NEIC

ENFORCEMENT AND SAFETY PROCEDURES FOR EVALUATION OF HAZARDOUS WASTE DISPOSAL SITES

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OFFICE OF ENFORCEMENT

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William C. Blackman, Jr., P.E.
Barrett E. Benson, P.E.
Kenneth E. Fischer, P.E.
Utah Z. Hardy

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Denver, Colorado

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Utah Z. Hardy, EPA-NEIC, Denver, Colorado

INTRODUCTION

Enactment of the Resources Conservation and Recovery Act of 1976 (RCRA), and promulgation of the implementing regulations bring about two requirements for evaluation of Hazardous Waste Disposal Sites (HWDS) by Federal, State and local pollution control agencies and their contractors. Whether for the development of evidence or for the design of remedial measures, HWD site evaluations require of the evaluator new dimensions of precision, document control, quality assurance, and safety procedures. These requirements grow from the fact that hazardous waste sites are hazardous not only to the investigator, but to large numbers of the public; that investigative procedures may transform a potential hazard into a virulent one; and that unassailable quality of data is required for use as evidence for remedial action.

Hazardous waste disposal sites may contain toxic, carcinogenic, reactive, flammable, or explosive materials. Hazards are not limited to the site, but are transferable by movement of surface and groundwaters, air movement, shipment of samples, analysis in the laboratory and remedial or ultimate disposal activity.

Enforcement procedures include exacting document control, Chain-of-Custody, and quality assurance because of the very large liabilities and remedial costs associated with HWDS and because of the similarly large costs and liabilities associated with errors of procedure or flawed data.

The Environmental Protection Agency (EPA), National Enforcement Investigation Center (NEIC) began development of techniques and strategies for HWDS evaluations, for enforcement purposes, on uranium mill tailings sites and chemical dumps, in the early 1970s. More recently, these procedures have evolved as a result of experience, adaption, improved equipment and recent agency emphasis, to now provide the basis for much of the agency's procedural doctrine. The safety and evidentiary aspects of those procedures are summarized in this paper. Three documents[1,2,3] are quoted or excerpted extensively throughout this paper, and rigorous citation of each quote or excerpt would be unwieldly.

The authors invite comment, critique, and recommendations pertinent to the subject, and to the material presented.

GENERAL INVESTIGATIVE CRITERIA

Evaluation of HWDS is directed toward providing answers to five basic questions:

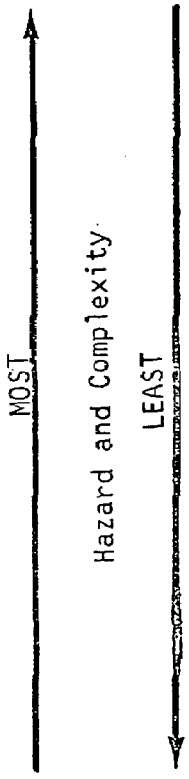
- Are the wastes adequately immobilized or destroyed at the site?
- By what routes or means can the wastes move off the site?
- What effects could occur (or might have occurred) through the discharge or release of the wastes?
- What steps are necessary to remedy the hazard(s)?

Procedures for determination of answers to the five basic questions are based upon the general requirements that: (a) exposure and hazard to investigative personnel and the public must be minimized, and; (b) evidence gathered must be litigable. It can be argued that some evaluations may not lead to litigation, however, the disposition of the data gathered is frequently indeterminate until after the investigation is complete. Moreover, rigid quality assurance, including document control, is essential irrespective of the purpose of the case.

The NEIC approach to the dual requirements of minimizing hazard and assuring litigability rests upon a scale of intensity [Table 1] that progresses from essentially no hazard and simple procedures, to maximum hazard and highly complex procedures. The standing rule for investigative team leaders is that procedures employed in HWDS investigations are to be limited in hazard and complexity to those necessary to meet objectives, i.e., screening, case development, cleanup, etc. Team leaders develop study

Table 1

INTENSITY OF HAZARDOUS WASTE DISPOSAL SITE
INVESTIGATIVE PROCEDURES



Onsite Measurements (Entry)

1. Drums
2. Tanks
3. Enclosed spaces
4. Test holes
5. Feed and process lines and valves
6. Sewers and manholes

Onsite Measurements (Accessible)

1. Soil
2. Spilled material
3. Air
4. Exposure (bioassay)
5. Onsite wells

Environmental Measurements (Offsite)

1. Ambient Air
2. Runoff
3. Groundwater (existing wells)
4. Peripheral test holes

Preliminary Assessment

1. Citizen information
2. Federal, state and local government files
3. Owner/operator files
4. Environmental data
5. Aerial imagery

plans to meet the stated objectives. With management guidance, safety review, legal counsel and peer review, the team leader judges the level of intensity that will be necessary to meet the objectives. Experience and informed judgment are major factors in the intensity decision.

PRELIMINARY ASSESSMENT

A preliminary assessment should be made of each HWDS to be investigated. The preliminary assessment may provide sufficient data to: (a) prioritize the case, (b) plan the necessary investigation, or (c) proceed to litigation or cleanup without further investigation. This assessment is accomplished through telephone and personal contacts with knowledgeable persons, file searches, and analysis of aerial photography.

The objectives are as follows:

- Determine if an emergency or potential emergency exists;
- Estimate potential severity of the problem and establish priorities for further investigation;
- Focus the inspection and field investigation efforts on the proper areas;
- Discover hazards to field personnel, allowing them to take proper safety precautions;
- Incorporate whatever findings are available from previous studies of the site, and;
- Develop an estimate of the kinds of resources needed to investigate the problem.

Initial Contacts

The original source of information, regarding a HWDS, whether private citizen or government official, should be asked for names of all other persons who might have knowledge about the site in question. If the contact is a private citizen, the names of anyone who might be able to corroborate the report should be requested. When appropriate, witnesses should be asked to prepare affidavits in support of their statements. If personal injury or property damage is claimed, the name and telephone number of the attending physician or insurance adjuster should be ascertained. If the source of information is an employee of the facility under discussion, it is advisable to inform that person of the the employee provisions of RCRA, Section 7001.

Government Files

After receiving a report of a possible waste disposal , the investigator should examine all available information in government files. Within the EPA regional offices, contacts in the Toxic Substances, Drinking water, Solid Waste, and Enforcement Offices should be consulted for information. State and local environmental agencies may have valuable information regarding sites, disposal practices, and other technical data. Fire departments and labor unions may have pertinent file material. In particular, information on whether the operator has an NPDES* permit should be sought.

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* National Pollutant Discharge Elimination System.

If the operator has applied for a permit, there may be considerable information on the wastesdisposed at the site and the engineering design of the facility. If no NPDES permits are held by the facility, then demonstration of discharges to surface waters may suffice for initiating a full enforcement investigation or enforcement action. In many cases, information may be available from State inventories of surface impoundments under the Safe Drinking Water Act (SDWA) or of open dumps under the Resource Conservation and Recovery Act (RCRA). In some cases, the U.S. Geological Survey (USGS) may have conducted investigations of groundwater pollution and found that the source is a waste disposal facility. Thus, USGS should be consulted for information on sites under study.

If the facility has applied for a State solid waste permit, a considerable amount of information may be available regarding geology, hydrology, and soils. Records of site visits and State enforcement actions should be requested. State water quality agencies may have data on ambient surface water and groundwater quality. Precise geographical location of the facility (geographical coordinates in degrees, minutes, and seconds) is important for obtaining aerial imagery. In many cases the county Registrar of Deeds will provide such information over the telephone; otherwise, they will generally respond to a written request. The investigator should also ask for highway direction to the site. Zoning or planning commissioners may be able to provide detailed maps of the site and its environs.

Environmental Data

Geology, hydrology, climate and other environmental factors are keys to evaluating the pollution potential of a waste management facility. Sources of and uses for, such information are:

1. Geology

Information on local bedrock types and depths may be important to an investigation of groundwater pollution problems, particularly where producing aquifers lie beneath the water table aquifer. Sedimentary strata (limestones, sandstones, shales) tend to channel groundwater flows along bedding planes; flow directions may be determined by the dip in the strata. Where limestones are present in humid climates, solution channels may develop allowing very rapid transport of pollutants over long distances with little attenuation. Igneous and metaphoric bedrock (granites, diorite, marble, quartzite, slate, gneiss, schist, etc.) may permit rapid transport of polluted groundwater along fracture zones. Depth to bedrock may be an important factor in selecting the appropriate type of remedial action. Sources of this information include USGS reports and files, State geological survey records, and local well-driller logs.

2. Soils and Overburden

Soil and overburden types and permeabilities are very important factors in evaluating the pollution potential of a waste management site. Highly permeable soils (i. e., 10^3 cm/sec) may permit rapid migration of pollutants,

both vertically and horizontally, away from containment areas. Rates of attenuation of pollutants in the unsaturated zone and underlying aquifers are a function of soil chemistry and physical characteristics. It is often important to ascertain the availability and quality of local clays in considering possible remedial measures. The USGS, the Soil Conservation Service, Agricultural Extension Service Agents, State geological survey records, local well drillers, and local construction engineering companies may be able to supply such information.

3. Climate

Local climate may also be an important factor in the pollution potential of a facility. Mean values for precipitation, evaporation and evapo-transpiration, and estimated infiltration can be used as general indicators of the potential for groundwater pollution at a site. In many cases, groundwater or surface water pollution has occurred due to unusually high amounts of precipitation. Even in an arid region where little or no recharge to groundwaters generally occurs, an extremely wet year may create a serious pollution problem. In evaluating the pollution potential of a "non-discharging" surface impoundment, it may be expedient to calculate a mass balance to determine if seepage through the walls or bottom is occurring. For these purposes, the investigator would find it necessary to consult monthly or seasonal precipitation and evaporation (or temperature) records during the period of operation. The maximum recorded or estimated rainfall for a given period of time (24/48-hour or monthly) may be an important factor in evaluating the amount of freeboard needed in a surface impoundment. Where airborne

contaminants may be a problem, it will be important to determine prevailing wind patterns and velocities. Such information can be obtained from the National Oceanic and Atmospheric Administration (NOAA) in Ashville, North Carolina.

4. Geohydrology

In most cases, the investigator will need to acquire information on the groundwater hydrology of a site and its environs. Depths to the water table and any underlying aquifers, characteristics of confining layers, piezometric surfaces (heads) of confined aquifers, direction(s) of flow, existence of perched aquifers, and areas of interchange with surface waters will be vital in evaluating the pollution potential of a facility. Groundwater use in the area of the site should be thoroughly investigated to find the depths of local wells, pumping rates, and the ways in which the water is used. Sources of such information include the USGS, State geological surveys, local well drillers, and State and local water resources boards. A list of all State and local cooperating offices is available from the USGS Water Resources Division in Reston, Virginia. This list has also been distributed to EPA Regional Offices.

5. Surface Waters

The locations of all surface waters or dry stream beds in the areas should be investigated, and surface gradients on and around the site should be determined.

If surface waters down-gradient from the site are used for drinking, recreation, fishing, irrigation, or livestock watering, this should be noted. Where pollution of surface waters is suspected, it is advisable to collect available base-line water quality data and stream flow rates. In addition, it may be necessary to get information on all NPDES permitted discharges by other operations in the vicinity of the site under investigation. Topographic maps, aerial photography, and the National Water Data Exchange (NAWDEX) systems of USGS can provide useful information on surface waters.

6. Sensitive Environments

The investigator should also determine if the site is located in a sensitive environment; e.g., in a floodplain, inside or adjacent to wetlands, in a recharge zone of a fresh water aquifer, in an area of karst topography, or in a fault zone. In general, the potential for long-term environmental disruption, if a discharge of hazardous wastes should occur, must be determined.

Site Environs

Before conducting a site visit, it is advisable to gather some information about the area surrounding the site. For the safety of those conducting a site visit, the names and telephone numbers of police and fire department responsible for that area should be noted. Furthermore, these departments may provide information on past incidents at the site under investigation. Sources of drinking water supplies in the area, both public

and private, should be noted. In addition, the investigator should check to see what analyses have been performed on these water supplies and request copies of all data. It may be important to find out what kind of treatment system is used by the public water supplier. If the area surrounding the site is serviced by a public water supply, it is important to determine the locations of water mains -- these could be conduits for entry of polluted groundwater into the public water system. Likewise, information should be gathered on the local sewer and storm drain systems to determine possible infiltration or illegal discharge points. The most important characteristics for determining the hazards in a given situation are population densities and distances to residences, schools, commercial buildings and any other occupied facilities in the vicinity of the waste site. The investigator should also try to determine if any flammables or explosives, such as liquified natural gas, are stored near the site. General land use of the environs should be studied if crops or livestock are raised in the area the types should be noted. Information on the wildlife or aquatic life in the area may yield important clues to the environmental impact of the site.

Hazardous Waste Management Information

If no information on wastes is available from government sources, it may be necessary to proceed with the site inspection and field investigations without benefit to background information. However, in some cases, it may be possible to form a hypothesis on the kinds of waste present at the facility. Where a landfill contains both municipal and industrial

wastes, it is probable that much of the waste comes from the local industries. If appropriate dates of operation of the facility are known, local officials or the Chamber of Commerce may be able to provide information on industries operating locally during that time period. In the case of an onsite (at the generator's site) facility, it may be possible to determine the type of waste present. Information on the composition of waste streams associated with various industrial processes may be obtained from the EPA Hazardous and Industrial Waste Division of the Office of Solid Waste in Washington, D.C. Other sources are the EPA Assessment of Industrial Hazardous Waste Practices[4] (14 industries covered) and Pollution Control in the Organic Chemical Industry[5] (Noyes Data Corporation).

Aerial Imagery

Aerial imagery is an effective and economical tool for gathering information on waste management sites. In general, aerial imagery should be acquired during the preliminary stages of an investigation for the following reasons:

- A considerable amount of information can be collected and documented with a minimal amount of effort.
- Locations of spills, discharges, leaks, or damage, may be pinpointed, enabling inspectors to plan their observation and sampling efforts.
- Maps of the site and its environs can be prepared prior to inspection.
- Obvious hazards to inspectors may be observed without exposing personnel to harm.

Examples of information available through analysis of imagery are: facility design and operation; surface drainage; spills; leaking containers; incinerator plumes; container inventories; surface leachate springs from landfills; seepage at dikes; surface water discharge points and plumes; vegetation damage; pipelines; land use of the site environs, and past waste disposal practices (using archival photos).

Federal agencies have been using aerial photography for a variety of purposes for several decades. In cases where it is important to gather information on the locations, areal extent, and historical development of facility operations (e.g., the size and locations of old landfill cells); archival photography can prove invaluable.

Archival photographs are available from the National Cartigraphic Information Center, U.S. Geological Survey, Reston, Virginia, and from EROS Data Center, Sious Falls, South Dakota. Photographs taken prior to 1950 are available from the National Archives. Generally, the requester must specify the geographical coordinates (latitude and longitude) of the site when requesting photography. Information on the photography available for a given site can usually be obtained in less than 30 minutes. Standard orders for copies of photographs are processed within six weeks; priority request require approximately one week at a significantly higher cost.

Aerial photography and photo interpretation services are available through contract arrangements and through cooperative arrangements with government agencies. Investigators should obtain competent counsel regarding

Dow vs EPA prior to initiating aerial photo or reconnaissance operations.

EVALUATION OF PRELIMINARY DATA

The initial evaluation of information concerning a site is performed after completion of the preliminary assessment to determine the following:

- the existence (or nonexistence) of a potential hazardous waste problem;
- the apparent seriousness of the problem and the priority for further investigation or action;
- the type of action or investigation appropriate to the situation.

Evaluation of the data by a team of specialists is desirable. Participants with some or all of the following professional and technical skills should be included in the process as appropriate: an environmental engineer (environmental, sanitary, chemical or industrial engineer), geohydrologist, chemist, and an attorney are recommended. Personnel with skills in assessing the health effects of exposure to toxic or hazardous substances, engineering personnel with the ability to assess appropriate remedies for hazardous waste disposal sites, and biologists trained and experienced in bioassay techniques (static and flow-through) may be needed.

Data Requirements

The data needed to evaluate the pollution potential of a waste management site can be roughly organized into four groups, presented in Table 2. "Waste

Table 2

DATA REQUIRED FOR EVALUATION

WASTE CHARACTERISTICS	WASTE MANAGEMENT
toxicity (Sax toxicity) - l,g,s,a,d	presence of leachate/presence runoff collection and treatment system - l,s,g
Ignitability (flash point or NFPA number) - f,l,a	presence of liners - g
reactivity - l,a,d,g	site security - d,f
corrosivity - l,d	presence of incompatible wastes - a,d,f
infectivity - l,g,s,a,d	condition of containers - l,g,s, a,d,f
persistence - l,g,s,a	danger of fire or explosion due to poor management practices - a,d,f
radioactivity - l,g,s,a,d	
quantity of waste - l,g,s,a	incinerator performance/pollution control devices - a
solubility - l,a,d	
volatility - l,a,d	
viscosity - l,s	
PATHWAYS	RECEPTORS
depth to groundwater - g	population density - l,g,s,a,d
soil permeability - g	proximity to surface drinking water supply - s
bedrock permeability - g	proximity to drinking water wells - g
proximity to surface water body - s	proximity to nearest non-site related building - l,a,d,f
net precipitation - g,s	zoning/land-use of adjacent area - l,a,d,f
soil thickness - g	zoning/land-use of adjacent area - l,a,d,f
evidence of groundwater contamination - a	endangered species or critical environments potentially effected - l,g,s,a,d
evidence of air contamination - a	
evidence of land contamination - l	

Key: l = land contamination; g = groundwater; s = surface water; a = air pollution; d = direct contact; f = fire/explosion.

Characteristics" refers to those factors which describe the hazardous nature of the substances involved, the mobility of the materials, and their persistence in the environment. "Waste Management" describes the extent to which the materials are adequately isolated and contained or destroyed at the site. "Pathways" describes the possible routes of movement of materials offsite and may be considered as a function of time. "Receptors" refers to the sensitivity of the site environs to pollution. The components listed under each major heading represent a relatively limited amount of information; if other information is available this should be factored into any decisions reached. In some instances not all the needed information will be available following the preliminary assessment. Thus, the offsite and onsite evaluations should be focused on acquiring the missing information.

Evaluation of Pollution Potential

In evaluating the information on a specific waste disposal site, the problem must be broken down into the various types of pollution or health problems, i.e., groundwater, surface water, air, direct contact, and fire or explosion. Under each item on Table 2 there is a key to relate that item to a problem. The pollution potential for each problem type should be evaluated separately on the basis of the relevant factors.

Major factors for evaluating groundwater pollution potential include:

WASTE CHARACTERISTICS	WASTE MANAGEMENT
toxicity	presence of leachate collection system
infectivity	condition of waste containers
radioactivity	
quantity of wastes	
solubility	
PATHWAYS	**RECEPTORS**
depth to groundwater	proximity to drinking water wells
soil permeability	critical environment (karst, fault lines, etc.)
bedrock permeability	population density
net precipitation	
soil thickness	
evidence of groundwater contamination	

The data once organized as above, should lead the investigator to the objective decision regarding further investigative activity. If the investigation is directed toward the "Imminent Endangerment" provisions of RCRA (Sec. 7003), the investigator must make the somewhat subjective judgment as to the additional data, if any, needed to establish "endangerment". Excerpts from an internal EPA memorandum, dated January 25, 1980, from the Acting Director, Hazardous Waste Enforcement Task Force, are included herein as Appendix A and may be helpful in planning for HWDS evaluations.

OFFSITE INVESTIGATIONS

The offsite investigations may be employed as the next level of intensity of investigation, or may be bypassed to proceed with an onsite investigation.

The offsite investigation is, in most cases, the approach taken to determine the extent to which hazardous materials are migrating from the site.

Environmental Measurements

All field observations, sample locations, time of sampling, type and disposition of samples taken, notations regarding photographs, and other field data should be recorded in bound field log books. Chain-of-Custody must be maintained on all samples and document control procedures must be imposed to ensure litigability. Chain-of-Custody and document control are discussed later herein.

The two primary items which should be investigated are actual and potential pathways for hazardous or toxic material to migrate offsite and the population at risk or environmental damage which may or has occurred. Migration from the site can occur via direct discharge to water courses or sewers, runoff incidents, spills, groundwater vectors, and airborne mechanisms. Obvious evidence includes vegetation damage and structural deterioration and discoloration.

Sewers and runoff channels should be located and sampled. If dry, sediment samples from the channels may indicate offsite migrations. Nearby wells should be sampled to detect contamination and to assess the hazard to users of water from the wells. Ambient air should be sampled downwind from the site for organic constituents. Care must be taken to accomplish the sampling with spark-free equipment.

Samples of surface runoff, groundwater, soil, sediment, biological material, and ambient air, collected offsite, may generally be considered to be "Environmental Samples". In general, the testing procedures and shipping requirements are designed for samples containing less than 10 ppm of any single organic pollutant and less than 100 ppm of any single inorganic pollutant although the samples may well exceed these concentrations. Investigative team leaders must exercise judgment, such that if samples are suspected of containing substantially higher concentrations, they be treated as Hazardous Samples. Environmental samples may be handled, shipped, and analyzed by standard procedures. Shipping of samples is discussed later herein.

Documentation

Photographs are important in documenting the cause and effect relationship of hazardous materials migrating offsite, expecially in the areas of environmental damage and potential exposure to the public. Whenever samples are collected, photographs should be taken to verify the written description in the field logbook. In all cases where a photograph is taken, the following information must be written in the logbook:

- time, date, location and, if appropriate, weather conditions;
- complete description or identification of the subject in the photograph and reason why the photograph was taken;
- the sequential number of the photograph and the file roll number;
- name of person taking photograph.

Wherever possible, a map should be drawn using aerial imagery. If aerial imagery is not available, then a sketch map of the site environs must be drawn in the field. The map should include all residences and other buildings in the vicinity of the site, drainage ditches, surface waters, known water wells, general land use patterns, roads, and reference points (e.g., telephone poles and their serial numbers). All sampling points must be noted on the map.

ONSITE INVESTIGATIONS

As noted above, an onsite investigation becomes necessary when assessments of existing data or offsite investigations fail to produce the data needed to meet objectives. Onsite investigations may be thought of as involving assessible materials or materials requiring entry of closed containers. Both types require rigorous planning and detailed study plans; adherence to the legal requirements for entry; strict observance of safety rules; special handling and shipping procedures for samples; and adherence to Chain-of-Custody and document control procedures. The study plan should state the objectives and provide a detailed scenario for achieving the objectives, which may include:

- Determination of the need for emergency response;
- Determination of disposal practices and methods;
- Compliance with Federal, State and local regulations;
- Determination of the extent of contamination;
- Amounts and locations of hazardous waste stored;
- Determining the adequacy of storage, disposal, or treatment facilities
- Potential for materials to migrate offsite;
- Determination of access control;
- Documentation or determination of imminent hazard;
- Remedies to bring site into compliance;
- Review of site records;
- Inventory of drums or drum contents;
- Mapping the site;
- Safety procedures for field investigation;
- Determination of potential sites for field investigation;
- Sample collection during inspection.

The study plan is an element of the case documentation, can be expected to be the basis for cross-examination by counsel for defendants, and must accurately reflect the various elements of the investigation. Changes found necessary during the course of the investigation must be rigorously documented in the field notebook.

Entry

The inspection personnel must notify the owner or operator or his representative at the site of be inspected and obtain permission to enter the property; written notification is not required under RCRA; however, an owner, operator, or designated official may not be present at an inactive site and advance nofication may be desirable. If the appropriate official is present onsite, permission should be obtained when the inspector arrives. Advance notification should be accomplished through agency arrangement. If the ownership of an abandoned site cannot be determined, or if responsible officials cannot be located, agency counsel should determine the appropriate course of action.

Section 3007 of RCRA authorizes officers and employees of the EPA or State "to enter at reasonable times any establishment or other place maintained by any person where hazardous wastes are generated, stored, or disposed of; to inspect and obtain samples from any person of any such wastes and samples of any containers or labeling for such waste". The inspector must present credentials to the appropriate person at the site which indicate that the inspector is a lawful representative of the Administrator of the EPA or state agency and is authorized to perform the inspection.

Unless a warrant has been obtained, inspections must be made with the consent of the owner/operator or other person so authorized. The following are general rules concerning consent.

- Official agency credentials must be presented to the plant representative authorized to give consent to an inspection of the facility.
- Consent must be given by the owner of the premises or the person in charge of the premises at the time of the inspection.
- Consent must be secured without any behavior which could be characterized as coercive (either in a verbal or physical sense), such as threats of punitive action.
- Consent to the inspection may be withdrawn at any time. That segment of the inspection completed before the withdrawal of consent remains valid. Withdrawal of consent is equivalent to refused entry. A warrant should be secured to complete the inspection.
- Consent is not required for observation of things that are in plain view, i.e., that a member of the public could be in a position to observe, including observations made while on private property in areas that are not closed to the public, e.g., matters observed while the inspector presents his credentials. However, a warrantless inspector's access to any portion of the facility may be limited at the discretion of the owner of the facility.
- Consent may be given with "conditions". When such "conditional" consent is proposed, guidance should be sought from the agency counsel, or other appropriate agency authority, prior to further activity. "Conditions" must be accurately recorded.

If denied entry after the appropriate steps have been followed, the reason for denying entry should be recorded in the field logbook along with the date, time and person's name. All events surrounding the refused entry should be documented. Also, note such observations about the appearance of the facility as are possible. The agency counsel should then initiate proceedings to obtain a warrant. Procedures for conduct of the investigation under warrant should be carefully listed by counsel and scrupulously followed by the investigator.

Sampling

Before samples are collected, the site must be checked for radioactivity and explosivity. If radioactivity is greater than 10 milli-Roentgens/hr (mR/hr) operations should be halted until continued operations have been recommended by a competent radiation monitoring team. If explosive concentrations of vapors are detected, all team members must be immediately evacuated, the fire department notified, and the supervisor consulted for direction regarding further operations. The pH of all liquid samples should be measured (litmus paper recommended) to determine if the material is corrosive, neutral, or caustic.

Sampling procedures should conform to techniques appropriate for the type of facility and waste, and they should be specified in the study plan. Cross-contamination must be avoided; therefore, all sampling equipment must be either thoroughly cleaned with soap and water, or solvent, or used once and consigned to safe disposal. For liquid wastes, if the equipment has been cleaned and is to be reused, the sampling equipment should be rinsed thoroughly with the liquid waste to be sampled before the sample is collected. Stainless steel, glass, or other compatible material should be used to collect the samples. Disposable surgical gloves should be changed between each sampling site.

All samples collected onsite are to be considered "hazardous samples" unless there is reliable data to the contrary. Hazardous samples are further classified according to containment as:

a. Unanalyzed Hazardous Waste Site Samples, Excluding Closed Container Samples, or

b. Unanalyzed Hazardous Waste Site Samples From Closed Containers.

All samples taken from closed containers on hazardous waste sites must be considered to be high-hazard and potential Poison A (defined later herein), unless there is clear evidence to the contrary. The shipping and testing procedures for these samples are designed to accommodate concentrations to 100%.

Extreme care should be used in collecting concentrated wastes (e.g., from drums). The team leader should discuss whether remote drum opening procedures and equipment should be implemented. If a disposable thief is used it must be disposed of in the drum. The drum must be re-sealed after sampling. Samples collected from an open drum or vessel may be toxic, and vapors could be liberated if the surface film is broken or the contents are disturbed. Samples of this type should be of minimal size consistent with analytical requirements. Shipping procedures are those specified for Poison A and are detailed later herein.

All onsite samples, whether from exposed areas or from closed containers should be prepared and given initial screening in a "regulated" laboratory prior to analysis in an "environmental" laboratory. This precaution is taken not only to prevent exposure or injury to analysts, but to prevent contamination of analytical equipment, instruments, and work-space in the environmental laboratory.

Documentation

As discussed under "Offsite Investigations" photographs should be taken, and logged, at various locations to document conditions and provide visual proof of potential hazards. When using self-contained breathing apparatus, the face mask will make focusing the camera difficult; therefore, it is recommended that a camera with automatic focus sensor be used.

Permission to take photographs should be obtained from the owner or operator of the site. If permission is denied the investigator may request that the owner/operator or representative take photographs, review them, and send copies. Alternately, agreement may be reached for the investigator to take the photographs and provide the film to the owner/operator for review before mailing to the investigator.

A sketch of the onsite area should be prepared with fixed landmarks (power poles, buildings, etc.) established as reference locations. Distances should be determined by measurement with a survey tape or hand-held range finder, or combination of both. The range finder should be calibrated by the inspector before measurements are taken. The survey tape may be contaminated by contact with material onsite; therefore, the tape should be disposed of or decontaminated upon completion of the inspection. Photographs of various areas of the site will aid in preparing the final sketch. All sample locations should be marked on the sketch. Inventory of visible drums should be made where possible and drum locations should be included on the sketch. The contents of the drums will probably be different than the contents specified on the labels; nevertheless, the labels may provide

useful information. Names of possible waste generators on labels or stencils should be recorded.

In addition to the drum inventory, the investigator should check for sewers and drains, spills or liquid disposal, and evaluate the runoff potential. Observations of soils and the exposed faces of subsurface materials and formations should be made. The potential for fires, explosions, and other imminent hazards should also be evaluated. If the situation requires an emergency response, the Oil and Hazardous Materials Coordinator in the EPA Regional Office, or the State or local counterpart should be contacted immediately.

Chain-of-Custody must be maintained on all samples and documents. Chain-of-Custody and Document Control are discussed later herein.

Leaving The Facility

When the inspection is completed, the inspector should notify the appropriate person at the site. If samples have been collected, RCRA requires that prior to leaving the site the owner, operator, or agent in charge must be given a receipt describing the sample(s) and, if requested, a portion of each sample equal in volume or weight to the portion retained. If such split samples are provided, a Chain-of-Custody sheet should be completed for the split samples and signed by the owner or agent. If air samples are to be split, duplicate samples must be collected; this must be determined prior to sampling.

If access to the site is controlled by fencing and locked gates, the inspectors must lock the gates when leaving if the owner or agent is not onsite. An entry should be made in the field logbook of the date and time the gate was locked. If left unlocked, an entry should be made stating the reason.

CHAIN-OF-CUSTODY AND DOCUMENT CONTROL

All participants in HWD site investigations must know Chain-of-Custody procedures. The procedures should be included in the Study Plan or be published and available to all personnel. Due to the evidentiary nature of sample-collecting investigations, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. To maintain and document sample possession; Chain-of-Custody procedures are followed:

1. Sample Custody*

   A sample is under custody if:

   - It is in your actual possession, or
   - It is in your view, after being in your physical possession, or,
   - It was in your physical possession and then you locked it up to prevent tampering, or,
   - It is in a designated and identified secure area.

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* Under the Toxic Substances Control Act (TSCA), tighter custody rules prevail. If the HWDS investigation is directed toward enforcement of TSCA, samples must remain in the physical possession of the investigator until transferred.

2. Field Custody Procedures

- When collecting samples for evidence, collect only that number which provides a fair representation of the media being sampled. To the extent possible, the quantity and types of samples and sample locations are determined prior to the actual field work. As few people as possible should handle the samples.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched.

- Sample tags shall be completed for each sample, using waterproof ink unless prohibited by weather conditions.

- During the course and at the end of the field work, the team leader determines whether these procedures have been followed, and if additional samples are required.

3. Transfer of Custody and Shipment

- Samples are accompanied by a Chain-of-Custody Record. When transferring the possession of samples, the individuals relinquishing and receiving must sign, date, and note the time on the Record. This Record documents transfer of custody of samples from the sampler to another person, to a mobile laboratory, or to the permanent laboratory.

- Samples must be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed Custody Record enclosed in each sample box or cooler. Shipping containers must be padlocked or custody-sealed for shipment to the laboratory. Preferred procedure includes use of costody seal* wrapped across filament tape that is wrapped around the package at least twice. The custody seal is then folded over and stuck to itself so that the only access to the package is by cutting the filament tape or breaking the seal to unwrap the tape. The seal is then signed. The "Courier to Airport" space on the Chain-of-Custody Record shall be dated and signed.

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* Custody Seals. Custody seals should be made of 1" x 6" U.L lutho tape with security slots. This tape is backed with a very strong self adhesive so that once stuck to itself it will not come apart without breaking the seal.

- All packages must be accompanied by the Chain-of-Custody Record showing identification of the contents. The original Record will accompany the shipment, and a copy will be retained by the team leader.
- If sent by common carrier, a Bill of Lading must be used. Receipts should be retained as part of the permanent documentation.

Section 3007 of RCRA requires splitting of samples with the "owner, operator, or agent in charge" of the facility. If the sample is to be split, it should be aliquoted into similar sample containers. Sample tags and custody records completed with identical information are attached to each of the samples and are marked as "Company Split" or "Split". If air samples are to be given to the facility representative, then duplicate samples must be collected. The agency should have a clearly stated policy regarding reimbursement for materials used in sampling. If reimbursement is required, the facility representative should be so advised at the time splitting is requested.

All documents issued or generated during a HWD site investigation must be accounted for when the investigation is completed. Accountable documents used or generated will include logbooks, field data records, correspondence, sample tags, graphs, Chain-of-Custody records, bench cards, and photograph prints. Each document should bear a serialized number and should be listed, with the number, in a project document inventory assembled at the project's completion. The team leader should maintain an adequate supply of serialized documents, issue them as needed, and record their transfer to the team members in the team leader's logbook. All pertinent information must be recorded in these logbooks from the time each

individual is assigned to the project until the project is completed. All logbooks are the property of the investigating agency and must be returned to the agency's Document Control Officer upon completion of the inspection or investigation.

Logbook entries must be dated, legible and contain accurate and inclusive documentation of an individual's project activities. Because the logbook forms the basis for the later written reports, it must contain only facts and observations. Language should be objective, factual and free of personal feelings or other terminology which might prove inappropriate. Entries made by individuals other than the person to whom the logbook was assigned are dated and signed by the individual making the entry. Individuals must sign each logbook assigned to them.

A detailed discussion of document control procedures is presented in Section IX of the contractor manual.[1]

SAFETY

Hazardous Waste Disposal site investigations, by their very nature, require precautions to prevent loss of life, injury, or health hazard to investigators and the public. <u>This responsibility transcends all others related to HWDS site investigations</u>.

It is clear that every safety hazard associated with HWDS investigations cannot be anticipated; and accordingly, rules cannot be developed for

every contingency that could arise. Consequently, a practical safety program consists of: (a) rules and adherence thereto, and (b) the application of common sense, judgment, and technical analysis. All personnel must therefore, be required to enforce and adhere to the published rules, but more importantly they must be required to maintain a high level of safety consciousness. The latter involves constant vigilance for unsafe or potentially hazardous conditions or practices, and immediate corrective action as necessary to ameliorate or avoid the condition or practice.

Organization for Safety Program Management

Agencies involved in HWDS investigations must clearly delineate responsibilities for management of safety in the conduct of all aspects of the investigations. Responsibilities must range from intensive oversight and clearly stated policy by agency management, through rigorous implementation of policy by middle-management and team leaders, to a consistent high level of safety, consciousness and thoughful feedback by team members. Detailed discussions of organization for safety are provided in the contractor manual,[1] and in the safety manual[2].

General Safety Precautions

All employees should be directed to bring to the attention of the most readily accessible supervisor any unsafe condition, practice, or circumstance associated with or resulting from HWD site investigations. In cases

of immediate hazard to employees or the public, any employee on the scene should take all practicable steps to eliminate or neutralize the hazard; this may include leaving the site. Followup consultation with the team leader or on-scene supervisor must then be made at the first opportunity. In such circumstances the team leader or supervisor must take, or cause to be taken, the necessary steps to ensure that the investigation can be completed safely. Such steps may include changes in procedure, removal or neutralization of a hazard, consultation with appropriate experts, or bringing in specialists such as Explosive Ordinance Disposal (EOD) units. All such actions must be coordinated with and approved by agency management. In cases where the hazard is not immediate, the employee should consult the team leader regarding appropriate corrective measures. Application of this rule requires the exercise of good judgment and common sense by all employees.

Protective Gear

Protective headgear, eyewear, footwear, and clothing should be worn at all times on abandoned hazardous waste sites. Likewise, self-contained breathing apparatus (SCBA) should be worn unless the on-scene team leader has determined that the ambient air may be safely inhaled. On-scene team leaders should exercise informed judgment on protective gear requirements at active sites, or in cases where sites have been repeatedly entered or occupied without apparent harm. In any case where doubt exists, the safe course of action must be taken. SCBA must be worn at all times when containers of suspected hazardous material are being opened, or when operating

in buildings or other enclosed space suspected of containing hazardous substances.

Radioactivity and Explosivity

All suspect sites must be checked for radioactivity, explosivity, and oxygen content during first entry onto the site. If O_2 concentration is less than 19%, SCBA must be used. Normal background radioactivity is approximately 0.2 milli-Roentgens per hour (mR/hr); however, activity of 10.0 mR/hr is acceptable for the period of exposure associated with a hazardous waste site investigation. Detection of levels of activity significantly greater than normal background is cause for a very careful survey of the entire site; if levels approaching 10 mR/hr are encountered, the advice of a competent radiation health physicist must be sought before continuing extended operations on the site.

If explosivity readings greater than 20% LEL* (not 20% concentration, which is frequently much higher than 20% LEL) are detected, very careful survey of the area, including ground-, waste-, and head-level readings, must be made. Readings approaching or exceeding 50% LEL are cause for immediately withdrawing personnel and notifying the fire department. The team leader should then be consulted for direction regarding further operations. Supervisors or managers should then take, or cause to be taken, actions necessary to safely resume the investigation.

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* LEL = Lower Explosive Limit.

Sample Handling

Samples of runoff, ambient air, or groundwater from an HWDS, or possibly affected areas, may be moved directly into laboratories and handled with normal safety precautions, unless the team leader determines that special handling is appropriate. Team leaders should consult with the receiving laboratory prior to departure from normal handling procedure. Samples of liquids or solid materials removed from closed containers should be processed and diluted in a controlled, or regulated, laboratory before analysis.

Forbidden Practices

Agencies engaged in HWD site investigations should specifically forbid the following practices during operations on suspected or known hazardous waste disposal sites:

a. Smoking, eating or drinking while onsite and after completing investigation until decontamination is completed.

b. Introduction of spark or ignition sources of any kind.

c. Entry into areas or spaces where toxic or explosive concentrations of gases or dust may exist without proper equipment available to enable safe entry.

d. Conduct of onsite operations without offsite backup personnel.*

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* On-scene team leaders should exercise informed judgment regarding the necessity for offsite backup at active sites, or in cases where sites have been repeatedly entered or occupied without apparent harm. In any case where doubt exists, offsite backup must be provided.

Health and Training

All employees who will engage in HWDS investigations or laboratory analyses should be required to complete a comprehensive health examination, be shown to be free of residual effects of exposure to hazardous materials, and be in general good health and physical condition. The comprehensive examination should be repeated at intervals no greater than annually for so long as the employee continues HWDS investigative work. All employees engaged in HWDS field work or laboratory analyses must receive training in basic first-aid, cardio-pulmonary resuscitation, and the use of protective clothing and equipment. Management should assume responsibility for providing training at the earliest practicable time, and refresher training at appropriate intervals.

Safety Procedures for Field Evaluations of Hazardous Waste Sites

The team leader is responsible for establishing, and adjusting as necessary, the level of safety precautions appropriate to the individual hazardous waste site being evaluated, such as use of SCBA, etc. The team leader ensures that all participants conduct their work in accordance with the study plan and applicable safety rules. He/she should be authorized to direct any assigned employee to leave the site if the employee fails to observe safety requirements or in any way creates a safety hazard.

Information Review and Reconnaissance

Development of a safe plan for an HWDS investigation must be preceded by thorough evaluation of existing data and, if possible, by an onsite reconnaissance. The information search may indicate possible chemical hazards such as the presence of incompatible chemicals, toxic gases, explosives, etc. Such indications will provide insight to specific safety precautions needed. Similarly, a perimeter inspection or aerial imagery, followed by an onsite reconnaissance, will reveal safety hazards requiring special attention.

The information review and reconnaissance should also include careful examination of possible hazards to the public. Such hazards may include contamination of groundwater supplies by drilling operations, release of toxic gases, or explosion/fire. Any such hazards must be avoided or eliminated, or appropriate measures must be taken to protect the public and public property. Any indication of the presence of explosives must be the basis for an initial investigation and appropriate followup by Army Explosive Ordinance Disposal (EOD) personnel or police explosives unit.

Before entry on a suspect or known HWDS, all investigative personnel must know the locations and emergency telephone numbers for the nearest medical facility, ambulance service, fire department, police department, and poison control centers.

Field Sampling

Clean Area

During operations on a suspect or known HWDS, a "clean" area must be established outside the area of suspected contamination. At least one backup team member* must remain in this area to:

- Assist in emergency removal of team members from the site in the event of accident or injury. The backup must have readily available protective clothing, breathing apparatus and first-aid equipment.
- Assist in moving equipment, samples, and supplies.
- Provide communication to emergency units.**
- Assist in decontamination or removal of contaminated clothing from the individuals emerging from the contaminated area.
- As appropriate, prevent entry of unauthorized persons to the HWD site while operations are underway.
- Provide other assistance as necessary, but with primary objective of facilitating safe transfer of personnel and equipment to and from the contaminated area.

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* On-scene Project Leaders may exercise informed judgment regarding the need for offsite backup at active sites, or in cases where sites have been repeatedly entered or occupied without apparent harm. In any case where doubt exists, the safe course of action must be chosen.

** Radio contact must be maintained when visual contact cannot be maintained.

Sampling Equipment

As a general rule, sampling equipment used on an HWDS should be disposable. Dippers, scoops, and similar devices for solids samples should be buried onsite, or placed in plastic bags for disposal or later decontamination. Liquid samples from barrels or tanks should be withdrawn in inert tubing, such as glass, and the tubing should then be broken and abandoned within the barrel or tank. If incineration or recycling of barrel contents is contemplated, the tubing may be disposed of in other suitable containers, or buried on the site. The widely discussed Composite Liquid Waste Sampler (or "Coliwasa") is unsuitable for use on HWDS investigations because it is extremely difficult to decontaminate under field conditions.

Clothing

Protective clothing must be worn by all assigned personnel while on a suspected or confirmed HWD site until sufficient data has been acquired to enable the team leader to make an informed judgment regarding the need. The team leader must weigh the fact that fatigue and alertness on the part of the team members is a significant safety factor. Protective clothing is cumbersome, hastens the onset of fatigue, and limits stay-time. In the absence of clear indications that work can proceed safely without protective clothing, required items include: chemical-resistant pants and jacket, rubber boots, protective gloves, hard hat or head cover, face shield or chemical safety glasses.

Disposable and reusable clothing is available, and each has advantages and disadvantages. The presently available disposable clothing is fragile, easily torn, and especially vulnerable during cold weather. The "bootees" that are furnished with this clothing are highly vulnerable and are of limited value on rough ground or for walking through snagging objects. Reusable clothing is available in much sturdier fabric and is generally preferred. The disadvantage is the necessity for decontamination onsite, or careful packaging, shipment, and later decontamination. The reusable suits are worn with heavy rubber slip-on boots, which are easily decontaminated onsite with reagent solution [Figure 1].

Full decontamination of reusable suits is accomplished in two steps. The first step is performed onsite using a reagent solution selected beforehand, based on limited knowledge of chemical and biological hazards on the site at that time. After cleansing, protective clothing is turned inside out, if feasible, and sealed in plastic bags for return shipment. The second decontamination step is taken later, after enough of the sample has been analyzed to determine what decontamination reagents are most suitable for each case. This second cleaning is then performed by personnel wearing disposable safety clothing. Waste decontamination solution should be treated as hazardous waste and disposed of accordingly.

Figure 1

SCBA/Respirators

Self-contained breathing apparatus (SCBA) must be worn onsite when:

- Still air conditions prevail.
- Containers of unknown or known hazardous materials are being opened.
- When in enclosed spaces, such as unventilated buildings or rooms.
- Under any circumstances where free-flow of air uncontaminated by toxics is in doubt.

In cases where the team leader has determined that onsite work may proceed without use of SCBA, participating personnel must carry respirators having organic vapor protection cartridges, or combination cartridges, or 5-minute escape hoods. An oxygen meter should be used to determine that at least 19% oxygen is present in the area where respirators are to be used. Respirators or escape hoods should be donned immediately upon experiencing breathing difficulty, dizziness or other distress, strong taste or smell, or judgment that precaution is in order. Once respirators or escape hoods have been donned, team members should withdraw from the site pending a decision by the team leader regarding continued operations. Cartridge respirators should not be relied upon for protection from organic vapors for extended periods. Escape hoods are the preferred equipment.

Remember:

- Respirator cartridges for organic vapors function as adsorbants. Once adsorbtive capacity is reached, the cartridge no longer functions. Cartridge respirators are of no value in oxygen deficient atmosphere.

Sampling Procedures

Containers (drums, tanks etc.) should be sampled only when necessary to meet enforcement or cleanup requirements. Opening drums or other sealed containers may be hazardous to sampling personnel unless proper safety procedures are followed. Gases can be released, or pressurized liquids can be expelled. A drum should not be moved or opened unless it can be ascertained beyond reasonable doubt that the drum is structurally sound. Drums standing on end, with bung up, should be opened by pneumatic impact wrench, operated from a remote site [Figure 2,a]. Drums on sides may be opened similarly if it is possible to safely rotate the drum so that the bung is high [Figure 2,b]. If the bung can be removed, sampling contained liquids may be safely accomplishes by glass tube, which is then broken and discarded within the barrel. A barrel that has a badly rusted bung, or that cannot be sampled as above, may be safely sampled with a hydraulic penetrating device [Figure 3,a]. The penetrating device with harness is shown in Figure 3,b. Following withdrawal of sample(s) the penetrating device is then abandoned in place, and disabled to prevent further withdrawal of liquids. Remote operation of both devices is shown in Figure 4. Sealed or closed tanks should be opened remotely, using ropes to lift hatches, etc.

In general, metal sample containers should not be used on HWDS investigations; if used, they must be electrically grounded, preferably to the drum or tank being sampled, while sample transfer is accomplished.

Subsurface sampling of a HWDS can also create hazards to employees and the public, unless adequate safety precautions are followed. Biodegradation of refuse in dumps produces methane and other explosive gases. The escaping gases may be ignited by drill rigs other ignition sources. Drilling into dump sites may cause discarded incompatibles to be mixed and thereby create reactive mixtures. Dump sites where leachate plumes are contained on impervious strata may be interconnected with producing aquifers if drilling is not planned according to competent groundwater technology and data.

Drilling in HWDS investigations should be confined to the periphery of dump sites, with the objective of characterizing the leachate that may be moving away from the site. If subsurface sampling of dump sites is necessary, excavation should be accomplished by hand, and with spark-free equipment.

All drilling associated with HWS investigations must be accomplished under the responsible supervision of a competent geohydrologist, groundwater geologist, geological engineer, or a person similarly qualified by experience. Drilling must be preceded by sweeps with metal detectors having a minimum 10-ft range, and drilling must be limited to areas where the

presence of buried drums or tanks is not indicated. Test holes must be cased or plugged when the investigation is completed. Drilling operations should not be initiated by team members without the express direction of agency management.

Ambient air sampling on HWDS must be accomplished with spark-free equipment if explosive vapors are present (most hi-vol samplers are spark sources).

Samples from HWDS must not be preserved, or "fixed", by the addition of chemicals. Cooling may cause undesirable chemical or physical changes and complicate shipping. Every effort should be made to maintain hazardous samples in "as is" condition until prepared for analysis.

Sample volume should be the smallest consistent with analytical requirements. Sample containers must, to the extent possible, be clean and free of spilled or residual waste material, on the exterior of the container prior to shipment.

SHIPPING

Investigation of an uncontrolled hazardous waste site is a unique procedure because almost any hazardous material may be present but knowledge of the presence of specific materials may not be available until after laboratory analysis. New Department of Transportation (DOT) regulations (49 CFR 173.1300, effective November 20, 1980) specify the use of new

designations: "Hazardous Waste, liquid, n.o.s.*" or "Hazardous Waste, solid, n.o.s.", and a new hazard class, ORM-E.** These designations place a more specific burden upon the shipper to correctly label the sample shipment.

New EPA Regulations

EPA regulations, which take effect November 19, 1980, defer to DOT regulations in regard to packaging for transportation. They apply to generators of hazardous waste, which are defined briefly as those who produce more than 1,000 kilogram of waste per month or more than one kilogram per month of certain specific chemicals called "Acute Hazardous Wastes (40 CFR 261.33). EPA has indicated that a regulation interpretation memorandum (RIM) will probably be issued which will exempt from the EPA manifest system samples shipped for analysis. The extent of that exception is unknown at the time of this writing (July 25, 1980).

Environmental Samples

As discussed earlier, "environmental samples" are those obtained off-site, which are mildly contaminated (e.g. surface runoff) and are suitable for analysis in environmental laboratories. Such samples are not considered DOT hazardous unless there is evidence to the contrary and may be packaged and shipped by conventional methods, taking care of course that proper Chain-of-Custody and sample identification procedures are followed.

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* Not otherwise specified.
** Other Regulated Materials-Series E.

Hazardous Waste Site Samples Excluding Closed Container Samples

DOT (49CFR173.2) indicates that hazardous material should be classed according to the following order of hazards:

1. Radioactive material
2. Poison A
3. Flammable gas
4. Non-flammable gas
5. Flammable liquid
6. Oxidizer
7. Flammable solid
8. Corrosive material (liquid)
9. Poison B
10. Corrosive material (solid)
11. Irritating materials
12. Combustible liquid (in containers having capacities exceeding 110 gallons)

Samples taken from onsite are considered to be heavily contaminated. Even though classed, by DOT, as ORM-E* these samples are considered to be as hazardous as a flammable liquid (or flammable solid) and are packaged accordingly. This is because the prioritized DOT classification above establishes only radioactive materials, poisons A, and gases as more hazardous than flammables. The presence of radioactive materials is eliminated by the use of geiger counters for personnel safety when entering a site; Poisons A are not present (see discussion below on third sample level) and gases are normally not sampled nor shipped. Moreover, flashpoint testing of samples, on a HWDS, is impractical and extremely hazardous.

Packaging consists of the sample bottle sealed in a plastic bag [Figure 5,a], in turn sealed inside a metal can [Figure 5,b], packed in a locked metal box with absorbent, non-combustible filler material in and surrounding the can [Figure 5,c]. More detailed discussion of this packaging and labeling procedure is provided in Appendix B.

This choice of containers, made from alternatives allowed by DOT for each hazard class, provides full protection even if other than flammables are present. For example, the packaging conforms to limited quantity Corrosive and Poison B requirements as to type of containers (although, of course, it is not marked and labeled as such).

Hazardous Waste Site Samples From Closed Containers

The third level of hazard, for shipping purposes, is for materials taken from closed containers. Samples are shipped as a DOT Poison A material even though classed as ORM-E, and gas cylinders are used for packaging as outlined in Appendix B. Poison A (49CFR173.326) is a class reserved by DOT for materials which are extremely dangerous to life. DOT defines Poison A as extremely dangerous poisonous gases or liquids of such nature that a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. This class includes the following:

*Bromacetone
Cyanogen
Cyanogen Chloride containing less than 0.9% of water
Diphosgene
*Ethyldichlorarsine
Hydrocyanic acid over 5% strength
*Methyldichlorarsine

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* Of the ten "Poison A" chemicals, only three, bromacetone ethyldichlorasine, and methyldichlorarsine occur as liquids in environmental conditions. The remaining seven chemicals occur as gases, and thus would not be sampled, or do not persist in the environment (or both). Thus the investigator cannot be certain that one of the three solid/liquid chemicals is not present in a sample from a closed container and must package and ship the sample as if "Poison A" is present. EPA is attempting to devise a field test for these three chemicals. If successful, this packaging requirement can be greatly simplified.

Nitrogen peroxide (tetroxide)
Phosgene (diphosgene)
Nitrogen tetroxide-nitric oxide mixtures containing up to 33.2% weight nitric oxide

Onsite samples are considered to be potentially highly toxic and are therefore prepared and given initial screening in a high-hazard laboratory. After an initial screening they can be shipped for further analysis as known substances and the DOT Hazardous Material Table (49CFR172.101) is used to determine shipping requirements.

THE AUTHORS

William C. Blackman, Jr., Barrett E. Benson, Kenneth E. Fischer, and Utah Z. Hardy are respectively Deputy Director, Environmental Engineer, Safety Officer, and Senior Technician at the Envinronmental Protection Agency's National Enforcement Investigations Center, Denver, Colorado.

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APPENDIX A

Excerpts from EPA Internal Memo of January 25, 1980, Subject: Standard of Proof for Hazardous Waste Enforcement Task Force Cases Which May Present an Imminent and Substantial Endangerment to Health and the Environment".

The Courts and Congress have been consistent in determining that "endangerment" means "risk of harm" or "potential harm." The term has not been construed to require proof of actual harm. In Reserve Mining Co. v. EPA, 514 F.2d 492 (8th Cir., 1975), the court of appeals addressed a provision of the Clean Water Act which allowed the Government to abate water pollution "which is endangering the health or welfare of persons." (Section 10(g) FWPCA, 33 U.S.C. Section 1160(g).) In affirming the district court's injunction, the court construed "endangering" to require only evidence of potential harm.

> "In the context of this environmental legislation, we believe that Congress used the term endangering in a precautionary or preventive sense, and, therefore, evidence of potential harm as well as actual harm comes within the purview of that term." (514 F.2d at 528.)

The Reserve Mining court then endorsed an interpretation of "endanger" formulated by Judge Wright of the D.C. Circuit in an action under the Clean Air Act (Ethyl Corporation v. Environmental Protection Agency, No. 73-2205 (D.C. Cir., January 28, 1975) (dissenting op. at 11).)

> "The meaning of 'endanger' is, I hope, beyond dispute. Case law and dictionary definition agree that endanger means something less than actual harm. When one is endangered, harm is threatened; no actual injury need ever occur. 'Endanger'... is not a standard prone to factual proof alone. Danger is a risk, and so can only be described by assessment of risks. (514 F.2d at 529.)

The decision of the D.C. Court of Appeals in Ethyl Corp. v. EPA, 541 F2d 1 (D.C. Cir., 1976) should be reviewed. In construing the term endangerment as used in the regulatory sections of the Clean Air Act, the court held that "the 'will endanger' standard is precautionary in nature and does not require proof of actual harm before regulation is appropriate." (541 F.2d at 17). The court continued:

> "Undoubtedly, certainty is the scientific ideal - to the extent that even science can be certain of its truth. But certainty in the complexities of environmental medicine may be achievable only after the fact, when scientists have the opportunity for leisurely and isolated scrutiny of an entire mechanism. Awaiting certainty will often allow for only reactive, not preventive regulation. Petitioners suggest that anything less than certainty, that any speculation, is irresponsible. But when statutes seek to avoid environmental catastrophe, can preventive, albeit uncertain, decision legitimately be so labeled?" (541 F.2d at 25.)

> "The levels of concentration of air pollution agents or combination of agents which substantially endanger health are levels which should never be reached in any community. When the prediction can reasonably be made that such elevated levels could be reached even for a short period of time - that is that they are imminent- an emergency action plan should be implemented to reduce emissions of air pollution agents and prevent the occurrence of substantial endangerment."
> S.Rpt. 91-1196, Clean Air Act, at 36.

In addition, there is support for the proposition that the modifier "imminent" should be read broadly to extend to situations presenting a long-standing risk of harm. In discussing Section 7003 of the Resource Conservation and Recovery Act, the report of the House Oversight Committee on Hazardous Waste states:

> "Imminence in this section applies to the nature of the threat rather than identification of the time when the endangerment initially arose. The section, therefore, may be used for events which took place at some time in the past but which continue to present a threat to the public health or the environment."
> Report of the Subcommittee on Oversight and Investigations of the Committee per Interstate and Foreign Commerce, Committee Print 96-1FC3.

In summary, our flexibility in using statutory emergency response provisions as an interim enforcement tool is enhanced by the broad interpretation of the "imminent and substantial endangerment" standard espoused by the Congress and Courts. The standard has been construed as requiring a showing of a risk of harm rather than actual harm. In addition, the modifiers "imminent" and "substantial" have been deemed to characterize this risk of harm and there is support for the proposition that such risk may be one of long standing.

PACKAGING, MARKING, LABELING, AND SHIPPING OF HAZARDOUS WASTE SITE SAMPLES

GENERAL PROVISIONS

The provisions apply to samples collected from a hazardous waste disposal site (HWDS) which in the judgment of the Project Leader are more hazardous than "environmental" samples.

Unanalyzed HWDS samples may not be fixed with any preservative or preserved with ice or dry ice.

If a material identified in the Department of Transportation (DOT) Hazardous Material Table (49 CFR 172.101) is known to be contained in a HWDS sample, that sample should be transported as prescribed in the table. Specific exemptions may also apply (e.g., use of Labelmaster, Inc. package #38, Dow Chemical Co. Imbiber Pack for shipment of Poison B, n.o.s. by United Parcel Service or letters of understanding granted an agency by DOT.)

Unanalyzed HWDS samples may be transported by rented or common carrier truck, bus, railroad, and by "cargo only" air firms; but they may not be transported by passenger-carrying non-government aircraft.

4. Place sealed bag inside a metal can with incombustible, absorbent cushioning material (e.g., vermiculite) to prevent breakage, one bag per can. Pressure-close the can and use clips, tape or other positive means to hold the lid securely, tightly and effectively.

5. Mark and label this container as indicated in No. 8 below.

6. Place one or more metal cans (or a single 1-gallon bottle; see footnote above), surrounded with incombustible packaging material for stability during transport, into a strong outside container, such as a picnic cooler or a fiberboard box.

7. Mark and label the outside container and complete shipping papers as described in No. 8 below.

8. Marking and labeling: Use abbreviations only where specified. Place the following information on the metal can, either hand printed or in label form: laboratory name and address and "Hazardous Waste, liquid, n.o.s. NA9189", (if not liquid, write "Hazardous Waste, solid, n.o.s. NA9189"). Place the following labels on the outside of the can, next to one another and near the Hazardous Waste marking:

"Cargo Aircraft Only"; "ORM-E"

A generator must affix an EPA Hazardous Waste label* (40 CFR 262.32; effective date November 19, 1980).

Note: If the cans are placed in an exterior container, both that container and inside cans must have the same markings and labels as above. "Laboratory Samples", "Limited Quantity", and "THIS SIDE UP" or "THIS END UP" should also be marked on the top of the outside container, upO ward pointing arrows should be placed on all four sides of the exterior container, and "Inside package comply with prescribed specifications" should be placed on the exterior container.

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* May be changed by an EPA Regulation Interpretation Memorandum (RIM) possibly issued in the Fall, 1980.

1. All samples from closed drums must be packaged as "Poison A" (49 CFR 173.328).

2. These samples classed as "Poison A" may not be transported by non-government aircraft.

3. Collect sample in a polyethylene or glass container which is of an outer diameter narrower than the valve hole on a DOT Spec. 3A1800 or 3AA1800 metal cylinder. Fill sample container allowing sufficient ullage (approximately 10% by volume) so it will not be liquid full at 130° F.

4. Attach properly completed sample identification tag to sample container.

5. With a string or flexible wire attached to the neck of the sample container, lower it into a metal cylinder which has been partially filled with incombustible, absorbent, loose packaging material (e.g. vermiculite). Allow sufficient cushioning material between the bottom and sides of the container and the metal cylinder to prevent breakage. After the cylinder is filled with cushioning material, drop the ends of the string or wire into the cylinder valve hole. Only one sample container may be placed in a metal cylinder. Replace valve and valve protector on metal cylinder.

6. Marking and labeling: Use abbreviations only where specified. Place the following information on the side of the cylinder, or on a tag wired to the cylinder valve protector, either hand-printed or in label form:

8. Unless samples are driven to the laboratory, an EPA employee will accompany shipping container(s) to the transport carrier and, if required, open outside container(s) for freight inspection.

END