GW - 32

REPORTS

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1989 - RCRA

WASTE PLAN

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OIL CONSERVATION DIV.
SANTA FE

WASTE AND UNIT CHARACTERIZATION PLAN
RCRA FACILITIES INVESTIGATION
GIANT REFINERY

A REPORT PREPARED FOR
GIANT INDUSTRIES, INC.
ROUTE 3, BOX 7
GALLUP, NEW MEXICO 87301

AES PROJECT NO. 5202

MAY 31, 1989
BY
APPLIED EARTH SCIENCES, INC.
8323 SOUTHWEST FREEWAY, SUITE 710
HOUSTON, TEXAS 77210-4415
(713) 981-7140

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1.0 INTRODUCTION

This document describes the methodology of characterization of the source at each SWMU. The document is taken from EPA 530/SW-87-001 RFI Guidance Documents.

For the Giant RFI's, the waste characterization will be accomplished through facility records and information from past and present employee information. The refinery, currently owned by Giant, has been in continuous operation since 1957. Because of the stable work force, employee information will be readily available. The feedstock and waste constituents have not changed significantly over time, having been Four-Corner Crude during the life of the refinery. Only if the resulting information is inadequate will waste sampling be completed.

APPENDIX A

RFI Guidance

Section 7
Waste and Unit Characterization

OSWER DIRECTIVE 9502.00-6C

RCRA FACILITY INVESTIGATION (RFI) GUIDANCE

VOLUME I OF IV

DEVELOPMENT OF AN RFI WORK PLAN AND GENERAL CONSIDERATIONS FOR RCRA FACILITY INVESTIGATIONS

EPA 530/SW-87-001

JULY 1987 *

WASTE MANAGEMENT DIVISION
OFFICE OF SOLID WASTE
U.S. ENVIRONMENTAL PROTECTION AGENCY

* Includes Revised Section 8 (12/87)

SECTION 7

WASTE AND UNIT CHARACTERIZATION

7.1 Objectives and Purposes of Waste and Unit Characterization

Because the waste managed or contained in a unit provides the source for a contaminant release, detailed knowledge of the source characteristics is valuable in identifying monitoring constituents and indicator parameters, possible release pathways, a conceptual model of the release, monitoring procedures, and also in linking releases to particular units. Waste and unit characteristics will also provide information for determining release rates and other release characteristics (e.g., continuous as opposed to intermittent). Waste and unit information is also important for determing the nature and scope of any corrective measures which may be applied.

Without adequate waste information, it is difficult to assure that all constituents of concern will be monitored during the release investigation, unless all possible constituents are monitored. The extent of adequate waste characterization, however, will vary depending upon the nature of the facility and types of units being studied. For example, waste characterization for a unit dedicated to a single steady-state process will be much less extensive than for a unit at an offsite facility that manages a variety of wastes, which vary over time.

As indicated above, waste characterization may also be helpful in identifying constituents to discriminate releases from different units. In some situations (e.g., where there is more than one unit in a waste management area), it may be important to identify which unit is responsible for the release of concern. Accurate identification of the unit from which the release is occurring may hinge on the ability to link the released contaminants to the waste managed in a particular unit (or, in some cases, to "decouple" the contamination from a particular unit).

Sufficient characterization of the waste for the purpose of the RFI may not be possible due to the diversity of wastes managed in the unit over time or the relative inaccessibility of the waste in the unit. Waste characterization may be of limited utility where:

- The waste managed in the unit varies over time such that adequate determination of the waste constituents cannot be made. An example of this is an offsite commercial facility receiving different wastes from different generators.

- The unit of concern is no longer active and the waste cannot be sampled through a reasonable effort. This situation may occur at closed landfills where sampling of buried drums may not be practical due to their inaccessibility.

In certain situations waste characterization may also not be advisable. For example, the waste in question may be extremely toxic (e.g., nerve gas), or highly reactive or explosive (e.g., disposed munitions). In such cases, release characterization may be based on constituents (or parameters) identified in the affected media (e.g., leachate) at the point where the media becomes (or is suspected of becoming) contaminated. If it becomes necessary to conduct waste characterizations in these situations, or to remove the waste in question, a high level of health and safety protection (See Section 6) should be instituted.

Waste characterization should also be designed to provide sufficient information to support remedial and removal actions. For example, if buried drums are identified during the investigation, the nature of the waste within these drums (e.g., ignitability, corosivity, reactivity, constituent concentrations), if accessible, should be ascertained to determine if they should be removed from the site and how they should be subsequently managed as well as to support the investigation of media-specific releases under the RFI.

Design and operational characteristics of the unit are factors that will affect the rate of release and location within the unit from which the contamination is or has been released. Such factors as unit size, type, operational schedule, and treatment, storage, or disposal practices should be helpful.

Although 40 CFR Section 264.13 of the RCRA regulations (General Waste Analysis) contains waste analysis requirements, the information required may not always be sufficient for purposes of the RFI. Waste characterization to determine specific hazardous constituents, for instance, is not always required. In addition, little or no data on inactive units may be available. The RFI Work Plan should be consistent, as appropriate, with the items identified in the requirements of 40 CFR Section 264.13. Further guidance is given below.

7.2 Waste Characterization

In cases where a waste characterization is to be performed, the following approach is recommended:

- Identify data needs through review of existing information;
- Sample the waste; and
- Characterize the physical and chemical properties of the waste and waste consitutents.

If the unit has a leachate collection system, the leachate should also be sampled and analyzed, as it may also provide useful information, particularly with respect to the leachable portions of wastes contained in the unit.

7.2.1 Identification of Relevant Information

In general, a waste characterization should produce the following types of information:

- Identification of specific hazardous constituents and parameters which can be used in release verification or characterization (See Section 3.6);
- Physical and/or chemical characteristics of the waste useful for identifying possible migration pathways through the environmental media of concern; and

- Physical and/or chemical characteristics of the waste which may be necessary to evaluate treatment and/or management options.

Identifying specific constituents of the waste through a sampling and analysis program may require an extensive level of effort. The owner or operator is advised to use various informational sources on the specific waste in question in order to focus the analytical effort required. Such sources are described below.

7.2.1.1 EPA Waste Listing Background Document Information

The RCRA Hazardous Waste Listing Background Documents developed for the identification and listing of hazardous wastes under 40 CFR Part 261 contain information on waste-specific constituents and their physical and chemical characteristics. These documents contain information on the generation, composition, and management of listed waste streams from generic and industry-specific sources. In addition to identifying hazardous constituents that are present in the wastes, the documents may also provide data on potential decomposition products. In some background documents, migratory potential is discussed and exposure pathways are identified.

Appendix B of the Listing Documents provides detailed information on the fate and transport of hazardous constituents. Major physical and chemical properties of selected constituents are listed, including molecular weights, vapor pressures and solubilities, octanol-water partition coefficients, hydrolysis rates, biodegradation rates, volatization rates, and air chemistry (e.g., reaction) rates. Another section of this appendix estimates the migratory potential and environmental persistence of selected constituents based on a conceptual model of disposal in an unconfined landfill or lagoon.

The appropriate uses and limitations of the Listing Documents are outlined in Table 7-1. In addition, Case Study No. 16 in Volume IV (Case Study Examples) illustrates the use of the Listing Documents.

A list of the available listing background documents may be obtained by reviewing 40 CFR Part 261.31 and 261.32. These background documents are available in EPA's RCRA docket at the following location:

Table 7-1

Uses and Limitations of EPA Listing Background Documents

Uses	Limitations
• Identifies the hazardous consituents for which a waste was listed. • In some cases, provides information on additional hazadous constituents that may be present in a listed waste. • In some cases, identifies decomposition products of hazardous constituents. • Provides overview of industry; gives perspective on range of waste generated (both quantity and general characteristics). • May provide waste-specific characteristic data such as density, pH, and leachability. • May provide useful information on the migratory potential, mobility, and environmental persistence of certain hazardous constituents. • May list physical and chemical properties of selected constituents.	• Applicable only for listed hazardous wastes. • Industry coverage may be limited in scope. For example, the Wood Preserving Industry Listing Document only covers organic preservatives. Inorganics such as inorganic arsenic salts, account for approximately 15 percent of the wood preserving industry. • Data may not be comprehensive. For example, not all potentially hazardous constituents may be identified. Generally, only the most toxic constituents common to the industry as a whole are identified. • Data may not be specific. Constituents and waste characteristics data often represent an industry average which encompasses many different types of production processes and waste treatment operations. • Some Listing Documents were developed from limited data/reports available to EPA at the time of promulgation, resulting in varying levels of detail for different documents. • Listing Documents for certain industries (e.g., the Pesticides Industry) may be subject to CBI (confidential business information) censorship. In such cases, constituent information may be expurgated from the document.

EPA RCRA Docket
U.S. Environmental Protection Agency (WH-562)
Room S-212
401 M St., S.W.
Washington, D.C. 20460

An additional reference that may be helpful in identifying constituents from listed hazardous wastes is:

U.S. EPA. 1984. Characterization of Constituents from Selected Waste Streams Listed in 40 CFR Section 261. Prepared by Environ Corporation for the Office of Solid Waste. Washington, D.C. 20460.

7.2.1.2 Facility Information

Identification of the constituents of a waste stream may be made through examination of records already existing in the facility. Engineering data on process raw materials or analytical data on the process effluents will also provide a good starting point for waste characterization. In some cases, generally where waste characteristics are well defined, data on process raw materials or effluents will provide sufficient information for performing the RFI. More specifically, these sources may be:

- Hazardous waste characterization data used for a RCRA Permit Application;
- Waste Analysis Plan (as required by 40 CFR Part 264.13);
- State or local permit applications;
- Initial batch treatment results from an offsite hazardous waste disposal facility;
- Hazardous waste compatibility results for bulk shipments;

- Purchase orders and packing lists;
- Analyses conducted to provide data for shipping manifests;
- Facility records of past waste analyses;
- Process operational data;
- Product quality control analyses;
- Data from past releases of hazardous waste into the environment;
- Compatability results for containment liner studies;
- Past Federal, State or local compliance and inspection results;
- Occupational Safety and Health Administration (OSHA) industrial hygiene monitoring results;
- Facility health and safety monitoring data;
- Engineering design data from construction of plant processes;
- Performance specifications for process equipment;
- Related emissions data such as NPDES discharge results; and
- Information from past or present employees.

7.2.1.3 Information on Physical/Chemical Characteristics

Information on physical or chemical characteristics of the waste or waste constituents that may be useful in predicting movement of the contamination through the media of concern or in evaluating waste treatment or management options may be found in the following references:

Callahan et al. 1979. Water-Related Environmental Fate of 129 Priority Pollutants, Volumes I and II. Office of Water Planning and Standards. NTIS PB 297606. Washington, D.C. 20460.

Dawson, et al. 1980. Physical/Chemical Properties of Hazardous Waste Constituents. Prepared by Southeast Environmental Research Laboratory for U.S. EPA. EPA RCRA Docket. Washington, D.C. 20460.

U.S. EPA. 1985. Health Effects Assessment for [Specific Chemical]. [Note: 58 individual documents available for specific chemicals or chemical groups]. Environmental Criteria and Assessment Office. Cincinnati, Ohio 45268. [See Section 8.4 for a list of these documents]

Jaber, et al. 1984. Data Acquisition for Environmental Transport and Fate Screening. Office of Health and Environmental Assessment, U.S. EPA. EPA 600/6-84-009. NTIS PB 84-140102. Washington, D.C. 20460.

Lyman, et at. 1982. Handbook of Chemical Property Estimation Methods. McGraw-Hill, New York.

Mabey, et al. 1982. Aquatic Fate Process Data for Organic Priority Pollutants. Prepared by SRI International, EPA Contract Nos. 68-01-3867 and 68-03-2981. Prepared for Office of Water Regulations and Standards. Washington, D.C. 20460.

U.S. EPA. 1980. Treatability Manual, Volume I. EPA 600/2-82-001a. Office of Research and Development. NTIS PB 80-223050. Washington, D.C. 20460.

U.S. EPA. 1984. Characterization of Constituents from Selected Waste Streams Listed in 40 CFR Section 261. Office of Solid Waste. Washington, D.C. 20460.

U.S. EPA. 1984. Exposure Profiles for RCRA Risk-Cost Analysis Model. Office of Solid Waste. Washington, D.C. 20460.

U.S. EPA. 1986. Ambient Water Quality Criteria. Office of Water Regulations and Standards. Washington, D.C. 20460.

Perry and Chilton. 1973. Chemical Engineers' Handbook. McGraw-Hill. 5th Ed. New York.

Verschueren. 1983. Handbook of Environmental Data for Organic Chemicals. Van Nostrand Reinhold Co. New York. 2nd ed.

Weast et al. 1979. CRC Handbook of Chemistry and Physics.

Windholtz, et al. 1983. The Merck Index. Merck & Co. Rahway, NJ.

U.S. EPA. 1986. Test Methods for Evaluating Solid Wastes. 3rd Edition. Office of Solid Waste. EPA/SW-846. GPO No. 955-001-00000-1. Washington, D.C. 20460.

U.S. EPA. 1984. Characterization of Hazardous Waste Sites--A Methods Manual. Volume III. Available Analytical methods. EPA 600/4-84-038. NTIS PB 84-191048. Washington, D.C. 20460.

Some commercially available computer information systems that contain chemical properties data and/or estimation methods may also be used. An example would be the CIS or Chemical Information System (7215 York Road, Baltimore, MD 21212). Another example is the GEMS (Graphical Exposure Modeling System) data base discussed Section 3.5. The owner or operator should consult with the regulatory agency prior to use of such systems.

7.2.1.4 Verification of Existing Information

If existing information is current and sufficient to completely identify the type, amount, and location of waste, then available information may be considered adequate. If existing information is used, the constituents present should be verified by recent waste analysis or by dated analysis that is substantiated by recent facility records showing that no changes in process, manufacturing, or other practices that could alter waste composition have occurred. If existing information does not provide adequate waste characterization, or if the waste characteristics have changed, a sampling effort may be required.

7.2.2 Waste Sampling

All sampling should be conducted in a manner that maintains sample integrity and encompasses adequate quality assurance and control. The characterization of waste in any unit must be representative. Wastes are often generated in bulk quantities from a large variety of processes. Adequate determination of the waste profile requires that cyclical or random variations in the waste composition be considered. The characterization should account for variation in waste content by collecting samples that are representative of all potential waste variations. If a wide variation in waste composition is expected, it is preferable to document the range of this variation through the analysis of numerous samples. If little variation is anticipated, a lesser amount of sampling may be appropriate. If composite sampling is proposed, it must not mask unexpected or unanticipated compositional variations, and should always be complemented with an appropriate number of grab (non-composited) samples. Generally, compositing should not be used when evaluating variation in waste composition. The collection of representative samples will involve different procedures for different waste and unit types. This is discussed further in Section 7.4.

7.2.3 Physical/Chemical Waste Characterization

Compound specific waste characterization should consider the constituents listed in 40 CFR Part 261, Appendix VIII, as the universe of overall constituents. Except for especially complex waste, many of the compounds on this list may be eliminated using the guidance presented previously in this section and in Section 3.6. As indicated in Section 3.6:

- The owner or operator should provide a sound justification or analytical results of waste analyses as substantiation for the elimination of constituents from further consideration;

- The analysis of waste samples to determine their characteristics should be performed using standard methods, suchs as those described in the 3rd edition of EPA/SW-846 (<u>Test Methods for Evaluating Solid Waste</u>), or equivalent methods; and

- A detailed QA/QC Plan should clearly define the sample preparation techniques, analytical methodology, required analytical sensitivities and detection limits, collection of blanks and duplicates.

In addition, for units that contain a mixture of solid, sludge and/or liquid waste material, each phase should be analyzed and volume proportions measured. Case Studies No. 13, 18, 19 and 21 in Volume IV (Case Study Examples) provides illustrations of waste sampling uses, considerations and techniques.

7.3 Unit Characterization

Information on unit characteristics may affect release properties and pathways. The owner or operator should obtain relevant information on the unit for use in developing the investigation strategy. Such information may include:

- Unit dimensions (including depth below grade);
- Unit type;
- Unit purpose (e.g., biodegradation);
- Structural description, including materials and methods of construction, and any available drawings
- Amounts of waste managed;
- Previous uses of area occupied by unit;
- Unit location;
- Description of liner or cap materials;
- Holding/retention time;
- Key operating parameters, such as waste management schedule;

- Waste treatment/application or loading rate;
- Biological activity present;
- Vent numbers and sizes; and
- Drainage areas.

7.4 Applicable Waste Sampling Methods

7.4.1 Sampling Approach

References for waste sampling methods discussed in this section are listed in Section 3.6.3. A summary of available waste sampling methods for various waste matrices are provided in Table 7-2.

The collection of waste samples requires methodology suited to the type of waste and unit being sampled. In addition, waste sampling requires specialized equipment and protocols that may be designed especially for waste analysis or adapted from other sampling methods. Several important points to consider when developing a sampling approach are:

- Compatability of sampling methods and materials with the constituents being sampled.
- Ensuring the safety of personnel. Careful attention should be given to the level of protection and safe practices required for sampling activities. If the sampler is wearing protective gear that limits vision and mobility, or is fatiguing to wear, the collection procedures should be as simple as possible.
- Waste samples are generally not preserved and are considered hazardous for shipping purposes.

TABLE 7-2. SAMPLING METHODS SUMMARY FOR WASTE CHARACTERIZATION

	1	2	3	4	5	6	7	8	9	10	11	12
Waste Type/Unit Type	Scoops and Shovel	Triers	Thiefs	Augers	Core Samplers	Glass Tubes	Petite Ponar Grab	Dippers	Coliwasa	Pump and Tubing	Kemmerer Bottle	Bacon Bomb
Solid Wastes												
Waste Piles	X	X	X	X								
Land Treatment Units	X				X*							
Landfills				X	X							
Drum Handling	X		X									
Sacks and Bags	X	X	X									
Trucks	X	X	X		X							
Conveyor Belts	X											
Unloading/Loading/ Transfer Areas	X				X							
Sludge Wastes												
Waste Piles	X	X			X		X					
Drum Handling	X				X	X			X			
Tanks	X							X	X			
Surface Impoundments	X						X	X	X			
Trucks	X	X			X		X	X				
Conveyor Belts	X	X										
Unloading/Loading/ Transfer Areas					X	X		X				
Liquid Wastes												
Drum Handling						X		X	X	X		
Tanks									X	X	X	X
Surface Impoundments								X	X	X	X	X
Trucks								X		X	X	X
Unloading/Loading/ Transfer Areas								X		X		X

* Core Sampler modified to serve as air-tight container for retention of volatile fraction.

7.4.2 Sampling Solids

Sampling of solid materials should utilize readily available techniques. In general, the primary concern for the sampling of solid materials is effectively representing a large amount of possibly heterogeneous material in small samples. In order to address this concern, discrete samples should be collected from sufficient locations to characterize the waste with respect to location and time. Sampling methods vary depending on whether samples are to be collected at the surface, or below the surface. For a unit currently in operation, variation in the waste stream composition over time should be considered in determining when samples should be taken.

For large amounts of solid materials, sample locations may be determined by applying a three-dimensional grid in combination with random sampling techniques as discussed in Section 3 of this document. Compositing of samples in certain circumstances may be acceptable to minimize the number of sample analyses, as long as the waste remains fairly constant over the sampling period. When the composition of the waste material is expected to vary (e.g., in complex wastes), grab samples should be taken. Compositing should only be employed when the representativeness of the waste characterization is uncompromised, and should always be accompanied by confirmational grab samples.

Bulk solid materials are generally homogeneous. They are likely to be found in waste piles, drums, bags, trucks or hoppers, or on conveyor belts. Bulk solid materials can be sampled using various methods. Surface soil or soil-like materials found at land treatment units, landfills and at waste transfer (e.g., loading and unloading) areas can also be sampled using the same basic methods. Deeper soil sampling will require other methods as described in Section 9 on soil.

Five basic solid sampling methods are discussed below:

- Scoops and shovels are useful for sampling dry or moist granular, powdered, or otherwise unconsolidated solids from piles as well as from other containers of solid material (e.g., bags, drums, hoppers, trucks, or shallow containers). Waste material that is transported to the unit by conveyor belt can be sampled using a scoop to collect samples from a moving or stationary conveyor belt. Scoops are applicable to solid waste material that are within easy reach of sampling personnel. Scoops made of stainless steel or Teflon are preferable. due to the inertness of these materials to most waste types. This sampling method is limited in utility to collection of samples near or on the surface of the waste. For collection of samples at greater depth, other methods are necessary. Shovels are used in the same manner as scoops when larger quantities of sample are needed or when an extended reach is required. Shovels are available in inert materials like Teflon or stainless steel. Scoops and shovels will be able to collect land treatment unit samples from depths of up to about 16 inches. Since most land treatment units manage organic waste streams, extreme care must be taken to retain the volatile organic components of the sample through rapid handling of the exposed sample during the collection process. Containers that have septum caps or air-tight lids should be used in conjunction with the scoop and shovel sampling method. Collection of soil samples from depths lower than the normal depths of tilling are described in Section 9. Contaminated surface soils at waste transfer areas are also easily sampled using scoops and shovels.

- Triers are used to withdraw a core of sample material. The trier is similar to a scoop in that it is inserted by hand into the material to be sampled; however, the design allows for the collection of a core of material. Triers are most useful for sampling waste piles, bags, hoppers or other sources of loose solid waste material. Cores are most readily obtained with triers when the material being sampled is moist or sticky so that the core, which is cut by rotating the trier, stays together while the sample is removed from the waste material source. These samplers are only useful when they can be inserted horizontally into the material being sampled. Triers are readily available in lengths from 61 to 100 cm and are usually made of stainless steel with wooden handles.

- Thiefs are essentially long hollow tubes with evenly spaced openings along their lengths. An inner tube with similar openings is oriented so that the openings are not aligned and the entire dual tube thief is inserted into the solid waste material. After insertion, the inner tube is rotated to align the openings, thus allowing the solid material to flow into the inner tube. The inner tube is then rotated back to the closed position sealing the openings prior to withdrawal of the sampler. Thiefs can be inserted horizontally, vertically, or at various angles into the sample as long as the material will flow (by gravity) into the slots of the sampling tubes. This method is best suited for sampling of dry free-running solids. Thiefs are available in a range of sizes to allow for collection of materials of varying particle size, but are not generally useful for particles in excess of 0.6 cm. Thiefs, like triers, are available in a variety of materials, usually brass or stainless steel, and are appropriate for sampling waste piles, drums, or hoppers.

- <u>Augers</u> can be used to sample solid material at varying depths. The use of augers is generally exclusive to the collection of soil samples at depth such as at landfills. However, for large waste piles, that cannot be sampled in any other manner, it may be necessary to obtain samples from the inside portions of the pile in order to assess the overall characteristics of the material in the pile. Generally, augers are used in conjunction with a thin-wall tube sampler that is inserted into the bore hole to collect an undisturbed sample from the depth at which the auger was stopped. The nature of the solid material and the physical size and accessibility of the unit will determine the applicability of augering and the type of auger that is most suitable. Augers are designed for general types of soil conditions and "disturb" samples to varying degrees. If possible, sampling of waste material should be conducted prior to or during waste placement since sampling by augers and thin-wall tubes can be difficult and time consuming. Backhoes may be required to gain access to the interior portions of the unit (e.g., a waste pile).

- <u>Core samplers</u> such as previously described in conjunction with augers are frequently used for soil sampling. Section 9 addresses soil sampling in greater detail. Core samplers can also be used to collect cores of land treatment unit samples and provide excellent samples for spanning the depth of treated soil. Thin wall tube core samplers can be used to collect vertical cores at most desired locations. Sampling of top soil layers that contain the applied waste material can usually be accomplished using conventional hand coring techniques. As with the scoop and shovel method, extra consideration should be given to preventing losses of volatile organic components from the sample; the use of air-tight sample containers is recommended. Another technique is to utilize a core sampler which can itself be used as an air-tight sampling container. Recent designs include a coring device with Teflon-gasketed end caps that can be used to both collect and contain land treatment samples for soil and soil-gas analyses.

7.4.3 Sampling Sludges

Sludges are "semi-dry" materials ranging from dewatered solids to high viscosity liquids. Due to their liquid content, sludge materials are not usually stored or handled as solids, and often require containment in drums, tanks, or impoundments, to prevent runoff of the liquid portion of the sludge. Sludges also include sediments with high liquid content found under a liquid layer. Sampling must frequently include extended reach equipment to gain access to the submerged sludge layer. For those cases where sludges are piled and have a sufficiently high solids content, methods previously discussed under "Solids" may be adequate. The equipment used in some of the solid material sampling methods are available with modifications to contain samples with a high liquid content.

Sediments can accumulate at the bottom of drums due to settling of suspended solids in liquid and sludge wastes. These sediments can be readily sampled using the previously discussed methodology. Glass tube samplers, particularly those of larger bore, can be pressed into bottom sediments of drums to obtain samples. For bottom sediments or sludges that are too thick or resistive for glass tubes, corers with or without core catchers can be inserted into the drum for collection of sediments.

Basic methods for sampling sludges are discussed below:

- Scoops and shovels are useful for collecting sludge samples from the surface of a sludge pile, or at shallow depths in drums, tanks, or surface impoundments. Shovels will allow for the collection of larger volume samples. Extra care may be required to collect "representative" samples if the liquid fraction of the sludge tends to separate from the sample while being collected. The liquid fraction should be considered part of the sludge material and must be retained for adequate characterization. Long sleeve gloves may be required for personnel protection.

- Triers may be useful for collection of cores of material from sludge piles. The nature of the waste will determine the utility of this method. Triers are not generally used for sludges; however, on a trial and error basis, their applicability may be determined.

- Core samplers modified to retain sludge material can be used to collect sludge from waste piles where samples are required from various depths. Core catchers such as thin-wall tube samplers that prevent washout of the wet sludge during recovery of the sampler from the sludge source, are available for attachment to the tip of coring devices. Since sludges are most often formed through deposition of solids from a liquid mixture, the composition of the sludge may vary significantly with regard to time and location. The use of a core sampler equipped with a core catcher can provide for collection of a sample profile. These types of corers are available with extension sections that allow for collection of samples from depths well below the surface of the waste. Corers are generally equipped with a cutting edge on the tip that greatly facilitates penetration of a thick bottom layer and can also be outfitted with core catchers to assist in retaining looser sediment materials that might be more readily lost from the bottom of a glass tube. The amount of sludge present can be easily estimated by measuring the depth to the apparent bottom and comparing it to the known interior depth.

- Glass tubes or a COLIWASA (Composite Liquid Waste Sampler) can collect bottom sediments from drums or shallow tanks by gradually inserting them into the solid layer at the bottom. Due to the fragility of glass and the danger of cuts, this technique is only applicable for materials that are easily penetrated by the tube. High liquid content bottom sediments may exhibit similar washout characteristics as liquid samples. In many cases, the only way to determine if sample losses from the bottom of the tube will occur is to carefully test it to see what happens.

- Petite Ponar Grab Samplers are clamshell type scoops activated by a counter lever system. The shell is opened and latched in place, then lowered to the bottom. When tension on the sample line is released, the shell halves are unlatched. The lifting action of the cable on the lever system closes the clamshell. These dredges are capable of collecting most types of sludges or sediments from silts to granular materials up to a few centimeters in diameter. Agitation of the liquid above the sludge does occur during sampling; therefore, it is advisable to collect sediment samples after all liquid sampling is complete. This method is particularly useful for tanks and surface impoundments.

7.4.4 Sampling Liquids

Liquid wastes require distinctly different sampling methods from solids and sludges, with the exception of some techniques for sampling submerged sediments, and should also account for parameters of interest (e.g., for volatile contaminants, it is important to prevent volatilization). The common liquid waste sources are drum handling units, tanks, and surface impoundments. A general safety concern associated with drums and tanks is the structural integrity. Safe access procedures for sampling these units should be established prior to sample acquisition.

Liquid wastes handled in drums can be sampled before being loaded into the drum or, if necessary, after placement. For facilities that receive wastes in drums, sampling should be conducted prior to the removal of the waste material from the drum. For waste streams that can be sampled directly prior to drum loading, grab sampling techniques are appropriate. As always, sufficient samples should be collected to account for waste variation over time. Sampling of drums can be done using several different methods, including grab sampling with a dipper from the open drum, routine full depth drum sampling using a disposable glass tube or COLIWASA, or with a sampling pump method with tubing that is lowered into the drum for sampling.

Tanks are containment structures larger than drums that can hold up to more than a million gallons. Tanks include tanker trucks, above-ground tanks and partially or fully underground tanks. Tanks usually have limited access due to small hatchway openings, ladders or walkways that often extend across open-top tanks.

Due to the greater depth of tanks versus drums, methods with extended reach capabilities are necessary. Waste materials contained in tanks generally include liquids and bottom sludges. When retention time of liquid wastes in tanks is long, layering or stratification including settling out of sediments is likely to occur. Great care should be taken to minimize the disturbance of liquid layers while collecting samples. The surface should be broken gently and samplers lowered gradually. Liquid sampling utilizes either pump and tubing methods or discrete depth samplers, such as Kemmerer Bottles or Bacon Bomb samplers. Bottom sediments that cannot be drawn up with a pump will require the use of small dredges, such as the Petite Ponar Grab sampler.

Surface impoundments can range in size from several hundred to several million gallons in capacity. Due to their large size, they are usually open to the atmosphere rather than covered . Sampling of an impoundment may be difficult, except near its edges or from walkways that extend over the impoundment. "Off- shore" sampling, when necessary, should be considered a serious, potentially dangerous operation and should be performed according to strict health and safety procedures. . Common means of sampling off-shore locations are boats, floating platforms, cranes with suspended enclosed platforms, and mobile boom vehicles with platforms.

Whenever possible, the waste should be characterized prior to its transfer into the impoundment. For example, waste pipelines can be sampled from valves, and tanker trucks discharging waste into impoundments can be sampled prior to the discharge. However, taking samples from the units is desirable, since changes in the concentrations reported for samples taken during transfer may have large impacts on the estimates of the amounts of hazardous waste or constituents in the impoundment.

Liquid sampling techniques for impoundments include Dippers (particularly in the pond sampler configuration with a telescoping handle), pump and tubing, Kemmerer bottles, and Bacon bomb samplers. The dipper or pond sampler method is the easiest to use; however, it is not capable of reaching off-shore locations or for collecting samples at varying depths below the surface.

Liquid sampling methods are described below:

- Dippers can be used to collect samples from the surface liquid layer of open drums, tanks, or impoundments. Other techniques are required to collect samples from drums where the only access is through the bung hole in the lid. This method is appropriate only for wastes that are homogeneous and likely to be represented by a grab sample from the top layer. In most cases, a full depth composite liquid sample is more representative. The dipper technique involves the use of an intermediate vessel that is submerged in the waste liquid. The sample is then poured into the designated sample container. Handles are attached to the vessel to make sampling easier and reduce direct contact of the sampling technician with the waste material. In one configuration, the dipper is attached to a telescoping pole for an extended reach; this configuration is called a pond sampler. The dipper sampling device is also useful for sampling from piping system valves.

- Glass tube samplers can collect a full depth liquid sample from a drum and can be used through the bung hole on the drum lid such that the lid need not be removed. Conventionally, the glass tubes are 122 cm long and 6 to 16 mm inside diameter. Larger diameter tubes can be used if the liquid to be sampled is more viscous. The major limitation of this method is spillage (i.e., liquid loss from the bottom of the tube is unavoidable). Smaller diameter tubes have fewer problems with sample loss than large bore tubing. This method is perhaps the most common drum sampling technique in use due its relative ease and the minimal equipment decontamination required.

- COLIWASA samplers are a more formalized version of the glass tube samplers. The COLIWASA (composite liquid waste sampler) utilizes an inner rod that is attached to a stopper at the bottom of the sampling tube. The sampler is slowly inserted into the drum with the bottom stopper open. When the sampler reaches the bottom, the inner rod is pulled up, sealing the sampling tube for removal of the sample. A COLIWASA can be made of many materials; however, inert materials (e.g., Teflon or glass) are the materials of choice.

- Pump and tubing (e.g., bladder pumps) systems are readily available and are useful for withdrawing liquid samples from up to 28 feet in depth. Peristaltic pumps are available in many sizes and flow rates to accommodate many sampling situations. Full depth composite samples can be collected by gradually lowering the tubing into the material being sampled. One limitation of this system is that the pump applies a vacuum to the sample that can alter the chemical equilibrium in the sample, resulting in the loss of volatile organic components. A modification to this basic system can be made by placing a sample vessel in-line between the tubing and the pump to prevent sample material from contacting the pump parts. In this configuration, collection of numerous samples is facilitated since pump tubing need not be cleaned or replaced between sampling events.

  High flow rates are not advisable since rapid overflowing of sample bottles may occur. A lower flow rate will assist in minimizing the disturbance of liquid layers in the tank and will cause less agitation of the sample as it enters the sample bottle. The peristaltic pump and tubing system can be utilized in two configurations -- one with the tubing connected directly to the pump and a second with an intermediary sample vessel in-line between the pump and tubing. The second configuration also eliminates pump decontamination between samples. When sufficient waste characterization data are available, small submersible pumps can also be used; however, these pumps are not generally made of materials that are chemically resistant or relatively inert. The utility of these small submersibles depends upon their ability to provide samples from greater depths. Peristaltic pumps have an upper limit of approximately 8 meters, whereas submersibles can be used for most depths of concern.

- Kemmerer Bottles are discrete-depth liquid samplers that are usually appropriate for tank or impoundment sampling. The Kemmerer Bottle is a spring loaded device that is lowered into the liquid in the open position, allowing the liquid sample to flow through it while it is descending. At the desired depth, a messenger is dropped down the sample line, releasing the spring loaded closing device to obtain the sample. Limitations of Kemmerer Bottles include the poor availability of devices constructed of relatively inert materials, the difficulty in decontamination between sampling, and the inability of this sampler to collect purely depth-discrete samples (since the sampler's surfaces are exposed to materials in the liquid layers as it passes through them to arrive at the designated depth).

- <u>Bacon Bomb samplers</u> are lowered on a sample line. A second line attached to an opening rod, which runs down the center of the bomb, will open the sampler when pulled. The sample can be collected with a minimal amount of agitation since the rod can open the top and bottom of the bomb, allowing the sample to enter the bottom and air to exit through the top. Bacon Bomb samplers are readily available from laboratory supply houses and are frequently constructed of chrome- plated brass. Relatively inert construction materials, such as Teflon or stainless steel, are preferable. Careful maintenance and regular inspection of samplers is advised. Samplers with plating materials flaking off should be removed from use. If waste characteristics are known, sample changes caused by the sampler can be avoided by using materials compatible with the type of waste being sampled. An advantage of the Bacon Bomb sampler is its ability to be lowered to the desired depth in the closed position before collecting a sample. This technique minimizes cross-contamination from liquid layers above.

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OIL CONSERVATION DIV.
SANTA FE

SAFETY EXECUTION PLAN
RCRA FACILITIES INVESTIGATION PROJECT
GIANT REFINERY
GALLUP, NEW MEXICO

A REPORT PREPARED FOR
GIANT INDUSTRIES, INC.
ROUTE 3, BOX 7
GALLUP, NEW MEXICO 87301

AES PROJECT NO. 5202

MAY 31, 1989
BY
APPLIED EARTH SCIENCES, INC.
8323 SOUTHWEST FREEWAY, SUITE 710
HOUSTON, TEXAS 77074
(713) 981-7140

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1.0 INTRODUCTION

Applied Earth Sciences, Inc. (AES) recognizes its responsibility to provide protection for its employees during the field activities of environmental assessments. The risk of exposure to hazardous, toxic, or otherwise dangerous materials has increased significantly with the growing involvement in hazardous waste management and subsurface investigations. Projects where the potential for exposures to organic and inorganic chemical agents exists require formal policies and procedures. Thus, in recognition of the need for a Health and Safety emphasis, AES has established the policy of assigning a Health and Safety Coordinator to any project where hazardous materials or conditions have a likelihood of being encountered. In addition, a site safety plan is required for every project where potential exposure to hazardous materials exists. The corporate Health and Safety Program has the objectives of:

1. alerting Applied Earth Sciences, Inc. employees and subcontractors to the necessity of safety awareness when involved in hazardous material situations,

2. presenting safety requirements,

3. presenting safety practices and procedures,

4. identifying the responsibilities of the On-Site Safety Coordinator, and staff involved in hazardous material management situations,

5. providing appropriate safety equipment to the employees.

By adhering to corporate Health and Safety Plan objectives, acts and failures that cause injuries or illness will be prevented, thereby preventing permanent disabilities and fatalities.

1.1 General Safety Practices

The following safety practices will be observed at the Giant Refinery where exposure to potentially hazardous contaminants exists:

1. All personnel going on-site will be thoroughly briefed on the anticipated hazards, equipment requirements, safety practices, emergency procedures, and communication methods.

2. Eating, chewing gum or tobacco, or taking medication are prohibited in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists. Smoking is prohibited throughout the site except at Giant-designated smoking areas.

3. Thorough washing of hands and face is required before eating.

4. The field crew will avoid direct skin contact with potentially contaminated substances. The field crew will also avoid, whenever possible, kneeling on the ground, and leaning or sitting on drums, equipment, or ground. Monitoring equipment will not be placed on potentially contaminated surfaces (i.e., drums, ground, etc.).

5. No beard or facial hair which interferes with a satisfactory qualitative respirator fit test will be allowed for field crew personnel potentially requiring respiratory protection.

6. Personnel will be familiar with and knowledgeable about standard operating safety procedures for both equipment utilization and site considerations.

7. Personnel will be familiar, knowledgeable, and adhere to all instructions in this Safety Execution Plan.

8. Personnel will consider fatigue, heat stress, and other environmental factors influencing the health of personnel.

9. Personnel will wear designated and approved respiratory protective devices and protective clothing as instructed by the On-Site Safety Coordinator.

10. Drill rig and sampling equipment will be steam cleaned between each drilling site and before they are taken off-site. Tool and instrument decontamination may be performed on or off the site.

11. Proper care will be taken to avoid vehicle contamination during transport of samples to the analytical chemistry laboratories.

    The outside of the ice chest will be thoroughly washed before the container is placed in the transport vehicle. If there is a possibility that the sample bottles, bags, or wrapping are contaminated, the analytical laboratory will be notified.

12. In the event that drilling operations generate considerable dust, water mist dampening of the area to control dust is recommended.

13. A work area of 30 feet in radius will be defined around the drill rig. Only properly protected individuals will be allowed inside the designated work zone. The on-site safety coordinator will provide final approvals for personnel entry.

Fatigue is a common problem for persons wearing safety equipment. Safety equipment is cumbersome, thus the wearer tires more easily and becomes less alert. This increases the opportunity for accidents as personnel are less observant. Site investigators will watch for fatigue in themselves and other team members. Appropriate measures such as rest breaks will be taken when fatigue is noted. Rest breaks will be scheduled into the investigation to alleviate fatigue.

2.0 SITE HAZARD ASSESSMENT AND PRECAUTIONS

The health and safety guidelines and requirements provided in this plan are designed to protect AES and subcontractor personnel. The intent is to minimize exposure to health-threatening concentrations of chemicals, to prevent fires, explosions, and mishaps that could occur while working during the study. The likelihood of encountering hydrocarbons during this study is low; however procedures for safe operation in such an environment are considered here.

2.1 Explosive/Flammable Environments

Drilling and well construction operations could affect the soil substructure in such a way to increase the potential for personnel exposure to explosive/flammable environments. Elevated concentrations of volatile organic compounds may be released if there is significant subsurface contamination. Explosive concentrations of these constituents could develop during drilling, soil sampling and well construction activities. Those chemicals possessing Lower Explosive Limits (LEL's) must be periodically monitored with the combustible gas indicator (CGI). Downhole measurements of volatile concentrations will occur prior to potential spark-producing activities. In the event an LEL is exceeded, nitrogen gas or another inert gas will be introduced into the borehole until the concentrations are reduced below 20% of the LEL.

Fire potential exists at this site during field operations. Chemical compounds which are flammable will not be identified and, therefore, any vapor or liquid must be treated as if it were flammable. In addition, spark-producing equipment will have the appropriate muffler systems to eliminate spark propagation. Smoking is strictly prohibited on this site except in Giant-designated smoking areas.

Fires involving flammable liquids are considered Class B fires. They require blanketing or smothering to extinguish the fire. This effect keeps oxygen away from the fuel and can be obtained with carbon dioxide (CO_2), dry chemical, foam, loaded stream, or multipurpose dry chemicals. Water spray, CO_2 and dry chemical extinguishers for these types of fires are marked by a "B" on a background of red.

A vital point in flammable liquid or gas safety is the prevention of the accumulation of explosive concentrations of vapors. Therefore, constant ventilation and periodic monitoring of the borehole(s) with the HNU meter or CGI are necessary to maintain a safe working environment.

2.2 Chemical Exposures

The organic nature of potentially encountered chemicals warrants caution via inhalation and dermal routes of exposure. The inhalation of volatile constituents is the most important means by which they gain entry into the body. Half-face cartridge respirators shall be worn on this site when OVA readings at breathing zone height exceed 5 ppm above background. Periodic monitoring with the HNU meter shall provide the necessary indicators when to don respiratory equipment, and to establish background concentrations.

Organic Vapor/Acid Gas High Efficiency cartridges will be used at the site when required. Periodic air monitoring with the HNU will occur even after the donning of respirators. This will provide additional guidance when cartridge replacement becomes necessary. Each AES field representative will be aware of cartridge "breakthrough." This phenomenon occurs when organic vapor concentrations are sufficiently high to render the filter cartridge useless. The field personnel may be aware of organic odors while wearing the respirators. Should such odors be sensed, the face seal will be checked for proper fit. In addition, the respirator inhalation or exhalation valves should also be checked for proper condition and operation. These checks will be performed by the investigator after leaving the work area. A change of cartridges will be necessary when the investigator assures correct seal and mechanical function of the respirator. The cartridge change is required because passing the noted check means the capacity of the cartridge to filter out contaminants has been reached.

Dermal protection at this site will be mandatory. The potential chemical components are organic in nature and can be absorbed through the skin. Protection via hard hats, safety glasses with side shields, gloves, boots, and clean protective clothing that fully covers the body will be required. Dermal exposure is most likely to occur through handling chemically contaminated soil or contaminated ground water. Caution should be employed to prevent encounters with raw contaminants.

Descriptions of health effects associated with organic hydrocarbons are presented in Appendix A. Prolonged exposure to toxic concentrations are not anticipated during field investigation operations. Prudent planning, though, dictates that appropriate personal protective equipment be worn to minimize inhalation or skin exposure.

2.3 Heat Stress (Level C Protection Only)

New Mexico is noted for its hot and dry climate during certain portions of the year. This type of climate coupled with heat produced in some working environments increases the occurrence of heat related illnesses.

Four factors will influence the interchange of heat between investigators and hot environments. These are 1) air temperature, 2) air velocity, 3) moisture content of the air, and 4) radiant temperature. The hot environment problem is one in which a combination of these factors produces an imbalance of metabolic heat production and heat loss. When heat loss fails to keep pace with heat gain, certain physiological mechanisms come into play: dilation of blood vessels, increased cardiac (heart) output, and increased sweat production. Prolonged exposure to excessive heat may cause increased irritability, decreased morale, increased anxiety, and inability to concentrate. The physical disabilities caused by excessive heat exposure are, in order of increasing severity: heat rash, heat cramps, heat exhaustion, and heat stroke.

There are four important factors involved with heat stress: water balance, salt balance, alcoholic habits, and physical fitness. Each factor will be discussed as a means of preparation for potential heat exposures.

Effective work performance in the heat depends on replenishing body water and salt lost in sweat. A fully acclimatized worker weighing 70 kg (154 lbs) can secrete 6-8 kg of sweat per 8-hour shift. If water lost in sweat is not replenished by drinking, continued sweating could lead to dehydration. Sweat loss of 1 kg of body water can be tolerated without serious effect. Water deficits of 2-4 kg (3-6% of body weight) can cause significant work performance impairment. Therefore, to avoid excessive depletion of body water, workers should drink frequently in the field at intervals of 30 minutes or less. Moreover, workers who drink sufficient amounts of water prior to the work shift until they urinate will have assured proper hydration.

Salt (NaCl) losses in sweat during work can usually be replaced at mealtime. The average American diet contains 10-15 grams per day of salt. The average worker who sweats 6-8 kg per shift usually expels 1-2 grams of salt per kilogram of sweat. Therefore, conscious salt supplementation is usually not necessary. Those individuals on no salt or low salt diets should consult their attending physicians for guidance.

Alcohol intake within hours or a day prior to heat exposure may produce severe heat illness. It is known that alcohol suppresses the hormone which governs reabsorption of body water. In effect, the kidney fails to reabsorb water and excretes body water in urine. Dehydration can be a factor primarily for workers who drink moderate amounts of alcohol prior to work in hot climates. Therefore, it is recommended that workers be informed that alcohol intake should be kept to a minimum during non-working hours. Alcohol intake during working hours is strictly prohibited.

Physical conditioning alone does not confer heat acclimatization. It does, though, enhance tolerance by increasing functional capacity of the cardiovascular system. Increased blood flow efficiency and greater capacity for oxygen transfer are the two major enhancements of good physical conditioning. Cardiac output during work can increase with less need to accelerate the heart. These factors combine to increase the capacity of work providing a wider margin of safety in coping with heat stress. Classification, medical aspects, and prevention of heat illnesses are summarized in Appendix B.

3.0 MANAGEMENT ACCOUNTABILITY

All operations which Applied Earth Sciences, Inc. initiates will be in accordance with the safety standards for Giant's Refinery. Giant Industries safety procedures are incorporated into this plan. In keeping with Giant's safety philosophy, AES believes its employees and subcontractors must maintain an increased awareness of their surroundings and of the hazards and risks associated with this particular project and with hazardous materials in general. However, particular duties and responsibilities including training of personnel are specifically entrusted to the On-Site Safety Coordinator (OSSC). These duties and responsibilities are discussed in the following section.

3.1 Safety Personnel

For each RFI, the OSSC will develop the following information:

1. A brief project description including project objectives, size, duration, location and number of field employees or others who could be potentially exposed to hazardous materials (for

example, soil lab personnel who may be handling samples).

2. A list of all known or suspected contaminants. Specific contaminants are listed in Appendix A.

   If specific contaminants are not known, a generic process description should be included, from the list shown in Appendix A.

3. Field and laboratory program start-up dates. The OSSC will begin the field activity with a Safety Briefing.

In addition to the Safety Briefing, the OSSC is responsibilities are:

- o to be thoroughly familiar with safety equipment and operational procedures;
- o to be aware of and understand the potential hazards of the particular project site;

- to observe fellow workers and changing field conditions to ensure proper safety precautions are enforced at all times;
- to assess the need for additional safety equipment (e.g., respirators) depending on site conditions;
- to obtain emergency assistance and provide emergency aid to other team members;
- to prepare and submit incident reports; and
- to coordinate with the client's Safety Officer or Safety Department, as necessary.

The OSSC generally assumes the role of the Safety Officer while working in the field. The OSSC has the authority to stop project activities if he or she feels that a significant change in conditions has developed and the Safety Execution Plan has become inadequate to protect the safety and health of field workers, spectators, nearby workers, or residents.

4.0 SAFETY AWARENESS

Every safety hazard associated with these investigative studies cannot be anticipated; accordingly, guidelines cannot be developed for every contingency that could arise. Consequently, a practical safety program consists not only of written procedures, but also of the application of a great deal of common sense, judgment, and technical analysis. All employees are required to adhere to procedures presented in this document, but they must also know that this safety plan stresses the importance of maintaining a high level of awareness. This involves constant vigilance for unsafe or potentially hazardous conditions or practices, and immediate corrective action.

Employees and subcontractors are encouraged to ask questions about any field conditions or situations about which they are uncertain or uncomfortable. Field conditions may be discovered which were unknown when the project was planned or implemented. Additional factors may be noticed by one of the field personnel that change the degree of safety protection required on this site.

Safety awareness also includes personal observation of fellow workers. Some indications of possible exposure to hazardous or toxic chemicals are the following symptoms:

- headaches
- dizziness
- blurred vision
- cramps
- irritation of eyes, ski, or respiratory tract
- changes in complexion, skin discoloration
- changes in coordination
- changes in demeanor
- excessive salivation, pupillary response
- changes in speech pattern

Constant awareness of surroundings and co-workers is a necessary prerequisite during field activities at the Giant Refinery.

5.0 SAFETY PRACTICES, PROCEDURES, AND REQUIREMENTS

5.1 Recommended Safety Guidelines

5.1.1 Drill Rig Guidelines

Drill rig maintenance and safety is the responsibility of the drilling operator. The following information is provided as general guidelines for safe practices on the Giant Refinery:

- Inspect the route of travel before moving drill rig off-road. Note rocks, trees, erosion, and uneven surfaces.
- Remove all passengers from the cab before moving drill rig onto rough or sloped terrain.
- Engage multiple drive power trains (when available) on rig vehicle when mobilizing off-road.
- Travel directly up or down grade on slopes when feasible. Avoid off-camber or traverse approaches to drill sites.

- Approach changes in grade squarely to avoid shifting loads or unexpected unweighting.
- Use a spotter (person at grade) to provide guidance when vertical and lateral clearance is questionable.
- Use hand brakes and chock rig wheels when grades are steep.
- Lower rig mast when traveling off-road.
- Secure all loads to rig prior to off-road mobilization.
- Locate overhead and buried utilities prior to drilling operations.
- Treat overhead electrical lines as if they were energized.
- Contact appropriate utilities agency to manipulate or deactivate overhead service in areas that interfere with drilling operations. Do not attempt to handle utilities.

- Note wind speed and direction to prevent overhead utility lines from contacting rig derrick. Allow at least 20 feet clearance between rig mast and utility lines.
- Contact appropriate utilities agency to survey, mark and flag locations of buried utility lines.
- Use geophysical techniques, or equivalent, to locate buried utility lines.
- Stabilize and level each work site prior to drill rig set-up.
- Maintain orderly housekeeping on and around the drill rig.
- Store tools, materials and supplies to allow safe handling by drill crew members. Proper storage on racks or sills will prevent spreading, rolling or sliding.
- Avoid storage or transportation of tools, materials, or supplies within or on the drill rig derrick.

- Maintain working surfaces free of obstructions or potentially hazardous substances.

- Store gasoline only in containers specifically designed and approved for such use.

- Wear eye protection when chipping, chiselling or breaking materials that present risk of flying objects.

- Inspect wire rope, hoisting hardware, swivels, hooks, bearings, sheaves, guides, rollers, clutches, brakes for the following:

    -- abrasions
    -- breaks
    -- wear
    -- fatigue
    -- corrosion
    -- jamming
    -- kinking

- Avoid the suspension of loads when hoist is unattended.

- Prevent hoisting loads directly over field personnel.
- Restrict hoisting operations during unfavorable environmental conditions such as rain or high winds.
- Maintain safe hand distance from hoisting equipment (e.g., wire rope, hooks, pinch points) when slack is reduced.
- Begin auger borings slowly with the drive engine operating at low RPM's.
- Establish a communication system between driller, helper and geologist for responsibilities during drilling operations.
- Engage auger to power coupling as recommended by the manufacturer.
- Restrict contact with power coupling or auger during rotation.

- Prevent placing hands or feet under auger sections during hoisting over hard surfaces.
- Avoid the removal of spoils cuttings with hands or feet.
- Assure drill rig is in neutral and the augers are not rotating before cleaning augers.

5.1.2 Water Sampling Guidelines

Collection of surface water and ground water samples generally follow standard safety practices which are summarized below:

- Avoid dermal contact and inhalation of vapors of contaminated water. Wear gloves and/or respirators as required by the OSSC.
- To collect surface water samples, use a sampling device which allows the sampler to stand safely on the bank or impoundment levee.
- Use proper lifting techniques for bailer and pump removal from wells.

5.1.3 Soil Sampling Guidelines

- Follow the procedures listed in Drilling Rig Safety (5.1.1) for the movement of any heavy excavation equipment or soil boring rigs.

- Avoid dermal contact and inhalation of vapor or windblown dust. Wear gloves and/or respirator as required by the OSSC.

5.2 Education and Training

All personnel involved in the field operations where close proximity to hazardous materials is expected must receive training in general safety practices, procedures, and equipment use. This includes thorough familiarization with this document and other such safety directives as may be considered appropriate.

The proper care, maintenance, records, and use of general safety equipment and personnel protective equipment is required. Appendix C discusses the suggested guidelines for handling or sampling chemical substances.

Site safety meetings involving applicable field personnel will occur:

1. prior to site mobilization of the field team,

2. when modifications to the site safety plan affect field personnel, and

3. when additional subcontractor staff begin field work.

The meeting content will include (as a minimum):

1. workers right-to-know
2. material safety data sheets (where appropriate)
3. potential hazards
4. health and safety practices
5. levels of protection
6. decontamination
7. safety organization

Site safety meetings will be the responsibility of the On-Site Safety Coordinator. Attendees will be personnel directly involved in implementing field activities. The Project Manager will receive a list of attendees and their signatures acknowledging attendance.

5.3 Emergency Response Procedures

Emergency response procedures are to protect the health and safety of personnel working at the site and all persons present in the surrounding community. The Safety Execution Plan procedures are designed to take all reasonable precautions to avoid any emergency situation and ensure a continuous work flow. These procedures will remain in effect for the duration of the site project. The objective of all risk of emergency should be minimized as far as possible.

Emergency phone numbers including paramedics, local hospitals and fire departments will be posted at all phone locations, and the central decontamination area. All accidents will be reported to the On-Site Safety Coordinator immediately and followed with a report.

a. Initiation of Emergency Response - Emergency response procedures will be initiated in response to the following situations:

- fire on site
- natural disaster
- air emissions which pose an immediate danger
- on-site accident or equivalent failure that poses immediate danger to life or health

b. Responsibilities - The On-Site Safety Coordinator will have overall responsibility for the proper functioning of emergency response procedures. Specific activities will include:

- worker protection plan
- decontamination procedures
- emergency response
- training program

Employees are responsible for the proper on-the-job application of knowledge obtained in the training courses. AES will be responsible for the administration of the health and safety program.

Entry to Site - Only authorized individuals will be allowed entry into the Giant Refinery. A brief training or orientation will be required of persons entering the site.

5.4 Safety Equipment and Protection

5.4.1 General Safety Equipment

The following safety equipment and information will be available on-site for use when needed. All equipment will be checked at a specified time interval to ensure that it is in proper condition.

- Eye wash solution
- First-aid kit
- Fire extinguisher on vehicle (ABC all purpose dry chemical)
- Hand cleaner and towels
- Clean water for washing in case of an accident
- Emergency phone numbers (hospital, police, fire department, toxicologist, etc.)
- Additional equipment as required to provide an adequate level of safety at a site

A list of emergency numbers (telephone numbers and radio call numbers, as appropriate) for the Giant Refinery will be placed in the first aid kit. These emergency numbers include the local police, fire department, medical care, paramedical squad, and the nearest emergency containment service. All team members will be instructed in how to obtain assistance. In the event of an emergency (accident, illness, explosion, hazardous situation at the site, or intentional acts of harm), emergency assistance will be obtained by the OSSC or other member of the team if the OSSC is unable to do so. A listing of emergency telephone numbers is presented in Appendix D.

5.4.2 Personal Protection Equipment

The following safety equipment shall be required for the project.

- Gloves: Gloves will be worn at all times at the site. Cotton gloves are acceptable except when performing tasks involving liquids. When liquids are involved, chemically resistant PVC or latex gloves will be worn.

- Hard Hat: Plastic with a plastic sweatband. Must not interfere with proper fit of respirator. (Cloth and leather sweatbands are more comfortable, but are harder to clean.)

- <u>Safety Glasses</u>: Safety glasses with side shields shall be worn on-site at all times.

- <u>Respiratory Protective Devices</u>: Respirators shall be used whenever a toxic contaminant is present. When using these devices, care shall be taken to follow device instructions carefully. In all cases, the equipment must be of the type approved by either the National Institute of Occupational Safety and Health (NIOSH) or by the Mine Safety and Health Administration (MSHA).

- <u>Half-Face Cartridge Respriators</u>:

The respirator must fit the face well. A beard, heavy sideburns, or glasses may prevent a good seal. Check the seal by covering the air intake and breathing in. If no air enters, there is a good seal. Cartridges and filter units shall be checked and maintained in accordance with manufacturer instructions. The face piece shall be washed regularly. This respirator will not protect when the oxygen supply is below 19.5%.

Table 1 provides more information on respiratory protective devices.

Table 1 RESPIRATORY PROTECTIVE EQUIPMENT

Atmosphere	Respirator Type	Applications and Limitations	Precautions
All particulates, gases, vapors, oxygen deficiency	Self-contained. Recirculating compressed oxygen. Demand compressed air or oxygen. Self-generating oxygen.	Use in any atmosphere. Allows freedom of movement, allows worker to leave atmosphere by any route. Limited time of use. Careful training required for proper use.	Wearer should be in good physical condition and thoroughly trained. Assure plentiful supply of air or oxygen in tank. Check for proper and tight fit, use with life line. Leave at once if an odor is detected. Do not remove until in respirable air.
	Supply air. Hose mask with blower. Hose mask without blower. Air line respirator.	Unlimited time of use in any atmosphere (except air line not to be used in oxygen deficient or immediately dangerous atmosphere). Not to be used where worker cannot escape unharmed without protection. Must exit by entrance route. 150 ft. maximum from exit (75 ft. hose mask without blower). Limits freedom of movement.	Place inlet in respirable air location, adjust fit and air lines properly. Test before entering dangerous atmosphere. Use life line, protect air line or hose from sharp edges or falling objects. Leave at once if air flow is interrupted. Do not remove until in respirable air. Air line respirators must have a clean supply of air free from dust, oil and carbon monoxide.
Particulates alone	Mechanical Filter. Special filter respirators.	Allow freedom of movement. Not to be used in excessively dusty atmospheres, in oxygen deficient atmospheres, in atmospheres containing gases or vapors, or in atmospheres of unknown characteristics. Not to be used for abrasive blasting. Relatively difficult to breathe. Limited time of use.	Use clean filter and change when plugged. Ensure good fit and good operating condition. Leave at once if difficulty in breathing increases significantly.

Table 1 RESPIRATORY PROTECTIVE EQUIPMENT (Cont.)

Atmosphere	Respirator Type	Applications and Limitations	Precautions
Gases and Vapors alone	<u>Chemical Absorbers</u>. Universal gas mask. Special canister gas mask. Special cartridge respirator.	Allows freedom of movement. Do not use in atmospheres deficient in oxygen or containing excessive contaminants at start of use (above 2% with gas masks, above 1000 ppm with cartridge type). Used for limited time and specific contaminant only. (Cartridge respirators not to be used in atmospheres immediately dangerous to life.) Relatively difficult to breathe. Limited time of use.	Adjust properly, ensure good tight fit. Check operating condition. Always use fresh canister or cartridge at start of use if possible. Enter atmosphere cautiously. Whenever odor is detected leave at once. Leave if difficulty in breathing increases significantly.
Combination of particulates and gases and vapors	<u>Chemical/Mechanical Filters</u>. Gas mask with filter. Filter respirator cartridge	See mechanical filters and chemical absorbers.	See mechanical filters and chemical absorbers.

Source: Sac, N. Irving, <u>Dangerous Properties of Industrial Materials</u>, 1968.

5.4.3 Levels of Protection

This section presents the guidance for selecting the level of protection necessary for various potential exposure situations. It is understood that the more encumbered with protective equipment a worker becomes, the more difficult it is to perform the job expeditiously, and the more susceptible the worker may be to heat stress. However, the following is a practical balance of worker protection and freedom of movement that should allow the work to be done without compromising health and safety.

Organic vapor concentrations measured by portable instruments (e.g, HNU meter) will be used to establish levels of protection. The appropriate level of protection will be decided by the On-Site Safety Coordinator prior to initial entry onto the site. Subsequent information may suggest changes in the original level selected.

Level D Protection

Level D is the basic work uniform and will be worn for all site operations not requiring greater protection. Level D protection will only be selected when drill and well sites are positively identified as having minimal toxic hazards.

Personal protective equipment required for Level D protection includes:

- Full body clothing: clean clothing covering all extremities
- Boots/shoes: chemically-resistant
- Safety glasses with side shields
- Hard hat (face shield optional)
- Half-face air-purifying cartridge respirator (carried)
- Gloves: cotton or chemically resistant if liquids are encountered

Level D Protection can be worn only under the following circumstances.

- No indication of airborne health hazards present.

- No gross indications above background on the photoionizer and/or organic vapor analyzer.

- Continuous air or personnel monitoring will occur while wearing Level D protection.

Level C protection will be worn when the total organic vapor readings at breathing zone height exceed 5 ppm above background on instruments such as the organic vapor analyzer.

Personal protective equipment required for Level C protection includes:

- o all Level D personal protective equipment,
- o half-face air-purifying cartridge respirator.

Level C protection shall be worn when:

- o Air concentrations of contaminants do not exceed the protection factor afforded by a full-face mask. If total organic vapor concentrations at breathing zone height exceed 50 ppm above background on the air quality monitoring instruments, all work will cease and personnel will evacuate the area until the vapor concentrations subside.
- o Exposure to unprotected body areas is less than the amount that will cause harm.

- o Well-documented, reliable history of site and patterns of prior entry are well known.
- o There is no evidence of potential acute or chronic effects to Level C protected personnel.

5.4.4 Decontamination

Field personnel could become contaminated in the course of performing field operations. Personal protective equipment, such as levels "D" or "C" protection, and well designed work practices help mitigate such contamination. Field investigators, instruments and equipment are at risk of contacting hazardous materials. Contamination reduction methods and decontamination procedures are developed and established prior to site entry. Maintenance and, where appropriate, modification of these techniques, are continued throughout site operations.

Decontamination is the removal, minimization or modification of hazardous materials on a given surface. The surfaces of import are those of respirators, clothing, gloves, boots, instruments, and equipment.

The specific decontamination protocol is based on considerations and factors unique to the Giant Refinery. Minimization of cross contamination can be achieved by:

(a) proper decontamination
(b) correct technique for doffing personal protective equipment, and
(c) consistent use of contamination reduction work zones.

The contamination reduction system provides a circularexclusion zone (hot zone) with a radius of 30 feet. Personnel inside the hot zone shall be wearing the level of protection designated at the site.

The decontamination plan assumes all personal protective equipment is contaminated. A decontamination system is established for personnel to either properly dispose or wash and rinse used protective equipment.

The extent of decontamination as planned is adapted to site specific conditions. The actual conditions may require more or less intensive effort. The toxicity of contaminants or hazard risk expected govern the degree of decontamination. Highly toxic or skin-destructive materials require full decontamination procedures. Less hazardous substances warrant a lower degree of decontamination complexity.

Consideration is given to the amount and location of contaminants on the protective clothing. Visual assessment is the usual method of estimating the magnitude of risk. A thorough decontamination is generally required if personal protective equipment is badly contaminated. Permeation or degradation of protective clothing can occur when hazardous substances remain on these surfaces for extended time periods. In addition, contamination on the upper areas of protective clothing present a greater risk to the field investigator. Concentrations at this higher level are more accessible to the breathing zone. There is also an increased probability of skin contact when investigators doff the upper clothing. Therefore, minimizing overall contamination on protective equipment and clothing is a constant goal for field investigators.

The type of work that each person performs governs the potential for hazardous substance contact. Managers, couriers, observers or others of similar role may not need their garments washed or rinsed. Others, however, who are intimately involved in the hands-on field investigation could require more thorough decontamination. Modification to decontamination protocol will be made on-site as job functions dictate.

Reasons for leaving the hot zone also decide the need and extent of decontamination. For example, a field investigator leaving the hot zone to pick up or drop off tools and immediately returning may not require decontamination. An investigator leaving to change respirator cartridges may require some degree of decontamination. Individuals who exit the exclusion zone for a break, lunch or at the end of shift must be completely decontaminated.

6.0 SECURITY REGULATIONS

Applied Earth Sciences, Inc. will adhere to all security regulations as put forth in Giant Industries Safety Plan.

7.0 INCIDENT REPORTING

The OSSC is responsible for submitting an incident report to management should an incident occur during the investigative testing. An incident is defined as an accident, illness, or case of exposure (suspected or actual). Another field team member may submit the report if the OSSC is unable to do so. The incident report will include the following:

- Date, time and place of occurrence
- Person(s) involved
- Type of incident
- Description of incident and action taken
- Recommendations for prevention of a similar occurrence

The report will be submitted within 24 hours after the incident, signed, and dated by the person completing it. All accident reports and follow-up action on the incidents will be kept on file.

8.0 MEDICAL SURVEILLANCE

The possibilities for long-term risk inevitably exist with the handling of toxic substances. Although there are measures designed to minimize these risks, handlers of toxic substances shall be warned of their dangers. All personnel who may be exposed to hazardous or toxic contaminants will be included in Applied Earth Sciences' surveillance program. This program includes the following medical services and monitoring:

- o Assessment of the health status of individuals prior to work (baseline medical evaluation).
- o Periodic assessment and evaluation of the worker's health during the project.
- o Monitoring of workers during their employment by the Safety Manager for evidence of post-work adverse health effects and suitability for future assignments.

Based on knowledge of work to be performed and of particular hazards to be encountered on project sites, the examining physician have recommended tests and procedures most capable of identifying adverse health effects in individual workers. These tests and procedures have been established into a yearly comprehensive physical.

Examinations consist of a detailed medical and occupational history and a thorough physical examination with particular attention to the cardiopulmonary systems; general physical fitness; skin; and blood-forming, hepatic, renal, and nervous systems. Tests include vision acuity, audiometric exam, chest X-ray, electrocardiogram, pulmonary function, urinalysis, a complete blood count, and a blood chemistry profile.

9.0 RECORDKEEPING PLAN

The objective of all recordkeeping and reporting procedures is to facilitate swift communication and efficient response as necessary.

The OSSC has the responsibility to maintain the file of various reports, regulations and guidelines related to the health and safety at the Giant Refinery site.

All documents in the recordkeeping system will be signed and dated by the person(s) responsible for completing and maintaining the records. The recordkeeping system will consist of the following documents and minimum information requirements:

- equipment calibration
- monitoring record
- incident report
- respirator - training
- personnel protective equipment issue
- emergency report form

Daily site safety will be the responsibility of the OSSC. All changes onsite will be recorded daily.

10.0 REFERENCES

"Enforcement Considerations for Evaluations of Uncontrolled Hazardous Waste Disposal Sites by Contractors," Chapter XII: Safety Procedures for Hazardous Waste Site Investigations; National Enforcement Investigations Center; Denver, Colorado; April 1980.

"Interim Standard Operating Safety Procedures;" Emergency Response Division, USEPA; April 1981.

OSHA Safety and Health Standards: 29 CFR 1910 and 29 CFR 1926; USDOL.

Safety Manual for Hazardous Waste Site Investigations (Draft); USEPA; September 1979.

"Industrial Hygiene Program for Hazardous Waste Site Investigations;" Weitzman, David and Jonas; Cohen, Linda; American Industrial Hygiene Association Journal; September 1981; p. 653.

"Occupational Diseases - A Guide to Their Recognition;" U.S. Department of Health, Education and Welfare; June 1982.

Hazardous Waste Operations and Emergency Response Requirements: 29 CFR 1910; USDOL.

APPENDIX A

HEALTH EFFECTS

ALCOHOLS

Eg. Butyl Alcohol, Ethyl Alcohol, Methyl Alcohol, Propyl Alcohol

In general, alcohols are irritating to mucous membranes. Their toxicity varies, but usually they produce some narcotic effect. They have some disinfectant action and, because of their fat solubility, most are absorbed through the skin.

Liquid and vapor can be irritating to the eyes and upper respiratory tract. Skin irritation and burns have been known to occur from contact with liquid but are usually delayed in onset and may be prolonged.

Inhalation on dermal exposures can produce nausea, vomiting, headaches, vertigo, dizziness, muscular weakness, drowsiness, blurred vision, optic nerve damage, or liver and kidney damage.

ALIPHATIC HALOGENATED HYDROCARBONS

Eg. Trichloroethylene, 1,1,1-Trichloroethane,
Methylene Chloride, Vinyl Chloride, Fluorocarbons

The toxicologic effects of halogenated hydrocarbons vary from one compound to another but, generally, most cause central nervous system depression. Also common to most is the defatting of the skin which can lead to dermatitis (inflammation of the skin). Liver or kidney injury may occur upon inhalation of high concentrations. Irritation to the lungs and damage to the liver may also occur after exposure to certain compounds.

Exposure to these compounds have caused toxic hepatitis, gastro intestinal upset, respiratory paralysis, tremor, cardiac arrest, sleeplessness and tingling in the limbs.

AROMATIC HYDROCARBONS

Eg. Benzene, Toluene, Xylene, Naphthalene

Typically, the vapor of aromatic hydrocarbons causes central nervous system depression and can cause kidney, liver or bone marrow disorders. Vapor is absorbed through the lungs, and the liquid may be absorbed through the skin. Repeated and prolonged skin contact may cause defatting of the skin which leads to dermatitis.

Acute exposures to aromatic hydrocarbons can result in dizziness, nausea, convulsions, aching limbs, insomnia, profuse sweating and irritation to the bladder.

AROMATIC HALOGENATED HYDROCARBONS

Eg. Chlorinated Benzenes, Chlorodiphenyls (PCB's), Chlorinated Naphthalenes

The vapor and liquid of these compounds are highly irritating to all mucous membranes and skin. Some are powerful lacrimators (tear-producing substances). The chlorinated naphthalenes and diphenyls produce a characteristic and disfiguring acne on skin contact. Skin absorption and inhalation of vapor can lead to severe liver damage. With the exception of chlorinated benzenes, the more highly chlorinated the compound, the greater the toxicity.

Signs and symptoms from acute exposures include fluid in the lungs, nausea, jaundice, fatigue, drowsiness, and anorexia (lack of appetite).

CYANIDES

Eg. Hydrogen Cyanide, Isocyanates, Sodium Cyanide, Ferric Cyanide

Hydrogen cyanide and its soluble salts are rapidly acting poisons. The cyanide ion when released in the body is capable of inhibiting many enzymes. Severe injury from acute exposure is due to chemical asphyxia (inability to uptake oxygen) at the cellular level.

Exposure to these chemicals can produce severe and immediate inflammation to the sinuses, larynx, and bronchioles (breathing tubes leading to the lungs). Inflammation and ulceration to eye tissue may occur upon contact. Symptoms of low exposure include shivering, fluid in the lungs, headache, confusion, weakness and wheezing or coughing during the night following the exposure.

METALLIC COMPOUNDS

Eg. Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel

In general, these geotechnical chemical activities will encounter metallic compounds in an insoluble or soluble inorganic state. The opportunity for fume generated concentrations is not expected. Therefore, skin absorption is the most important route of entry. Each metal has a unique health effect upon exposure and there are potentially many metals present. Consequently, not all health effects can be listed. Metallic compounds can cause immediate short term effects through unnoticeable long term effects. The effects can be localized and specific, or systemic and very broad spectrum. Due to this wide variety of effects, extreme caution must be exercised to prevent skin exposure.

ACIDS

Eg. Hydrochloric, Hydrofluoric, Chromic, Nitric, Sulphuric

These compounds can cause immediate burns to the skin and eyes upon contact. In addition, their gases (Eg. sulfur dioxide, chlorine, phosgene and nitrogen oxides) are far more dangerous than are the acids.

In some cases acid exposure to air results in liberation of acid gases. Acids or their acid gases possess corrosive characteristics when in contact with the eyes, skin or mucous membranes. The acids may produce burns, ulcerations, and scarring on skin and mucous membranes. Dermatitis may occur on repeated exposure. Eye contact may result in reduced vision or blindness. Ingestion may produce severe effects from destruction of esophageal (food pipe to stomach) or stomach tissue. The irritant effect of vapors on the respiratory tract can cause inflammation of the larynx, bronchioles, and cause fluid in the lungs.

APPENDIX B

EMERGENCY TREATMENT GUIDELINES

Emergency Treatment Guidelines

The purpose of emergency treatment is to give immediate and temporary care to a victim of an accident or sudden illness until the services of a physician can be obtained. In the case of poisioning, emergency treatment helps to remove, dilute, or slow up the movement of the poison. Knowledge of the poison combined with prompt treatment is essential in reducing the poison's concentration. Medical attention should be sought when appropriate. In addition, prior to visiting a hazardous waste site, the toxicity, and characteristics of the chemicals at the site should be identified (LD-50-Inhalation, -Dermal, etc.). Arrangements should be made with local medical facilities to alert them of the potential for needing emergency services. The following tables provide emergency treatment guidelines for the four major routes of entry.

INHALATION

Breathing a gas, vapor, mist, fumes, or dust is the most common form of accidental exposure.

Inhalation affects the lining of the air passages of the nose, throat, and lungs, and usually results in an irritation and may cause mild burns. The chemical may enter the bloodstream through the lungs and be distributed throughout the body tissues, causing a systemic effect.

Sampling should always be done in a well-ventilated area and respirators should be used.

EMERGENCY TREATMENT

- If still conscious, get out of the contaminated air space immediately.
- If the victim is unconscious, he should be removed at once from the contaminated area. All rescuers should make sure they have proper respiratory equipment operational before attempting rescue.
- If the victim is no longer breathing, mouth-to-mouth resuscitation, or cardio-pulmonary resuscitation (CPR) should be begun immediately.
- Medical attention should be sought immediately.

INGESTION

Toxic amounts of a substance may be carried to the mouth by hand when drinking, eating, or smoking.

Precautions include:

- Wash hands thoroughly before eating, drinking, or smoking.
- NEVER pipette or siphon liquids by mouth.
- Do not bring hands into contact with the mouth until hands have been thoroughly washed.

EMERGENCY TREATMENT

- Call Poison Control Center.
- Dilute poison with water or milk.
- When petroleum products are involved, get medical advice immediately.
- Do not induce vomiting unless instructed by Poison Control Center.
  - Take an emetic to induce vomiting. A tablespoon of salt or powdered mustard in a glass of warm water may also be effective in inducing vomiting.
  - Treatment should be continued until vomitus is clear.
- Seek medical advice immediately.

EYE CONTACT

Eyes may be harmed by substances in either liquid or vapor form.

Precautions to protect the eyes include:

- o Wear goggles or face shield.
- o Do not rub eyes at any time.

EMERGENCY TREATMENT

- o Eye(s) should be washed immediately with plenty of water. The eye should be held open and flooded with water so that all surfaces are thoroughly washed.
- o Washing should continue for 15 minutes.
- o Seek medical aid.

SKIN EXPOSURE

Some substances have the capacity to penetrate to unbroken skin and enter the bloodstream.

Precautions to be used in sampling include:

- Wipe all residue off the containers after filling them with the sample.
- Use proper procedures for removing contaminated clothing.
- Skin should be washed immediately after removal of contaminated clothing. Clothing should not be worn again unless decontaminated.

EMERGENCY TREATMENT

- Wash skin with plenty of soap and water for a minimum of 15 minutes.
- If clothing is contaminated, it should be removed in such a way to minimize further contact with the substance.
- Get under a shower immediately and remove clothing while showering. Certain substances are rapidly absorbed through the skin. WASTE NO TIME.
- All contaminated parts of the body, including hair, should be thoroughly decontaminated. It may be necessary to wash repeatedly.

APPENDIX C

SUGGESTED GUIDELINES FOR HANDLING OR SAMPLING CHEMICAL SUBSTANCES

Handling of Chemical Substances: General Guidelines

The following guidelines shall be followed when handling or sampling chemical substances. When extraordinary circumstances exist, such as handling of spills or highly toxic substances, guidance and direction must be sought from your supervisor.

- Before entering any facility, ask the appropriate representative if there are any special safety precautions that should be taken or if there is any special equipment needed.
- Check all labels, manifests, and other sources of information before sampling a chemical in an effort to identify the substance and learn of potential hazards.
- Determine what routes of exposure to avoid for the chemical substance being sampled and the proper sampling and protective equipment to be used.
- Use only proper tools for opening containers (e.g., non-sparking bung wrench) and be careful when opening and closing them. Never bang on a drum or container, it may explode.
- Exercise caution; the substance may be mislabeled.
- Open and sample substances in areas where spills can be cleaned up easily and properly.
- Use all appropriate protective clothing and equipment.
- Be carefull not to spill toxic substances on the skin or clothing. If it happens, disrobe completely in a manner that keeps contact with the substance to a minimum, and wash the skin thoroughly for at least 15 minutes. A change of clean clothing should always be available.
- After exposure, remove all protective gear and dispose of it properly. Wash hands immediately after sampling, before eating, smoking, drinking, or using toilette facilities.
- Never use your mouth to siphon or pipette or put your hands near your eyes or mouth. Use an automatic pipette or siphon.
- A supply of detergent soap, clean water, and waterless hand cleaner should be readily available.
- Know the limitations of your protective equipment, especially respirators.
- Transport and store samples in an airtight storage box.
- Be alert for spilled materials, improperly stacked materials, moving equipment (fork lifts, conveyor belts, etc.), poor ventilation, bad lighting, etc.

APPENDIX D

EMERGENCY TELEPHONE NUMBERS
EMERGENCY COORDINATION

APPENDIX D

EMERGENCY TELEPHONE NUMBERS

LOCAL FIRE DEPARTMENT	911 or 722-4195
LOCAL PARAMEDICS	862-7440
LOCAL SHERIFF	911 or 722-5471
LOCAL MEDICAL CARE	722-7746
POISON CONTROL	1-800-432-6866

APPENDIX D (Continued)

CLIENT CONTACT	Bob McClenahan (505) 722-2320
APPLIED EARTH SCIENCES' OFFICE	713/981-7140
PROJECT MANAGER, HEALTH & SAFETY	David Bratberg
(HOME)	713/980-9517

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OIL CONSERVATION DIV.
SANTA FE

DATA MANAGEMENT PLAN
RCRA FACILITIES INVESTIGATION PROJECT
GIANT REFINERY
GALLUP, NEW MEXICO

A REPORT PREPARED FOR
GIANT INDUSTRIES, INC.
ROUTE 3, BOX 7
GALLUP, NEW MEXICO 87301

AES PROJECT 5202-00

DECEMBER 15, 1989
BY
APPLIED EARTH SCIENCES, INC.
8323 SOUTHWEST FREEWAY,SUITE 710
HOUSTON, TEXAS 77074
(713) 981-7140

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1.0 DATA MANAGEMENT AND PRESENTATION

1.1 Data Management

Release characterization studies may produce significant amounts of data, including results of chemical, physical or biological analyses. This may involve analyses of many constituents, in different media, at various sampling locations, and at different points in time. Data management procedures should be established to effectively process these data such that relevant data descriptions (e.g., sample numbers, locations, procedures, methods, and analysts) are readily accessible and accurately maintained.

1.2 Data Presentation

RFI data will be arranged and presented in a clear and logical format. Tabular, graphical, and other visual displays are essential for organizing and evaluating such data. Tables and graphs are not only useful for expressing results, but are also necessary decision-making during the investigation.

1.2.1 Tables

Tabular presentations of both raw and sorted data are useful means of data presentation. These are discussed below.

1.1.2.1 Listed (Raw) Data

Simple lists of data alone are not adequate to fully illustrate trends or patterns resulting from a contaminant release. However, such lists serve as a good starting point for other presentation formats. These lists are also valuable for sample validation and auditing purposes. Therefore, such lists are highly recommended for reporting of results during the RFI. Each data record should provide the following information:

- Unique sample code;
- Sampling location and sample type;
- Sampling date;
- Parameter measured;
- Result of analysis (e.g., concentration);
- Detection limits; and
- Reporting units.

All data should be reported to the regulatory agency, including suspected outliers or samples contaminated due to improper collection, preservation, or storage procedures. The rejected data should be marked as such in the data tables, and explanations of rejected data should be presented in footnotes.

Sampling logs will also be provided for all samples obtained during the investigation. Information in the log should include:

- Name of sampler;
- Purpose of sampling;
- Date and time of sampling;
- Sample type (e.g., soil);
- Sampling location;
- Sampling method;
- Number of samples taken
- Sample identification number(s);
- Amount purged (for ground water);
- Field observations;
- Field measurements made (e.g., pH, temperature); and
- Weather conditions.

1.1.2.1.2 Sorted Summary Tables

Presentation of results grouped according to data categories is amoung the simplest format used to display trends or patterns in the data. Examples of categories of data include medium tested, sampling data, sampling location, and constituent or property measured.

1.1.2.2 Graphical Presentation of Data

Graphical methods of data presentation will often illustrate trends and patterns better than tables. Some graphical formats that are useful for environmental data include bar graphs, line graphs, and contour-plots. These graphical methods of data presentation are discussed below.

1.1.2.2.1 Bar Graphs and Line Graphs

Bar graphs and line graphs may be used to display changes in contaminant concentrations with time, distance from a source, or other variables. Bar graphs are generally preferable to line graphs in instances where there is not enough information to assume continuity between data points. However, line graphs generally can display more information in a single graph.

Attention to the following principles of graphing should provide clear and effective line and bar graphs:

° Do not crowd data onto a graph. Plots with more than three or four lines or bar subdivisions become confusing. Different symbols or textures should be used to distinguish each line or bar;

° Choose the scale of the x and y axes so that data is spread out over the full range of the graph. If one or two data points are far outside the range of the rest of the data, a broken line or bar may be used to indicate a discontinuous scale. If the data range exceeds two orders of magnitude, the owner or operator may choose to plot the logarithms of the data;

° The x and y axes of the plot should be clearly labeled with the parameter measured and the units of measurement; and

2 The x axis generally represents the independent variable and the y axis generally represents the dependent variable.

1.2.2.3 Vertical Profiles or Cross-Sections

Vertical profiles are especially useful for displaying the distribution of a contaminant releases in all media. For soil and ground water, the usual approach is to select several soil cores (or monitoring wells) that lie approximately in a straight line through the center of the contaminant release. This cross-section represents a transect of the site. A diagram is then prepared of the soil (or ground water) profile along the length of the transect, displaying subsurface stratigraphy, location of the source, and the location and depth of boreholes.

1.3 Data Reduction

Data should be reported according to accepted practices of quality assurance and data validation. All data should be reported. Considerations, however, include treatment of replicate measurements, identification of outlier values, and reporting of results determined to be below detection limits.

1.3.1 Treatment of Replicates

Replicate measurements of a single sample should be averaged prior to further data reduction. For example, Table 1 shows how to calculate an overall mean when replicate analyses for a single sample have been performed. The three "B" values are averaged before the mean is calculated. This removes bias from the overall mean. "n" indicates the number of analyses.

TABLE 1

Calculation of Mean Values for Replicates

Raw Data		Data Summary		
Sample	Concentration	Sample	Concentration	n
A	4.3	A	4.3	1
B	1.8	B	1.8	3
B	2.0	C	7.6	1
B	1.6	D	6.3	1
C	7.6			
D	6.3	mean [(A+B+C+D)/4]	5.0	6

1.3.2 Reporting of Outliers

Any program of environmental measurement can produce numbers that lie outside the "expected" range of values. Since field variability of environmental measurements can be great, deciding whether an extreme (outlier) value is representative of actual contaminant levels may be difficult. Outlier values may be the result of:

- A catastrophic unnatural (but real) occurrence such as a spill;
- Inconsistent sampling or analytical chemistry methodology;
- Errors in the transcription of data values or decimal points; and
- True but extreme concentration measurements.

An attempt to correct outlying values if the cause of the problem can be documented should be made. The data should be corrected, for example if outliers are caused by incorrect transcription and the correct values can be obtained and documented from valid records. Also, if a catastrophic event or a problem in methodology occurred that can be documented, data values should be reported with clear reference. Documentation and validation of the cause of outliers must accompany any attempt to correct or delete data values, because true but extreme values must not be altered. Statistical methods for identifying outliers require that the analytical laboratory have an ongoing program of quality assurance, and that sufficient replicate samples be analyzed to account for field variability.

Outlier values should not be omitted from the raw data reported to the regulatory agency; however, these values should be identified within the summary tables.

1.3.3 Reporting of Values Below Detection Limits

Analytical values determined to be at or below the detection limit should be reported numerically (e.g., $\leq$0.1 mg/l). The data presentation procedures should cite analytical methods used including appropriate detection limits.

1.4 Reporting

Various reports may be required. These may include interim, draft, and final reports. In addition, periodic progress reports (e.g., monthly) may also be required. Progress reports should include the following information:

- A description and estimate of the percentage of the RFI completed;
- Summaries of all findings;
- Summaries and rational for all changes made in the RFI Work Plan during the reporting period;
- Summaries of all contacts with representatives of the local community, public interest groups, or government representatives during the reporting period;
- Summaries of all problems or potential problems encountered during the reporting period;
- Actions being taken to rectify problems;
- Changes in personnel during the reporting period;
- Projected work for the next reporting period; and
- Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

Reports, including interim, progress, draft, and final reports may also be required for specific activities that may be performed during an RFI. Examples of specific reports that may be required include:

- RFI Work Plan;
- Description of Current Situation;

- Waste and Unit Characterization;
- Environmental Setting Characterization;
- Selection of Monitoring Constituents/Indicator Parameters;
- Results of "Phases" of the Investigation;
- QA/QC results;
- Interim Corrective Measures;

In addition, a draft and final RFI report which incorporates the results of all previous reports will generally be required. This report should be comprehensive in nature and should be sufficiently detailed to allow decisions to be made by the regulatory agency regarding the need for interim corrective measures and/or a Corrective Measures Study. It should be noted that these decisions may have already been made by the regulatory agency on the basis of results of progress and/or other reports as described above.

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1.0 INTRODUCTION

The purpose of the Community Relations Plan is to document the procedures to dessiminate information pertaining to the assessment of the Solid Waste Management Unit's (SWMU). Two major operations will be undertaken to achieve the transfer of information; internal meetings with Giant Refinery personnel, and the dessimination of public information. Each of the topics is discussed below.

2.0 INTERNAL MEETINGS

Giant Refinery presently holds semi-annual meetings with plant personnel to discuss RCRA activities at the refinery and to train personnel to assist in RCRA compliance. The results of the RFI workplans will be discussed with the employees during these meetings, in order to keep them informed and to allow each of the employees to assist in communicating with the public.

3.0 PUBLIC INFORMATION

3.1 Information Repositories

In order to develop effective communication between Giant Refinery and members of the community, an information repository will be created with the Gallup Public Library, 115 West Hill Avenue, Gallup, New Mexico. This information repository will allow free and convenient access to information deemed useful to be made available to the public. Information in the repository will be updated as necessary.

Potential materials for the file include:

- A facility description;
- Technical data concerning the facility;
- Non-technical descriptions of the facility;
- Announcement of all public involvement activities;
- Transcript of public hearing, agendas, handouts; and
- Final documents of workplans and reports which have been approved by the EPA.

Each of the reports will be summarized to allow for review by the public.

3.2 Public Notices

Public notices are intended to keep the community members informed of the status and results of site activities. An advertisement will be placed at least annually in a local Gallup, New Mexico newspaper which will briefly describe the RFI activities and refer interested parties to the information repository at the public library. The public notice will be brief and to the point. The issues will be conceptualized from the public's point of view and presented in a clear, concise manner.

3.3 Public Meetings

If public interest or response to a public notice is sufficiently great, an informed meeting may be held to review the RFI activities and to provide opportunities for public comment.

Carbonate		12.00	<5	<2	ND
Sulfate	79.00	71.00	17.00	8.59	17.00
TDS	876.00	805.00	755.00	704.00	920.00

OW-11 Giant Refining Gallup, New Mexico

Date: 04 APR 90

TCL Volatile Organics
Method 8240

Parameter	Result	Units	Reporting Limit
1,1-Dichloroethene	ND	ug/L	5.0
2-Butanone	ND	ug/L	10
1,1,1-Trichloroethane	ND	ug/L	5.0
Benzene	ND	ug/L	5.0
Tetrachloroethene	ND	ug/L	5.0
Toluene	ND	ug/L	5.0
Ethylbenzene	ND	ug/L	5.0
Xylenes (total)	ND	ug/L	5.0

OW-11 Giant Refining Gallup, New Mexico

Date: 04 APR 90

Refinery Hazard Constituent Semivolatiles
Method 8270

Parameter	Result	Units	Reporting Limit
Benzo(a)anthracene	ND	ug/L	10
Benzo(b)fluorathene	ND	ug/L	10
Benzo(a)pyrene	ND	ug/L	10
bis(2-Ethylhexyl) phthalate	ND	ug/L	10
Chrysene	ND	ug/L	10
7,12-Dimethylbenz(a)-anthracene	ND	ug/L	10
Dimethyl phthalate	ND	ug/L	10
Fluorathene	ND	ug/L	10
1-Mthylnaphthalene	ND	ug/L	10
Naphthalene	ND	ug/L	10
Phenanthrene	ND	ug/L	10
Pyrene	ND	ug/L	10
o-Cresol	ND	ug/L	10
m & p-Cresol(s)	ND	ug/L	10
2,4,6-Trichlorophenol	ND	ug/L	10
2-Chlorophenol	ND	ug/L	10

OW-11 Giant Refinery Gallup, New Mexico

Date: 04 APR 90

Metals
Dissolved Metals

Parameter	Result	Units	Reporting Limit
Arsenic	ND	mg/L	0.0050
Barium	0.014	mg/L	0.010
Cadmium	ND	mg/L	0.0050
Calcium	4.8	mg/L	0.20
Copper	ND	mg/L	0.010
Manganese	ND	mg/L	0.010
Nickel	ND	mg/L	0.040
Selenium	ND	mg/L	0.050
Silver	ND	mg/L	0.010
Sodium	382	mg/L	5.0
Zinc	ND	mg/L	0.010

OW-11 Giant Refining Gallup, New Mexico

Date: 04 APR 90

Metals
Total Metals

Parameter	Result	Units	Reporting Limit
Chromium	ND	mg/L	0.010
Lead	ND	mg/L	0.0050
Mercury	ND	mg/L	0.00020

OW-11 Giant Refining Gallup, New Mexico

Date: 04 APR 90

General Inorganics

Parameter	Result	Units	Reporting Limit
Alkalinity, Bicarb. as CaCO3 at pH 4.5	461	mg/L	5.0
Alkalinity, Carb. as CaCO3 at pH 8.3	ND	mg/L	5.0
Chloride	123	mg/L	3.0
pH	8.26	units	--
pH	8.24	units	--
pH	8.21	units	--
pH	8.24	units	--
Average pH	8.24	units	--
Phenolics	ND	mg/L	0.010
Sulfate	ND	mg/L	5.0
Specific Conductance at 25 deg.C	1640	umhos/cm	1.0
Specific Conductance at 25 deg.C	1640	umhos/cm	1.0
Specific Conductance at 25 deg.C	1640	umhos/cm	1.0
Specific Conductance at 25 deg.C	1630	umhos/cm	1.0
Average Specific Conductance at 25 deg.C	1638	umhos/cm	1.0
Total Organic Carbon	6.0	mg/L	1.0
Total Organic Carbon	6.0	mg/L	1.0
Total Organic Carbon	6.0	mg/L	1.0
Total Organic Carbon	6.0	mg/L	1.0
Total Organic Halogen as Cl	ND	ug/L	30.0
Total Organic Halogen as Cl	ND	ug/L	30.0
Total Organic Halogen as Cl	ND	ug/L	30.0
Total Organic Halogen as Cl	ND	ug/L	30.0
Total Dissolved Solids	944	mg/L	10.0
Water Elevation	6902.09	ft	--

OW11 Giant Ciniza Refinery Gallup, New Mexico

DATE	12/80	1/81	6/81	9/81	1/85	2/85	3/86	2/89	6/89	9/89
PARAMETER										
pH		7.80				8.20	7.00	8.25	8.30	8.20
								8.25		8.20
								8.20		8.20
								8.25		8.20
Average		7.80				8.20	7.00	8	8.30	8.20
Sp. Cond.						1600	800	1200	1710	1710.00
								1150		1710.00
								1100		1700.00
								1150		1710.00
Average						1600	800	1150	1710	1707.50
mg/L (unless otherwise indicated)										
Benzene									ND	ND
Tolulene									ND	ND
Ethyl Benzene									ND	ND
Xylene									ND	ND
Ag				(0.01	(0.03		(0.1			
As		(0.01			0.02		0.006		ND	ND
Al							0.40			
Ba					1.50		(0.1		0.03	0.02
Be							(0.1		ND	
B							0.60			
Cd				(0.001	0.01		(0.1		ND	
Ca		11.00					11.00		6.70	ND
Cl		88.00				105.00	33.50	114.00	129.00	
CN		(0.1								
Cr	0.003	0.003	0.003	0.003	0.007		(0.1		ND	ND
Co							(0.1		ND	
Cu							(0.1			
F										
Fe		0.30				0.078	0.30			
Hg				(0.0004	(0.002	(0.002			ND	
K							1.95			
Mg							3.30		0.60	
Mn		0.03			1.59	0.012	0.05		0.03	ND
Mo							(0.1			
N		1.80								
Na		380.00				359.00	246.00		378.00	418
Ni							(0.1		ND	
Pb	0.002	0.002	0.004	0.021	0.087	0.004	(0.1		ND	ND
Se		(0.01			0.048		(0.005		0.04	0.034
Si							4.40			ND
Sn							(0.1			
St							0.40			
V							(0.1		0.01	
Zn							(0.1			