the installation of electrical equipment or the use of electrical apparatus or appliances shall comply with the provisions of NFPA 70, the National Electric Code which has been adopted by OSHA 209 CFR 1910 and 29 CFR 1926. Electric installations themselves shall meet the requirements of the authority having jurisdiction.

In general, electrical requirements to be adhered to at the Site include, but are not limited to the following:

- Use of GFI's on all electrical tools/equipment being used during decontamination activities
- Use of multiple pronged (grounded) electrical power supply systems and appliances unless double insulated
- Restrictions or limitations on the use of flexible (extension) cords
- Clearance requirements for electrical service boxes
- Grounding provisions for fixed equipment
- Use of explosion-proof equipment for hazardous locations, as specified in articles 500-503 of the NEC
- Lock-out/Tag-out requirements on equipment being serviced

◆ Welding/Burning/Cutting

- Use of permit as shown in Appendix D
- Use of proper personal protective equipment (face shields, gloves, etc.)
- Fire protection
- Monitoring requirements

◆ Drum Moving

- Full drums will not be moved without mechanical assistance (e.g. a drum dolly)
- Inspect drum lids/seals for damage
- Communicate with other personnel helping to move drums
- Avoid pinch points
- Ensure that pull drum lids are tightened prior to moving
- Use pallets to provide easier means of movement
- Use leather work gloves while handling drums where possible

5.5 TASK HAZARD ANALYSIS

5.5.1 SURFACE SOIL SAMPLING

Surface soil samples will be collected from both potentially affected and unaffected areas of the Site. Radiological surveys previously conducted on site did not reveal surface radiological readings to be of any occupational exposure concern. Any potential exposure will be primarily through dermal contact and inhalation. However, surface soil sampling operations routinely do not generate any significant amount of dust to be of any inhalation concern. The use of designated personal protective equipment (PPE) such as coveralls, gloves and boot covers will considerably reduce any potential for dermal exposure. Following of proper decontamination and good hygiene practices will reduce any potential exposure by accidental ingestion of contaminated Site materials.

Radiological contamination monitoring will be conducted by the RSO or designee during this operation and samples will be handled with care in order to minimize contact with potentially radioactive material. If action levels set in Table 8-1 are exceeded then the RSO will contact the HP for further guidance.

5.5.2 SUBSURFACE SOIL SAMPLING

Subsurface soil sampling will be conducted in affected areas. Drilling operations will be conducted using a truck mounted coring rig and hollow stem auger and samples will be collected by driving split spoons through the borehole. This type of operation routinely does not generate significant airborne dust concentrations. However, real time monitoring for dust will be conducted and respirators will be worn if action levels for dust set for Level D operations are exceeded.

Any dermal contact with potentially contaminated materials will be significantly reduced through the use of the prescribed PPE found in Section 7.2 of this RADHASP. Following proper decontamination and good hygiene practices will reduce any potential exposure by accidental ingestion of contaminated Site materials.

Additionally, radiological contamination monitoring will be conducted during this operation and if action levels are exceeded, the RSO will contact the HP for further guidance.

5.5.3 GROUNDWATER SAMPLING

Groundwater samples will be collected from existing monitoring wells, water found at the bottom of any auger holes and any additional monitoring wells installed at the Site. During this operation Site personnel have a potential to come into contact with water that is potentially contaminated with radioactive material. The use of coveralls, gloves and boot covers will significantly reduce the potential of exposure to the Site contaminants by dermal contact. Sample bottles shall be wiped clean prior to packaging and bringing them into the support zone in order to avoid spread of contamination.

5.5.4 SEDIMENT SAMPLING

Sediment samples will be collected from Turnpike Lake in order to determine if undissolved radionuclides are present from runoff from contaminated surface soil, and/or building outfalls. Seven sediment samples are planned to be taken along the shoreline of Turnpike Lake.

Any potential exposure to radiological contamination will be through dermal contact. The use of coveralls, gloves and boot covers will significantly reduce exposure potential. Radiological contamination monitoring will also be conducted by the RSO in order to identify areas of potential exposure concern and to limit the amount of time personal spend in such areas. However, it is not anticipated that

personnel will have any significant occupational exposure to radiological contaminants during sediment sampling operations.

In addition to the potential radiological hazards, there are physical hazards that will be considered during this operation. Soft banks can give away under a person's pressure and personnel involved in this task shall test their foot holds prior to proceeding with sampling operations. If necessary they will use lanyards or safety belts to tie themselves securely to any solid structure (e.g. tree) present along the bank. If this is not possible then the lanyard should be held by another person standing in a secure place.

Other physical hazards include drowning if personnel accidentally fall in the lake and are unable to swim to the shore. However, Turnpike Lake is shallow (less than three feet) at the proposed sampling location. If there is a potential for Site personnel involved in this task to accidentally, fall in the lake then they will either tie themselves securely to a solid structure along the bank and/or wear Type III floatation devices during this operation.

5.5.5 AIR SAMPLING

Air sampling will be conducted at selected Site perimeter locations and in the region of potential soil remediation to determine current concentration of airborne radionuclides and establish a baseline to compare airborne concentrations during soil movement activities. Perimeter and on-site locations will be sampled using a high volume air sampler with a glass fiber filter. The samples will be collected for eight hours. The samples will be analyzed for U_{238}, U_{235} and U_{234}.

It is not anticipated that the surface contamination levels at these locations represent an occupational exposure hazard. However, the locations where the sampling pumps will be set up will be monitored for surficial radiological contamination and personnel will wear appropriate PPE, such as boot covers, in order to limit contact with surface contamination. Additionally, this task does not require constant attention and any potential exposure will further be limited due to the short duration of this task. As the nature of this operation does not generate any significant amount of dust, respirators are not required for this task.

Additionally, the analysis of the air samples in itself will provide further information on potential inhalation exposure to the airborne radionuclide concentrations present at the Site.

5.5.6 ROOF SAMPLING

Due to past incinerator operations at the Site, it is hypothesized that radioactive ashes may have settled on the roof of the building. Therefore, personnel will be collecting selected samples of the roof material and drain pipes. Personnel will be using utility knives or machetes to cut out the roof materials.

It is not anticipated that surface contamination on top of the roof is of occupational exposure concern. However, any potential exposure to radiological contamination will be primarily through dermal contact. The use of coveralls, gloves and boot covers will significantly reduce exposure potential. Radiological contamination monitoring will also be conducted by the RSO in order to identify areas of potential exposure concern and to limit the amount of time personnel spend in such areas.

Additionally, full body safety harnesses and lanyards will be used in order to prevent personnel falling off the edge of the roof. The length of the lanyard will be such that it allows for no more than six feet of free fall.

6.0 TRAINING AND MEDICAL REQUIREMENTS

6.1 SITE-SPECIFIC TRAINING

Prior to commencement of field activities, all field personnel assigned to the project will be provided training that will specifically address the activities, procedures, monitoring and equipment for the Site operations. It will include Site and facility layout, hazards, and emergency services at the Site, and will highlight all provisions contained within this RADHASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

6.2 ON-SITE SAFETY BRIEFINGS

Project personnel and visitors will be given periodic on-site health and safety briefings by the RSO to assist Site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or the Site's environmental conditions. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits.

6.3 FIRST AID AND CPR

The RSO shall identify those individuals requiring First Aid and CPR training in order to ensure that emergency medical treatment is available during field activities. It is expected that at least two members of the field team will have First Aid and CPR training. The training will be consistent with the requirements of the American Red Cross Association.

6.4 RADIATION SAFETY TRAINING

A minimum of four (4) hours of Radiation Safety Training will be provided to field personnel by the HP or designee prior to start of project operations. This requirement may be waived for personnel who have previously had this training, with the approval of the HP and the HSM.

6.5 RESPIRATOR TRAINING

Project personnel who may be required to wear respirators during project tasks shall be required to have completed training in the use and care of respirators pursuant to 29 CFR 1910.134 prior to starting work at the Site.

6.6 HAZARD COMMUNICATION TRAINING

Hazard Communication training covering 29 CFR 1910.1200 will be conducted as part of the site-specific training and on an as needed basis during the life of the project (Appendix E). The training will include the following:

- requirements of the standard
- operations involving hazardous chemicals
- location and availability of the written program, chemical list and MSDSs
- methods used to detect the presence or release of hazardous chemicals
- physical and health hazards of the chemicals
- protective measures, work practices, emergency procedures

6.7 SUBCONTRACTOR TRAINING

All subcontractor personnel directly involved with the building interior decontamination activities will be required to meet the above training requirements.

6.8 JOB SAFETY AND HEALTH POSTERS

The OSHA and the NRC posters will be posted at the Site in a conspicuous place (Appendix F and Appendix G).

6.9 MEDICAL REQUIREMENTS

All personnel performing work at the Engelhard Corporation's Site shall be cleared for work by an occupational physician. The occupational physician shall evaluate the physical condition of the Site employees to ensure that employees are in good health to perform the work that is required of them (Appendix H). Additionally, all Site personnel shall be required to obtain medical clearance to wear respiratory protection pursuant to 29 CFR 1910.134.

7.0 SITE CONTROL, PERSONNEL PROTECTION AND COMMUNICATIONS

7.1 SITE CONTROL

A three zone approach will be employed in order to contain the potential spread of contamination from the Site. The three zones will include the Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ) and the Support Zone (SZ).

7.1.1 SUPPORT ZONE

The Support Zone (SZ) is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labelled samples.

Building 1 on site will be designated as the support zone.

7.1.2 CONTAMINATION REDUCTION ZONE

The Contamination Reduction Zone (CRZ) is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable equipment. The CRZ will be used for general Site entry and egress in addition to access for heavy equipment and emergency support services.

Designated areas around drill rigs and sampling locations will be considered contamination reduction zones.

7.1.3 EXCLUSION ZONE

An area where contamination potentially exists, also known as an affected area will be considered as an exclusion zone. All areas of drilling and sampling which contain potentially contaminated materials are considered an exclusion zone (EZ). This zone will be clearly delineated by cones, tapes or other means. Entry and exit point(s) to and from the EZ will be strictly controlled and decontamination facilities will be set at all such points. Personnel exiting the EZ will decontaminate as per designated procedures. Personnel are not allowed in the EZ without the following:

- A buddy
- Appropriate personal protective equipment
- Site Specific Training

A radius of roughly 30 feet, wherever possible, will be marked as the exclusion zone around drill rigs and sampling locations.

7.2 PERSONAL PROTECTIVE EQUIPMENT

During Site operations in order to minimize contact with potential radiological materials and to protect themselves from physical hazards (such as overhead hazards, splash, etc.) will use the following Level D personal protective equipment:

- Street clothes or disposable coveralls
- Gloves, outer work gloves
- Boot covers or over boots
- Steel toed safety shoes
- Hard hat
- Safety glasses
- Hearing protection (during operation of drill rigs and compressors)

If real time air monitoring results indicate that action levels for total dust set for Level D operations (Table 8-1) are exceeded then personal will upgrade to Level C PPE which will include the above listed PPE and full face air purifying respirators with High Efficiency Particulate (HEPA) filters.

7.3 SAFETY EQUIPMENT

Basic emergency and first aid equipment will be available at the Support Zone and/or the CRZ. They will include:

- One standard industrial first aid kit
- One fire extinguisher rated at least 1A, 10:ABC
- One portable emergency eyewash unit
- Air horns (at least one)

7.4 COMMUNICATIONS

The nearest telephone is located in the building and can be used for contacting emergency response personnel in the event of an emergency. Hand signals will be employed by down range field teams where necessary for communications. Hand signals shall be reviewed during site- specific training and understood by the entire field team prior to commencement of Site activities. The hand signals listed in Table 7-1 will be used when necessary:

TABLE 7-1

HAND SIGNALS

Signal	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

8.0 RADIOLOGICAL MONITORING

8.1 REAL TIME MONITORING

Real time monitoring serves to establish and reaffirm the level of protection and to identify the areas of potential contamination. The following monitoring instruments will be available for use during field operations as necessary:

- MIE Miniram (PDM-3) dust monitor or equivalent
- Alpha scintillation detector
- uR Meter (Micro Rem meter)

The dust monitor shall be used periodically (at least four times per shift) during drilling and soil sampling activities to monitor for ambient dust concentration by the RSO or designee.

Prior to start up of each day's operation daily background counts will be measured by the RSO with the uR meter and the alpha scintillation probe. A calibration check will also be conducted. Periodic, (following decontamination to leave the exclusion zone), frisking of personnel and equipment with the alpha scintillation probe shall be conducted during Site operations to determine potential real time exposure to radiation. Radiological monitoring will be conducted by the RSO or designee.

Radiological monitoring instruments will be calibrated semi-annually using sources traceable to National Institute of Standards and Technology (NIST) standards. Additionally, daily operability checks using appropriate sources will be conducted.

8.1.1 ACTION LEVELS

Action levels for real time monitoring instruments (Table 8-1) have been set conservatively in order to be protective of employee health. The RSO or designee shall use professional judgment in interpreting the instrumentation response. These action levels may be modified as additional information become available regarding the extent, type of contamination and the potential for exposure to Site contaminants during planned Site activities.

8.1.2 ACTION LEVEL DECISION LOGIC

The action level decision logic is presented in Appendix I. The radiological dust action level is based on the average level of contamination present on site and on the dose factor for U_{235}, the highest value for an isotope with a beta emitter in secular equilibrium and other assumptions listed in Appendix I. It is calculated to be 77 mg/m^3. The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for nuisance dust is 10 mg/m^3. In order to be in compliance with the ACGIH TLV and as well as be protective of potential employee exposure the dust action level is reduced to 5 mg/m^3 (half the ACGIH TLV).

8.2 PERSONAL MONITORING

Personal monitoring for total dust will be conducted on a weekly basis to confirm that Site procedures are protective of employee exposure to airborne radioactive dust particulates potentially generated during drilling and soil boring operations.

At least two dust samples will be collected on a weekly basis following NIOSH sampling method 0500 for total dust. The samples will be sent to an American Industrial Hygiene Association (AIHA) accredited laboratory for analysis. Sample blanks will be incorporated with each sample batch at a minimum of 20% of the samples sent for analyses. A 48 hour turnaround time will be requested on the sample analyses.

The results of laboratory sample analyses will be compared to the action level set for total dust and if required Site procedures will be modified accordingly. The results of personal sampling will be reported to the employees in accordance with Section 13.3.

The sampling pumps used for sample collection will be flow calibrated before and after each use using a flow calibrator traceable to National Institute of Standards and Testing (NIST). If a deviation of $\pm$ 10% is encountered in the flow rate during pre and post calibration then the HSM shall be consulted in order to ascertain the relevance in analysis of the sample. Each sample, including blanks, will be assigned a unique identification number. All relevant data such as pump serial numbers, sample numbers, pre and post calibration values, sample locations, total volume collected, etc., shall be logged in an appropriate sampling form and maintained on file.

TABLE 8-1

ACTION LEVELS

INSTRUMENT	READING	ACTION
Dust Monitor	2.5 mg/m^3 (In BZ NT above Bkgd)	Initiate dust suppression measures
Dust Monitor	5 mg/m^3 (In BZ NT above Bkgd)	Level C
Alpha Probe	>25 CPM above Bkgd (personnel frisking only)	Re-enter CRZ to decontaminate further
uR Meter	2 x background	Contact HP for further guidance

mg/m3 = Milligrams per cubic meter

CPM = Counts per minute

9.0 GENERAL STANDARD OPERATING PROCEDURES FOR FIELD OPERATIONS

- A RSO or designee will be present on site at all times during radiological characterization survey activities and shall provide all monitoring and health and safety support in order to ensure the adequacy of protective equipment and safety procedures.

- Knowledge of the location of safety equipment and emergency evacuation procedures will be established prior to initiation of operations. Use of designated protective clothing will be required during all activities as described in the scope of work in this RADHASP.

- The buddy system and line-of-sight shall be employed at all times when in an exclusion zone.

- If field personnel perceive an unsafe condition or situation, the RSO or their supervisor will be notified immediately.

- All field operations should be planned and discussed with personnel prior to the beginning of start up of Site activities.

- Be cognizant of slip-trip hazards present due to areas of difficult terrain.

- Practice contamination prevention both on- and off-site.

- Safety briefings will be held prior to the onset of field activities and regularly during the progress of Site activities.

- Ignition sources in the vicinity of potentially flammable materials are prohibited.

- When working in areas where flammable vapors may be present, particular care must be exercised with tools and equipment that may be sources of ignition. All tools and equipment provided must be properly bonded and/or grounded.

- Approved and appropriate safety equipment as specified in Section 7.2 of this RADHASP shall be worn where required.

- No smoking, eating, or drinking be allowed in the contaminated areas.

- Contaminated tools and hands must be kept away from the face. Do not unnecessarily touch a contaminated surface or allow clothing, tools or other equipment to do so.

- Persons with long hair and/or loose fitting clothing that could become tangled in power equipment must take adequate precaution.

- Report the presence of open wounds to the RSO prior to work in exclusion zone. If a wound occurs which in such an area, report immediately to RSO and attend to the wound. Apply first aid immediately to any and all cuts, scratches and abrasions.

- Horseplay is prohibited in the work area.

- Follow good "housekeeping" practices to minimize the amount of material and equipment that has to be decontaminated or disposed of as contaminated wastes.

- Working under the influence of intoxicants, narcotics, or controlled substances is prohibited.

- Be alert to your own physical condition. Watch your buddy for signs of fatigue and/or exposure.

- Initiate a work/rest regimen if ambient temperatures and protective clothing create a potential heat stress situation.

- Do not proceed or continue working unless adequate lighting exists and appropriate supervision is present.

10.0 DECONTAMINATION

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-examination. Procedures for contamination avoidance include the following:

Personnel

- Do not walk through areas of obvious or known contamination
- Do not directly handle or touch contaminated materials
- Make sure that there are no cuts or tears on PPE
- Fasten all closures in suits, covering with tape, if necessary
- Particular care should be taken to protect any skin injuries
- Stay upwind of airborne contaminants
- Do not carry cigarettes, cosmetics, gum, etc., into contaminated areas

Sampling/Monitoring

- If possible, cover instruments with clear plastic, leaving openings for sampling ports
- Bag sample containers prior to placement of sample material

Equipment

- Care should be taken to limit the amount of contamination that comes in contact with the heavy equipment (tires, hand rests, etc.)
- If contaminated tools are to be placed on non-contaminated equipment for transport to a decontamination area, plastic should be used to keep the equipment clean

10.1 PERSONNEL DECONTAMINATION

The RSO or designee shall be responsible for establishing personnel decontamination procedures. All personnel and equipment exiting the exclusion zone shall be adequately decontaminated. The procedure for personnel (radiologic) decontamination is outlined below and will be followed should radiation levels significantly higher than background levels be encountered.

In general the radiological decontamination procedures will consist of:

- Radiation scanning or "frisking"
- Segregated equipment drop
- Boot removal
- Outer glove removal
- Coverall removal
- Rescanning (if necessary)

- Soap and water rinse (or wipe with baby wipes) of skin areas, i.e., face, hands, arms, that have indicated contamination during frisking.

Scanning or "frisking" will be conducted with the alpha scintillation probe or equivalent. If the instrument measures 25 counts per minute (CPM) above background, personnel shall decontaminate further. This procedure will be repeated until frisking of personnel indicates decontamination has been satisfactorily completed (i.e., <25 CPM). Should readings of > 100 CPM or more be obtained then personnel will be required to change clothing. The RSO will contact the HP and the HSM for advice.

Equipment for personnel decontamination will include plastic wash and plastic rinse tubs, brushes, alconox, water and impervious lining material as needed.

10.2 EQUIPMENT DECONTAMINATION

- The Field Operations Leader will be responsible for all equipment decontamination. Adequate performance of this task shall be verified by the RSO
- Monitoring equipment shall be wiped down.

- All heavy equipment and tools used during decontamination activities will be steam cleaned and/or power washed prior to leaving the Site. A location for this activity shall be determined by the RSO and the Project Manager or designee.

- A decontamination certification will be completed after each heavy equipment is decontaminated. A copy of the decontamination certificate can be found in Appendix J.

10.3 EMERGENCY DECONTAMINATION

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The Site RSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances and/or medical personnel. Outer garments are then removed at the medical facility. No attempt will be made to wash or rinse the victim, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel or the person is suffering from heat stroke. For minor medical problems or injuries, the normal decontamination procedures will be followed. Note that heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention and removal of protective clothing immediately. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and first aid begun immediately.

11.0 DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects shall be handled in such a way as to exclude the potential for the spread of contamination, creating a sanitary hazard or causing litter to be left on site. All potentially contaminated disposable wastes, e.g. boots, gloves, coveralls, will be scanned to determine if they are radiologically contaminated. If contaminated, they will be bagged and/or drummed, labeled and segregated in a designated and secured area on site for disposal. All contaminated waste materials shall be disposed of in accordance with applicable state/federal regulations. All non-contaminated materials shall be collected and bagged for proper disposal as normal domestic waste.

All other disposable protective clothing: gloves, boot covers, contaminated coveralls, will be tightly bagged and stored appropriately on site in drums or other adequate containers following completion of each day's work. All drums/containers used for storage of such waste will be clearly labelled as "PPE".

All non-disposable contaminated personal protective equipment that will not decontaminate adequately will also be discarded and disposed of as above and replaced with new or uncontaminated equipment as needed. Steel-toed field boots or shoes will be decontaminated thoroughly. If this procedure does not adequately remove all contaminated materials, they will also be disposed of as described above.

Contaminated washwater and radiologically contaminated materials will be collected and drummed appropriately. If possible, dedicated or disposable equipment should be used for decontamination operations at the site. Dedicated contaminated equipment will be bagged or appropriately containerized for disposal. All potentially contaminated materials will be collected and drummed upon termination of operations. All non contaminated materials shall be collected for appropriate disposal as domestic waste.

12.0 EMERGENCY PLAN

The emergency plan outlined in this section, will be known by all field personnel involved in Site activities. The emergency plan will be available for use at all times during Site work.

Various individual Site characteristics will determine preliminary actions taken to assure that this emergency plan is successfully implemented in the event of a Site emergency.

The emergency coordinator, the Field Operations Leader, shall make contact with the Engelhard Corporation personnel at the Site prior to beginning of work on site. Prior to start up of Site operations the emergency coordinator shall also contact the local emergency services regarding the nature and duration of work expected on the Site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The emergency coordinator will make necessary arrangements to be prepared for any emergencies that could occur.

The emergency coordinator will implement the emergency plan whenever conditions at the Site warrant such action. The emergency coordinator will be responsible for coordination of the evacuation, emergency treatment, and emergency transport of Site personnel as necessary, and notification of emergency response units and the appropriate management staff.

12.1 EVACUATION

In the event of an emergency situation, such as fire an air horn or other appropriate device will be sounded in **10 second** intervals indicating the initiation of evacuation procedures. All personnel will evacuate and assemble at a pre-designated location. The location shall be upwind of the Site where possible. For efficient and safe Site evacuation and assessment of the emergency situation, the emergency coordinator will have authority to initiate action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The RSO or designee will see that access for emergency equipment is provided and that all equipment have been shut down and secured once the alarm has sounded. Once the safety of all personnel is established, the emergency response groups, as necessary, will be notified by telephone of the emergency.

12.2 POTENTIAL OR ACTUAL FIRE

Immediate evacuation of Site (air horn will sound in 10 second intervals) shall be initiated by the emergency coordinator. The local fire and police department, and other appropriate emergency response groups will be notified immediately if an actual fire takes place.

12.3 PERSONNEL INJURY

In the event of an injury, emergency first aid will be applied on site as deemed necessary, then the individual will be decontaminated, as may be necessary, and transported to the nearest medical facility if needed. The RSO will supply medical data sheets to the medical personnel and complete the accident/incident reports in accordance with Enserch Environmental policy.

In an emergency situation an ambulance shall be contacted for transportation to the hospital as necessary. Only in non-emergency situations shall an injured person be transported to the hospital by means other than an ambulance. The hospital route is identified below in Section 12.7.

12.4 OVERT PERSONNEL EXPOSURE

In the event project personnel are exposed to toxic chemicals, the following guidelines will be followed:

SKIN CONTACT: Apply copious amounts of soap and water. Wash/rinse affected area thoroughly and provide appropriate medical attention. An emergency eyewash is located in the Support or the Contamination Reduction Zone. Eyes should be rinsed for a minimum of 15 minutes upon chemical exposure.

INHALATION: Move to fresh air and area, if necessary, decontaminate/transport to hospital.

INGESTION: Decontaminate and transport to hospital.

PUNCTURE WOUND/LACERATIONS: Decontaminate and transport to hospital.

12.5 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the RSO or designee will determine if work can continue without compromising the health and safety of field personnel. Some of the items to be considered prior to determining if work should continue are the following:

- Potential for heat stress and heat-related illnesses
- Potential for cold stress and cold-related illnesses
- Treacherous weather-related working conditions
- Potential for an electric storm

Site activities will be limited to daylight hours (unless adequate artificial lighting is provided) and acceptable weather conditions. Unacceptable working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

12.6 ACCIDENT/INCIDENT REPORTING

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by the RSO via telephone:

1. Mike McSherry: (609) 467-4041 (W) (b)(6)

2. Steve Graham, Project Manager: (617) 451-1201 (W) (b)(6)

3. The employer of any injured worker, if not an Enserch Environmental employee

Written confirmation of verbal reports are to be submitted within 24 hours by the RSO or designee. The report form entitled "Accident/Incident Report" (provided in Appendix K) is to be used for this purpose. All Enserch Environmental representatives contacted by telephone are to receive a copy of this report. If the employee involved is not an Enserch Environmental employee, his employer will receive a copy of this report.

For reporting purposes, the term accident refers to fatalities, lost time injuries, OSHA recordable injuries, spill or exposure to hazardous materials (radioactive, toxic, explosive, flammable or corrosive), fire, explosion, damage to property, or potential occurrence of the above.

Any information released from the health care provider, which is not deemed confidential patient information, is to be attached to the appropriate form. Any medical information which is released by patient consent is to be filed in the individual's medical records and treated as confidential.

12.7 EMERGENCY CONTACT INFORMATION

Enserch Environmental Personnel:

Project Manager	Steve Graham	617 - 451-1201
Health & Safety Manager	Mike McSherry	609 - 467-4041
Health Physicist	Jim Mayberry	706 - 821-3128

Emergency Services Contact Numbers:

Plainville Police Department	911 or 508 - 695-7115
Plainville Fire Department	911 or 508 - 695-2311
Plainville Ambulance Service	911 or 508 - 695-2311
Sturdy Memorial Hospital	508 - 222-5200

(See Appendix L for Maps/Figures)

Directions to the Hospital: Travel South on Route 152. Follow Blue Hospital signs (See Appendix L).

13.0 LOGS, REPORTS AND RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping for the Engelhard Corporation Project.

13.1 FIELD CHANGE REQUEST

To be completed for initiating a change to the RADHASP. The HSM and Project Manager approval is required. The original will be kept in the project file. A copy of the Field Change Request Form can be found in Appendix A.

13.2 ON-SITE LOG

A log of personnel on-site each day will be kept by the RSO or designee. A copy of these logs will be sent to the Regional Records Coordinator for data entry. Originals will be kept in the project file.

13.3 EXPOSURE RECORDS

Any Material Safety Data Sheets, personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR 1910.20. For Enserch Environmental employees, copies will be sent to the Records Coordinator. For subcontractor employees, copies will be sent to the subcontractor employer and a copy kept in the project file.

13.4 ACCIDENT/INCIDENT REPORTS

An Enserch Environmental accident/incident report must be completed following procedures given in Section 12.6 of this RADHASP. The originals will be sent to the appropriate Regional Records Coordinator for maintenance by Enserch Environmental. Copies will be distributed as stated. A copy of the forms will be kept in the project file.

13.5 OSHA FORM 200

An OSHA Form 200 (Log of Occupational Injuries and Illnesses) will be kept at the project Site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the HSM for maintenance. Subcontractor employees must also meet the requirements of maintaining an OSHA 200 Form. The Enserch Environmental accident/incident report meets the requirements of the OSHA Form 101 (Supplemental Record), which must be maintained with the OSHA Form 200 for all recordable injuries or illnesses.

13.6 HEALTH AND SAFETY FIELD LOG BOOKS

The RSO or designee will maintain the log book in accordance with standard Enserch Environmental procedures. Daily Site conditions, activities, personnel, calibration records, monitoring results and significant events will be recorded. The original log books will become part of the exposure records file and will be maintained by the Project Manager in the project files.

13.7 MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheets (MSDS) will be obtained and kept on file at the project Site for each hazardous chemical brought to, used, or stored at the Site. The MSDS will be kept in the project file.

14.0 AUTHORIZATIONS AND FIELD TEAM REVIEW

14.1 AUTHORIZATIONS

Personnel authorized to enter the Site while field operations are being conducted must be approved by the RSO. Authorization will involve completion of appropriate training courses and review and sign-off on this RADHASP.

14.2 FIELD TEAM REVIEW

Each field team member shall sign a Field Team Review form after site-specific training is completed and before being permitted to work on site. A Field Team Review Form is provided in Appendix M.

15.0 REFERENCES

The following references were used in the development of this Radiological Health and Safety Plan:

- Berlin et al, 1993. R. Berlin and W. Duggan, April 1993. "Radiological Characterization Survey Program for Plainville Massachusetts Site of Engelhard Corporation", 30 pp, plus tables and figures.

- Berlin et al, 1994. R. Berlin, W. Duggan and J. Mernin, August 1994. "Draft Radiological Characterization Survey of Interior of Plainville, Massachusetts Plant of Engelhard Corporation", 44 pp plus figures and appendices.

APPENDIX A

FIELD CHANGE REQUEST FORM

Health & Safety Plan
Change Notice

PAGE____ of____

PROJECT: _____ W.O.-CN _____

1) HASP VERSION:_____ SECTION:_____ PAGE(s):_____

RE: __ Change to existing HASP Anticipated Revision date _____

__ Addition to existing HASP

__ Other:_____

_____ CONT.__

2) PROPOSED CHANGE: _____

_____

_____

_____ CONT.__

3) REASON FOR PROPOSED CHANGE(s)

__ Required by SPEC or Change Order __ Other: _____

__ Disposition of Deficiency

__ Change in Regulatory or Other Requirement _____ CONT.__

__ Operational Experience

4) EXHIBITS ATTACHED __ NO __ YES (if YES, describe)_____

_____ CONT.__

5) EBASCO APPROVALS PROJECT MANAGER: _____ Date: _____

SITE MANAGER: _____ Date: _____

H&S MANAGER: _____ Date: _____

Client Approval Required __ NO __ YES (if YES, date submitted) _____

6) CLIENT APPROVAL ___ APPROVED __ REMANDED __ REJECTED

Comments _____

_____

_____ CONT.__

Client Representative _____ Date: _____

7) DISTRIBUTION AFTER APPROVAL

X HASP UPDATE LIST __ OTHER: _____

X CLIENT _____

X PROJECT FILES _____

8) PREPARED BY: _____ Date: _____

Title: _____

APPENDIX B

RESUMES

EXPERIENCE SUMMARY

Over four years of experience in industrial hygiene, safety, and environmental science. Experience includes developing and implementing compliance programs and health and safety plans for hazardous and radioactive waste operations, sampling for asbestos and organic solvents, and serving as on-site Health and Safety Officer (HSO) for hazardous waste site operations. Additionally, served as an instructor for various OSHA required hazardous materials operations training courses.

EDUCATION

M.S., Environmental Science, New Jersey Institute of Technology - continuing
B.E., Chemical Engineering, Stevens Institute of Technology (b)(6) EX 6

ADDITIONAL TRAINING

Health and Safety Course, Pittsburgh, Pennsylvania-November 1988
Health and Safety Course for hazardous waste site activities.

Asbestos Supervisors/Handlers Course, National Asbestos Training Institute, New Jersey-July 1988
General orientation in EPA and OSHA requirements regarding asbestos abatement and training for asbestos abatement projects.

NIOSH Occupational Respiratory Protection Course, University of Cincinnati, Ohio-October 1989
General orientation on various types of respirators, their limitations, and methods of fit testing.

Fundamentals of Radiation Protection, Radiation Safety Associates Inc., Portland, Maine-Janaury, 1990
General orientation in radiation, dosages, and protection.

Radiation Instrumentation, Rutgers, Cook College, New Brunswick, March 1993
General orientation in the various types of radiation monitoring detectors and dosimeters and principle of operations.

Radiation Protection Program, Rutgers, Cook College, New Brunswick, March 1993
General orientation in the various aspects of developing a radiation protection program.

REPRESENTATIVE EBASCO ENVIRONMENTAL, INC. EXPERIENCE (1.5 Years):

Health and Safety Officer responsible for evaluation, development and implementation of Health and Safety Plans and programs and oversight of subcontractor health and safety programs for hazardous and radioactive waste sites operations. Assisted field teams in soil and groundwater sampling operations. Instructor in corporate health and safety programs for hazardous waste operations.

REPRESENTATIVE EBASCO ENVIRONMENTAL, INC. EXPERIENCE (Cont'd)

Representative projects include:

Sumitomo Machinery Corporation - Served as project Health and Safety Officer and Radiation Safety Officer during investigation and remedial operations at this mixed waste site located at Teterboro, New Jersey. Responsibilities included revision and implementation of site specific Health and Safety Plan and Standard Operating Procedures and conducting process safety evaluation for control of worker and public exposure to physical, chemical and radiological hazards present on site. Additional responsibilities included supervising project Health Physicist to ensure radiation safety procedures were developed and implemented on site in accordance with current regulations and project guidelines, conducting site specific safety training and generating and maintaining appropriate administrative records and reports.

AlliedSignal Aerospace - Served as Health and Safety Officer at the AlliedSignal facility located at Teterboro New Jersey during construction of a groundwater treatment system. Responsibilities included development and implementation of site Health and Safety Plan, supervision of workers and control and evaluation of worker exposure to the hazards present on site.

Manufactured Gas Product Sites - Served as site Health and Safety Officer at several former Manufactured Gas Product Sites in New Jersey owned and operated by New Jersey Natural Gas and Jersey Central Power and Lighting. Responsibilities included supervision of workers, evaluation and control of worker exposure to hazards on site and implementation of the site specific Health and Safety Plan.

Vineland Chemical Company - Served as site Health and Safety Officer during a pilot project for sediment treatability study at Vineland Chemical Company at Vineland, New Jersey. Responsibilities included implementation of site specific Health and Safety Plan and conducting ambient air monitoring for evaluation and control of worker exposure to airborne chemicals present on site.

Bridgeport Rental and Oil Services (BROS) - Served as Health and Safety Technician during remediation operations at the BROS site located at Bridgeport, New Jersey. Responsibilities included conducting real time air monitoring for control and evaluation of worker exposure to hazardous materials present on site and implementation of the site Health and Safety Plan.

PRIOR EXPERIENCE (4 Years)

Emilcott Associates, Inc.
Madison, New Jersey
Senior Industrial Hygienist

Served as Health and Safety Monitor for Fluor Daniel, Inc. during the construction of a Small Scale Organics Pilot Plant at the Merck & Co. Inc. Rahway, New Jersey facility. Responsibilities included control and evaluation of worker exposure to hazardous material, conducting site specific health & safety training and advising the Project Safety Manager on implementation of the site Health and Safety Plan.

PRIOR EXPERIENCE (Cont'd)

Served as Health and Safety Officer for the Du-Pont Acid Brook Remediation and Restoration Project, Pompton Lakes, New Jersey. Responsibilities included implementation of both occupational as well as community health, safety and environmental procedures. These procedures included air sampling for worker and community protection, community noise measurements, and health and safety plan evaluation.

Served as Health and Safety Officer during site activities for the construction of an 800 bed floating facility at the Halleck Street Site, Bronx, New York. This site was contaminated with waste materials from a former coal gasification process. Responsibilities included implementing health nd safety plan and control and evaluation of worker exposure to hazardous materials.

Developed Emergency Response Plan and Procedures and Hazard Communication Program for major chemical manufacturing firms. Additionally, assisted in developing substance specific as well as health and safety compliance programs for two major chemical manufacturing firms.

Member of a project team for RCRA auditing of a major industrial instrument manufacturing facility. Responsibilities included developing audit protocols, conducting a RCRA audit and writing the RCRA and Underground Storage Tank audit reports.

Conducted comprehensive industrial hygiene sampling collection and evaluation at a 1.2 million square feet air conditioner manufacturing facility and an electronic manufacturing facility.

Member of Emilcott Associates' teaching staff for various OSHA required hazardous materials operations training courses. Re-designed Emilcott Associates' 8 Hour Refresher Course.

Assisted in developing a computerized version of the OSHA Standard 1910.1450 (Exposure to Hazardous Chemicals in the Laboratory) used as a presentation material in a seminar.

ABB Environmental Services, Inc.
Roseland, New Jersey
Health and Safety Officer

Conducted numerous Asbestos Assessments for a major telecommunication firm and private clients. These involved conducting building/facility walkthroughs, collecting asbestos bulk samples, preparing reports and recommending alternatives.

Conducted methane gas survey for New York DEP project.

Served as site Health and Safety Officer on several hazardous waste remediation projects. Duties included developing and implementing site specific health and safety plans, interfacing with project personnel and conducting accident investigations.

Developed and presented a training session on Managing Video Display Terminals for ABB Environmental Services, Inc. personnel.

Hesco Environmental Safety Co., Inc.
Secaucus, New Jersey
Asbestos Safety Technician

Inspected asbestos abatement sites to ensure compliance with EPA and OSHA regulations and evaluated worker exposure to asbestos fibers.

ADRIAN GILL

EXPERIENCE SUMMARY

Mr. Gill has over eight years of environmental remediation and operations experience in progressively responsible positions, including management, operational oversight and consulting, on the planning, design and remediation of 102 TSCA, RCRA, CERCLA and NJ ECRA spill and hazardous waste sites.

Mr. Gill has had management oversight responsibilities for 72 projects worth over $96 million with direct management responsibilities for 56 projects worth $69 million.

He has been responsible for a remediation divisions operational management of over 140 people; including divisional planning, bid preparation and review, subcontracting, and budget/scheduling of divisional operations; as well as project management on major government and commercial/industrial remedial investigation, design, and remediation projects.

Mr. Gill has been involved in projects involving a wide variety of on- and off-site treatment/ impoundment/disposal technologies including in-situ and land treatment bioremediation, soil venting, stabilization, filter press waste minimization, slurry walls, RCRA caps, water treatment, physical/chemical treatment, secure landfill, incineration, and other technologies.

EDUCATION

B.A., English Literature, North London Polytechnic College, Collingdale, London, England; (b)(6)

OTHER EDUCATION AND TRAINING

CFR 29 1910.120 40 hour OSHA Hazardous Waste Training and Yearly Refreshers.
Confined Space Entry (Qualified Person) Training.
Emergency Response (Spill) Training.
Hazard Categorization (Field Unknown Waste Characterization) Training.
Hazardous Chemical Handling (HAZ Waste Packaging/D.O.T. Transportation Requirements) Training.
Excavation Safety Training.
Hazardous Waste Site Supervision Training.
Project Management Professional Development (Basic and Advanced A.M.A. Accredited)
Effective Supervision (Company Management Training).
International Loss Control Institute (ILCI) Study Courses.
First Aid/CPR Basic Qualified.

REPRESENTATIVE EBASCO ENVIRONMENTAL EXPERIENCE (Since 1991)

Project Manager

As ***Project Manager***, Mr. Gill has overall management responsibilities for the site investigation and remediation activities at a 19-acre industrial former pesticide formulations plant in New Jersey.

REPRESENTATIVE EBASCO ENVIRONMENTAL EXPERIENCE (Cont'd)

The investigation and cleanup is mandated in New Jersey under ECRA whereby cessation of plant operations triggered the required environmental site mitigation.

The project originally valued at $148 thousand has grown, through required planning, investigations, and the execution of an interim remedial action at an adjacent property, to $3 million and is anticipated to cost from $15 to $25 million at completion.

The project has progressed in a phased assessment approach whereby through 1991, 5 of 10 planned phases, and 28 of the 37 phase/task currently contracted elements, are primarily complete.

Mr. Gill has responsibilities for the coordination of all phases and task deliverables that involve the cost, schedule and performance of multi-disciplined technical and field operations personnel, subcontracting, permitting, procurement, cost estimation and document preparation.

During the first five phases, tasks elements required technical support disciplines in geology, hydrogeology, regulatory affairs, human health and ecological risk assessment, health and safety, remediation, cost/scheduling, geophysics, multimedia sampling and analysis, QA/QC, civil, mechanical and chemical engineering, design drafting, wetland and stream encroachment assessment, mapping and permitting, estimating and procurement, archeology and strategic planning.

Mr. Gill has responsibility for coordination of between 16 and 35 technical, support, and operations personnel involved with the execution of the task deliverables.

PRIOR EXPERIENCE (7 YEARS)

Mr. Gill was the *Acting Operation's Manager* for Chemical Waste Management, ENRAC Eastern division of Princeton, New Jersey. As Acting Operation's Manager, he was responsible for the scheduling of over 140 field employees in the division, assignment of project resources, support management of the division's supply warehouse and field equipment and maintenance program, and the hiring of nonexempt and exempt personnel to the level of Project Manager.

Mr. Gill was *Senior Project Manager* at Chemical Waste Management, ENRAC Eastern Division. Mr. Gill had management oversight responsibilities for the cost estimation, redesign, installation and operation of a screening, crushing, and stabilizing plant installed to process soils, rock and debris. A total of 48,000 tons of material was removed over an 18-month period from three mountainous waste areas that had been contaminated with lead, mercury and high hazard detonating caps. The project was executed for a major chemical company in New Jersey at a cost of $17.6 million.

This project included the application and implementation of design changes to retrofit commercial screeners, conveyers, and impact crushing equipment. This was required to meet NJDEPE air emission standards and adapt standard construction equipment to non-standard hazardous materials safe handling applications.

Materials handled were processed to one-quarter inch in size, then shipped by rail for chemical stabilization at a secure hazardous waste landfill.

PRIOR EXPERIENCE (Cont'd)

Mr. Gill participated in contractual negotiations, operational design review, and budget and change order control. Additionally, he developed specifications for subcontractors performing remote drilling and blasting, building construction, and personnel, transportation and disposal scheduling.

Mr. Gill was a *Project Manager* with Chemical Waste Management, ENRAC Eastern Division with responsibilities for the completion of a pesticide-contaminated soils removal at a New Jersey site subject to ECRA closure valued at $1.2 million. He was also responsible for the execution of a remediation consisting of 78 tanks, 3,000 drums, 250,000 gallons of contaminated water, and 350,000 gallons of mixed solvents. This contract at a former Solvent Recycling Superfund site in Maryland is valued at $7.4 million.

A synopsis of Mr. Gill's experience at Chemical Waste Management, ENRAC Division includes the following project summaries:

- NJ Division of Water Resources-mandated remediation to remove TPH-contaminated soils (7,000 tons) and install/startup an in situ pump and treat/bioremediation system;
- NJ ECRA-mandated removal of PCB soils and site repair (2,000 tons);
- OHIO EPA-mandated removal and solidification of PCB-contaminated sludge (1,800 tons);
- OHIO client (2 projects) lagoon filter press biosludge waste minimization and disposal (15,000 cubic yards, 4,800 tons dry);
- PADER-mandated removal of soils and buried drums contaminated with solvents (1,200 tons soil/2,000 drums);
- EPA Region III-mandated, PRP-responsible CERCLA site tank cleaning, drum categorization and liquids/water removal and disposal (78 tanks, 350,000 gallons of liquids, 5,500 drums, 250,000 gallons of water);
- NJ ECRA-mandated removal and processing of lead/mercury and explosive cap contaminated soils, transportation and disposal (48,000 tons);
- NJ ECRA-mandated barrier wall and cap conceptual design, installation including onsite bioremediation (4.2 acre cap 2,300 linear ft wall 3,500 tons of soil);
- NJ ECRA-mandated demolition and disposal by recycling of former tank farm (1,900 tons concrete and debris);
- NJ ECRA-related pesticide soils contaminated removal and disposal (2 projects) involving both landfill and incinerator disposal, water disposal, and ECRA cleanup plan preparation (14,000 tons of soils, 160,000 gallons of water);
- NJ ECRA-mandated soils remediation, in situ groundwater pump and treatment system installation, installation of sewer line and tank cleaning/tank abandonment, tank decontamination and retaining wall installation (3,000 tons of soils, 200,000 gallons of water);
- OHIO EPA-mandated remedial action for the removal of 8,000 tons of PCB-contaminated soils;
- USACOE design/management oversight for installation/upgrade of A.W.T.S. at a NJ CERCLA site; and
- NJ ECRA-mandated removal of soils and water contaminated with pesticides requiring both landfill and off-site incineration (8,000 tons of soil/180,000 gallons of water).

PRIOR EXPERIENCE (Cont'd)

As a ***Project Manager/Site Superintendent*** with IT Corporation of Edison, New Jersey, Mr. Gill was responsible for providing operational methods/efficiency review, cleanup plan preparation and estimating support to the engineering and ECRA/RCRA consulting groups; as well as bidding, estimating, scheduling and managing remediation projects that included:

- Installation of NJ ECRA-mandated below-grade soil venting systems (3 gas stations);
- Oil and chemical spill response management on water and land (7 water, 23 land);
- NJ ECRA-mandated bioremediation land treatment cell construction;
- Managed two NJ CERCLA-mandated privately funded, drum burial and soil remediations on three farms in remote locations; (18,000 tons of soil, 3,200 drums, 98,000 lab bottles) involving large quantities of PCBs, heat and air reactive materials;
- Managed four asbestos abatement projects (one in New Hampshire of 1,400 tons, three in New Jersey of 600 tons combined);
- Supervising cleanup teams of up to 50 people on a NJ CERCLA-mandated dioxin cleanup in the middle of a busy city area;
- Supervising high hazard silane salt materials transfer, including design and fabrication of remote opening equipment for aboveground, non-vented tanks under hydrogen pressure at a New Jersey chemical plant;
- Supervision of construction teams on a major ADEM-mandated three coal tar lagoon closure with RCRA cap and slurry wall installation;
- Supervision of several groundwater pump and treat operations with vapor phase extraction, air stripping and carbon absorption methods in New Jersey;
- Management of NJ ECRA-mandated R & D facility decontamination and underground storage tank removal;
- Management of a 64-tank cleaning project at a former solvent recycling plant mandated for cleanup under NJ ECRA and RCRA that included cleanup plan design preparation, cost estimating and remediation;
- Preparation of NJ ECRA-mandated cleanup plans and estimates for a mercury contaminated former capacitor manufacturing plant;
- Preparation of NJ ECRA-mandated conceptual cleanup plans and estimates for a major oil refinery facility;
- Preparation of NJ ECRA-mandated cleanup plans and estimates for a former construction equipment assembly plant;
- Preparation of NJ ECRA-mandated cleanup plans and estimates for a major chemical (perfume) manufacturing plant including bioremediation;
- Preparation of cleanup plan designs and estimates for a major New Jersey chemical (food additive) plant;
- Preparation of cleanup plan designs and estimates for two NJ ECRA-mandated former oil distribution terminals; and
- Preparation of conceptual designs and associated cleanup plans and estimates, including a RCRA cap, interceptor wall and land treatment bioremediation, for a former phosphates manufacturing plant mandated by NJ ECRA.

STEPHEN J. GRAHAM

EXPERIENCE SUMMARY:

Mr. Graham has sixteen years of experience in the environmental field, including the past 12 years in civil/environmental engineering. He has served as a project manager for major licensing, RI/FS, design, and construction projects involving RCRA and CERCLA hazardous waste and NRC/mixed waste. These projects have included subsurface investigations; risk assessments; soil, sediment, and sludge excavation and capping; groundwater collection, pumping and treatment; stormwater runoff; facility decontamination; and soil vapor extraction. As a project manager, he has been responsible for all technical, schedule, financial and administrative aspects of work assignments. Mr. Graham also currently manages the civil/environmental engineering and design group, for Ebasco-New England operations.

PROFESSIONAL AFFLIIATIONS:

Member, Air and Waste Management Association
Member, Hazardous Materials Control Research Institute

EDUCATION:

M.S., Civil/Environmental Engineering, Tufts University, Medford, MA (b)(6) Ex 6

Research Assistant, Engineering Science Lab, Harvard University, and Woods Hole Oceanographic Institution, Woods Hole, MA, 1978-1981.

B.A., Biological Sciences, Minor: Chemistry, (summa cum laude), University of Northern Colorado, Greeley, CO, (b)(6) Ex 6

TRAINING:

40-hour OSHA Health and Safety Training for Hazardous Waste Operations
8-hour OSHA Health and Safety Refresher Course
DOT HM 181 Hazardous Waste Transportation Basic Awareness Training

REPRESENTATIVE PROJECT EXPERIENCE:

Mr. Graham has worked for Ebasco since 1990 and for other national engineering firms in Boston since 1982. Mr. Graham's experience is indicated below.

• **U.S. EPA, Pinette's Salvage Yard Superfund Site, Washburn, ME** - Project Manager for final design (drawings and specifications), bid package preparation, and CBD procurement of a $7 million EPA design-build project involving on-site treatment of PCB/VOC contaminated soil via proprietary solvent extraction. Mr. Graham subsequently served as Project Engineer (and alternate Resident Engineer) during construction. In addition to the innovative solvent extraction technology, key project work elements include a packaged wastewater treatment system, soil excavation and off-site incineration, and project administration in accordance with state-of-the-art construction management, regulatory compliance, and sampling and analysis plans.

• **U.S. EPA, Wells G&H Superfund Site, Woburn, MA** - Project Manager for EPA oversight of $69 million (projected) in design, construction and long-term operation projects at four industrial sites at this nationally known location. Work-to-date has included: installation and sampling of 100 wells; 30 day pump tests and pilot groundwater treatment at two sites; designs (plans, specifications, O & M plans), construction, and operation since October 1992 of groundwater well interception galleries, and 20 gpm and 50 gpm pump and treat plants (using innovative UV-oxidation), respectively; and soil excavation and removal at those sites. Designs of soil vapor extraction and groundwater sparging programs have been reviewed at a third site requiring extensive soil excavation and debris decontamination, and soil and groundwater testing has been conducted at a fourth site.

• **Dupont (Remington Arms), Bridgeport, CT** - Project Manager for a $900,000 RCRA facility investigation and remediation project, involving design (drawings and specifications) and construction management of capping and closure (with Hypalon liner installation) of a two million gallon waste-water lagoon. Other tasks included: evaluation of existing wastewater treatment plant; geotechnical investigation of a munitions furnace site: preparation of a RCRA closure plan to remove/control contaminated soil and ground water at a 2 acre waste pile; subsurface investigation of a groundwater spill; preparation of a RCRA Part B permit application for a drum storage area; preparation of a post-closure permit application for the closed impoundment; and waste delisting activities.

• **Confidential Client, Worcester, MA** - Project Engineer for RCRA Corrective Action solid waste management unit (SWMU) inventory program for this major metal-working manufacturing plant covering 20 acres. Approximately 100 SWMU's were defined over a six week field program, including underground solvent tanks, radioactive drums, oil lagoons, machine coolant and degreaser units, PCB transformers, corrosive tanks, spills, flue gas vent dust (metals), and asbestos. Recommendations for remedial action were developed, and a SWMU inventory technical memorandum was subsequently prepared for client submittal to EPA.

• **U.S. DOE, RCRA/NRC Mixed Waste Projects, Various Installations:**

- **Fernald, OH** - QA Reviewer for storage facility investigation and inventory, involving verification of additional storage facilities, for over ten thousand drums of RCRA/NRC mixed wastes. Also reviewed regulatory database prepared to identify NRC, RCRA, NFPA, and other design criteria for the waste drum facility storage, and reviewed other facility RCRA and decontamination and deommissioning plans.

- **Savannah River, GA** - Prepared technical approach and budget estimate for a RCRA Part B permit for a new multimillion dollar RCRA/NRC mixed waste storage, treatment, and processing building.

- **Piketon, OH** - Directed resident engineering for construction management of capping and closure of a 2 acre metal sludge landfill. A RCRA cap, including 2 feet of 10^{-7} cm/sec clay, 40 mil HDPE liner with gravel buttress, and extensive erosion controls/swales, were installed.

• **Marcal Paper Mills, Mechanic Falls, ME** - Project Engineer for the design (drawings and specifications), and Project Manager/Resident Engineer for the construction management, of the closure of three sludge lagoons, several waste piles, and an industrial waste landfill, covering a total of 20 acres. Also prepared applicable permits and directed subsurface investigations, including groundwater monitoring.

• **U.S. EPA, Old Springfield Landfill, Superfund Site, Springfield, VT** - Project QA Officer and Lead Civil Engineer for oversight of design (plans, specifications, O & M plans) and construction consisting of a 60 gpm pump and treat plant, RCRA cap (Claymax and 40 mil HDPE), steep slope stabilization, and groundwater interception and treatment (deep French drains and extraction wells) at a five-acre Vermont industrial sludge/municipal landfill.

• **U.S. EPA, W.R. Grace Superfund Site, Acton, MA** - Project QA officer and Lead Civil Engineer for oversight of treatability studies and design (plans and specifications) for multiple lagoons excavation, physical-chemical fixation of sludge and disposal, and RCRA capping (claymax and 40 mil HDPE) and closure of a waste pile and a two-acre landfill contaminated with dye residues. Construction worth approximately $10 million on this project is slated to begin in autumn 1993.

• **Syntex Agribusiness, Times Beach, MO** - Directed preparation of RCRA Part B permit application for a design-build project involving a 30 TPH incinerator and associated facilities to treat 100,000 CY of dioxin-contaminated soil and debris. Facilities included storage processing and ash physical-chemical fixation. Prepared design specification on applicable regulations, and reviewed overall design specifications bid package.

• **U.S. Army Corps of Engineers, Defense Fuel Service Center, Alexandria, VA** - Project Engineer for preparation of pollution prevention plans for three major military petroleum terminals in Newport, RI; Searsport; ME, and Verona, NY. Two of the terminals involved marine fuel piers and associated pipelines, and contained over 40 million gallons in numerous underground and above ground tanks for jet fuel, diesel oil, lube oil and heating oil. SPCC, facility emergency response, and stormwater prevention plans were prepared.

• **U.S. EPA, Nyanza Superfund Site, Ashland, MA** - Reviewer for groundwater treatability studies and proposed remedial alternatives involving biological and physical-chemical treatment unit operations (e.g., UV-oxidation and carbon adsorption), and reviewed for technical feasibility, implementability, appropriateness, and capital and O & M costs.

• **U.S. Army Corp of Engineers, Redstone Arsenal, Huntsvile, AL** - QA Reviewer for 60% design (plans and specifications) for capping and closure of 2 acre metal sludge landfill.

• **U.S. EPA, Old Southington Landfill Superfund Site, Southington, CT** - QA Reviewer for a Feasibility Study for closure (RCRA cap) of a metal sludge landfill, groundwater interception and treatment, and resettlement of residents and businesses residing on the landfill.

• **U.S. Navy, Hawaii** - Project Engineer for a project involving all U.S. Navy hazardous waste in Hawaii, requiring the preliminary design of new unit operations and modifications to the existing industrial wastewater treatment plant, involving organics, corrosives, alcohol and soap treatment, solvent distillation, paint centrifugation, oil filtration, and solidification. Also included were a laboratory and an automated drum-handling system. Process schematics, plant layouts, and equipment lists were developed; and infrastructure (HVAC, fire protection, plumbing, structural, electrical and instrumentation systems) and power requirements, and capital and O & M costs were identified.

• **U.S. EPA, Saltville Superfund Site, Saltville, VA** - Project Engineer for a feasibility study for EPA Region III, which provided a conceptual design evaluation of a 100-gpm mercury brine wastewater treatment system for impoundment leachate. The engineering evaluation considered reverse osmosis, ultrafiltration, electrodialysis, evaporation, ion exchange, and carbon and chemical treatment systems based on performance; constructability; ability to meet regulatory standards; and capital, operations, and maintenance costs. A process schematic, equipment list, plant layout, and budget costs were prepared for the selected technology based on established design criteria and vendor submittals.

• **IBM, Mobil Chemical, Dupont, GSX - (Various Locations)** - Prepared several RCRA Part B permit applications or waivers for drum and tank storage facilities, landfills, impoundments, and treatment plants for these industries and municipalities in New England, New York, South Carolina and Illinois. Closure plans and budget costs were prepared for each facility.

• **U.S. EPA, H.E.R.L. - Cincinnati and O.W.P.E. - Washington DC** - Project Engineer for preparation of a guidance manual on the cover designs for RCRA impoundment closures for EPA's Office of Waste Programs Enforcement. Also, for the U.S. EPA Hazardous Waste Engineering Laboratory, Mr. Graham performed field evaluations at several commercial hazardous waste treatment facilities to assess their capacity and effectiveness to treat cyanides, solvents, waste oils, corrosives, and heavy metals, in support of EPA's landfill ban. He subsequently helped prepare a briefing document for EPA on available physical/chemical/thermal treatment alternatives.

• **Wyman - Gordon, Connecticut DOT, U.S. Navy, State of Massachusetts** - As part of waste minimization programs for clients such as the U.S. Navy, the Connecticut Department of Transportation, and aircraft parts, machine tools, and food processing industries, Mr. Graham performed inventories of machining, cutting, heat treatment, painting, sonic testing, welding, forging, and degreasing operations. He also inventoried underground tanks, storage and disposal facilities for substances such as oils, solvents, alcohols, PCB's, asbestos, radioactives, reactives, and corrosives. He helped recommend process changes, material substitutions, and installations of solvent stills and soluble oil recycling units. For the State of Massachusetts, Mr. Graham prepared a report on waste minimization strategies at six plating facilities that generated spent solvents and oils.

PUBLICATIONS AND PRESENTATIONS

R. Donati and S. Graham. "Updating Oil Pollution Prevention Plans." Accepted, in preparation. National Air and Waste Management Association, Cincinnati, OH, June 1994.

S. Graham, J. Inglis, A. Fowler, R. Gilleland, and K. Fitzgerald, 1991. "Remedial Design for Solvent Extraction of PCB Contaminated Soils at Pinette's Salvage Yard, Washburn, Maine." Presentation at First EPA Conference on Design and Construction Issues at Hazardous Waste Sites, May 1-3, Dallas, TX.

S. Graham, R. Underwood, and G. Adams, 1989a. "Construction Closure of a RCRA Surface Impoundment." Hazardous Materials Control Research Institute Proceedings, New Orleans, Louisiana. April 12-14, p. 563-567.

S. Graham, 1989b. "Minimizing Metalworking Oil Wastes." Hazardous Waste Minimization Handbook, Chapter 3. Lewis Publishers, Chelsea, Michigan. P. 33-50.

S. Graham, June 1988. "Engineering Considerations in Evaluating Composting of Refuse and Sludge." Invited presentation at the Cape Cod Planning Commission Annual Conference on Refuse Recycling, Hyannis, Massachusetts.

S. Graham, November 1985. "Hazardous Waste in Municipal Landfills: The Problem, Its Regulation." Public Works. p. 73-76.

S. Graham, D. Pompelia, D. Pederson, and E. Kunce, June, 1984. Production of Chlorinated Dioxins and Furans from Resource Recovery Facilities, Part I: Sources, Emissions, and Standards. Proceedings of the 11th ASME National Waste Processing Conference. Orlando, Florida. p. 345-357.

JAMES MAYBERRY

EXPERIENCE SUMMARY

Total experience: Over five years in radiation protection, specializing in the assessment of impacts to the public from release of radioactive material from nuclear facilities.

PROFESSIONAL AFFILIATION

Health Physics Society
Completed Part I of the American Board of Health Physics Certification Process

EDUCATION

Ex 6

M.S., Health Physics, Georgia Institute of Technology (b)(6)
B., Nuclear Engineering, Georgia Institute of Technology (b)(6) (INPO Scholar)

REPRESENTATIVE EBASCO ENVIRONMENTAL PROJECT EXPERIENCE (Since 1987)

Mr. Mayberry was lead radiological assessment engineer for the Maxey Flats Remedial Investigation/Feasibility Study (RI/FS) project. His responsibilities included the assessment of radiological and chemical impacts associated with the low-level waste site in Kentucky. He produced a risk assessment based in no remediation at the site and evaluated remedial alternatives based on short- and long-term impacts to workers and the public. The work included the development of an assessment model and utilized a probabilistic approach to parametric uncertainty.

Mr. Mayberry provided Florida Power and Light with an assessment of public impacts resulting from a reactor accident at the St. Lucie and Turkey Points Power Plants. This assessment utilized the CRAC2 and MACCS computer codes. The assessment results were used to address Unresolved Safety Issue A-46.

In addition, Mr. Mayberry provided assessment assistance on the Electric Power Research Institute project to assess dose from accidents involving BRC wastes. This work involved the application of the Latin Hypercube Sampling process to develop statistical distributions for assessment short terms.

Mr. Mayberry performed a health risk assessment as part of the remedial investigation at the Lodi Municipal Well Site. This site is currently proposed for inclusion on the National Priority List. The risk assessment included the selection and analysis of exposure pathways for chemicals and radionuclides. Mr. Mayberry was also lead engineer for the Lodi Municipal Well Site Feasibility Study. This study presented the alternative to be used to remediate the site.

Mr. Mayberry performed a radiological risk assessment as part of the health risk assessment for the Halfmoon Co-Generation Plant. This assessment was used to estimate the impacts associated with the release of natural occurring radionuclides during the burning of coal. This analysis considered impacts through direct exposure pathways, agricultural pathways and waterborne pathways.

Mr. Mayberry developed a field sampling and analysis plan for properties contaminated with radium and thorium. This plan provided Allied-Signal Aerospace Company with a sampling scheme and sampling procedures to identify radiologically contaminated "hot spots" as well as areas that can be certified as clean. The plan includes methods for selecting sampling points by utilizing a more efficient triangular sampling grid.

REPRESENTATIVE EBASCO ENVIRONMENTAL PROJECT EXPERIENCE (Cont'd)

Mr. Mayberry assisted on a project to reduce the dose rate in uncontrolled areas around the Chinshan Nuclear Power Plant in Taiwan. The first phase of this project included travel to the site to map the dose rates around the plant and identify potential trouble spots and their sources. The second phase of the project will consist of the design of alternatives to reduce the dose rate in those trouble spots.

Mr. Mayberry performed a radiological performance assessment for the New Jersey Low-Level Radioactive Waste Project. The assessment utilized the PRESTO-CPG computer code to estimate the importance of site characteristics on dose to the public. The results were used to develop criteria used to select sites to be characterized as a potential low-level radioactive waste site.

Mr. Mayberry performed an assessment to determine radioactive waste concentration limits for waste classes I, II and III for the Idaho National Engineering Laboratory. External and internal radiological impacts were estimated for unit concentrations of 45 radionuclides for inadvertent intruder scenarios. PATHRAE and MICROSHIELD computer codes were used to estimate the dose equivalent to a member of the public. Unit impacts were converted into concentration limits using applicable US Department of Energy dose limits.

PRIOR EXPERIENCE

Battelle Project Management Division
Office of Nuclear Waste Isolation
Radiation Protection Specialist (3 years)

Assigned to the Preclosure System Analysis Section, Mr. Mayberry was charged with radiation protection and occupational safety aspects of a high-level nuclear waste repository during the development, verification, validation, and implementation of dose assessment computer codes; the review of repository design in terms of radiological impacts to workers and the public; the application of probabilistic risk assessment to preclosure analyses; the interaction between preclosure assessment and regulatory compliance; and the completion of analyses to support the final Environmental Assessments for the Salt repository sites. Mr. Mayberry was involved in a Department of Energy committee charged with developing a uniform preclosure risk assessment methodology to be used for all repository projects. Mr. Mayberry also managed subcontracts.

Consolidated Edison
Assistant Engineer (Summer)

Assigned to Environmental Health and Safety Group. As a summer intern. Mr. Mayberry worked in all areas of radiation protection (e.g., respiratory protection, radiation surveys, record keeping) at the Indian Point Nuclear Power Station.

Tennessee Valley Authority
Engineer Aide (Summer)

Assigned to the Preoperational Test Group. As a summed intern, Mr. Mayberry was involved in review and testing of power plant systems prior to operation of the Watts Bar Nuclear Power Plant.

PUBLICATIONS

Coauthor, Agricultural-Related Radiation Dose Calculations, BMI/ONWI-669, Office of Nuclear Waste Isolation, Battelle Memorial Institute, Herford, Texas, 1987.

Coauthor, Preclosure Radiological Calculations to Support Salt Site Evaluations, BMI/ONWI-541 (Rev. 1), Office of Nuclear Waste Isolation, Battelle Memorial Institute, Columbus, Ohio, 1986.

Coauthor, "Parametric Optimization Study of Offsite Doses from an Operating High Level Nuclear Waste Repository" Environmental Radiation '85, Proceedings of the Eighteenth Midyear Topical Symposium of the Health Physics Society, Colorado Springs, Colorado, 1985.

Coauthor, Preclosure Performance Assessment Review of the Draft Site Characterization Plan Conceptual Design Report, BMI/ONWI/C-301, Office of Nuclear Waste Isolation, Battelle Memorial Institute, Columbus, Ohio, December, 1987.

MICHAEL P. MCSHERRY, CIH, CSP

EXPERIENCE SUMMARY

Sixteen years experience in industrial hygiene and occupational safety. Responsible for overseeing Health and Safety Program implementation at environmental remediation and restoration projects. Activities include the development and implementation of site Health and Safety Plans; employee and supervisor training; air monitoring plans; and hazardous work procedures such as drum removal, confined space entry and lockout/tagout. Conducts incident investigations and works with site management and staff to implement control measures. Mr. McSherry has five years experience in hazardous waste remediation.

EDUCATION

(b)(6) TEMPLE UNIVERSITY, PHILADELPHIA, PA, M.S. INDUSTRIAL HYGIENE

(b)(6) ST. FRANCIS COLLEGE, LORETTO, PA, B.S. BIOLOGY

CERTIFICATIONS

December 1986 **AMERICAN BOARD OF INDUSTRIAL HYGIENE**
Comprehensive Practice
Certificate Number 3454
Certification Revalidated March 1993

December 1991 **BOARD OF CERTIFIED SAFETY PROFESSIONALS**
Management Aspects
Certificate Number SN 10844

AFFILIATIONS

American Industrial Hygiene Association - Protective Clothing and Equipment Technical Committee
American Academy of Industrial Hygiene
American Industrial Hygiene Association - Delaware Valley and Lehigh Valley Sections

MICHAEL P. MCSHERRY, CIH, CSP

EBASCO EXPERIENCE

Mr. McSherry joined Ebasco Environmental Division in June, 1993 and was immediately assigned to assist in the implementation of the Health and Safety Program at the Bridgeport Rental and Oil Service (BROS) Superfund Site in Bridgeport, NJ. This project involves the removal of contaminated sludges and sediment from a large waste lagoon. The wastes are treated in an on-site aqueous waste treatment system (AWTS) and incinerated in a thermal destruction facility (TDF). Work activities occur in protection levels D, C, and B. Potential contaminants include various volatile and semi-volatile organics, PCBs, and lead.

In addition to the BROS site, Mr. McSherry has H&S oversight responsibilities for the Allied-Sumitomo project which involves the use of a proprietary process to thermally desorb organic contaminants form a mixed-waste stream, as well as for the Times Beach Remediation Project for treatment of dioxin contaminated soils.

PRIOR EXPERIENCE

August, 1991 to May 1993 — **THE ADVENT GROUP, INC.**
DIRECTOR OF HEALTH AND SAFETY SERVICES

Managed the Health and Safety Program for an environmental consulting firm. Provided clients with safety and industrial hygiene services. Projects included HazCom training, exposure monitoring, indoor air quality investigations, and compliance reviews. Industries served included petrochemical, durable goods manufacturing, waste management, hazardous waste remediation and health care. Provided health and safety services for the Whitmoyer Laboratories Site in Meyerstown, PA involving remediation of waste materials heavily contaminated with arsenic.

July 1988 to August 1991 — **CHEMICAL WASTE MANAGEMENT, INC.**
HEALTH AND SAFETY MANAGER

Managed the Health and Safety Program for a hazardous waste site remediation division through a period of rapid growth. Developed and implemented programs to reduce risk. Supervised a staff of two industrial hygienists, a safety trainer, three full time Health and Safety Officers (HSOs), a secretary and up to eight collateral duty HSOs. Reviewed RFPs for H&S requirements. Prepared site-specific H&S Plans. Reviewed operations for hazards and compliance with plans. Managed Medical Surveillance and Workers' Compensation programs. Developed and presented advanced training for Supervisors and HSOs. OSHA Recordables and LWD cases reduced 50%. Projects included numerous Superfund projects including EPA and ACOE managed sites as well as private clean-ups. Remediation methods included removal of

soils contaminated with PCBs, dioxin, metals, pesticides and volatile organics; on-site incineration; mercury building decontamination; removals of bulk flammables and toxics; and leachate trench construction and landfill capping.

April 1986 to July 1988 — **PENNWALT CORPORATION**
CORPORATE INDUSTRIAL HYGIENIST

Assisted plants in implementing Industrial Hygiene programs through site visits, training, exposure surveys and program review. Developed monitoring programs and coordinated the services of IH and medical consultants. Assisted plants in managing asbestos removal projects. Wrote corporate Industrial Hygiene Manual and Guidelines for Asbestos Management.

April 1977 to April 1986 — **US DEPARTMENT OF LABOR - OSHA**
INDUSTRIAL HYGIENIST

Conducted site inspections of workplace safety and health hazards in various industries. Monitored workers' exposures to chemical and physical agents. Recommended corrective approaches and reviewed proposed and operating engineering controls. Led team inspections and supervised the work of other compliance officers.

LES SKOSKI, Ph. D.

EXPERIENCE SUMMARY

Dr. Skoski has over 20 years of management and technical experience in the radiological, mixed, and hazardous waste field. He has managed the execution of RI/FS programs, EIS and SDMP programs, and other environmental and waste investigatory projects for federal government clients (DOE, EPA, NRC) and private clients. Currently he is Project Manager for the BNL BOA for Environmental Engineering Services and serves as Project Manager for an RI/FS at a mixed waste EPA Superfund site (Lodi, New Jersey) and was the Project Manager directing EPA's oversight responsibilities at DOE's Maywood, New Jersey FUSRAP site. He is also Project Director/Manager for Ebasco's work with AlliedSignal Aerospace Company, directing both the radiological and chemical characterization programs, alternatives analysis, conceptual design and future remedial action.

EDUCATION

Ph.D., Physics, New York University - (b)(6)
M.S., Physics, New York University - (b)(6)
B.S., Engineering Physics, New York University

PROFESSIONAL AFFILIATIONS

Health Physics American Nuclear Society
American Association for the Advancement of Science

REPRESENTATIVE EBASCO ENVIRONMENTAL PROJECT EXPERIENCE (Since 1986)

REM III and ARCS II EPA - As Project Manager, Dr. Skoski is responsible for completion of an RI/FS for mixed waste at the EPA Superfund Site in Lodi, New Jersey. This site included a series of former municipal wells contaminated with radiological and chemical constituents. The study encompassed a wide variety of techniques including packer testing, downhole gamma logging, downhole televiewers, and the use of rare earths as indicator species. As project manager for the Phase I effort, Dr. Skoski was responsible for the initial RI/FS and conclusions therein leading to Phase II. The Phase II effort focused on both downhole sidewall cores, radioactive rare earth isotopic ratios as well as typical NORM/secular equilibrium ratios. The RI was completed and approved by EPA. Upon completion of the state's review, a public meeting will be held leading to the Record of Decision (ROD). He was also EPA's Project Manager directing their oversight responsibilities at DOE's Maywood, New Jersey FUSRAP site. EPA's responsibilities include assuring DOE compliance with RCRA, CERCLA, and SARA legislation.

AlliedSignal Teterboro/Sumitomo - As Project Director/Manager for the AlliedSignal Aerospace Company's thorium and radium (mixed/waste NORM) site in Teterboro, New Jersey, he is responsible for the radiological and chemical characterization of the site under New Jersey's ECRA legislation. The site includes diffuse buried NORM waste, buried drums of thorium magnesium slag and chemical contaminants such as solvents, TPH, etc. The site has diverse contaminants, with radioactive and hazardous components. The characterization phase included groundwater, surface water, and soils. Chemical remediation of the site (an FS leading to an RI) is expected to begin in the summer of 1993 using proprietary soil washing reinjection technology. Radiological and PCB contamination remediation has been completed.

REPRESENTATIVE EBASCO ENVIRONMENTAL PROJECT EXPERIENCE (Cont'd)

He is also Project Director of the AlliedSignal Sumitomo Site Investigation. As Project Director, he coordinates the efforts of the Project Manager to produce a cohesive response to the needs of these physically adjacent sites. The contaminants on the Sumitomo Site are similar in nature to the above discussed Teterboro site. The focus of the remediation of the mixed VOC/radium contaminated sites is low-temperature, thermal volatilization followed by disposal.

Principal Investigator and principal author of a resource manual, "Low-Level Radioactive Waste Volume Reduction and Stabilization Technologies Resource Manual" for DOE/ID. Responsible for technical quality of sections dealing with volume reduction (incineration, compactor, evaporators) technologies and solidification (cement and asphalt) system.

Project Manager for the evaluation of the technical basis for the low-level waste form stability testing requirements. The objectives of this study were to investigate potential redundancy and relevance of testing procedures recommended in the draft NRC regulatory guide for demonstrating waste form stability. AIF/NESP submitted this report to the NRC to request the re-evaluation of the recommendations in the draft regulatory guide.

Project Manager for an Edison Electric Institute Mixed Wastes Study, providing an in-depth comparative assessment of EPA's regulations for hazardous waste tank system and comparable NRC nuclear power plant requirements. The purpose of the study is to assist nuclear power plant operations in formulating a compliance strategy for meeting EPA's hazardous waste regulations. Principal Investigator developing a topical report to determine the feasibility of on-site decommissioning of a nuclear generating station encompassing the long-term storage of all statewide generated low-level radioactive waste. Consideration included satisfying 10 CFR 30, 50, and 61 regulatory constraints.

Ronson Metals Corporation, Rare Earth Metal Processing Facility Closure Project - Dr. Skoski is also Radiological Lead for a potential Site Decommissioning Management Plan (SDMP) site in Newark, NJ. The site, a rare earth processor, previously produced mishmetal, the basis for flints. The major contaminant was thorium. Both buildings and surrounding soils were contaminated with thorium residues. The work to-date includes a Phase I characterization. The Phase II detailed delineation and remediation are undergoing NRC review.

Idaho National Engineering Lab-BOA - His DOE expertise also includes management of, or participation in, projects for DOE facilities such as Idaho National Engineering Laboratories, Argonne National Engineering Laboratory, West Valley Demonstration Project and the Savannah River Plant. Examples of his experience included Project Manager for a DOE/EG&G Feasibility Study on concrete longevity under the Low Level Radioactive Waste Program, and principal author of a manual on "Low Level Radioactive Waste Volume Reduction and Stabilization Technologies" under the same program. For FMPC he managed the SARs for waste storage and Plant 2/3 (the refinery). He was also the manager responsible for the radiological portions of three EIS's under the DOE's UMTRAP program.

Savannah River, DOE - He was an instructor in the Environmental Quality Assurance course Ebasco has taught to DOE contractor employees involved in the Savannah River Plant Environmental Surveillance Program. This course covered all aspects of NQA-1 requirements related to environmental investigations, regulatory compliance and program implementations.

PRIOR EXPERIENCE

Project Manager/Senior Physicist for consulting firm of Dames & Moore. Responsible for development and management of radiological and hazardous waste programs for diversified client group. Programs included low-level waste investigations, preparation of environmental impact statements (EISs), environmental reports (ERs), other licensing documents, preparation of remediation programs, preparation of Safety Analysis Reports (SARs), radiological baseline, operations and closure programs, and public hearing participation.

Project Manager/Senior Physicist responsible for domestic and foreign radium/radon related field and office investigations. Responsible for preparing EISs and ERs, and conducting field investigations and regulatory compliance programs for some 20 major uranium mines and mills and secondary uranium producers (phosphate and beryllium). Client list (and facility) includes Anaconda (Bluewater Mill and Jackpile Pagute Mine, N.M.), Exxon (Highlands Mill, WY), Atlas Minerals (Moab Mill, Utah), Energy Fuels (Blandings and Hanksville Project, Utah), Brush Wellman (Lyndell, Utah), Ranchers Exploration (Naturita, Co.), Phillips Uranium (Nose Rock Mill, NM), Union Carbide Corporation (Uravan Mill, Col - Gas Hills Mill, WY), Gardiniar (Tampa Phosphate Facility, Fla.), Mississippi Chemical (Phosphate Facility, Fla.), Minerals Exploration (Sweetwater, Wy. - Anderson Mill, Co.), Brinex Ltd. (Kitts-Michelin Project, Canada), Rossing Uranium Ltd. (Rossing Mill, Namibia - South West Africa), Norranda (Australia).

Project Manager for the radiological portion of the EISs for three inactive mill tailings sites (Durango, Col; Vitro, Utah; Shipprock NM) under the DOEs Uranium Mill Tailings Rehabilitation Action Program (UMTRAP).

Project Manager for a confidential major Midwest chemical manufacturing corporation. Investigated potential migration of thorium into the groundwater from waste piles, determined the nature and extent of contamination, and developed economically-attractive alternative remediation measures.

Project Manager supervising investigation of a radiologically-contaminated Superfund Site (Denver Radium Site). Characterized degree of on-site and off-site contamination, assessed alternative remediation measures, and developed cost-effective remediation plans to return site to unrestricted use.

Project Manager, 10 CFR 61 compliance program for low-level waste for the New York Power Authority's James A Fitzpatrick nuclear generating plant. Developed statistical analysis and data interpretation programs leading to scaling factors used for radionuclide correlation and concentration projections in accordance with established waste classes.

Task Manager of Waste Generation and Project Data Group for low-level radioactive waste disposal studies for the Southeast Interstate Radioactive Waste Management Compact. Developed analytical methodology to project quantities and types for future generation of low-level waste. Performed economic analysis of treatment and disposal practices.

Project Manager coordinating development of a computerized bibliographic database on shallow land burial of non-high level radioactive waste for the Oak Ridge National Laboratory.

Waste Management Group, Inc.- Associate, responsible for performing radiological assessments of radioactive waste disposal facilities (low-level waste and high-level waste), uranium mines and mills, and the preparation of environmental assessments, environmental impact statements and related materials.

PRIOR EXPERIENCE (Cont'd)

Participated in the preparation of the Programmatic Environmental Impact Statement for Three Mile Island, Unit-2 cleanup and decommissioning. Estimated occupation doses from waste transport and evaluated alternatives for disposal of treated wastewater/decontamination solutions.

Co-developed computer program RADMAN, proprietary software developed to assist utilities in compliance with 10 CFR Part 61 low-level waste classification and preparation of waste disposal manifests.

Principal Investigator responsible for development of generic methodology for radiological assessments and impacts for the DOE's FUSRAP program.

PUBLICATIONS

1. Skoski, L., J. Furfaro, 1984, "DEIS - Remedial Actions at the Vanadium Corporation of American Uranium Mill Site, Durango, La Plata County, Colorado", (radiological sections), DOE/EIS-0111D, for US Dept. of Energy UMTRAP Program.

2. Skoski, L., J. Furfaro, 1984, "DEIS - Remedial Actions at the Virtro Corporation Uranium Mill Site, Salt Lake City, Utah, (radiologica sections), DOE/EIS, in prep, for US Dept of Energy UMTRAP Program.

3. Skoski, L., 1983, "Environmental Assessment - Remedial Actions at the Shipprock Uranium Mill Site, Shipprock, New Mexico, (radiological sections), submitted to US Dept. of Energy.

4. Skoski, L., 1984, "Radiological and Radon Assessment of the Tailings Pile, Rossing Uranium Mill," for Rossing Uranium Ltd., Namibia (South West Africa).

5. Skoski, L., 1984, "Review of On-Site Occupational Hygiene Criteria and Recommendations for Off-Site Public Exposures", for Rossing Uranium Ltd., Namibia (South West Africa).

6. Skoski, L., 1984, "Reclamation and Decommissioning Evaluation for the Rossing Uranium Mill", Rossing Uranium Ltd., Namibia (South West Africa).

7. Skoski, L., J. Furfuro, 1983, "Remedial Plan for the Former US Radium Facility, Orange, NJ", for Dughi and Hewitt Attorneys, Westfield, New Jersey.

8. Tappen J., H. Tuchfeld, L. Skoski, R. E. Berlin, 1982, "A Comparative Analysis of the Radiological Impacts Associated with the Processing of Uranium One By Means of Thin-Layer Heap and Conventional Agitation Leach Process," for Holmes and Narvar, Orange, Calif.

9. Berlin, R.E., L. Skoski, 1982, "Methods for Assessing Environmental Impacts of a FUSRAP Property Cleanup/Interim-Storage Remedial Action", Chapter 1 and Appendix B, ANL/EIS-16, US Dept. of Energy.

10. Re G., L. Skoski, 1981, Draft Environmental Impact Statement - Mississippi Chemical Corporation Hardee County Phosphate Mine, Hardee County Fla, for Mississippi Chemical Corporation.

PUBLICATIONS (Cont'd)

11. Skoski L., H. Tuchfeld, 1979, "NRC Source Material License Amendment Information, Expansion of the Highland Uranium Mill to 7000 TPD Capacity", for Exxon Minerals Company USA.

12. Tuchfeld, L. Skoski, 1979, "NRC Source Material License Amendment Information, Expansion of the Highland Uranium Mill to 5000 TPD Capacity", for Exxon Minerals Company USA.

13. Re G., L. Skoski, R. Berlin, 1979, "Analysis of Background and Tailings Pond Radiological Characteristics and the Subsequent Determination of Cover Thickness Requirements for Rio Algon Corp, Lisbon Valley Uranium Mill La Sal Utah", for Rio Algon Corp. Ltd.

14. Re G., J. Tappen, L. Skoski, 1979, "Preliminary Report - Radiation", Hanksville Blandings Project, Utah; for Energy Fuels Nuclear Inc.

15. Tappen J., L. Skoski, 1978, "Supplemental Report Baseline Radiology Environmental Report", White Mesa Project, San Juan County Utah; for Energy Fuels Nuclear, Inc.

16. Re, G., L. Skoski, 1979, "Supplemental Environmental Impact Statement - Uravan Uranium Mill, Radiology", for the Union Carbide Corporation; Uravan, Colorado.

17. Skoski, L., J. Tappen, H. Tuchfeld, 1978, "Radiological Impacts Assessment, Nose Rock Project, McKinley County, New Mexico", for Phillips Uranium Corp.

18. Skoski, L., 1977, "Analysis of Tailings Disposal Alternatives for Union Carbide Corporation Gas Hill, Wy, Uranium Mill", for Union Carbide Corp.

APPENDIX C

HEAT AND COLD STRESS

COLD STRESS

The cold stress TLVs are intended to protect workers from the severest effects of cold stress (hypothermia) and cold injury and to describe exposures to cold working conditions under which it is believed that nearly all workers can be repeatedly exposed without adverse health effects. The TLV objective is to prevent the deep body temperature from falling below 36°C (96.8°F) and to prevent cold injury to body extremities (deep body temperature is the core temperature of the body determined by conventional methods for rectal temperature measurements). For a single, occasional exposure to a cold environment, a drop in core temperature to no lower that 35°C (95°F) should be permitted. In addition to provisions for total body protection, the TLV objective is to protect all parts of the body with emphasis on hands, feet, and head from cold injury.

Introduction

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. The clinical presentations of victims of hypothermia are shown in Table 1. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36°C (96.8°F); lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia, whole body protection must be provided.

1. Adequate insulating dry clothing to maintain core temperatures above 36°C (96.8°F) must be provided to workers if work is performed in air temperatures below 4°C (40°F). Wind chill cooling rate and the cooling power of air are critical factors. [Wind chill cooling rate is defined as heat loss from a body expressed in watts per meter squared which is a function of the air temperature and wind velocity upon the exposed body.] The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required. An equivalent chill temperature chart relating the actual dry bulb air temperature and the wind velocity is presented in Table 2. The equivalent chill temperature should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

2. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

TABLE 1. Progressive Clinical Presentations of Hypothermia*

Core Temperature °C	Core Temperature °F	Clinical Signs
37.6	99.6	"Normal" rectal temperature
37	98.6	"Normal" oral temperature
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss
35	95.0	Maximum shivering
34	93.2	Victim conscious and responsive, with normal blood pressure
33	91.4	Severe hypothermia below this temperature
32	89.6	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases
31	87.8	
30	86.0	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases
29	84.2	
28	82.4	Ventricular fibrillation possible with myocardial irritability
27	80.6	Voluntary motion ceases; pupils nonreactive to light; deep tendon and superficial reflexes absent
26	78.8	Victim seldom conscious
25	77.0	Ventricular fibrillation may occur spontaneously
24	75.2	Pulmonary edema
22	71.6	Maximum risk of ventricular fibrilation
21	69.8	
20	68.0	Cardiac standstill
18	64.4	Lowest accidental hypothermia victim to recover
17	62.6	Isoelectric electroencephalogram
9	48.2	Lowest artificially cooled hypothermia patient to recover

*Presentations approximately related to core temperature. Reprinted from the January 1982 issue of *American Family Physician*, published by the American Academy of Family Physicians.

under such conditions, the outer layer should be water repellent, and the outerwear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a hot environment before entering the cold area, the employee should make sure that clothing is not wet as a consequence of sweating. If clothing is wet, the employee should change into dry clothes before entering the cold area. The workers should change socks and any removable felt insoles at regular daily intervals or use vapor barrier boots. The optimal frequency of change should be determined empirically and will vary individually and according to the type of shoe worn and how much the individual's feet sweat.

3. If exposed areas of the body cannot be protected sufficiently to prevent sensation of excessive cold or frostbite, protective items should be supplied in auxiliary heated versions.
4. If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.
5. Workers handling evaporative liquid (gasoline, alcohol or cleaning fluids) at air temperatures below 4°C (39.2°F) should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of "cryogenic fluids" or those liquids with a boiling point that is just above ambient temperature.

Work–Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below –7°C (19.4°F), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing should be provided as necessary to prevent workers from returning to work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of the diuretic and circulatory effects.

For work practices at or below –12°C (10.4°F) ECT, the following should apply:

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shifts

Air Temperature—Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
–26° to –28°	–15° to –19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4
–29° to –31°	–20° to –24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
–32° to –34°	–25° to –29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
–35° to –37°	–30° to –34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
–38° to –39°	–35° to –39°	40 min	4	30 min	5	Non-emergency work should cease					
–40° to –42°	–40° to –44°	30 min	5	Non-emergency work should cease							
–43° & below	–45° & below	Non-emergency work should cease									

TABLE 2. Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−24	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−32	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−121
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−51	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	*LITTLE DANGER* In < hr with dry skin. Maximum danger of false sense of security				*INCREASING DANGER* Danger from freezing of exposed flesh within one minute.				*GREAT DANGER* Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA

Evaluation and Control

For exposed skin, continuous exposure should not be permi when the air speed and temperature results in an equivalent chill t perature of −32°C (−25.6°F). Superficial or deep local tissue free will occur only at temperatures below −1°C (30.2°F) regardless of v speed.

At air temperatures of 2°C (35.6°F) or less, it is imperative workers who become immersed in water or whose clothing becor wet be immediately provided a change of clothing and be treatec hypothermia.

TLVs recommended for properly clothed workers for periods work at temperatures below freezing are shown in Table 3.

Special protection of the hands is required to maintain mar dexterity for the prevention of accidents:

1. If fine work is to be performed with bare hands for more t 10–20 minutes in an environment below 16°C (60.8°F), spe provisions should be established for keeping the workers' ha warm. For this purpose, warm air jets, radiant heaters (fuel bur or electric radiator), or contact warm plates may be utilized. Me handles of tools and control bars should be covered by therr insulating material at temperatures below −1°C (30.2°F).
2. If the air temperature falls below 16°C (60.8°F) for sedentary, 4 (39.2°F) for light, −7°C (19.4°F) for moderate work, and fine mar al dexterity is not required, then gloves should be used by t workers.

To prevent contact frostbite, the workers should wear anticonta gloves.

1. When cold surfaces below −7°C (19.4°F) are within reach, a war ing should be given to each worker to prevent inadvertent conta by bare skin.
2. If the air temperature is −17.5°C (0°F) or less, the hands should I protected by mittens. Machine controls and tools for use in co conditions should be designed so that they can be handled witho removing the mittens.

Provisions for additional total body protection are required if wo is performed in an environment at or below 4°C (39.2°F). The worke should wear cold protective clothing appropriate for the level of co and physical activity:

1. If the air velocity at the job site is increased by wind, draft, or artif cial ventilating equipment, the cooling effect of the wind should t reduced by shielding the work area or by wearing an easily remov able windbreak garment.
2. If only light work is involved and if the clothing on the worker ma become wet on the job site, the outer layer of the clothing in us may be of a type impermeable to water. With more severe wor

Notes to Table

* 1. Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods of ten (10) minutes in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour work period in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at −35°C (−30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m^2; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m^2. In general, the warmup schedule provided above slightly undercompensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges because windy conditions rarely prevail at extremely low temperatures.
4. TLVs apply only for workers in dry clothing.

*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

1. The worker should be under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods should be taken in heated shelters and opportunity for changing into dry clothing should be provided.
3. New employees should not be required to work fulltime in the cold during the first days of employment until they become accustomed to the working conditions and required protective clothing.
4. The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.
5. The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
6. The workers should be instructed in safety and health procedures. The training program should include as a minimum instruction in:
   a. Proper rewarming procedures and appropriate first aid treatment.
   b. Proper clothing practices.
   c. Proper eating and drinking habits.
   d. Recognition of impending frostbite.
   e. Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
   f. Safe work practices.

Special Workplace Recommendations

Special design requirements for refrigerator rooms include the following:

1. In refrigerator rooms, the air velocity should be minimized as much as possible and should not exceed 1 meter/sec (200 fpm) at the job site. This can be achieved by properly designed air distribution systems.
2. Special wind protective clothing should be provided based upon existing air velocities to which workers are exposed.

Special caution should be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow and/or ice-covered terrain should be supplied. Special safety goggles

to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace monitoring is required as follows:

1. Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16°C (60.8°F) so that overall compliance with the requirements of the TLV can be maintained.
2. Whenever the air temperature at a workplace falls below –1°C (30.2°F), the dry bulb temperature should be measured and recorded at least every 4 hours.
3. In indoor workplaces, the wind speed should also be recorded at least every 4 hours whenever the rate of air movement exceeds 2 meters per second (5 mph).
4. In outdoor work situations, the wind speed should be measured and recorded together with the air temperature whenever the air temperature is below –1°C (30.2°F).
5. The equivalent chill temperature should be obtained from Table 2 in all cases where air movement measurements are required; it should be recorded with the other data whenever the equivalent chill temperature is below –7°C (19.4°F).

Employees should be excluded from work in cold at –1°C (30.2°F) or below if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below –24°C (–11.2°F) with wind speeds less than five miles per hour, or air temperatures below –18°C (0°F) with wind speeds above five miles per hour, should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissues in addition to providing for first aid treatment.

APPENDIX D

HOT WORK PERMIT

EBASCO ENVIRONMENTAL

BURNING/CUTTING/WELDING PERMIT

Date Issued: _____ Permit Number: _____
Valid Through: _____

Work Area: _____
Activity: _____

Potential Hazards	Safety Requirements	Monitoring Requirements
☐ Burn (Skin/Eye)	☐ Fire Extinguishers	☐ Combustible gas (%)
☐ Fire	☐ Keep Area Clean	☐ Oxygen (%)
☐ Sparks	☐ Combustibles moved 30-40 ft away or covered with appropriate shielding	☐ Organic Vapours (ppm)
☐ Heat	☐ Burning goggles	☐ None
	☐ Welders mask	
	☐ Face shield	
	☐ Leather work gloves	
	☐ Pre-inspect equipment	
	☐ Welding Screen	
	☐ Level of Protection:	

_____
_____
_____
_____

I certify that he location where the above work is to be done has been personally examined. The required precautions for safe burning/cutting/welding as listed above have been checked.

_____ _____
Supervisor Print Name

_____ _____
Health and Safety Print Name

I have been properly instructed for safe burning/cutting/welding and understand my duties.

_____ _____
Welder Print Name

APPENDIX E

HAZARD COMMUNICATION PROGRAM

1.0 PURPOSE

The purpose of this procedure is to familiarize employees with the dangers involved in the use of hazardous or potentially hazardous chemicals in the workplace. This procedure is intended as a reference for both new and current employees. This procedure shall be read and understood by all new employees prior to the conduct of any work requiring the use of or the potential for exposure to hazardous chemicals.

2.0 SCOPE

The Hazard Communication Standard applies to all employers engaged in a business where chemicals are either used or produced for distribution. Although the Ebasco Environmental Division (EED) does not produce chemicals, many EED projects require the use of chemicals. This procedure refers to any hazardous chemical known to be present at the workplace in such a manner that employees may be exposed under normal working conditions or in a foreseeable emergency. This procedure does not apply to hazardous wastes, only to chemicals brought on site by EED or their subcontractors.

The contents of this procedure shall constitute the basis for the EED Hazards Communication Program. Employees shall, at least annually, be trained in this procedure.

Copies of this procedure shall be made available to all EED employees, their representatives, subcontractors and any other parties with a demonstrated need for the information. Copies are maintained by the Health and Safety Officer (HSO) at all project locations where the potential for use or storage of hazardous chemicals exists, and with the Health and Safety Coordinator (HSC) for each office.

3.0 DEFINITIONS

Chemical Manufacturer - a work place where chemical(s) are produced for use or distribution.

Exposed Worker - any worker subjected to a hazardous chemical in the workplace through any route of entry (inhalation, ingestion, skin contact, absorption, etc.).

Foreseeable Emergency - any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that could result in an uncontrolled release of a hazardous chemical into the workplace.

Hazardous Chemical - any chemical that constitutes a physical hazard or a health hazard. Chemicals with a label containing the words CAUTION, WARNING or DANGER indicate the chemical is hazardous. Consumer products are not considered hazardous where it can be demonstrated that the product is used in the workplace in the same manner as for normal consumer use.

Material Safety Data Sheet (MSDS) - written or printed material describing characteristics, hazards, and controls associated with a specific chemical or combination of chemicals.

Work Area - a room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

4.0 RESPONSIBILITIES

4.1 HEALTH AND SAFETY DIRECTOR (HSD)

The HSD oversees the Hazard Communication Program described in this procedure, approves any revisions to this procedure, and may audit implementation of the program on projects.

4.2 REGIONAL HEALTH AND SAFETY MANAGER (RHSM)

Each EED RHSM implements the Hazard Communication Program within his or her respective region. The RHSM may audit implementation of the program on projects.

4.3 HEALTH AND SAFETY COORDINATOR (HSC)

The HSC designates a Health and Safety Officer (HSO) to provide Hazard Communication training to EED personnel, subcontractors and others as appropriate. The HSC ensures that all training material meets the requirements of 29 CFR 1910.1200 and also ensures that copies of the Hazard Communication Standard are made available to all appropriate employees and to all EED field offices where applicable.

4.4 HEALTH AND SAFETY OFFICER (HSO)

The HSO is responsible for the training of all EED, subcontractor and other personnel as appropriate. He or she organizes, presents, and schedules each training session and

monitors the levels of understanding and adjusts the training accordingly. The HSO assures that appropriate MSDS are available for hazardous materials used on site.

4.5 EMPLOYEES

Employees who procure or authorize the procurement of hazardous material must ensure the vendor provides a MSDS and that the HSC or HSO receive the MSDS to include with the site-specific health and safety plan (HASP).

5.0 PROCEDURES

Hazard Communication Standard is the name for the Occupational Safety and Health Act (OSHA 29 CFR 1910.1200), which implements the portion of the Worker and Community Right to Know Act related to the work place. The Standard sets requirements for information and training on hazardous chemicals used in the work place. Federal law requires all states to comply with hazard communication regulations, and many states and local governments have adopted their own "equally or more stringent" hazard communication standards. It is important, therefore, to consult applicable state and local standards when conducting projects in states that have their own standards. The following are guidelines for complying with the federal Hazard Communication Standard.

5.1 LABELING

The Hazard Communication Standard requires that the employer ensure the following:

1. Ensure that each container of hazardous chemicals in the work place is labeled, tagged, or marked with the following information:

   a. Identity of the hazardous chemical(s)

   b. Appropriate hazard warnings

   c. Name and address of the chemical manufacturer, importer, or other responsible party.

2. Ensure that existing labels on incoming containers of hazardous chemicals are not removed or defaced, unless the container is immediately marked with the required information.

3. Ensure that labels or other forms of warning are legible, are in English, and are prominently displayed on the container, or readily available in the work area throughout each work shift.

4. Ensure that employees are apprised of the hazards of the chemicals in their workplace in accordance with the standard.

5.1.1 Label Warning Systems

The types of common label warning systems are:

1. The National Fire Protection Association (NFPA) Standard defines five degrees of hazard in each of three categories: Emergency health hazard, fire hazard, and instability or reactivity hazard. This system is primarily to signal degrees of hazard in case of a spill or acute exposure. Attachment A includes an example of a National Fire Protection Association (NFPA) sample warning sign.

2. The Consumer Product Safety Commission requires precautionary labeling on every hazardous chemical intended for household use. Basic precautionary information and labeling terms have been identified by the Manufacturing Chemists Association including the following:

   - toxic
   - highly toxic
   - flammable
   - extremely flammable
   - corrosive
   - irritant
   - poison.

3. The Department of Transportation (DOT) requires shipping containers of hazardous chemicals to be labeled appropriately, i.e., their hazardous

characteristics are to be prominently displayed on the containers. Such characteristics include the following:

- poison
- flammable liquid
- flammable gas
- corrosive
- irritant
- explosives
- radioactive materials.

All EED projects shall use the NFPA system for labeling containers that are not already appropriately labeled by the manufacturer. This includes containers that are general use (e.g., gasoline cans) and containers that have materials transferred to them from original containers.

5.1.2 Personal Responsibilities

It is important to understand the hazards involved when using chemicals. Once hazard communication training has been provided, it becomes the direct responsibility of the user to familiarize himself or herself with the specific chemical to be used and its hazards. Personnel using or handling any chemical shall follow these steps when handling chemicals:

1. Read the label on the container. If special instructions are provided, they usually will be part of the label.
2. Look for information concerning special precautions for personal protection.
3. Note appropriate first aid in case of an exposure.
4. Become familiar with the various types of labels and their warnings.

5. Consult the HASP for further warnings or requirements.

5.1.3 Specific Labeling Requirements

Hazardous substances that have specific labeling requirements under other standards include the following:

- carcinogens
- lead
- asbestos
- hydrogen, oxygen and anhydrous ammonia
- cotton dust
- coke oven emissions
- formaldehyde.

5.2 Material Safety Data Sheets (MSDS)

The MSDS is used to relay chemical hazard information from the manufacturer/importer to the employer and employee. The Hazard Communication Standard requires an MSDS for each hazardous material product an employee packages, handles, or transfers. Attachment B includes a copy of an OSHA MSDS that may be used as an example. The Hazard Communication Standard does not require a MSDS sheet for hazardous chemicals present as contaminants at a hazardous, mixed waste, or radioactive site. Only those hazardous chemicals brought onto the job site by the contractor are required to have an MSDS sheet. However, the site-specific HASP will contain similar information on the known or potential contaminants in the hazard assessment section.

5.2.1 MSDS Contents

MSDS that are received with incoming shipments of hazardous chemicals shall be maintained in an on-site file by the HSO at the site and shall be made available to all site employees. Each MSDS shall include the following information:

- trade name of the chemical (if appropriate)
- name, address, and telephone number for hazard and emergency information
- date of MSDS preparation
- chemical and common name of all ingredients
- Occupational Safety and Health Administration (OSHA) permissible exposure limits (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV) and other applicable limits
- physical and chemical characteristics
- physical hazards
- primary route(s) of entry into the body, such as inhalation, ingestion, or skin absorption
- acute and chronic health hazards, including signs and symptoms of exposure and medical conditions aggravated by exposure
- carcinogenic hazards
- emergency and first aid procedures
- precautions for safe handling and use
- engineering/exposure control measures and personal protective equipment.

Upon receipt of a MSDS (with a shipment of chemicals or otherwise) the following steps shall be performed:

1. The MSDS is given to the on-site HSO, who inspects it for completeness (above). If incomplete, the MSDS is returned to the manufacturer with a request for a complete version (see Attachment C).
2. The HSO incorporates a copy of the complete MSDS into the site project file.

3. If a revised version of a MSDS is received, the old version of the MSDS is stapled to the revised MSDS and placed in the site project file.

In the event that a MSDS is not received with a shipment of chemicals, a letter requesting an MSDS is sent to both the supplier and the manufacturer of the product and followed up with a telephone call. Copies of all letters and telecons are retained as site project records.

MSDS are a good source of information for those seeking quick hazardous material references. In the case of emergencies, however, not all of the pertinent information is provided and at times the information may be more damaging than helpful. Response to any emergency requires quick judgement calls. If there is any question of which first aid procedures to follow, it is best to call the emergency number provided on each MSDS specific to the material in question.

5.3 Hazard Communication Standard Training

Hazard Communication Training shall be provided as part of the health and safety training discussed in Procedure HS-1. Documentation is maintained for each employee trained in hazard communication. This documentation may be an initial training certificate and copy of the training or a site-specific training form. When a new chemical is brought into the workplace, a chemical training program for both new and experienced employees shall be held.

5.3.1 Training Elements

There are two required elements of the training program:

1. Information - Employees are informed of the following:
   - The Hazard Communication Standard requirements
   - any operations in their work areas that involve hazardous materials
   - the location and availability of the written Hazard Communication Program, including the list(s) of hazardous chemicals and MSDS.
2. Training - Employees who are exposed or potentially exposed to hazardous materials are trained in the following:

- detecting the presence or release of hazardous chemicals
- being aware of the physical and health hazards of hazardous chemicals in the work area
- protecting themselves through work practices, emergency procedures, and personal protective equipment.

Specific components of the hazard communication training include the following:

- how to obtain information from MSDS
- how to read the warnings on container labels
- how to identify the presence of release of hazardous chemicals
- when and how to report leaks and spills
- how to recognize the symptoms of overexposure and how to protect against it
- how to implement exposure control methods including work practices, engineering controls, administrative controls, personal protective equipment, and emergency procedures
- where to get more information including the locations of the written Hazard Communication Standard, lists of hazardous chemicals, and MSDS.

Attachment E provides a hazard communication checklist that may be used to ensure that the training is in compliance with the Hazard Communication Standard.

5.3.2 Nonroutine Training

In the event that a new or infrequent task is delegated to an employee or a new hazard is introduced to his or her area the HSO shall conduct additional training that includes the following:

- objectives of the task

- physical and health hazards associated with the task as well as those of the chemicals involved
- methods to detect the presence or release of the hazardous chemicals
- procedures and practices recommended to protect themselves from the hazards
- emergency procedures in the event of a hazardous situation or exposure
- location and availability of the written program, lists of chemicals, and MSDS.

5.4 SUBCONTRACTORS

Subcontractors working for EED shall be required to meet the safety and health requirements outlined in their contracts. To help meet these requirements, subcontractors are informed of EED procedures by the HSO and instructed on where to find information on hazardous materials being used on the project.

Laboratories contracted by EED are informed by the HSO of the potential hazard involved with any sample suspected of being a problem or of a hazardous nature. Warning information will also be included in the sample data sheet and chain-of-custody form.

6.0 REFERENCES

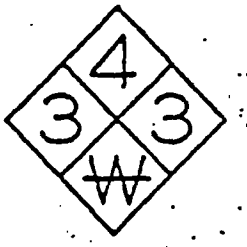
1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), 29 CFR 1910.1200—Hazard Communication.

7.0. ATTACHMENTS

Attachment A -	EXAMPLE OF THE NFPA HAZARDOUS MATERIAL WARNING SIGN
Attachment B -	EXAMPLE AND EXPLANATION OF AN MSDS
Attachment C -	LETTER TO SUPPLIER OR MANUFACTURER
Attachment D -	LIST OF INCOMPATIBLE CHEMICALS
Attachment E -	HAZARD COMMUNICATION CHECKLIST

Attachment A

EXAMPLE OF THE NFPA HAZARDOUS MATERIAL WARNING SIGN



IDENTIFICATION OF THE FIRE HAZARDS OF MATERIALS

Identification of Health Hazard Color Code: BLUE		Identification of Flammability Color Code: RED		Identification of Reactivity (Stability) Color Code: YELLOW	
	Type of Possible Injury	Susceptibility of Materials to Burning		Susceptibility to Release of Energy	
Signal		Signal		Signal	
4	Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given.	4	Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily.	4	Materials which in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.	3	Liquids and solids that can be ignited under almost all ambient temperature conditions.	3	Materials which in themselves are capable of detonation or explosive reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.
2	Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.	2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.	2	Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.
1	Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.	1	Materials that must be preheated before ignition can occur.	1	Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.
0	Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.	0	Materials that will not burn.	0	Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.

Attachment B

EXAMPLE AND EXPLANATION OF AN MSDS

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name	Emergency Telephone Number
Address (Number, Street, City, State, and ZIP Code)	Telephone Number for Information
	Date Prepared
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)

Section III — Physical/Chemical Characteristics

Boiling Point		Specific Gravity (H_2O = 1)	
Vapor Pressure (mm Hg.)		Melting Point	
Vapor Density (AIR = 1)		Evaporation Rate (Butyl Acetate = 1)	

Solubility in Water

Appearance and Odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL

Extinguishing Media

Special Fire Fighting Procedures

Unusual Fire and Explosion Hazards

Section VII - provides precautions for a safe handling and use of the chemical, explaining what to do if there is a spill, leak or any accidental release, the waste disposal methods to be taken, and any precautions in the handling and storage of the chemical.

Section VIII - describes the protective clothing and equipment (e.g., respiratory, gloves, eye protection) that should be used with the chemical as well as the appropriate work/hygienic practices.

Many of the terms used in MSDS can be abbreviated and are technical in nature. A glossary of common terms used in MSDS can be used as an aid in comprehension.

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable		

Incompatibility (*Materials to Avoid*)

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

Section VI — Health Hazard Data

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

Health Hazards (*Acute and Chronic*)

Carcinogenicity: NTP? IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure

Medical Conditions
Generally Aggravated by Exposure

Emergency and First Aid Procedures

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing

Other Precautions

Section VIII — Control Measures

Respiratory Protection (*Specify Type*)

Ventilation	Local Exhaust	Special
	Mechanical (*General*)	Other

Protective Gloves	Eye Protection

Other Protective Clothing or Equipment

Work/Hygienic Practices

* USGPO 1986-491-529/45775

MATERIAL SAFETY DATA SHEETS

The following is provided to aid in the understanding of a Material Safety Data Sheet (MSDS). Review the following for a section-by-section layout of how information should be presented in a MSDS.

Section I - gives the identity of the chemical as it is on the label. Included is the name and address of the company that makes or imports the chemical, the emergency phone numbers to call for emergency or additional information, and the date the MSDS was prepared.

Section II - shows where you will find the hazardous component, chemical identification, and common names. Worker exposure limits to the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) and ACGIH threshold limit values (TLVs) and other recommended safe exposure limits are included. Even if the chemical makeup is a trade secret the safety precautions are still given.

Section III - describes the physical and chemical characteristics of the hazardous chemical, which can be complicated. If there is uncertainty, a supervisor or a glossary of common terms should be consulted for a better understanding of how these items could effect you in different work situations.

- The boiling point and melting point is where a liquid at a certain temperature will change from liquid to breathable gas.
- Vapor pressure, vapor density, and evaporation rate are especially important for toxic gases and vapors.
- Solubility in water and specific gravity tells you if a chemical will dissolve in water, sink or float.

Section IV - helps judge the risk of fires and explosions. The flash point refers to the minimum temperature needed to initiate explosive conditions. Flammability limits indicate the concentration of the substance in the form of a gas or vapor that is needed for the gas or vapor ignite. It also gives instructions as to what to use (water, CO_2, foam, etc.) to put out a fire and any special hazards associated with the fire fighting procedures.

Section V - reveals the reactivity of the chemical, i.e., under what conditions it is stable or not stable. The data indicate how possible reactions may be reduced and describes spill prevention and storage precautions.

Section VI - describes the chemical's primary route(s) of entry into the body (e.g., inhalation, ingestion) and presents exposure symptoms (e.g., headaches, nausea, dizziness and rashes. Some effects occur right after exposure (e.g., a skin burn, while others have long-term or chronic effects (e.g., cancer). It also tells of existing conditions such as asthma that can be made worse by exposure to the chemical. Lastly, first aid procedures are offered should you be exposed and become ill or injured.

Attachment C

LETTER TO SUPPLIER OR MANUFACTURER

EBASCO

99/99/99

EXAMPLE OF LETTER REQUESTING ADDITIONAL INFORMATION FOR A MSDS

EBASCO Environmental
143 Union Blvd. Suite 1010
Lakewood, Colorado 80228

Manufacturer Name
Street Number
City, State Zip Code

Dear Sirs:

We recently received a shipment of chemicals from your firm that was deficient in the following:

____ No MSDS was present for the chemicals received.

____ The MSDS received did not contain adequate information.

Listed below are the products requiring the above information. Pursuant to 29 CFR 1910.1200 I respectfully request that the appropriate MSDS for these items be sent to the above address, marked to my attention. Your cooperation is greatly appreciated.

Sincerely,

EBASCO Environmental

Attachment D

LIST OF INCOMPATIBLE CHEMICALS

TABLE 2 Classes of Incompatible Chemicals[a]

A	B
Acids	Bases
Alkali and alkaline earth metals	Water
carbides	Acids
hydrides	Halogenated organic compounds
hydroxides	*Oxidizing Agents*[b]
oxides	Chromates, dichromates, CrO_3
peroxides	Halogens
	Halogenating agents
	Hydrogen peroxide and peroxides
	Nitric acid, nitrates
	Perchlorates and chlorates
	Permanganates
	Persulfates
Inorganic azides	Acids
	Heavy metals and their salts
	Oxidizing agents[b]
Inorganic cyanides	Acids, strong bases
Inorganic nitrates	Acids
	Metals
	Nitrites
	Sulfur
Inorganic nitrites	Acids
	Oxidizing agents[b]
Inorganic sulfides	Acids
Organic compounds	*Oxidizing agents*[b]
Organic acyl halides	Bases
	Organic hydroxy compounds
Organic anhydrides	Bases
	Organic hydroxy compounds
Organic halogen compounds	Aluminum metal
Organic nitro compounds	Strong bases
Powdered metals	Acids
	Oxidizing agents[b]

[a]Chemicals in columns A and B should be kept separate.
[b]Oxidizing agents include the types of compounds listed in the entry for alkali and alkaline earth metals, etc.

Source: CRC Handbook of Laboratory Safety (1990)

TABLE 3 Specific Chemical Incompatibilities [a]

A	B
Acetylene and monosubstituted acetylene (R—C≡CH)	Halogens Group IB and IIB metals and their salts
Ammonia and NH_4OH	Halogens Halogenating agents Silver Mercury
Carbon, activated	*Oxidizing agents*[b]
Hydrogen peroxide	Metals and their salts
Nitric acid	Metals Sulfuric acid Sulfides Nitrites, other reducing agents Chromic acid and chromates Permanganates
Mercury and its amalgams	Ammonia and NH_4OH Nitric acid Acetylene Sodium azide
Oxalic acid	Silver Mercury
Phosphorus (yellow)	Oxygen *Oxidizing agents*[b] Strong bases
Phosphorus pentoxide	Water Halogenating agents
Sulfuric acid	Metals Chlorates Perchlorates Permanganates Nitric acid

[a]Chemicals in columns A and B should be kept separate.
[b]Oxidizing agents include the types of compounds listed in the entry for alkali and alkaline earth metals, etc.

Attachment E

HAZARD COMMUNICATION CHECKLIST

HAZARD COMMUNICATION CHECKLIST

____ 1. Have we prepared a list of all the hazardous chemicals in our workplace?

____ 2. Are we prepared to update our hazardous chemical list?

____ 3. Have we obtained or developed a material safety data sheet (MSDS) for each hazardous chemical we use?

____ 4. Have we developed a system to ensure that all incoming hazardous chemicals are checked for proper labels and MSDS?

____ 5. Do we have procedures to ensure proper labeling or warning signs for containers that hold hazardous chemicals?

____ 6. Are our employees aware of specific information and training requirements of the Hazard Communication Standard?

____ 7. Are our employees familiar with the different types of chemicals and the hazards associated with them?

____ 8. Have our employees been informed of the hazards associated with performing nonroutine tasks?

____ 9. Do our employees understand how to detect the presence or release of hazardous chemicals in the workplace?

____ 10. Are employees trained about proper work practices and personal protective equipment in relation to the hazardous chemicals in their work areas?

____ 11. Does our training program provide information on appropriate first aid, emergency procedures, and the likely symptoms of overexposure?

____ 12. Does our training program include an explanation of labels and warnings that are used in each work area?

____ 13. Does the training describe where to obtain data sheets and how employees may use them?

____ 14. Have we worked out a system to ensure that new employees are trained before beginning work?

____ 15. Have we developed a system to identify new hazardous chemicals before they are introduced into a work area?

____ 16. Do we have a system for informing employees when we learn of new hazards associated with a chemical we use?

APPENDIX F

OSHA POSTER

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $7,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations.

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration

(Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.)

APPENDIX G

NRC POSTER

NRC FORM 3
(6-93)

WHAT IS THE NUCLEAR REGULATORY COMMISSION?

The Nuclear Regulatory Commission is an independent Federal regulatory agency responsible for licensing and inspecting nuclear power plants and other commercial uses of radioactive materials.

WHAT DOES THE NRC DO?

The NRC's primary responsibility is to ensure that workers and the public are protected from unnecessary or excessive exposure to radiation and that nuclear facilities, including power plants, are constructed to high quality standards and operated in a safe manner. The NRC does this by establishing requirements in Title 10 of the Code of Federal Regulations (10 CFR) and in licenses issued to nuclear users.

WHAT RESPONSIBLILITY DOES MY EMPLOYER HAVE?

Any company that conducts activities licensed by the NRC must comply with the NRC's requirements. If a company violates NRC requirements, it can be fined or have its license modified, suspended or revoked.

Your employer must tell you which NRC radiation requirements apply to your work and must post NRC Notices of Violation involving radiological working conditions.

WHAT IS MY RESPONSIBILITY?

For your own protection and the protection of your co-workers, you should know how NRC requirements relate to your work and should obey them. If you observe violations of the requirements or have a safety concern, you should report them.

WHAT IF I CAUSE A VIOLATION?

If you engaged in deliberate misconduct that may cause a violation of the NRC requirements, or would have caused a violation if it had not been detected, or deliberately provided inaccurate or incomplete information to either the NRC or to your employer, you may be subject to enforcement action.

HOW AM I PROTECTED FROM DISCRIMINATION?

If you believe that you have been discriminated against for bringing violations or safety concerns to the NRC or your employer, you may file a complaint with the U.S. Department of Labor pursuant to Section 211 of the Energy Reorganization Act of 1974 (42 U.S.C. 5851). Your complaint must describe the firing or discrimination and must be filed within 180 days of the occurrence.

Send complaints to:

Office of the Administrator
Wage and Hour Division, Room S3502
Employment Standards Administration
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210

or any local office of the Department of Labor, Wage and Hour Division. Check your telephone directory under U.S. Government listings.

WHAT CAN THE DEPARTMENT OF LABOR DO?

The Department of Labor will notify the employer that a complaint has been filed and will investigate the case.

If the Department of Labor finds that your employer has unlawfully discriminated against you, it may order that you be reinstated, receive back pay, or be compensated for any injury suffered as a result of the discrimination.

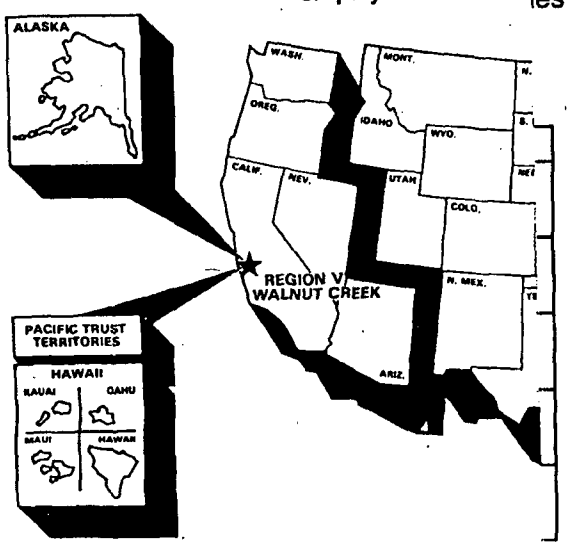
WHAT WILL THE NRC DO?

The NRC may assist the Department of Labor in its investigation. NRC may conduct its own investigation where necessary to determine whether unlawful discrimination has occurred.

Also if the NRC or Department of Labor finds that unlawful discrimination has occurred, the NRC may issue a Notice of Violation to your employer, impose a fine, or suspend, modify, or revoke your employer's NRC license.

U

A representative of the Nu llect telephone calls from
employees who wish les and regulations.



To report incidents involving
fraud, waste, or abuse
by an NRC employee
or NRC contractor,

telephone:

OFFICE OF THE INSPECTOR GENERAL

HOTLINE

1-800-233-3497

GPO · 1993 O – 352-628

APPENDIX H

MEDICAL DATA SHEET

MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all on-site personnel and will be kept in the Command Post during the conduct of site operations. It is in no way a substitute for the Medical Surveillance Program requirements consistent with the Enserch Environmental Corporate Health and Safety Program for Hazardous Wastes Sites. This data sheet will accompany any personnel when medical assistance is required or if transport to hospital facilities is required.

Project: Engelhard Corporation, Plainville, Massachusetts Site

Name: _____

Address: _____

Age: _____ Height: _____ Weight: _____

Emergency Contact Name and Phone Number:

_____

Allergies: _____

Particular Sensitivities: _____

_____

Do You Wear Contact Lenses?: _____

Are You Currently Taking Any Medications?: _____

_____

Do You Have Any Medical Restrictions?: _____

_____

_____

APPENDIX I

ACTION LEVEL DECISION LOGIC

Decision Logic

Table A presents the results of the characterization of the inside of the Engelhard Corporation facility[1]. Each entry in the table is the average for each characterized area. The table does not include results from cracks and crevices and pipes and drains.

The dust action level is based on the average level of contamination. The average alpha activity is 19 dpm/100 cm^2 and the average beta activity is 2165 dpm/100 cm^2. The three uranium isotopes (U-234, U-235, and U-238) are alpha emitters. U-235 and U-238 decay to short-lived beta emitters (thorium-231 for U-235 and thorium-234 and protactinium-234m for U-238). These short-lived isotopes would be in secular equilibrium with their parents. In secular equilibrium, the activity of the daughter equals the activity of the parent. Therefore, for setting the dust action level, the beta activity results were applied to the alpha emitting uranium isotopes.

The three dose conversion factors for the uranium isotopes, taken from the USEPA[2], are as follows:

U-234:	3.58×10^{-5} Sv/Bq
U-235:	3.32×10^{-5} Sv/Bq
U-238:	3.20×10^{-5} Sv/Bq

The dose per unit activity from the daughters are less than one-tenth of one percent the dose per unit activity of the parent and have been ignored.

The dust action level is based on the dose factor for U-235, the highest value for an isotope with a beta emitter in secular equilibrium, and the following assumptions:

1. Walls and floors are scabbled to a depth of 1 cm during decontamination.
2. Decontamination workers are limited to 1 mSv/yr (100 mrem/yr) of dose equivalent.
3. The walls and floors have a density of 2400 mg/cm^3, a nominal value for concrete.
4. The inhalation rate for heavy work is 0.02 m^3/min.
5. Except for cracks and crevices, the contamination is surficial.

---

[1] Berlin, R.E., W. Duggan, and J. Memin, 1994. *Draft Radiological Survey of Interior of Plainville, Massachusetts Plant of Engelhard Corporation*, May.

[2] U.S. Environmental Protection Agency, 1988. *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion*, Federal Guidance Report No. 11, EPA-520/1-88-020, Washington, DC.

The dust action level, X mg/m^3 is determined by:

[(1/1 cm * 2165 dpm/100 cm^2 * 1 Bq/60 dpm)/ 2400 mg/cm^3] * X mg/m^3 * 0.02 m^3/min * 60 min/hr * 2000 hr/yr * 3.32 x 10^{-5} Sv/Bq $\leq$ 1 x 10^{-3} Sv/yr
X = 77 mg/m^3

The value for X, 77 mg/m^3, represents the action level for radiological concerns only. The dust action level is the limiting level for both radiological and nonradiological concerns. In this case, the action levels are set at 5.0 and 2.5 mg/m^3 for nonradiological concerns (*i.e.*, nuisance dust).

For monitoring personnel when leaving the exclusion zone, an alpha scintillation probe is to be used. The action level for the probe is 50 times the ratio of the active area of the probe and 100 cm^2. The action is that the individual must decontaminate the affected area.

The action level is based on the surface release standard in the U.S. Nuclear Regulatory Commission Regulatory Guide 1.86, *Decontamination for release for Unrestricted Use.* The standard for removable uranium contamination is 1000 dpm/100 cm ^{2}. This is for building surfaces and equipment. To develop a value for personnel, one-tenth this value, or 100 dpm/100 cm ^{2} is used. Assuming an efficiency for the probe of 50 percent, 100 dpm translates into 50 cpm. This value is modified by the ratio of the area of the probe and 100 cm^2 to arrive at the action level.

Table A. Engelhard Corporation Characterization Results

Alpha Activity, dpm/100 cm^2	Beta Activity, dpm/100 cm^2
0	197
0	220
17	122
104	1880
13	1996
36	16642
14	2150
7	1026
0	1853
9	33
0	26
80	0
3	0
2	0
6	893
17	1063
56	827
1	2694
24	483
25	14362
11	599
16	2280
2	440
443	49786
19.26087	2164.609

APPENDIX J

DECONTAMINATION CERTIFICATE

SUBJECT: Engelhard Corporation, Plainville, Massachusetts Site
Decontamination of Equipment

EQUIPMENT ID: _____

_____

_____

_____

Dear Sir/Madam:

The above referenced equipment was decontaminated on (Date:_____) in accordance with the procedures in Section 10.3 of the site Health and Safety Plan.

Sincerely,

_____
Engelhard Project Site
Health and Safety Officer or
Health Physicist

_____
Engelhard Project Site
Site Manager

cc: Site Health and Safety File

APPENDIX K

ACCIDENT/INCIDENT REPORT

EBASCO ENVIRONMENTAL
A Division of Ebasco Services Incorporated

☐ Recordable ☐ Non-Recordable

ACCIDENT/INCIDENT REPORT

☐ Original Submittal ☐ Correction Submittal	Report Prepared By (please print):	Date Prepared:
Project:	Project Location (Address, City, State, Zip):	

Involved Employee Name (Last, First, M.I.):			Social Security No.:		Severity of Injury/Illness 0 First Aid 1 Medical 2 Lost Time 3 Fatal 4 Non-Industrial	Lost Work Days: Est.: Actual: Restricted Work Days: Est.: Actual:
Sex: M or F	Age:	Date Reported:	Accident Date:	Accident Time (Military):		

Home Address: _____
Street
_____ Phone: (___) _____
City State Zip

Company Name:	Department:	Work Phone: ( )
Regular Job Title:	Supervisor:	
Time on Job: Years: Months	Time Employed: Years: Months:	Experience: Years: Months:

Witnesses to Incident:

1. Name: _____ Company: _____
   Address: _____
   Home Phone: ( ) _____ Work Phone: ( ) _____
2. Name: _____ Company: _____
   Address: _____
   Home Phone: ( ) _____ Work Phone: ( ) _____

If Hospitalized:

Name of Hospital: _____ Phone: (___) _____
Address: _____
Street City State Zip

Physician's Name: _____ Phone: (___) _____
Address: _____
Street City State Zip

Property Damage (describe property damaged and dollar estimate of damage):

_____
_____
_____
_____

ACCIDENT/INCIDENT REPORT (cont.)

Narrative Report of Accident/Incident (include date, time, location, etc.):

Causative Factors of Accident/Incident (i.e., training, carelessness, faulty equipment, weather conditions, etc.):

Use Space Below to Map Location of Accident/Incident (include landmarks such as well number, borehole number, cross street names, section number, etc.):

ACCIDENT/INCIDENT REPORT (cont.)

Additional Information:

Report Prepared By: _____ **Date:** _____
Signature

Accident/Incident Investigation Participants:

1. **Name:** _____ **Date:** _____
Print Signature

2. **Name:** _____ **Date:** _____
Print Signature

3. **Name:** _____ **Date:** _____
Print Signature

ACCIDENT/INCIDENT REPORT FOLLOW-UP

Date: _____

Name of Involved Employee:

_____
First Middle Last

Date of Accident/Incident: _____ **Project:** _____

Actions Taken to Prevent Recurrence:

_____

_____

_____

_____

_____

Outcome of Incident:

_____

_____

_____

_____

_____

_____

_____

Physician's Recommendations (attach return-to-work form if available):

_____

_____

_____

_____

Follow-up Report Prepared By:

_____ _____
Print Clearly Signature

Attach any additional information to this form.

Incident Analysis (circle one from each category):

Worker Class
1 technician
2 assistant
3 associate
4 engineer
5 other

Craft
01 administration
02 driller
03 laborer
04 electrician
05 engineer
06 technician
07 welder
08 geologist/hydrogeologist
09 health and safety
10 biologist
11 meteorologist
12 air quality
13 QA/QC
14 other

Work Phase
01 excavation
02 construction
03 general labor
04 mechanical
05 office
06 warehouse
07 welding
08 drilling
09 sampling (specify)
_____
_____
10 other

Employment Period
01 1 week or less
02 2–4 weeks
03 1–2 months
04 2–6 months
05 6–12 months
06 1–2 years
07 2–5 years
08 5–10 years
09 over 10 years
10 unknown

Approximate Age
01 under 20
02 20–30
03 31–40
04 41–50
05 51–60
06 over 61
07 unknown

Time of Accident
01 0801–1000
02 1001–1200
03 1201–1400
04 1401–1600
05 1601–1800
06 1801–2000
07 2001–2200
08 2201–2400
09 0001–0200
10 0201–0400
11 0401–0600
12 0601–0800

Injury Type
01 amputation
02 strain/sprain
03 crush/mash/smash
04 fracture
05 cut/puncture/laceration
06 burn
07 contusion/abrasions
08 foreign body/eye injury
09 faint/dizziness
10 bruises
11 blisters
12 hearing loss
13 none—refer to illness code
14 other

Body Part
01 head/face
02 eye
03 ear
04 neck/shoulders
05 arm/elbow
06 wrist/hand
07 thumb/finger
08 back
09 chest/lower trunk
10 ribs
11 hip
12 leg/knee
13 foot/ankle
14 toe
15 hernia/rupture
16 heart attack
17 internal
18 death
19 other

Injury Cause
Struck by Tool or Object
01 hand tool or machine in use
02 falling or flying objects
03 tipping, sliding, or rolling objects
04 object handled by others
05 moving parts of machine
06 object being lifted or handled
07 motor vehicle

Strain or Overexertion
10 lifting
11 using tool or machine
12 pushing or pulling
13 holding or carrying
14 reaching

Cut, Puncture, Scrape Injury by
15 hand tool/not powered
16 powered hand tool/appliance
17 object being lifted/handled
18 broken glass

Fall or Slip
21 on same level
22 from different level
23 slipped, but not fall

Striking Against
31 object being handled
32 stepping on sharp objects
33 stationary object
34 moving parts of machine
35 moving object

Motor Vehicle Injuries
41 collision with another vehicle
42 collision with a fixed object
43 vehicle upset

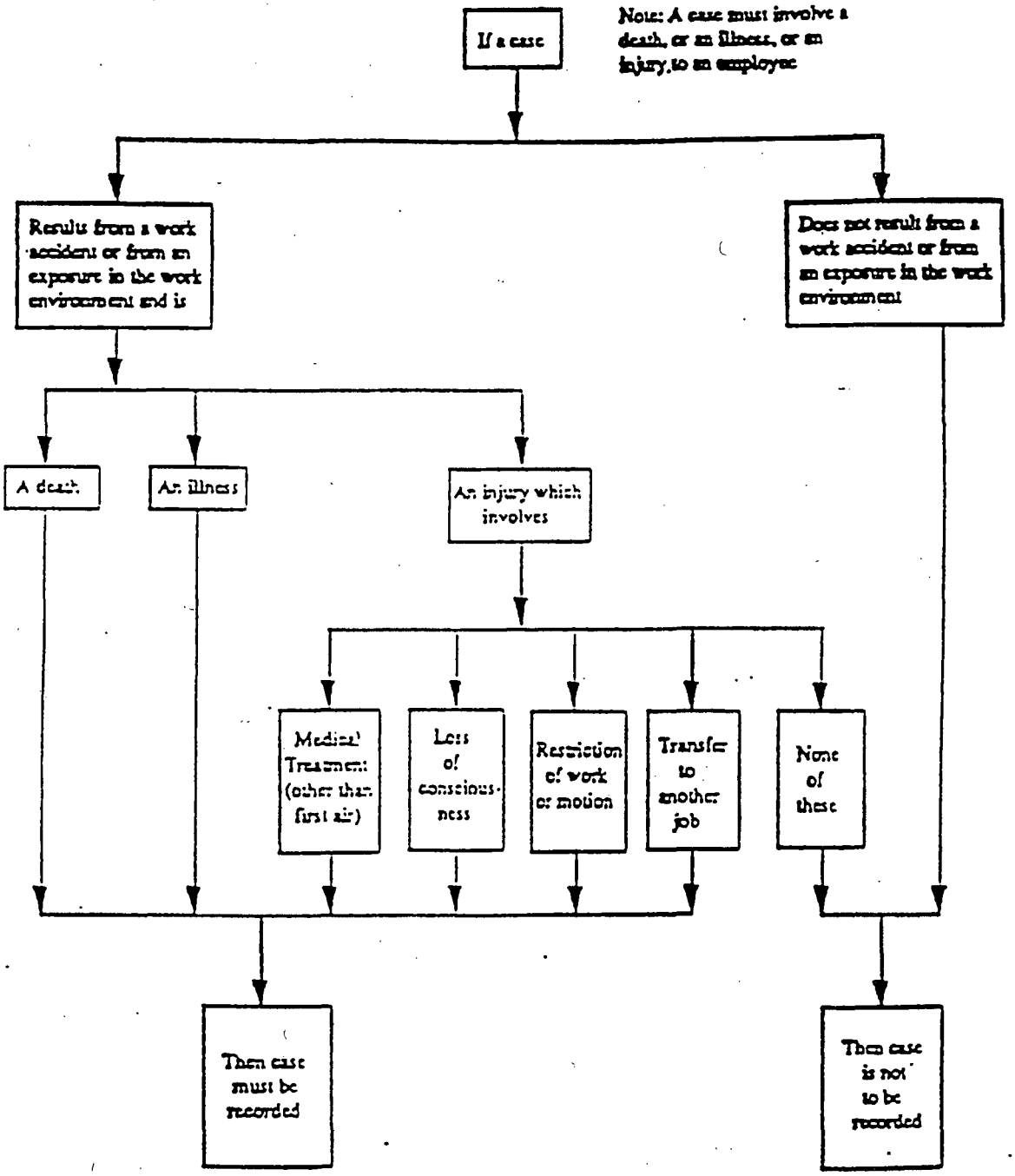
Caught On, In, or Between
51 machine or machine parts
52 mechanical apparatus
53 object handled/other object

Burn or Heat–Cold Exposure
61 steam or hot fluids
62 welding operatios
63 fire or flame
64 contact with hot object
65 acids–chemicals
66 heat exhaustion
67 heat stroke
68 hyperthermia
69 frostbite

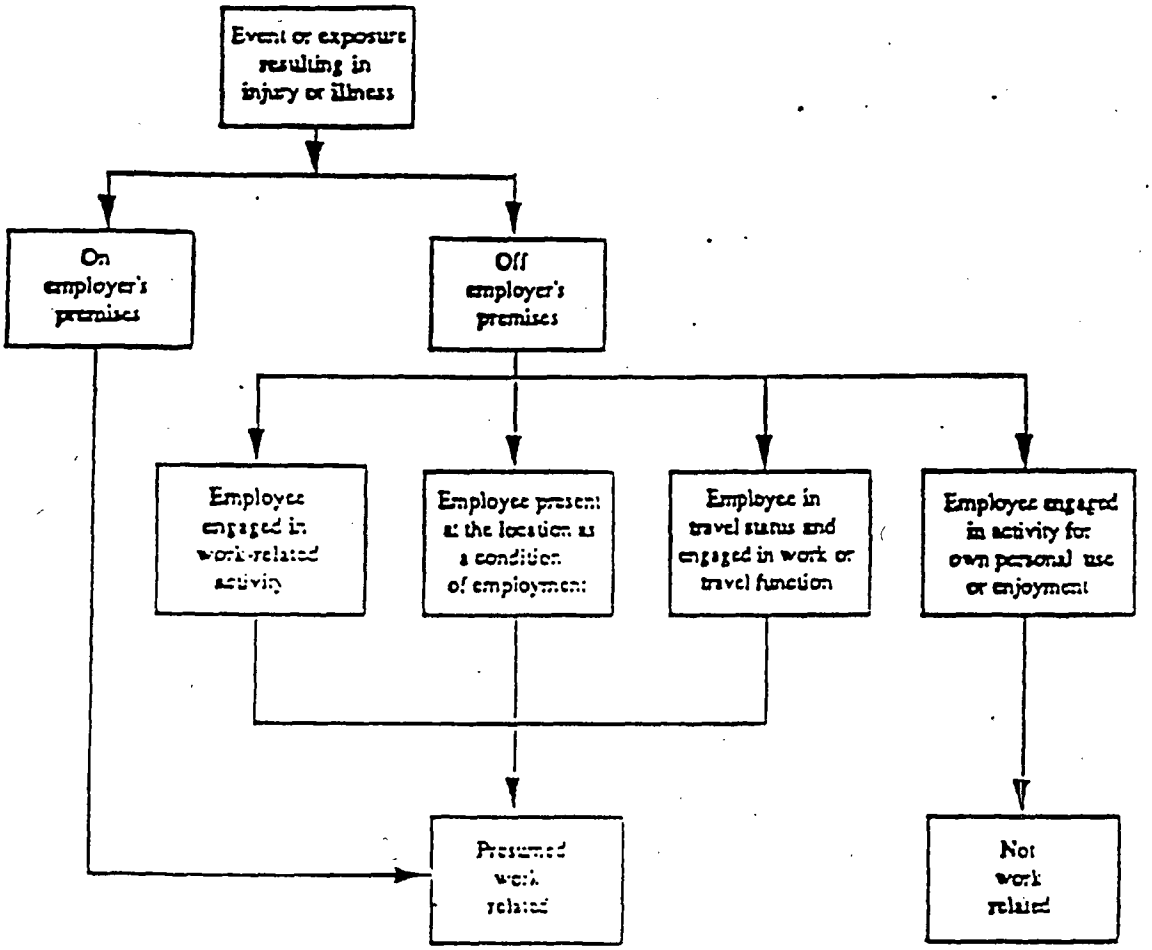
Miscellaneous Causes
71 contact with electrical current
72 suffocation
73 explosion or flashback
74 by animal or insect
75 foreign body in eye
76 miscellaneous describe

Illness
91 skin disease
92 respiratory disease
93 accidental poisoning
94 systemic effects
95 disorders due to physical agents
96 repetitive trauma disorders
97 other describe

Guide to Recordability of Cases Under the Occupation Safety and Health Act

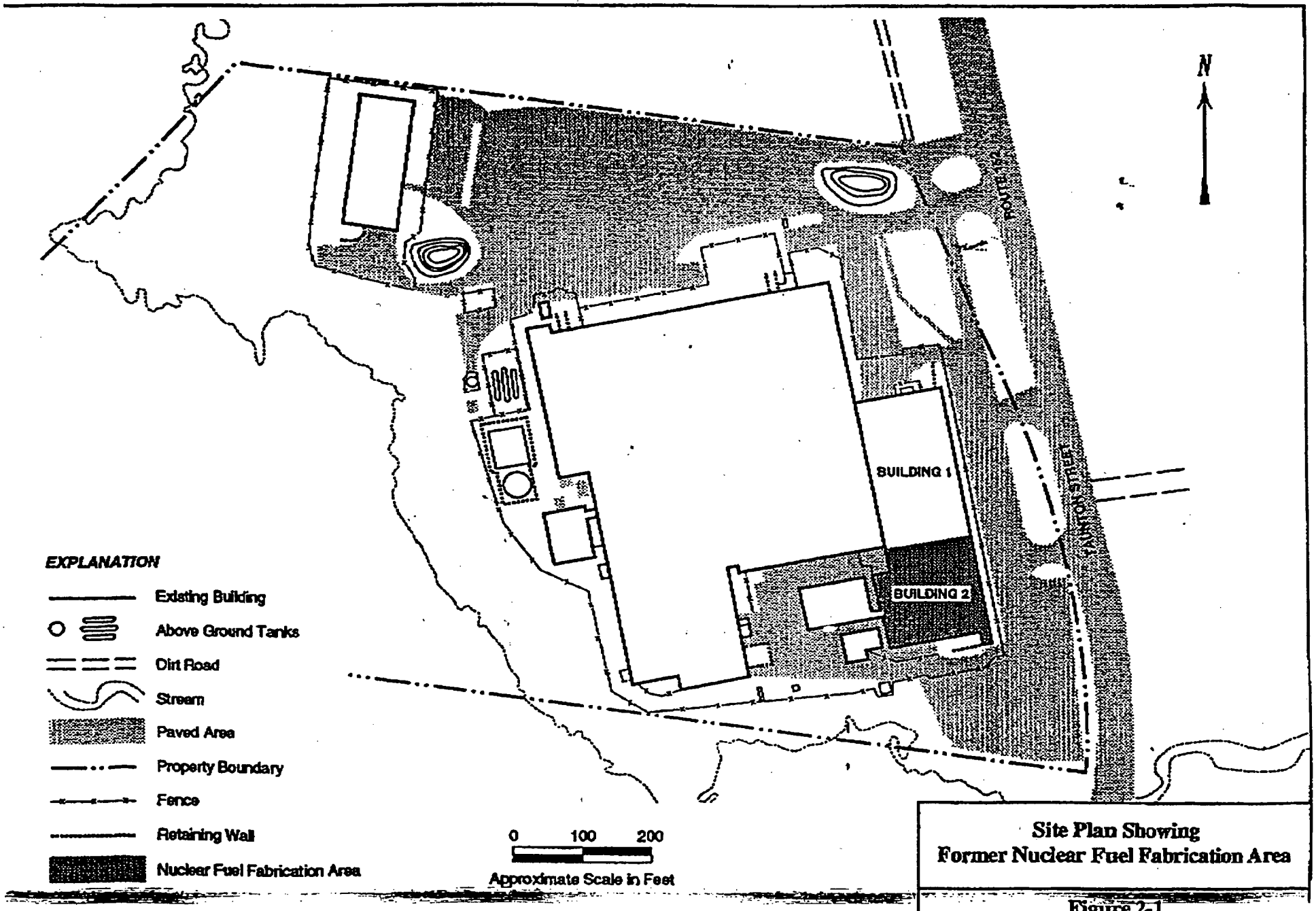


Guidelines for Establishing Work Relationship



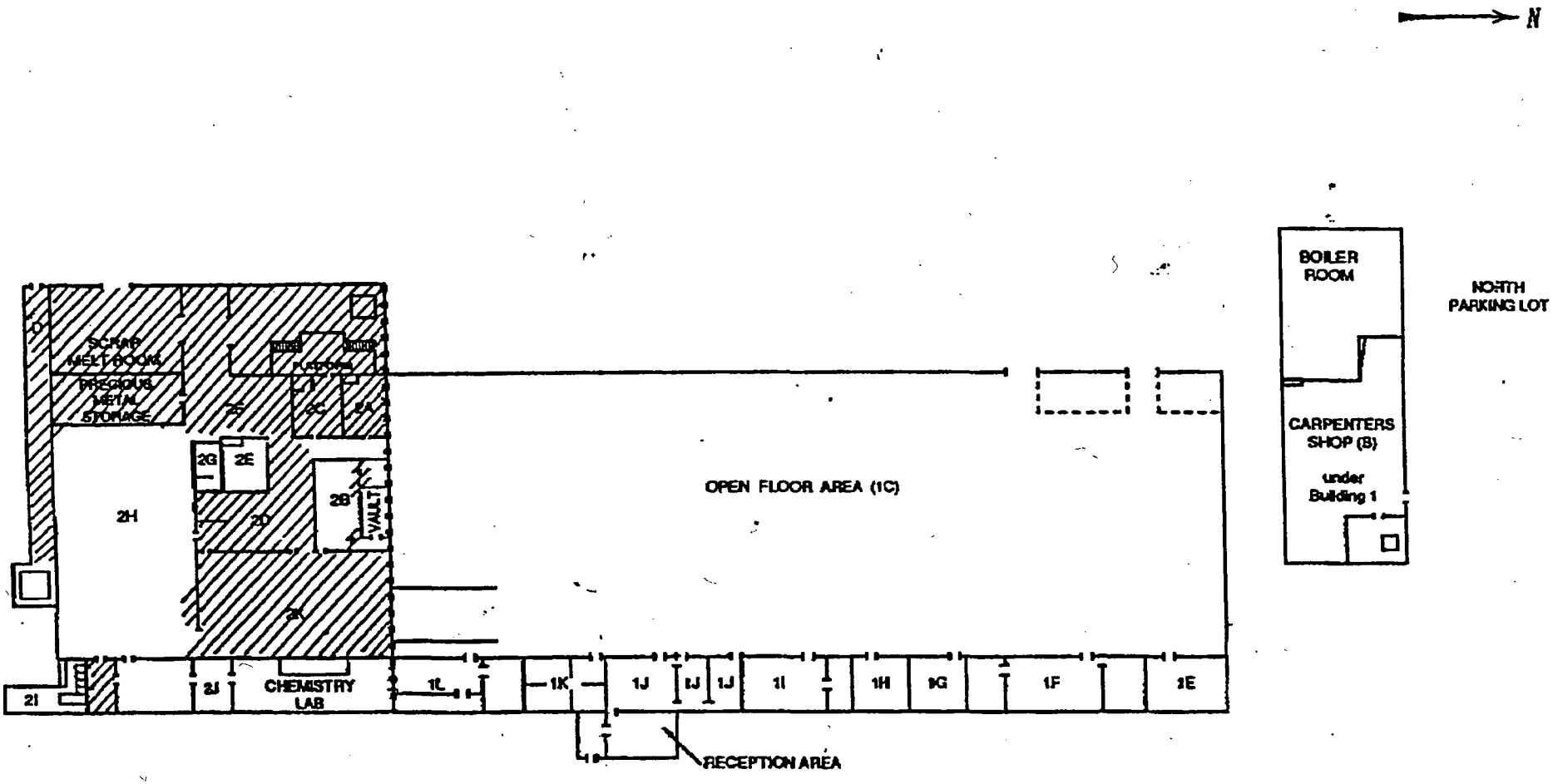
APPENDIX L

MAPS/FIGURES



Site Plan Showing
Former Nuclear Fuel Fabrication Area

Figure 2-1



NOTE

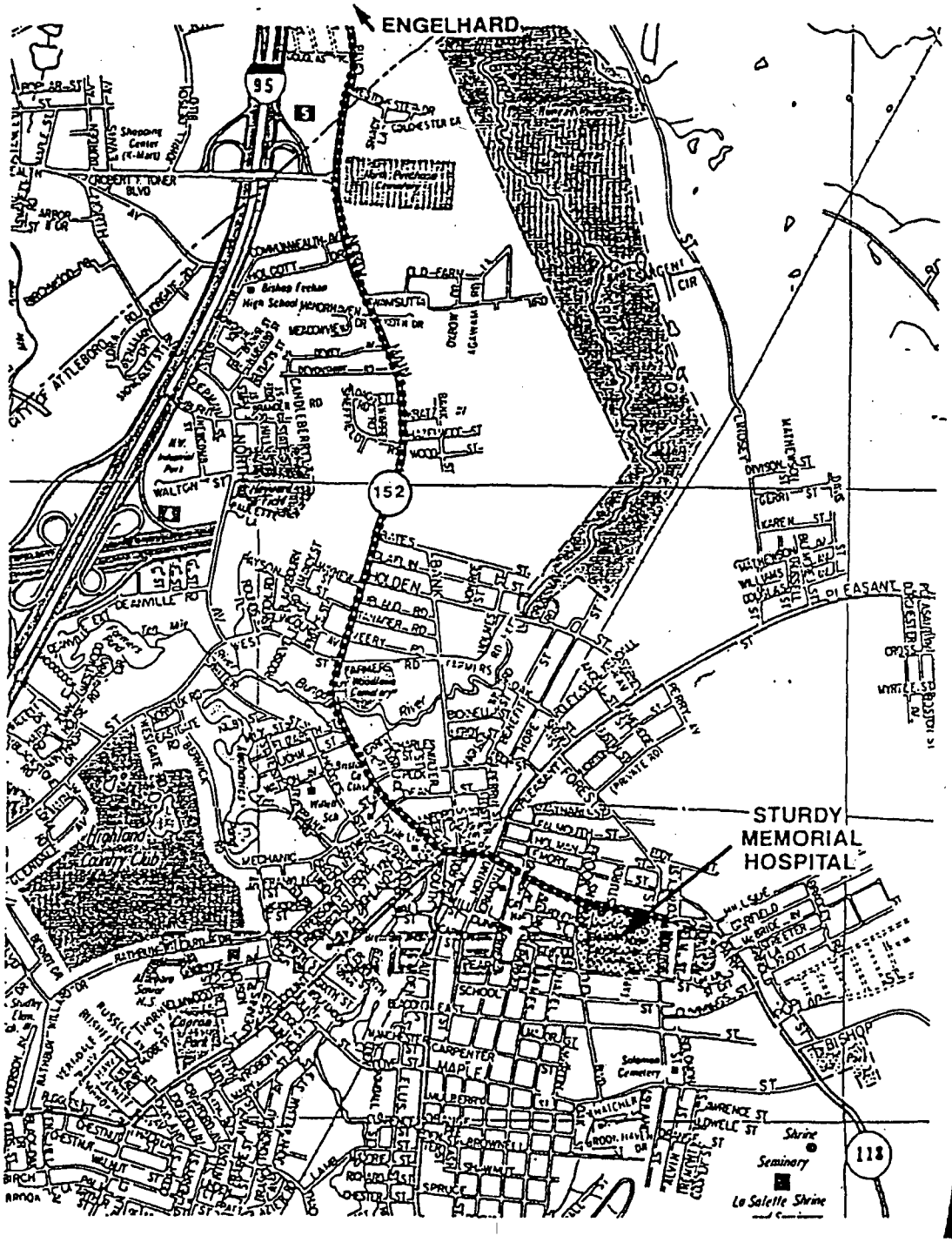
▪ ▪ ▪ Partition wall separating building 1&2

//// Redefined Affected Area

REDEFINED AFFECTED AND UNAFFECTED AREAS

FIG 2-2

Figure 2-1



EXPLANATION

Route to Hospital

0 2500 5000

SCALE IN FEET

ENVIRON

Counsel in Health and Environmental Science

Direction to Sturdy Memorial Hospital
Engelhard Corporation
Plainville, Massachusetts

DRAWN BY	CONTRACT NUMBER	DATE	APPROVED	REVISED
RS	03-3578C	1/94		

FIGURE

K-6

APPENDIX M

FIELD TEAM REVIEW FORM

FIELD TEAM REVIEW FORM

Each field team member shall sign this section after site specific training is completed and before being permitted to work on site.

I have read or have been verbally advised of all aspects of this Health and Safety Plan for the Engelhard Corporation Project Site located at Plainville, Massachusetts. I understand and will comply with the provisions contained therein.

Date	Print Name	Signature