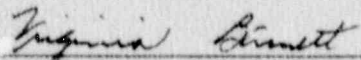


EBASCO SERVICES INCORPORATED


HEALTH AND SAFETY PLAN  
RADIOLOGICAL CLEANUP  
ALLIED SIGNAL AEROSPACE COMPANY  
TETERBORO FACILITY AND SURROUNDING PROPERTIES  
TETERBORO, NEW JERSEY

September 1990

Prepared by:

  
Virginia E. Barnett  
Health & Safety Officer  
Ebasco Services Incorporated

Approved by:

  
William Beckett  
Manager of Health & Safety  
Ebasco Services Incorporated

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SECTION I: APPROVALS

By their signature, the undersigned certify that this Health and Safety Plan will be utilized for the protection of the health and safety of on-site personnel during remedial activities at the Allied Signal Aerospace Company Site.

Health and Safety Officer Virginia Barnett	<u>Virginia Barnett</u> Signature	<u>9/25/90</u> Date
Project Manager Les Skoski	<u>Les Skoski</u> Signature	<u>9/26/90</u> Date
Health and Safety Manager William Beckett	<u>William Beckett</u> Signature	<u>10/1/90</u> Date
Mgr. NY-Metro Operations Dev R. Sachdev	<u>Dev R. Sachdev</u> Signature	<u>10/1/90</u> Date

SECTION II: GENERAL

2.1 Project Information

This plan has been prepared in conformance with the Ebasco Health and Safety Program. It addresses all those activities associated with the remediation of radioactive contamination at the Allied Signal Aerospace Company Project Site and will be implemented during site work. Compliance with this Health and Safety Plan (HASP)\* is required of all workers and third parties who enter this site.\*\*

SITE: Allied Signal Aerospace Company

PLAN DATE: November 1990

<u>PROJECT MANAGER</u>	<u>HEALTH AND SAFETY OFFICER</u>	<u>MANAGER OF HEALTH &amp; SAFETY</u>
<u>Les Skoski</u>	<u>Virginia Barnett</u>	<u>William Beckett</u>
<u>(201) 460-6178</u>	<u>(201) 460-6297</u>	<u>(210) 460 6255</u>

2.2 Emergency Phone Numbers

Teterboro Police Dept.	(201) 288-2103
Teterboro Fire Dept.	(201) 288-1000
N.J. State Police, Garden State Parkway, Bloomfield Barracks	(201) 338-8260
Teterboro Ambulance	(201) 288-1000
Hackensack Medical Center	(201) 441-2300
Passaic General Hospital	(201) 365-4300
Town Administration	
EPA National Response Center	(800) 424-8802
Poison Control Center	(800) 962-1253
N.J. DEP Hotline	(609) 292-7172
N.J. Dept. of Health	(800) 367-6543
Nuclear Regulatory Commission (John Kinneman)	(215) 337-5000

\* This plan is an intermediate step which addresses the specific requirements of site reconnaissance as well as generally addressing work activities. The content of the HASP may change or undergo revision based upon results of further reconnaissance/survey operations or upon additional information made available when the specific work programs have been developed.

\*\* Responsibility for adherence to the contents of this HASP shall be limited to Ebasco personnel, their contractors and subcontractors



### SECTION III: HEALTH AND SAFETY PERSONNEL

#### 3.1 Health and Safety Personnel Designations

The following briefly describes the health and safety designations and general responsibilities which will be employed for the Allied Signal Aerospace Company Project.

#### 3.2 Health and Safety Officer (HSO)\*

The HSO has the responsibility to develop and implement this site-specific Health and Safety Plan (HASP) in accordance with the Ebasco Corporate Health and Safety Program. The HSO will execute the appropriate monitoring technique to ensure adequate protection for site personnel and conduct on-site inspections for safety and health hazards. The HSO will investigate all accidents and incidents occurring on this site and will conduct safety briefings and site-specific training for on-site personnel. The HSO will accompany all NRC and other government agency personnel visiting the site in response to health and safety issues. The HSO is responsible for modifying and/or developing new procedures, after consultation with the Health & Safety Manager if site or environmental conditions change or new operations are conducted.

The HSO has stop-work authorization if he/she determines that an imminent hazard or potentially dangerous situation exists. Authorization to proceed with work will be verified by the Health & Safety Manager. The HSO will be responsible for implementing evacuation procedures, including the shutting down of appropriate equipment, removing equipment from excavation areas and coordinating emergency services on-site.

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\* Responsibilities of the Radiation Safety Officer (RSO) will be assumed in their totality by the HSO.

SECTION III: HEALTH AND SAFETY PERSONNEL

3.3 Health & Safety Manager (HSM)

The HSM has primary responsibility for ensuring that the policies and procedures of this HASP are implemented by the HSO. The HSM ensures that all personnel designated to work at the Allied Signal Aerospace Site are qualified according to Ebasco Medical Surveillance and H&S training requirements. The HSM is responsible for authorizing the appropriate monitoring, safety equipment and other resources necessary in implementing the Allied Signal Aerospace Site HASP.

The HSM or his designee will be contacted immediately after a stop-work order is issued by the HSO. The HASP and significant changes to the HASP must be approved by the HSM. The HSM has the authority to resolve outstanding H&S issues that arise during site operations.

SECTION IV: SITE LOCATION

4.1 Location/Description

Bendix (currently Allied Signal) acquired the 101-acre Teterboro property in 1937. This original Bendix property is now (approximately) bounded on the east by Teterboro Airport, on the north by Route 46, on the west by Route 17 and on the South by Malcolm Avenue (Exhibit 4-1). Exhibit 4-2 includes a map of the site proper. When purchased, the land was undeveloped, consisting mainly of marsh and swampland. Approximately three to four feet of fill was added prior to building on the property.

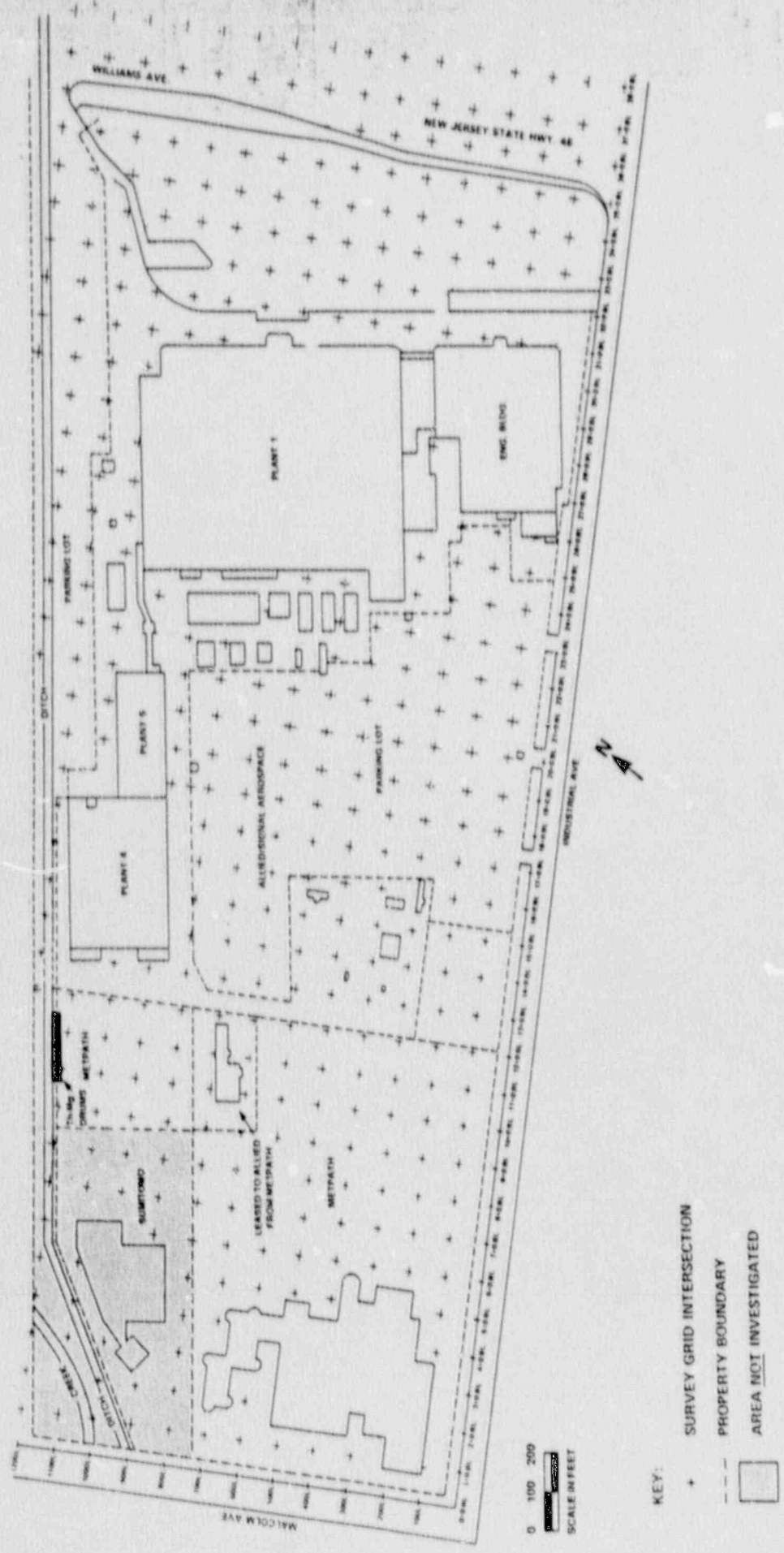




EXHIBIT 4 - 1  
SITE LOCATION



Exhibit 4-2  
Site Map



KEY:  
+ SURVEY GRID INTERSECTION  
- - - PROPERTY BOUNDARY  
□ AREA NOT INVESTIGATED

0 100 200  
SCALE IN FEET

SECTION V: WASTE DESCRIPTION/CHARACTERIZATION

5.1 The following information is presented in order to identify the radioactive material at the Allied Signal Aerospace Project Site. The detailed information on these materials was obtained from Dangerous Properties of Industrial Materials-SAX; Condensed Chemical Dictionary - HAWLEY; Chemical Hazards of the Workplace - Proctor/Hughes; Available Documentation/Low Level Radioactive Sites.

5.2 Chemical Data Sheets

The following are the radioactive compounds of concern to be found at the Allied Signal Aerospace Company Site. Appendix A includes Chemical Data Sheets for the compounds listed below. It provides information such as the chemical characteristics, health hazards and protective measures.

Thorium - Magnesium Alloy \_\_\_\_\_  
Radium \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5.3 Waste Types: Liquid \_\_\_\_\_ Solid X Gas \_\_\_\_\_  
Sludge \_\_\_\_\_ Semi-solid \_\_\_\_\_ Other \_\_\_\_\_

5.4 Characteristics: Corrosive \_\_\_\_\_ \*Flammable X  
\*Explosive X Volatile \_\_\_\_\_  
Radioactive X Inert \_\_\_\_\_  
Other \_\_\_\_\_

5.5 Containment: Pit \_\_\_\_\_ Pond \_\_\_\_\_ Lagoon \_\_\_\_\_  
Lake \_\_\_\_\_ Process Vessel \_\_\_\_\_  
Tank \_\_\_\_\_ Piping \_\_\_\_\_ Drum \_\_\_\_\_  
Tank Car \_\_\_\_\_ Lab Pack \_\_\_\_\_  
Other Soil \_\_\_\_\_

\*As individual compounds, thorium and magnesium powders are pyrophoric when sufficiently pulverized. Starred (\*) entries in Section 5.4 would then apply in this instance.

## SECTION VI: HAZARD ASSESSMENT

The primary health concern during soil and drum excavation and removal activities at the Allied Signal Aerospace Project Site will be the presence of thorium and radium. The magnesium present in and around the drum area is as part of the thorium-magnesium alloy and is not expected to pose a health risk to field personnel.

During soil excavation and removal activities, however, it is possible that metal dust from the alloy material can be generated causing resuspension of particulates. Although this possibility remains remote, a dust monitor (DM) may be required on-site. (refer to Section 9.2).

Thorium is a naturally occurring radioactive element. Thorium-232, the principle isotope of thorium, is a long-lived precursor to a natural decay chain. In other words, thorium-232, which has a 14,000,000,000 year half-life, decays into a series of elements, which are also radioactive. The chain end in a stable isotope of lead. Two members of the decay chain, radium-228 (6.7 year half-life) and thorium-228 (1.9 year half-life) are the only members of the chain with a half-life greater than 4 days. A half-life is the time required for one half of the atoms of a radionuclide to decay, or transform, into a different isotope.

Thorium and its decay products emit alpha and beta particles and gamma-rays. Gamma-rays can be a hazard to an individual when the radioactive material is external to the body. However, the thorium series radionuclides emit gamma-rays at such a low rate that contamination at the Allied Signal Aerospace Project site would appear to pose minimal risk to field personnel. Alpha and beta particles are easily blocked by protective clothing or skin and do not pose a threat to an individual when the radionuclide is external to the body.

Radium-226, with a half life of 1602 years, and its progeny are capable of emitting alpha, beta and gamma radiation. As an alpha emitter, radium poses a particular internal hazard. Radium is a bone seeker, tending to replace

SECTION VI: HAZARD ASSESSMENT

calcium in the bone. Once established in the bone, radium has caused anemia from bone marrow destruction, osteitis, followed by osteonecrosis and osteosarcoma. (Biological Effects of Radiations - Grosch and Hopwood. 1979).

External radiation limits prescribed by Title 10 of the U.S. Code of Federal Regulations are 5 rem/year, 100 mrem/week for the body and 1500 mrem/week for the hands. Ebasco policies and procedures limit workers to one-tenth the regulatory limits. Although the radiation levels expected at the Allied Signal Aerospace Project Site will not approach these limits, all field personnel will be provided with thermoluminescent dosimeters (TLD badges) which will provide a record of exposure during remedial activities for the duration of this project. Personnel may also be provided with a direct-reading Pocket Ionization Chamber (PIC).

If a radionuclide is taken into the body, it is incorporated into body tissue. Alpha and beta particles and, to a lesser extent, gamma-rays then deposit their energy into the body tissue. The radionuclide continues to deposit energy into body tissue until it decays to a stable element or is eliminated from the body. Thorium, once taken into the body, is primarily deposited onto bone surfaces and is not readily eliminated. Because the body tissues are exposed to the radiation from thorium series radionuclides over an extended period of time, there is an internal potential for damage to body cells.

In addition, the degree of thorium and radium toxicity is dependent upon the form in which it is ingested or inhaled. The radiotoxic source of concern during site operations is primarily inhalation of dust particulates from contaminated soil. Secondly is exposure via ingestion, potentially occurring due to poor housekeeping, neglectful decontamination practices and/or lack of good contamination avoidance practice by field personnel. The HSO, during morning briefings, shall therefore, reinforce the procedures and practices expected to be effected by personnel on-site in order to eliminate the pathways of potential exposure.



SECTION VI: HAZARD ASSESSMENT

This is a medium to high potential for personnel to come into direct contact with contaminated soils and dermatitis can result from this direct contact. Level D personnel protective equipment has been selected for field activities and personnel shall be double-gloved and outer gloves and boot covers shall be taped to outer clothing. Refer to Section VIII. Respirators will not initially be required. However, due to the potential for exposure to radioactive materials in resuspended soil during remedial activities, respiratory protection (with appropriate radionuclide cartridges) will be available on-site. Upgrading respiratory protection will be based on action levels and final decision for appropriate respiratory protection and protective clothing shall be made by the HSO. Refer to Section IX.

A portion of excavation and removal activities will take place in areas of vehicular traffic. In these areas and due to the heavy moving equipment to be used, a radius of 30' (as feasible) shall be delineated around each excavation. All overhead power lines shall be accounted for. Traffic flow and direction shall be maintained by members of the field team. All members of the field team shall remain acutely aware of their surroundings at all times.

The West Ditch area contains several physical slip-trip hazards due to tree stumps, overgrowth, sloping terrain and the drums. An additional hazard is the heavy equipment that will be necessary for excavation in this area.

Working personnel shall adhere strictly to use of steel-toed/shank field shoes and hardhats and use of the buddy system and line-of-sight. Members shall also familiarize themselves with the mobility and capability (including arm radius) of the earth-moving equipment. All heavy moving equipment shall be equipped with a backup alarm (1C74Ba).

Hearing protection shall be provided by the HSO.

## SECTION VII: TRAINING AND MEDICAL SURVEILLANCE REQUIREMENTS

### 7.1 Fundamental H&S Training Required

All employees who are scheduled to perform field work at the Allied Signal Aerospace Project Site are required to complete the basic EBASCO Hazardous Waste Training Program or its equivalent as required under 29 CFR 1910.120. This training includes instruction and practice in the use of protective clothing, air purifying respirators, self-contained breathing apparatus (SCBA), supplied air systems, air tank change operations and decontamination procedures specific for each level of protection. This 40-hour course includes classroom instruction in physical and chemical properties of hazardous materials, toxicology, hazard control, site safety, fire protection, confined space entry, instrumentation and heat stress.

Personnel whose activities are limited solely to the Support Zone may be waived from this training requirement since no exposure is anticipated in this zone. Such a waiver must be determined by the HSM.

### 7.2 Site-Specific Training

On-site training will be conducted regarding planned field activities, procedures, monitoring and equipment for the site operations. This training will include reviewing site and facility layout, hazards and emergency services at the site and procedures contained within this HASP. This training will ensure field personnel understand their responsibilities regarding safety for their particular activity.

### 7.3 Safety Briefings

Project personnel will be given briefings by the Site Health and Safety Officer as needed prior to start-up of remedial activities, when new operations are to be conducted, if changes in work practices must be implemented due to newly available information, or if site or environmental conditions change.

## SECTION VII: TRAINING AND MEDICAL SURVEILLANCE REQUIREMENTS

Briefings will also be given to facilitate conformance with prescribed safety practices, when conformance with these practices is not being met, or if deficiencies have been identified during safety audits.

### 7.4 First Aid and CPR

The HSO will identify those individuals possessing this training in order to ensure emergency treatment is available at field activities. It is expected that a number of field team members will have First Aid training and CPR training. These courses will be consistent with the requirements of the American Red Cross Association.

### 7.5 Medical Surveillance

All personnel and subcontractors who will be performing field work at the Allied Signal Aerospace Project Site will be required to have passed the EBASCO Medical Surveillance Examination or equivalent within one year prior to reporting to the site. This physical examination shall include tests to ensure that the person is qualified to wear respiratory protection. A copy of the Physician's Statement and Disclosure Agreement must be sent to the EBASCO Health and Safety Manager or his designee. Other tests in the examination include a CBC, a SMAC Profile, EKG, periodic chest X-rays, urinalysis, GGTP, audiometry and visual acuity.

Additional medical testing may be required if an overt exposure occurs, or if other site conditions warrant further medical surveillance. The Medical Data Sheet (Section XVII) will be completed by all on-site personnel and kept in the support area for emergency reference. This form does not substitute for the medical surveillance requirements.

SECTION VIII: ZONES, PERSONNEL PROTECTION AND COMMUNICATIONS\*

8.1 Site Zonation

Ebasco employs a three zone approach to site operations to control the potential spread of contamination from the site. The three zones include the Exclusion Zone, the Contamination Reduction Zone (CRZ) and the Support Zone.

8.1.1 Exclusion Zone

Areas that contain, or are suspect of containing, hazardous materials will be considered Exclusion Zones. Each area of excavation, including a 30' radius around each excavation shall be considered an Exclusion Zone and each zone will be clearly delineated by a "Hotline" using flagging tape and cones or equivalent materials. Refer to Section VI (Hazardous Assessment). The HSO may also establish more than one restricted area within an Exclusion Zone. No personnel are allowed in the Exclusion Zone without: 1) a buddy, 2) the proper personal protective equipment, 3) medical authorization and 4) training certification.

8.1.2 Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) will be established adjacent to and between each Exclusion Zone and the Support Zone. The CRZ will contain the contamination reduction corridor (CRC) and will provide for full personnel and portable equipment decontamination. The CRZ is to be used for general exclusion zone entry and egress in addition to access for heavy equipment and for investigation activities. The CRZ will also contain appropriate safety and emergency equipment such as a portable emergency eyewash, fire extinguisher, stretcher and first aid kit.

\*Refer to Appendix E (Site Control and Safety)



## SECTION VIII: ZONES, PERSONNEL PROTECTION, COMMUNICATIONS

### 8.1.3 Support Zone

The Support Zone is considered an uncontaminated area and will be separated from the CRZ by a "Contamination Control Line." It will contain the Command Post which will provide for team communications and emergency response. In addition, an emergency drench system will be available on-site.

Appropriate sanitary facilities, safety and support equipment will be located in this zone. The majority of site operations will be controlled from this location as well as site access of authorized persons. The Command Post shall be located upwind of site operations, if possible, and could be used as a potential evacuation point. No potentially contaminated personnel or materials will be allowed in this zone unless appropriately decontaminated. Meteorological conditions should be observed and noted from this zone, as well as those factors pertinent to heat stress.

## 8.2 Personnel Protection

### 8.2.1 General

The level of protection to be worn by field personnel will be defined and controlled by the Site Health and Safety Officer. After review of site hazards and conditions, proposed operations and preliminary monitoring of the site, using the SPA-3, a high sensitivity gamma probe, Level D personnel protective equipment has been selected for site activities. However, it should be noted that this level of protection, including both protective clothing and respiratory protection, may be modified if site conditions or the scope of work changes.

### 8.2.2 Site Evaluation

Prior to initial entry, the site was evaluated using all background information and available data in determining the level of protection for

SECTION VIII: ZONES, PERSONNEL PROTECTION, COMMUNICATIONS

field personnel, in addition to any special equipment or procedures necessary. Factors considered included site history, location, topography, present condition of the contaminated areas, proposed excavation activities, available emergency services, potential seasonal weather conditions and visual assessment of the integrity of the site.

8.2.3 Personnel Protective Equipment/Task

Task	Levels of Protection	
	Respiratory	Clothing
Reconnaissance/Walkover	D	D
Soil Excavation and Removal	D/C	D
Sampling Activities		
Creek Water	D	D
Sediment	D	D
Soil (post-remedial)	D/C	D
Decontamination:		
Personnel	D	D
Equipment	D	D

Note Level C respiratory protection may be worn with Level D clothing.

8.2.4 Personnel Protective Equipment

The following describes the equipment necessary for the levels of protection indicated. For specific site conditions or work tasks, modifications or alterations for each level may be necessary and these changes will be implemented by the EBASCO HSO.

A) Respiratory Protection

- 1) Level C - Full Face Air Purifying respirator with combination Dust Filter (HEPA), radionuclide and organic vapor cartridge.

SECTION VIII: ZONES, PERSONNEL PROTECTION, COMMUNICATIONS

- 2) Level D - No respirator will be worn. Certain operations may require a face shield or a respirator to be carried by personnel.

Radionuclide	Concentration in Soil, pCi/g		
	Dust Loading, mg/m <sup>3</sup>		
	<u>0.1</u>	<u>1.0</u>	<u>10.</u>
Ra-226	13,000	1,300	130
Th-232	68	6.8	0.68

The above table presents concentrations in soil, in pCi per gram, of Ra-226 and Th-232 that would deliver a radiation dose equivalent commitment of 1 mrem for three time weighted average dust loadings. These concentrations are based on the assumptions that an individual is subjected to these dust loadings for 8 hours a day for the 9 days of excavation activities and breathes at a rate of 10 cubic meters for an eight hour work day. It is expected that 1.0 mg/m<sup>3</sup> is an upperbound estimate of dust loading and 0.1 mg/m<sup>3</sup> approaches a more realistic estimate. Since 1 mrem is considered a de minimis level of dose equivalent, it is not expected that the soil concentrations present at the site will be a hazard to workers without respirators. If situations change, however, Level C respiratory protection may be required.

B) Personnel Protective Equipment (PPE)

1) Levels C:

- o Chemical protective suit (e.g., polycoated TYVEK);
- o Coveralls;

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\*Outer gloves and nuke booties (or boot covers) shall be taped to outer clothing.

## SECTION VIII: ZONES, PERSONNEL PROTECTION, COMMUNICATIONS

- o Gloves, inner (surgical type);
- o \*Gloves, outer (chemical protective);
- o Boots (steel toe/shank);
- o \*Nuke Booties or boot covers; and
- o Hard hat.

### 2) Level D:

- o Uncoated tyvek or coveralls;
- o \*Gloves (2 pairs);
- o Boots/shoes (steel toe/steel-shank);
- o Safety goggles;
- o \*Nuke Booties or boot covers; and
- o Hard hat.

### 8.3 Safety Equipment

Basic emergency and first aid equipment will be available at the Support Zone and/or the CRZ. It will include communications such as an intrinsically safe 2-way radio, first aid kit, portable emergency eyewash, fire extinguishers, and other safety-related equipment. In addition, there shall be access available to emergency shower facilities inside the buildings. The Command Post will be manned when teams are downrange and communications will be maintained, at all times. Other safety equipment may be located at the site of all excavation operations, i.e., stretchers, fire extinguishers.

### 8.4 Communications

- o Walkie-Talkies - Hand held units will be utilized by the field team for communication between construction operations and the Command Post base-station.



SECTION VIII: ZONES, PERSONNEL PROTECTION, COMMUNICATIONS

- o Telephones - A telephone will be located at Field Operations in the Support Zone for communication with emergency support services or the nearest public phones will be identified if one is not available in the Support Zone.
- o Air horns - These may be carried by the downrange field team and maintained in the Support Zone and used for initiation of emergency evacuation procedures (see Section XIV) and backup for other forms of communications.
- o Hand signals - To be employed by the downrange field team while utilizing the buddy system. These signals are very important when working with heavy equipment. They will become familiar to all members of the field team before sampling operations begin.

<u>Signal</u>	<u>Meaning</u>
o Hand gripping throat	Out of air, can't breathe
o Grip partner's wrist	Leave area immediately; no debate
o Hands on top of head	Need assistance
o Thumbs up	OK; I'm all right; I understand
o Thumbs down	No; negative

- o Signs - Danger signs will be used where an immediate hazard exists. Caution signs will be used to warn against potential hazards and to caution against unsafe practices. Traffic control and barricades will be used when needed.

8.5 Sanitary Facilities

Provision shall be made for outdoor sanitary facilities for use by field personnel. This may also include portable field washing facilities.

SECTION IX: MONITORING PROCEDURES FOR SITE OPERATIONS

9.1 Monitoring During Field Operations

Determination of radiation background levels shall be made in the an area unaffected by contaminated areas, prior to the start of each day's activities. Background levels shall be taken a minimum of twice a day, in the morning and again in the afternoon.

On-site monitoring serves to establish and reaffirm the level of protection and to identify the areas of contamination.

Monitoring will be performed continuously by the Site Health & Safety Officer or Health Physicist during soil excavation and removal operations using the SPA-3 gamma scintillation probe and a dust monitor\*\*.

Frisking, using the \*HP-260 probe, will be performed upon entering the CRZ and again following decontamination and prior to entering the Support Zone.

\*Alpha, beta, gamma detector

9.2 Action Levels

<u>Instrument</u>	<u>Action Level (Dust)</u>	<u>Level of Protection/Action</u>
**DM	0-5.0 mg/m <sup>3</sup> (TWA) above background in breathing zone	Level
**DM	5.0-10 mg/m <sup>3</sup> (TWA) above background in breathing zone	Level C
**DM	> 10 mg/m <sup>3</sup> (TWA) above background in breathing	Stop work, withdraw from area, investigate cause

\*\* Use of a dust monitor will be optional and at the discretion of the HSO.

SECTION IX: MONITORING PROCEDURES FOR SITE OPERATIONS

<u>Instrument</u>	<u>Zone Action Level</u>	<u>Level of Protection/Action</u>
HP-260	50 CPM** (Above background)	Reenter CRZ for further decontamination

Considering the following:

- o Prior to going on-site, a background level will be determined following readings taken at several local areas surrounding Teterboro Airport;
- o On the basis of 2,000 working hours/year (40 hours/week, 50 weeks/year) and 500 millirem/year as the upper limit of exposure for field personnel during remedial activities;

If radiation exposure levels, using the SPA-3, are determined to be:

- o 0.25 mR/hour above background, the RSO will reevaluate dose rates in the vicinity of the excavation location;
- o At 2.5 mR/hour, work shall stop and a health physicist will be consulted.

The background level for the SPA-3 is expected to vary and fluctuate daily. (refer to Section 9.1).

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\*\* Counts per minute

SECTION IX: MONITORING PROCEDURES FOR SITE OPERATIONS

9.3 Personnel Monitoring Procedures

During sampling activities, personnel exposure monitoring shall be implemented for all field team members through the use of thermoluminescent dosimeters (TLD) which shall be laboratory-analyzed appropriately at termination of the (4 week) sampling period. Analyses of the TLD badges shall remain as a permanent record of employee exposure.

The TLD badges shall be worn on the front of the body between the neck and the waist, with the correct (lettered) side facing out. Further, the badges will have the employee's name for identification. They shall be worn only during work hours on the site, and, upon exiting the site following completion of the work shift, each employee will turn in his/her badge to the HSO. The HSO will distribute the badges to employees at the start of each workshift. This routine shall remain in effect until completion of soil excavation and dewatering removal activities.

The TLD badge should never be exposed to excessive heat. If it should become damaged or lost, report it immediately to the HSO in order to obtain a replacement.

In addition, field personnel may each be issued a direct-reading Pocket Ionization Chamber (PIC) capable of measuring 0-200 mR/hour. The same routine will apply as above.



SECTION X: SAFETY CONSIDERATIONS FOR SITE OPERATIONS

10.1 GENERAL

A Health and Safety Officer or designee will be present on-site at all times during soil excavation and removal activities and shall provide all monitoring and health and safety support in order to ensure the adequacy of protective equipment and safety procedures.

The proximity of water, sewer and electrical lines will be identified prior to all subsurface activity. The possibility for the presence of underground conduits or vessels containing materials under pressure will also be investigated before attempting any intrusive operation.

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 sampling operations.

All radiological field sampling will be performed under the level of protection described in Section VIII and assigned by the HSO. The level of protection will be established by review of facility history, available data and updated, as necessary, by results of ongoing health and safety monitoring performed at each excavation location.

10.2 Safety Consideration During Remediation Operations

During all remediation activities, the following procedures shall be strictly adhered to by personnel:

- o The buddy system and line-of-sight shall be employed at all times when in an exclusion zone.
- o Contamination avoidance shall be practiced by all field personnel.

SECTION X: SAFETY CONSIDERATIONS FOR SITE OPERATIONS

- o If field personnel perceive an unsafe condition or situation, the HSO or FOL will be notified immediately.
- o All field operations should be planned and discussed with personnel prior to the beginning of startup of remedial activities.

10.3 Soil Excavation and Removal Operations

Prior to the startup of remedial operations, an exclusion zone shall be established around each excavation location. Background readings shall be taken (at least twice) daily using the SPA-3 gamma probe. Personnel within the exclusion zone shall be dressed in the level of protection adequate for the potential hazard(s) that may be present. The SPA-3 will be used to monitor gamma radiation (uR/hr). The HSO shall also determine when a dust monitor will be used in order to measure fugitive dust emissions at the breathing zone and in the excavation.

10.4 Sampling Handling

Personnel responsible for the taking and handling of post-remediation samples shall wear the designated level of protection. Samples will be identified as to their hazard and packaged as to prevent spillage or breakage. Any unusual sample conditions should be noted.

- o Prior to start-up of daily activities, monitoring instruments will be covered with clear plastic, leaving openings for sampling ports and sensor points, if appropriate.
- o Sample containers shall be bagged after filling with sample material.

## SECTION XI: DECONTAMINATION

### 11.1 Contamination Prevention

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should eliminate all potential employee exposure and cross-contamination. Procedures for contamination avoidance include:

#### Personnel

- o Do not walk through areas of obvious or known contamination.
- o Do not handle or touch contaminated materials directly.
- o Make sure all PPE has no cuts or tears prior to donning or during use.
- o Fasten all closures on suits, covering with tape if necessary.
- o Particular care should be taken to protect any injuries to the skin. Consult the HSO if an injury exists.
- o Stay upwind of the contaminant source.
- o Do not carry cigarettes, gum or drinks into areas of contamination.

### 11.2 Personnel Decontamination

The Health & Safety Officer or Health Physicist shall be responsible for ensuring personnel are properly decontaminated.

All personnel and equipment exiting the exclusion zone shall be thoroughly decontaminated. The procedure for personnel decontamination is outlined in Figure 11-1. In general, the radiological decontamination procedures will consist of:

- o Radiation frisk out;
- o Segregated equipment drop;
- o Tape removal;
- o Outer glove removal and suit removal;

## SECTION XI: DECONTAMINATION

- o Respirator removal
- o Boot removal and inner glove removal;
- o Refrisk
- o Soap and water rinse of skin areas, i.e., face, hands, arms, that have indicated contamination during frisking.

Following removal of PPE, field personnel shall use the step-off pad at the Contamination Control Line and be frisked again using the HP-260 Probe. If the instrument measures 50 counts per minute (CPM) above background, personnel shall reenter the CRZ for further decontamination. This procedure will be repeated until frisking of personnel indicates decontamination has been satisfactorily completed (i.e., <50 CPM). Responsibility for proper personnel decontamination shall be that of the Health and Safety Officer.

Equipment for personnel decontamination will include plastic wash and plastic rinse tubs, brushes, soap and water, impervious lining material, a table and a hand pump sprayer.

### 11.3 Equipment Decontamination

- o Monitoring equipment shall be wiped down
- o Equipment used during excavation activities that may be contaminated with radioactive soil will be cleaned prior to leaving the site. A location for this activity shall be determined by the HSO and the Project Manager or designee.
- o The Field Operations Leader will be responsible for all equipment decontamination. Adequate performance of this task shall be verified by the Health and Safety Officer.



SECTION XI: DECONTAMINATION

11.4 PPE Decontamination

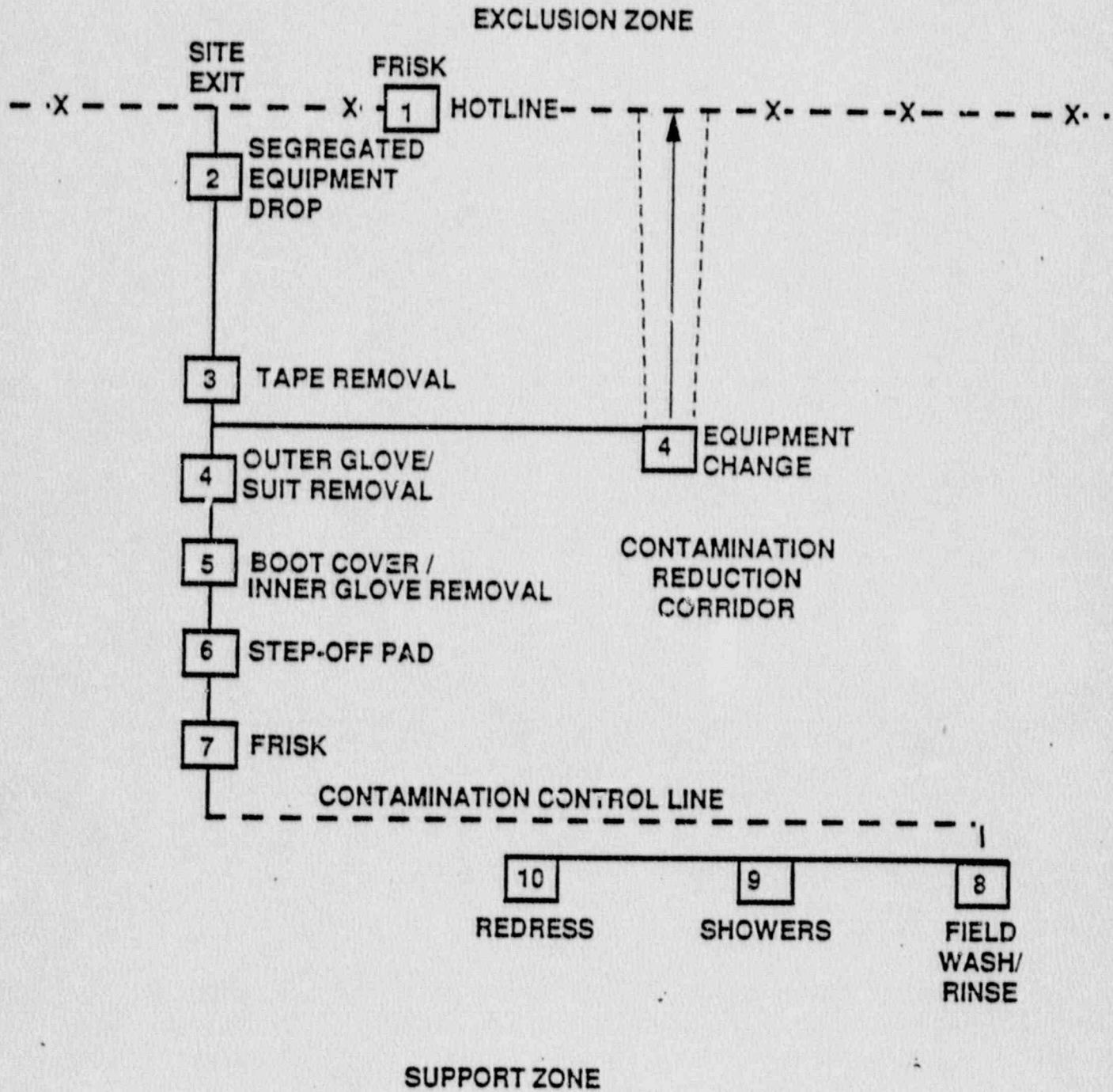
Personnel protective equipment shall be decontaminated, cleaned or laundered, maintained or replaced as needed to optimize their effectiveness during remedial activities.

11.5 Additional Procedures

- o Spent decon solutions may be required to be segregated from water rinses, drummed and disposed of as radioactive waste at a pre-determined approved low level radioactive waste disposal site.
- o Decontamination shall be performed in a manner so as to minimize the amount of waste generated and necessary for disposal.
- o Sample decontamination will be the responsibility of the sampler indicated on the Chain-of-Custody form.
- o Sampling equipment will be brushed clean and rinsed with distilled water and decontaminated following procedures in the Field Operations Plan.
- o Samples will be dry wiped prior to packaging.

ALLIED SIGNAL AEROSPACE  
TETERBORO AIRPORT, NJ

DECONTAMINATION PROCEDURES



SECTION XII: ADDITIONAL WORK PRACTICES

Refer to the site Health & Safety Officer for specific concerns for individual site tasks.

- o Be cognizant of the several slip-trip hazards present due to difficult terrain.
- o Always use the buddy system.
- o Practice contamination avoidance both on and off-site.
- o Plan activities ahead of time.
- o Apply immediate first aid to any and all cuts, scratches and abrasions.
- o Report all accidents, no matter how minor, immediately to the HSO.
- o Be alert to your own physical condition. Watch your buddy for signs of fatigue and/or exposure.
- o Do not proceed with work unless adequate natural light exists and appropriate supervision is present.
- o Safety briefings will be held prior to the onset of all field activities and as needed during the progress of site operations.

SECTION XIII: DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects will be handled in such a way as to preclude the potential for spreading radioactive contamination, creating a sanitary hazard or allowing litter to be left on-site. All contaminated disposable materials, e.g. nuke boots, gloves, tyvek will be double-bagged, drummed, labeled and segregated in a designated and secured area on-site for future disposal at a low level radioactive waste disposal site. All contaminated waste materials will be disposed of as required by the provisions included in the contract and consistent with regulatory provisions. All non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste.



SECTION XIV: EMERGENCY/CONTINGENCY PROCEDURES

14.1 Emergency Procedures

As a result of the planned activities at the site and the conditions under which operations may be conducted, there is potential for an emergency situation to develop. In this event, an emergency contingency plan will be implemented for all field personnel at the Allied Signal Aerospace Facility.

- 14.2 The Ebasco Site Emergency Coordinator is: Jim Mayberry  
The Ebasco Site Health & Safety Officer is: Virginia Barnett

The emergency coordinator shall implement the contingency plan if conditions at the site warrant such action. The emergency coordinator and HSO will be responsible for ensuring a safe evacuation, emergency on-site medical treatment and transport of site personnel to the designated medical facility and notification of emergency response units and appropriate management staff.

14.3 Evacuation

In the event of an emergency situation, an air horn or other appropriate device will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. Communication by walkie-talkies may suffice. All personnel in both the restricted and nonrestricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the Site H&S Officer. The location shall be upwind of the source. The Site Health & Safety Officer will have authority to initiate proper action if outside services are required. Under no circumstances will non-emergency response personnel be allowed to proceed into the area once the emergency signal has been given.

SECTION XIV: EMERGENCY/CONTINGENCY PROCEDURES

The Site Health & Safety Officer or designee must ensure that access for emergency equipment is provided once the alarm has been sounded. As the safety of all personnel is being established, emergency response groups will be notified by telephone of the emergency.

Teterboro Fire Dept. - (201) 288-1000  
Teterboro Police Dept. - (201) 288-2103  
NJ DEP Hotline - (609) 292-7172  
NJ Dept. of Health - (800) 367-6543

14.4 Personnel Injury

Emergency first aid will be applied on-site and transport of the individual to the designated facility will be made as needed. The Site Health & Safety Officer will supply medical data sheets to appropriate medical personnel and he/she shall complete an incident report as soon as possible following the incident. Selected emergency response and medical personnel will to be notified prior to the startup of site activities of the work to be conducted on-site and the potential hazards that may be encountered by field personnel during remedial activities.

Hackensack Medical Center - (201) 441-2300  
Passaic General Hospital - (201) 365-4300  
Rescue - (201) 288-2103

SECTION XIV: EMERGENCY/CONTINGENCY PROCEDURES

Primary Hospital Route (Exhibit 14-1) - Hackensack Medical Center.  
20 Prospect Ave; Hackensack, N.J.

From the site, take Rte 46 West to Rte 17 North, exit at Boulevard/Summit Avenue. Proceed to the light and make a right onto Summit Avenue. Travel to the first Light (Summit Avenue/Essex Street intersection) and make a right. Proceed one block to Prospect and make a left. Follow signs to Emergency Room.

Backup Hospital Route (Exhibit 14-2) - Passaic General  
350 Boulevard,  
Passaic, N.J.

From the site, take Rte 46 West to Paulison Ave; as you exit proceed under overpass and go to 3rd traffic light, at 3rd traffic light, make right turn (Oak St.) continue 2 more blocks and make right turn onto Boulevard, hospital is on left. Follow signs to Emergency Room.



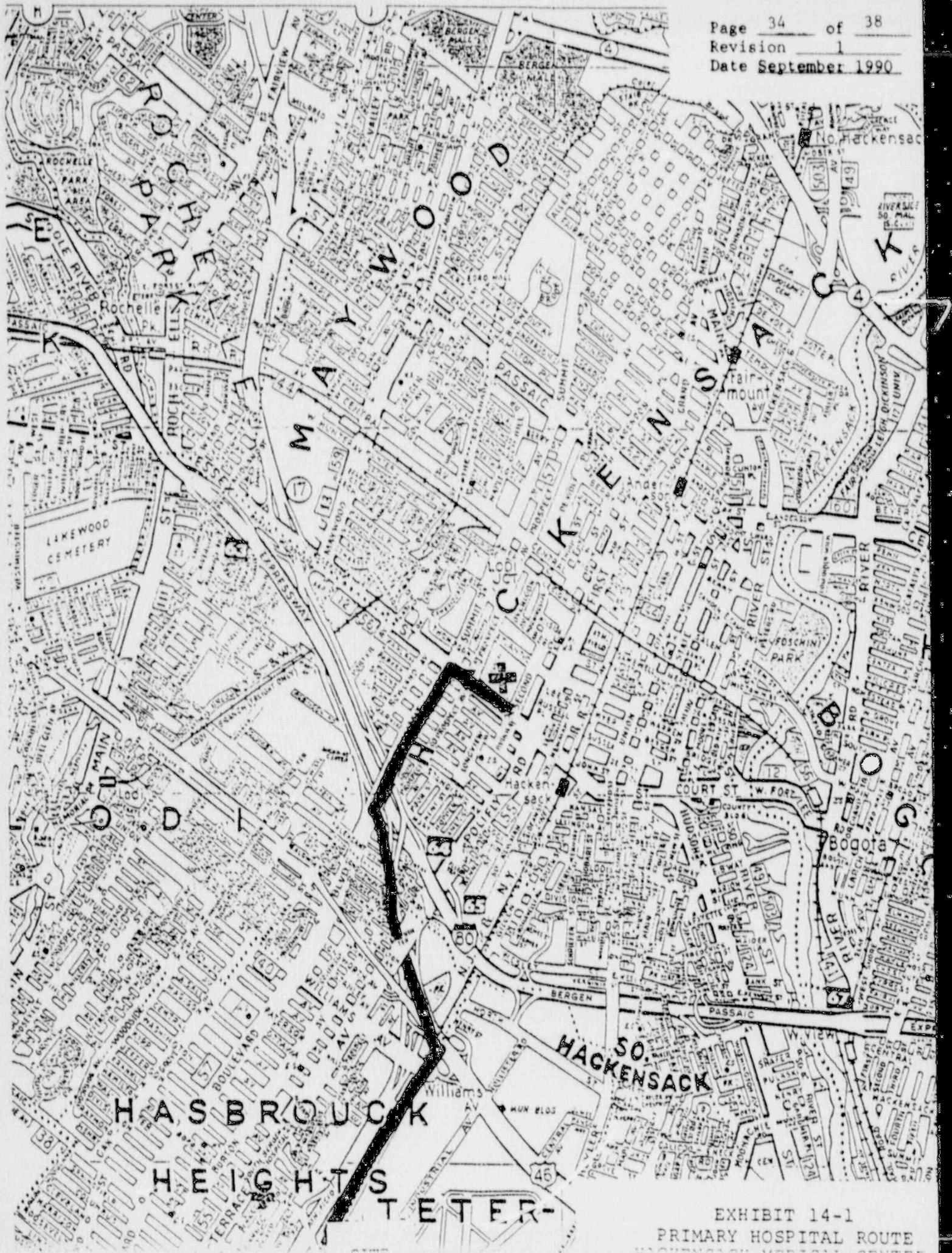
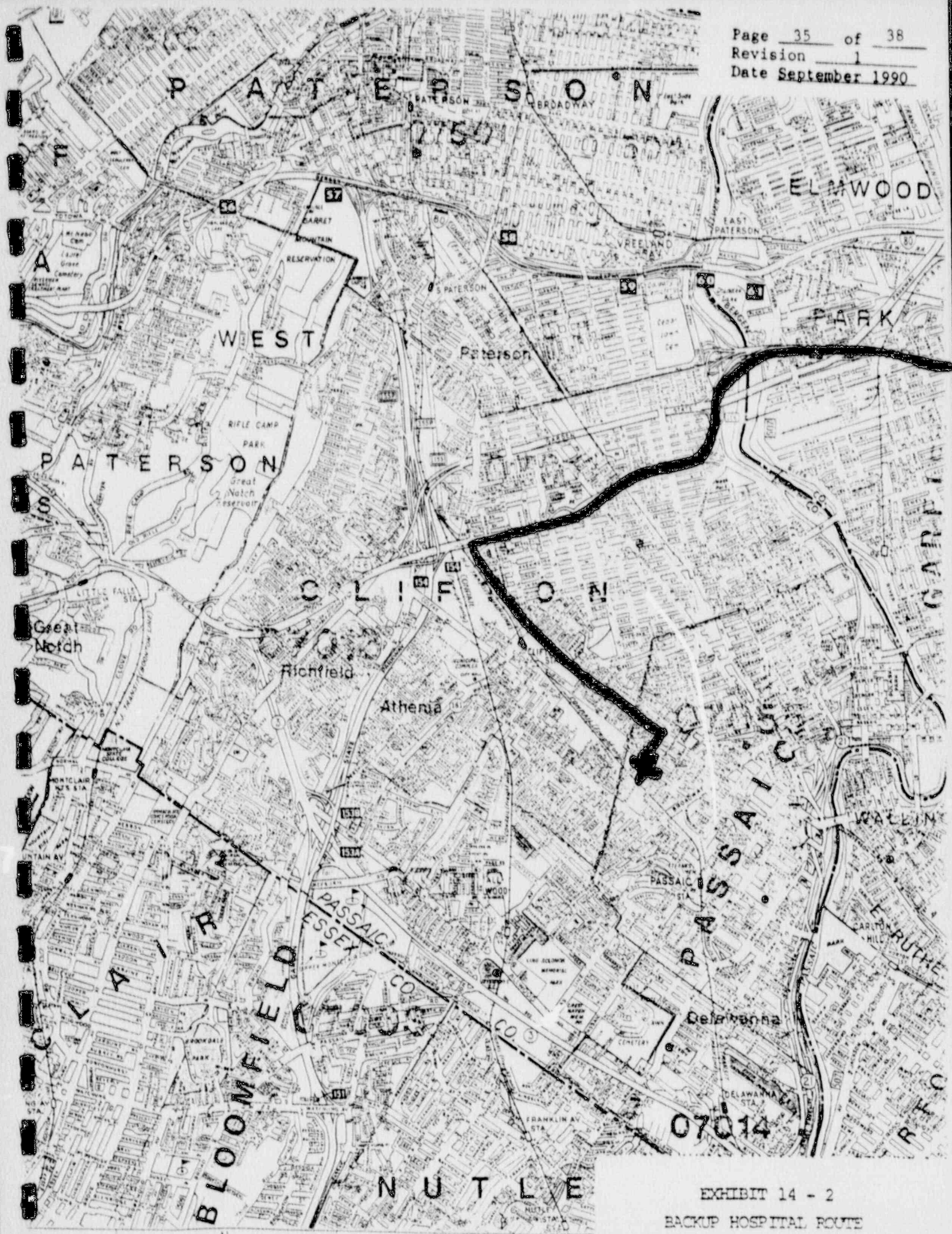


EXHIBIT 14-1  
PRIMARY HOSPITAL ROUTE





07014

EXHIBIT 14 - 2  
BACKUP HOSPITAL ROUTE

SECTION XIV: EMERGENCY/CONTINGENCY PROCEDURES

14.5 Overt Personnel Exposure

SKIN CONTACT: Use copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes, decon; then provide appropriate medical attention. Eyewash and emergency shower or drench system shall be provided on-site at the CRZ and/or Support Zone.

INHALATION: Move to fresh air and, as necessary, decon/transport to hospital.

INGESTION: Decon/transport to hospital.

The site Health and Safety Officer shall provide medical sheets to appropriate medical personnel.

Hackensack Medical Center - (201) 441-2300  
Passaic General Hospital - (201) 365-4300  
Rescue (Teterboro Police) - (210) 288-2103  
Poison Control Center - (800) 822-9761

14.6 Adverse Weather Conditions

In the event of adverse weather conditions, the Site Health and Safety Officer will determine if field work can continue without sacrificing the health and safety of field personnel. Some of the prevailing conditions to be considered are:

- o Potential for cold stress
- o Treacherous weather-related working conditions
- o Limited visibility
- o Potential for electrical storms



SECTION XV: COMMUNITY RELATIONS

15.1 General

This segment of the Allied Signal Aerospace Project involves the excavation and removal of radiologically contaminated soil.

15.2 Project Description

On-site remedial operations will consist of:

- o Soil excavation and removal
- o Drum removal
- o Radiation survey
- o Post-remediation sampling

Because radioactive materials are present, the necessary safety precautions will be implemented. This will include the use of Level D protective equipment (PPE) for intrusive field activities to be worn by field personnel and the establishment of an exclusion and contamination reduction zone around each excavation location. Respirators will not be required initially but may be required if potential for inhalation of contaminants increase.

Enquiries regarding specific project questions should be directed to:

Mark Schwind, Environmental Engineer  
Allied-Signal Aerospace Company,  
Teterboro Airport, NJ  
201-393-2452

The primary Ebasco contact is: Les Skoski  
201-460-6178

SECTION XVI: MEDICAL DATA SHEET/FIELD TEAM REVIEW

This brief Medical Data Sheet will be completed by all on-site personnel and will be kept in the Support Zone during field activities. This Data Sheet is not a substitute for the Medical Surveillance Program requirements consistent with the Ebasco Health and Safety Program for field personnel. This data sheet will accompany any personnel if medical assistance or transport to hospital facilities is required. If more information is required, use the back of this sheet.

Project Allied Signal Aerospace

Name \_\_\_\_\_ Employee No. \_\_\_\_\_

Address \_\_\_\_\_ Home Telephone \_\_\_\_\_

Age \_\_\_\_\_ Height \_\_\_\_\_ Weight \_\_\_\_\_

Emergency Contact \_\_\_\_\_ Telephone \_\_\_\_\_

Allergies \_\_\_\_\_

Particular Sensitivities \_\_\_\_\_

Do You Wear Contacts? \_\_\_\_\_

Provide a Checklist of Recent Illnesses \_\_\_\_\_  
or Exposures to Hazardous Chemicals \_\_\_\_\_

What medications are you presently using? \_\_\_\_\_

Do you have any particular medical restrictions? \_\_\_\_\_

Name of Personal Physician \_\_\_\_\_ Telephone \_\_\_\_\_

I have read and reviewed the Site-Specific Health and Safety Plan and understand the information contained therein and will comply.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Site/Project: \_\_\_\_\_



APPENDIX A  
CHEMICAL DATA SHEET

3513K



Date: 10/2/89

CHEMICAL DATA SHEET

I. Chemical/Compound Name: Magnesium  
A. Synonyms: \_\_\_\_\_  
B. CAS #: 1309-48-4

II. Physical Characteristics:  
A.      Liquid   X   Solid      Powder      Gas  
B. Color silvery-white  
C. Odor- odorless  
D. LEL     % Flash pt.     °F  
E. Boiling Point 1107°F Melting Point 651°F  
Ionization Potential       
F. Other AW 24.32

III. Recommended Air Purifying Cartridge:  
  X   Dusts, Fumes, Mists      Acid Gases  
     Organic Vapors      Pesticides  
  X   HEPA      Air Purifying is  
Inappropriate  
     Ammonia/Amines      Other     

IV. Health Hazards Data:  
A. Routes of Entry:   X   Inhalation (of fumes)  
     Skin Absorption      Ingestion  
B. OSHA Listed Carcinogen:   X   No      Suspect      Yes  
C. Sensitizer:      No   X   No Data      Suspect      Yes  
D. Acute Toxicity:  
Eye Contact- irritation (fumes)

Skin Contact- "Chemical gas gangrene" if skin is perforated,  
local reaction at site of injury producing blisters,  
ulcers or more seriously, necrosis of tissue  
Inhalation- (of fumes) metal fume fever producing flu-like  
symptoms, i.e., fever, cough, chest pain.

E. Chronic Toxicity:  
Target Organs-       
Long-Term Effects- no evidence that magnesium produces true  
systemic poisoning. Occupational health hazards in  
foundries probably due to atmospheric contaminants, i.e.,  
fluorides, sulfur dioxide, carbon tetrachloride and chromium  
compounds

V. Exposure Limits:  
A. OSHA PEL: 15 mg/m<sup>3</sup> (TWA)  
B. ACGIH TLV: 10 mg/m<sup>3</sup> (TWA)  
C. IDLH:       
D. NIOSH REL:       
E. STEL:     

VI. Other Pertinent Information/Special Precautions: Most serious  
hazard is danger from burns when handling or processing  
magnesium.



Date: 6/90  
#: 87

CHEMICAL DATA SHEET

I. Chemical/Compound Name: \*Radium-226/Radon-222  
A. Synonyms: \_\_\_\_\_  
B. CAS # \_\_\_\_\_

II. Physical Characteristics  
A.        Liquid   X   Solid        Powder   X   Gas  
B. Color: \_\_\_\_\_  
C. Odor- \_\_\_\_\_  
D. LEL        % Flash pt.        °F  
E. Boiling Point        °F Melting Point        °F  
Ionization Potential \_\_\_\_\_  
F. Other: \*Naturally occurring from U-238 decay chain;  
Half-life - 1620 years, an alpha particle emitter

III. Recommended Air Purifying Cartridge:  
       Dusts, Fumes, Mists        Acid Gases  
       Organic Vapors        Pesticides  
       HEPA        Air Purifying is  
       Ammonia/Amines        Inappropriate  
         X   Other: radionuclide

IV. Health Hazards Data  
A. Routes of Entry:   X   Inhalation        Skin Absorption  
  X   Ingestion  
B. OSHA Listed Carcinogen:   No     Suspect     Yes    
C. Sensitizer:          No     No Data     Suspect     Yes    
D. Acute Toxicity:  
Eye Contact: \_\_\_\_\_  
Skin Contact: \_\_\_\_\_  
Whole Body Exposure: vomiting, nausea, epilation, sore  
(>100 rems) throat, hemorrhage, purpura, petechiae,  
diarrhea, CNS injury and disorientation

E. Chronic toxicity:  
Target Organs: Skeleton, lungs, bone marrow, CNS,  
Long-Term Effects: osteosarcoma, aplastic anemia, lung  
cancer among miners of radioactive ores-may be due to high  
concentrations of radon gas.

V. Exposure Limits (\*NRC) - (10CFR Part 20, App. B)  
Concentrations in air and water above natural background

Element	Isotope	Air (uCi/ml)	Water (uCi/ml)
Radium	RA-226	S <sup>1</sup> 3 x 10 <sup>-10</sup>	4 x 10 <sup>-4</sup>
		I <sup>2</sup> 5x10 <sup>-11</sup>	9 x 10 <sup>-4</sup>
Radon	Rn-222	3 x 10 <sup>-8</sup>	

\*Nuclear Regulatory Commission  
S<sup>1</sup> - Soluble I<sup>2</sup> - Insoluble

VI. Other Pertinent Information/Special Precautions: Following decay  
of Ra-226 in bone, approximately 67% of Ra-222 diffuses to blood and  
is exhaled; maximum permissible body burden: 0.1 uCi (Ra-226)



APPENDIX B  
COLD STRESS

3513K

These Threshold Limit Values (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 core temperature from falling below 36°C and to prevent cold injury to body extremities. Deep body temperature is the core temperature of the body as determined by rectal temperature measurements. For a single, occasional exposure to a cold environment a drop in core temperature to no lower than 35°C 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. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: (1) shivering, (2) apathy, listlessness, sleepiness, and rapid cooling of the body to less than 95°F, (3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate, (4) freezing of the extremities, and, finally, (5) death.

Workman 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 vary like 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 clothing to maintain core temperatures above 36°C must be provided to workers if work is performed in air temperature below 4°C (40°F). Wind chill factor or the cooling power of the air is a critical factor. 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 Wind Chill Chart. 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.
3. Employees shall be excluded from work in cold at  $-1^{\circ}\text{C}$  ( $30^{\circ}\text{F}$ ) 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  $-24^{\circ}\text{C}$  ( $-10^{\circ}\text{F}$ ) with wind speeds less than five miles per hour, or air temperatures below  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) 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 secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment.

In cold environments, wind-chill temperature is a better description of thermal conditions than the ambient temperature alone. The wind adds to the rate of cooling and it is the combination of wind speed and air temperature that is most important. In the wind-chill chart, arbitrary risks of frost bite are given for short exposure periods. For example, at a wind-chill temperature of  $-25$  (from a  $5^{\circ}\text{F}$  temperature and  $15$  MPH wind) exposed flesh may freeze within one minute. However, fingers, toes, nose tips, ears or cheeks may become frost bitten at ambient temperatures as high as  $32^{\circ}\text{F}$  with high winds. This is approximately the freezing point of skin in the absence of subcooling.

Hypothermia (general lowering of body temperature) can occur from exposure to conditions well above freezing. The lethal deep body temperature is placed at about  $78^{\circ}\text{F}$ . This condition can occur where a worker is immersed in cold water (divers), is exposed to cool, high winds, is in a state of physical exhaustion, or has insufficient food. Alcohol should not be consumed in cold environments because the resultant dilation of blood vessels can permit a rapid loss of body heat increasing the risk of hypothermia. For warming purposes, liquid intake should be hot, non-alcoholic beverages or soup.



## Frost Bite

1. Frost nip or incipient frostbite. The condition is characterized by sudden blanching or whitening of skin.
2. Superficial frostbite. Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
3. Deep frostbite. Tissues are cold, pale, and solid; extremely serious injury.

Frost bite may be either superficial involving only the skin or deep, extending below the skin. Frost bite may be considered to be superficial if exposure time was short. Otherwise assume the injury to be deep and, therefore, serious, in which case it should be treated at a hospital rather than in the field. Superficial frost bite can be treated by

1. covering the cheeks with warm hands until pain returns,
2. placing uncovered frost bitten fingers under the opposing armpit next to the skin,
3. placing bare frost bitten feet under the clothing against the skin of a companion
4. never rewarm a frost bitten part by massage, exposure to open fire, cold water soaks or rubbing with snow. Gradual rewarming against the skin is always preferred. It is important to know that pain will occur when thawing has occurred.
5. where deep frost bite exists, it is essential to get the patient to the hospital as quickly as possible. Frozen parts should be protected from additional cold injury but no attempts should be made to thaw them in the field. The patient should also be kept warm.

For work practices at or below  $-12^{\circ}\text{C}$  ( $10^{\circ}\text{F}$ ) ECT the following shall apply:

1. The worker shall 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 must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
3. New employees shall not be required to work full-time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
4. The weight and bulkiness of clothing shall be included in estimating the required work performance and weight to be lifted by the worker.



5. The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used. The worker should be protected from drafts to the greatest extent possible.
6. The workers shall be instructed in safety and health procedures. The training program shall 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 signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
  - f. Safe work practices.

Special caution shall 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 shall 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 are required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace monitoring is required as follows:

Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16°C (60°F) to enable overall compliance with the requirements of the TLV to be maintained.

In outdoor situations, the windspeed should be measured and recorded at least every 4 hours, together with the air temperature whenever the air temperature is below -1°C (30°F).

For exposed skin, continuous exposure should not be permitted when the air speed results in an equivalent chill temperature of -32°C (-25°F). Superficial or deep local tissue freezing will occur at temperatures below -1°C regardless of wind speed.

### Work-Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below  $-7^{\circ}\text{C}$  ( $20^{\circ}\text{F}$ ) heated warming shelters (tents, cabins, rest rooms, etc.) shall be made available nearby and 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 outerlayer of clothing shall 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 shall be provided as necessary to prevent workers from returning to their 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 a diuretic and circulatory effect.

### Protective Clothing

1. Clothing for both cold-wet (moderately cold weather above  $14^{\circ}\text{F}$ ) and cold-dry (temperatures below  $14^{\circ}\text{F}$ ) should be available.
2. Clothing worn loosely and in layers provides maximum protection because the trapped layers of warm air are more effective insulators than the cloth itself.
3. Clothing must be kept dry. If not, the exposure to cold must be altered with periods of rewarming and drying of clothes.
4. Moisture should be kept off clothes by brushing or shaking snow from it prior to entering heated shelters.
5. Means of evaporating perspiration should be encouraged by opening the neck, waist, arm sleeves and ankle fasteners as needed to provide periodic fresh air circulation.
6. During severe wind-chill conditions, a cold weather mask or wool scarf should also be worn.
7. When wearing face protectors that they be removed periodically to check for frost bite.
8. Skin on the hands can freeze easily, therefore, cold metal should never be touched with bare hands. Special protection of the hands is required to maintain manual dexterity for the prevention accidents. If the air temperature is  $-17.5^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ), the hands should be protected by mittens.

9. Pants should be tucked in and lapped over boot tops to prevent the entry of snow and cold water into the boot.
10. The foot wear for outdoor work in wet snow should be water proof and reach well up on the leg. The soles and upper part of the boot should provide good insulation as well. A combination of working boots and rubber overboots provides this insulation.
11. Socks should be fairly heavy and reach well up on the leg to encourage wicking and evaporation of sweat.

#### Other Precautions

Balanced meals and adequate liquid intake are essential to body heat production and the prevention of dehydration. Dehydration is as prevalent in cold regions as it is in hot, dry areas. Warm liquids (hot soup or tea) are obviously preferable since they do not have to be warmed by the body after consumption. Cold foods and drinks should only be eaten as a matter of necessity. Hair should be cut and beards shaved or clipped closely. Long hair or a beard add very little in insulation value and natural hair oils soil the clothing. In the open, a beard serves as a base for ice build-up and will mask the appearance of frost bite. Electric razors are preferable since they do not remove protective oils from the face.



### WINDCHILL CHART

WIND SPEED (MPH)	LOCAL TEMPERATURE (F)										
	32	23	14	5	-4	-13	-22	-31	-40	-49	-58
5	29	20	10	1	-9	-18	-28	-37	-47	-56	-65
10	18	7	-4	-15	-26	-37	-48	-59	-70	-81	-92
15	13	-1	-13	-25	-37	-49	-61	-73	-85	-97	-109
20	7	-6	-19	-32	-44	-57	-70	-83	-96	-109	-121
25	3	-10	-24	-37	-50	-64	-77	-90	-104	-117	-130
30	1	-13	-27	-41	-54	-68	-82	-97	-109	-123	-137
35	-1	-15	-29	-43	-57	-71	-85	-99	-113	-127	-142
40	-3	-17	-31	-45	-59	-74	-87	-102	-116	-131	-145
45	-3	-18	-32	-46	-61	-75	-89	-104	-118	-132	-147
50	-4	-18	-33	-47	-62	-76	-91	-105	-120	-134	-148

For Properly Clothed Persons    Little Danger    Considerable Danger    Very Great Danger  
**DANGER FROM FREEZING OF EXPOSED FLESH**

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.

APPENDIX C  
INCIDENT REPORT

3513K





WITNESSES TO INCIDENT

1. NAME \_\_\_\_\_ COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
TELEPHONE NO. \_\_\_\_\_
2. NAME \_\_\_\_\_ COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
TELEPHONE NO. \_\_\_\_\_

INJURIES

FIRST INJURED PERSON

Name and Address of Injured: \_\_\_\_\_  
\_\_\_\_\_

SSN: \_\_\_\_\_ Age: \_\_\_\_\_ Sex: \_\_\_\_\_

Years of Service: \_\_\_\_\_ Time on Present Job: \_\_\_\_\_

Title/Classification: \_\_\_\_\_

Severity of Injury or Illness: \_\_\_\_\_ Non-disabling  
\_\_\_\_\_ Disabling \_\_\_\_\_ Medical Treatment  
\_\_\_\_\_ Fatality

Estimated Number of Days Away From Job: \_\_\_\_\_

Nature of Injury or Illness: \_\_\_\_\_  
\_\_\_\_\_

Classification of Injury:

\_\_\_\_\_ Fractures \_\_\_\_\_ Heat Burns \_\_\_\_\_ Cold Exposure  
\_\_\_\_\_ Dislocations \_\_\_\_\_ Chemical Burns \_\_\_\_\_ Frostbite

<input type="checkbox"/> Sprains	<input type="checkbox"/> Radiation Burns	<input type="checkbox"/> Heat Stroke
<input type="checkbox"/> Abrasions	<input type="checkbox"/> Bruises	<input type="checkbox"/> Heat
<input type="checkbox"/> Lacerations	<input type="checkbox"/> Blisters	<input type="checkbox"/> Exhaustion
<input type="checkbox"/> Punctures	<input type="checkbox"/> Toxic Respiratory Exposure	<input type="checkbox"/> Concussion
<input type="checkbox"/> Faint/Dizziness		<input type="checkbox"/> Bites
<input type="checkbox"/> Respiratory Allergy		<input type="checkbox"/> Toxic
		<input type="checkbox"/> Ingestion
<input type="checkbox"/> Dermal Allergy		

Part of Body Affected: \_\_\_\_\_  
Degree of Disability: \_\_\_\_\_

Date Medical Care was Received: \_\_\_\_\_  
Where Medical Care was Received: \_\_\_\_\_  
Address (if off-site): \_\_\_\_\_

If Hospitalized  
Name, Address and Telephone No. of Hospital: \_\_\_\_\_

Name, Address and Telephone No. of Physician  
\_\_\_\_\_

SECOND INJURED PERSON

Name and Address of Injured: \_\_\_\_\_  
\_\_\_\_\_

SSN: \_\_\_\_\_ Age: \_\_\_\_\_ Sex: \_\_\_\_\_

Years of Service: \_\_\_\_\_ Time on Present Job: \_\_\_\_\_

Title/Classification: \_\_\_\_\_

Severity of Injury or Illness: \_\_\_\_\_ Non-disabling  
 Disabling  Medical Treatment  
 Fatality

Estimated Number of Days Away From Job: \_\_\_\_\_

Nature of Injury or Illness: \_\_\_\_\_  
\_\_\_\_\_

Classification of Injury:

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Fractures           | <input type="checkbox"/> Heat Burns                 | <input type="checkbox"/> Cold Exposure   |
| <input type="checkbox"/> Dislocations        | <input type="checkbox"/> Chemical Burns             | <input type="checkbox"/> Frostbite       |
| <input type="checkbox"/> Sprains             | <input type="checkbox"/> Radiation Burns            | <input type="checkbox"/> Heat Stroke     |
| <input type="checkbox"/> Abrasions           | <input type="checkbox"/> Bruises                    | <input type="checkbox"/> Heat Exhaustion |
| <input type="checkbox"/> Lacerations         | <input type="checkbox"/> Blisters                   | <input type="checkbox"/> Concussion      |
| <input type="checkbox"/> Punctures           | <input type="checkbox"/> Toxic Respiratory Exposure | <input type="checkbox"/> Bites           |
| <input type="checkbox"/> Faint/Dizziness     |   | <input type="checkbox"/> Toxic Ingestion |
| <input type="checkbox"/> Respiratory Allergy |   |  |
| <input type="checkbox"/> Dermal Allergy      |   |  |

Part of Body Affected: \_\_\_\_\_  
Degree of Disability: \_\_\_\_\_  
Date Medical Care was Received: \_\_\_\_\_  
Where Medical Care was Received: \_\_\_\_\_  
Address (if off-site): \_\_\_\_\_

If Hospitalized  
Name, Address and Telephone No. of Hospital: \_\_\_\_\_

Name, Address and Telephone No. of Physician  
\_\_\_\_\_

(If more than two injuries, provide information on separate sheet).

PROPERTY DAMAGE

Brief Description of Property Damaged  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Estimate of damage: \$ \_\_\_\_\_



INCIDENT LOCATION

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

INCIDENT ANALYSIS

Causative agent most directly related to accident (Object, substance, material, machinery, equipment, conditions):

\_\_\_\_\_  
\_\_\_\_\_

Was weather a factor?: \_\_\_\_\_

Unsafe mechanical/physical/environmental condition at time of incident (Be specific):

\_\_\_\_\_  
\_\_\_\_\_

Unsafe act by injured and/or others contributing to the incident (Be specific, must be answered):

\_\_\_\_\_  
\_\_\_\_\_

Personal factors (Improper attitude, lack of knowledge or skill, slow reaction, fatigue):

\_\_\_\_\_  
\_\_\_\_\_

On Site Incidents

Level of personal protection equipment required in site Safety Plan: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Modifications: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Was injured using required equipment?: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



Date \_\_\_\_\_

INCIDENT FOLLOW-UP

Date of Incident: \_\_\_\_\_

Site: \_\_\_\_\_

Brief description of incident: \_\_\_\_\_  
\_\_\_\_\_

Outcome of incident: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Physician's recommendations: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date injured returned to work: \_\_\_\_\_

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM



APPENDIX D

OSHA POSTER

3513K

# 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/or optional penalties of up to \$1,000 for each nonserious violation. Penalties of up to \$1,000 per day may be proposed for failure to or delay in corrections 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



APPENDIX E  
SITE CONTROL AND SAFETY

3513K



SITE CONTROL AND SAFETY POLICY  
FOR WORK ASSOCIATED WITH RADIOLOGICAL REMEDIAL OPERATIONS  
ALLIED SIGNAL AEROSPACE PROJECT

PERSONNEL RESPONSIBILITIES

Although trained personnel in health and safety will oversee remedial activities, each individual involved in these operations must constantly remain aware of potential radiological and occupational safety problems which may be encountered. Each action on-site may directly affect personal safety, potential contamination and the overall radiological problems associated with sampling activities.

Radiation Work Procedures

Entry into a potential radioactive area for any purpose will require specific authorization and instructions. Effective radiation control is dependent upon judgment, training and experience. Prior to entry, personnel will become familiar with these procedures. Safety information will be provided regarding protective clothing and other equipment needed for remedial activities and special precautions that might have to be taken.

Protective Clothing

Protective apparel will be provided to prevent a potential of contamination to your personal clothing or body. The Health and Safety Officer (HSO) will tell you what protective clothing will be required. At a minimum, this will be shoe covers, surgical gloves and uncoated tyvek.

The type of protective clothing required depends upon the amount and type of contamination present. Assigned protective clothing may feel cumbersome, but for protection, it is necessary that all skin surfaces be covered completely.

The HSO may specify "no personal outer clothing". This means your ordinary outer clothing, i.e., jacket, sweater, shirt, trousers may not be worn into the exclusion area beneath your protective coveralls. This requirement is mandatory and if contamination of your personal clothing occurs, the clothing will have to be taken for disposal or decontamination. Rings, watches and other jewelry must not be taken into the exclusion area for safety and potential contamination of the articles.

Protective apparel is effective - if it is used properly. So for your own safety, it is important that you take full advantage of this protection. Here are some important things to remember:

1. Read the Health & Safety Plan to know exactly what protective clothing is required for the job. Then follow the instructions carefully.
2. Do not wear any protective clothing that has a hole or tear in it or is improperly mended.
3. Be sure the protective clothing is the right size. You will not be well protected if coverall sleeves expose part of your arms, or if dragging pant legs pick up and spread ground contamination, or if your shoe covers are so loose they slip off.

#### Tools and Equipment

If you have any tools or equipment you want to take into the exclusion area, check them in first with the HSO. He/she can tell you how to protect them from potential contamination while in use or arrange for their decontamination when your job is complete.

#### Monitoring

When you enter the exclusion area, the HSO or designee will go with you to establish air quality and check for contamination. Do not enter a potentially-contaminated area without a qualified individual and if a question arises about conditions, do not proceed until you have obtained the assistance of the site health and safety officer. The job of the health and safety officer is to assist you in performing your job in the safest possible manner.

#### Precaution Reminders

Your Site-Specific HASP will tell you what will be required during remedial operations, but there are a few general precautions which should always be kept in mind.

- o Never eat or smoke in the Exclusion Zone.
- o Always wear your thermoluminescent dosimeter (TLD).
- o Never remove any article of protective clothing while you are in the exclusion area (except for changing gloves or in case of certain emergencies).

## EXITING THE EXCLUSION ZONE

### Step-off Pads

Each time you leave the Exclusion Zone, assume your clothing may be potentially contaminated. When you encounter a step-off pad, use the following procedure. The proper application and use of these step-off pads is the primary method for controlling the spread of potential radioactive contamination. Before stepping on the pad, remove the shoe cover on that foot. When the shoe cover is removed, that foot must not be placed anywhere but on the step-off pad. Now repeat for the other foot. The important thing to remember is that you are moving from a potentially contaminated zone to a "clean zone" and you want to leave all contamination behind you.

### Personal Contamination Survey

For your own protection, frisking with an HP-260 probe will be required after leaving the Exclusion Zone and again after decontaminating and prior to entering the Support Area.

## HANDLING OF TROUBLE

### Minor Injuries

Radioactive material can enter the body through breaks in the skin. When working in the Exclusion Zone, and if you incur a minor injury, or later discover a cut or scratch you may have received there, proceed as follows:

1. Leave the Exclusion Zone immediately.
2. Flush the wound with running water.
3. Notify the Field Leader and Health and Safety Officer.
4. The Health and Safety Officer will survey the wound and, if possible, the object which caused it. You will then be instructed on how to obtain medical treatment.

### Major Injuries

In case of major injury, particularly one involving severe bleeding, the victim must receive medical treatment as quickly as possible - even if that means bypassing normal Exclusion Zone exit procedures.



### Skin Contamination

If potential radioactive contamination is discovered anywhere on your skin, notify the Health and Safety Officer immediately.

You should not attempt to remove the contamination yourself. Skin decontamination should be directed or performed by qualified persons only.

### Contaminated Personal Clothing

If radioactive contamination is discovered on your personal clothing, remove the clothing immediately and notify the Health and Safety Officer. He/she will make arrangements for decontamination.

APPENDIX F  
REPORTING FORMS

3513K

H&S WEEKLY REPORT

SITE: \_\_\_\_\_

WEEK OF REPORT: \_\_\_\_\_

HSO: \_\_\_\_\_

Activities	Levels of Protection	Comments/Unusual Occurrences
Drilling, GW sampling, etc.)	(Resp.)	
M		
T		
W		
Th		
F		

Summary of job-related injuries/illnesses:

Summary of violations or near misses:

Other notable items, incidents, conditions, etc.:







APPENDIX B

LABORATORY PROCEDURES



SUBJECT: ENVIRONMENTAL MONITORING

PAGE: \_\_\_\_\_

TITLE: Soil and Sediment  
Sample preparation with  
ball millingDATE: 1/27/83APPROVED: \_\_\_\_\_ *am*

- 
1. Weigh sample and record as wet weight.
  2. Place entire sample into aluminium pan. (Note: Tray should be clean and marked with lab number)
  3. Dry sample in oven for 24 hours at 110°C. (If possible dry to constant weight.)
  4. Sieve sample through a #10 sieve, discard all rocks.
  5. Record dry weight of sample include rocks and discarded material in weight.
  6. Transfer sample to 1 gallon can and place 5-10 one inch stainless steel balls in can. Seal lid and tape to insure lid is secure.
  7. Place samples on ball milling unit. Ball mill samples for 4-18 hrs. depending on type of soil (e.g. soft clay will be reduced to fine powder in approx. 4 hrs.)
  8. Sample is now ready for aliquoting for other analysis required.



subject: ENVIRONMENTAL PROCEDURES page: 1  
 title: GAMMA ISOTOPIC in SOIL or SEDIMENT date: 6/79

approved: MAC EAR

Gamma emitting radionuclides are determined routinely by gamma spectral analysis of aliquots of dried sample, using a GeLi detector. The volume of sample, counting geometry, and counting time may vary as long as the client's sensitivity requirements are achieved.

TMA/EBERLINE

RADIOMETRICS INSTRUMENT OPERATING PROCEDURES

---

Ge(Li) #1

WRITTEN BY:

Kathy Bundson

Radiometrics Supervisor

5/16/88

Date

APPROVED:

[Signature]  
Manager, Analytical Laboratory

[Signature]  
Date

Ernest A. Sanchez  
Manager, Quality Assurance

6/9/88

Date

Rev. 1  
Date: 05/16/88

RI09-21



## Ge(Li) #1

### 1.0 Purpose

The purpose of this procedure is to provide instructions for the proper counting of samples in Ge(Li) #1.

### 2.0 Scope

This procedure describes the proper method of counting samples for gamma isotopes in Ge(Li) #1.

### 3.0 References

3.1 TMA/Eberline ND 6600 General Instructions

### 4.0 Equipment

- 4.1 ND 6600 Multichannel Analyzer
- 4.2 PGT LGC 19 SD Ge(Li) Detector with Preamp
- 4.3 PD AEC5080B High Voltage Supply
- 4.4 PGT 340 Amplifier
- 4.5 ND 570 ADC
- 4.6 TI Omni 800 820 KSR Printer

### 5.0 Procedure

- 5.1 Display ADC #1 on analyzer. See ND 6600 General Instructions.
- 5.2 Erase spectrum.
- 5.3 Open shield door.
- 5.4 Put sample in plastic bag and place squarely on detector.
- 5.5 Close door.
- 5.6 Select desired count time. See ND 6600 General Instructions.
- 5.7 Press "acq" to start count.
- 5.8 When count is finished print-out spectrum per General Instructions.

TMA/EBERLINE  
RADIOMETRICS INSTRUMENT QUALITY CONTROL MANUAL

---

GAMMA SPECTROMETERS

WRITTEN BY:

Kathy Bumban  
Radiometrics Supervisor

5/16/88  
Date

APPROVED:

P. J. ...  
Manager, Analytical Laboratory

5/16/88  
Date

Ernest R. Sanchez  
Manager, Quality Assurance

6/7/88  
Date

Rev. 1  
Date: 05/16/88

RIQC6-12

## GAMMA SPECTROMETER

### 1.0 Purpose

The purpose of this procedure is to verify the stability (efficiency and background) of the gamma spectrometers.

### 2.0 Scope

This procedure describes the proper method of efficiency and background testing of the gamma spectrometers.

### 3.0 References

- 3.1 Source Certificates of Calibration
- 3.2 TMA/Everline Radiometrics Instrument Operating Procedures

### 4.0 Equipment

- 4.1 NEN Ba-133 source, NEN-1305, Cs-137 source, NEN-131S and Co-60 source, NEN 134S
- 4.2 Ge(Li) systems I, II, III and Germanium IV system

### 5.0 Procedure

#### 5.1 Efficiency Test

- 5.1.1 Count the NEN Ba-133, Cs-136, and Co-60 sources for 1 minute.
- 5.1.2 Enter Kev and identify the channel for the 81 and 1332.5 kev. Kev per channel is derived.
- 5.1.3 Calculate the efficiency of the Co-60 by dividing cpm by dpm.

#### 5.2 Background Test

- 5.2.1 Count chamber background for 400 minutes.



Subject: QUALITY CONTROL PROCEDURE

QC-1

Page: 1

Title: Laboratory Quality Control

Date: 12/05/84

Approved: *Em* 12/12/88

## 1.0 Types of Samples Analyzed for Quality Control Purposes

- 1.1 Blank samples - samples which are known to contain radioactivity in concentrations below the detection limits of the overall analytical procedure employed.
- 1.2 Spiked samples - samples to which have been added known amounts of known nuclides. Samples need not be "spiked" with primary (or even secondary) standard solutions, but should be spiked with amounts of activity which are well known.
- 1.3 Standard samples - samples run for calibration purposes.
- 1.4 Intercalibration samples - aliquots of samples supplied by other laboratories for comparison or qualification purposes.
- 1.5 Split samples - samples which have been divided into two or more aliquots.

## 2.0 Frequency of Analyses

- 2.1 One "blank", or one "spike", or one "split" is to be run for each ten routine samples for all types of analyses.
- 2.2 Standard samples are run whenever procedure calibration is required.
- 2.3 Intercalibration samples are run as made available.

## 3.0 Methods of Analysis

All samples run for quality control purposes will be run by the procedures normally utilized for the particular sample matrix.

## 4.0 Preparation of Quality Control Samples

- 4.1 Spike, blank, and split samples may be prepared by the technician routinely performing the analyses.
- 4.2 Intercalibration samples are normally prepared by an outside agency such as the EPA, AEC, IAEA, etc. In the case of intracompany intercalibration samples, preparation is by the Laboratory Supervisor or his designate.
- 4.3 Standards are prepared by the Laboratory Supervisor or his designate.

## 5.0 Records

Quality Control data are received on a daily basis by the QC representative or his qualified designate. The QC data are then summarized in a report

# NSD Procedure Manual

Eberline

A DIVISION OF  
**TE** Thermo  
Electron  
CORPORATION

Subject: QUALITY CONTROL PROCEDURE

QC-2  
Page: 2

Title: Laboratory Quality Control

Date: 12/05/84

Approved: *EW* 12/7/88

## 5.0 Records (con't)

format on a monthly basis. A copy of the report is sent to the QA manager and to the clients as appropriate.

### Corrective Action

The QC representative or his qualified designate review the quality control data on a daily basis. If the quality control values are outside the 3 sigma control limits, then corrective actions are taken. The corrective action includes review of the data for possible errors, possible interference in the sample, recounting of the sample, and/or reanalysis.