PDHonline Course C388 (3 PDH)

Environmental Investigation and Remediation of a Hazardous Waste Site
 Part 3 – Preparation of Project Plans and Procedures

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Course Content

Introduction

Starting in the 1960s, a research institute operated a small (0.65 acre) hazardous chemical and radioactive waste disposal facility on its campus for about 20 years. All waste buried at the site resulted from the use of radioactive isotopes and hazardous chemicals that were used in research experiments. Waste brought to the disposal site for burial was in both solid and liquid form, and the liquids were in various types and sizes of containers. The waste was placed in narrow 8 to 12 feet deep trenches dug into the soil at the burial site. Once the stacked waste reached about 4 feet from the surface, dirt from a newly dug trench was used to fill the older trench up to grade.

When the site was decommissioned and no longer used for waste disposal, it was fenced, posted and locked. Minimal ground maintenance was done until the State Radiation Protection Agency (State RPA) notified the Institute that they were to keep the fence clear of vegetation and the area within the fence mowed and free of trees. The following photo shows the waste disposal area after the site was decommissioned and the ground maintenance started.

Figure 1: Decommissioned waste disposal site at the Institute

Following decommissioning, yearly testing of soil, surface water and vegetation of the site by the State RPA showed no evidence of significant radioactive contamination outside the burial area. In the late 1980s, the State RPA recommended that the Institute install a series of monitoring wells to allow sampling and testing of the groundwater. In response, and under the guidance of the State Groundwater

Protection Agency (State GPA), the Institute installed five monitoring wells around the waste disposal site. The location of the five wells is shown on the following figure.

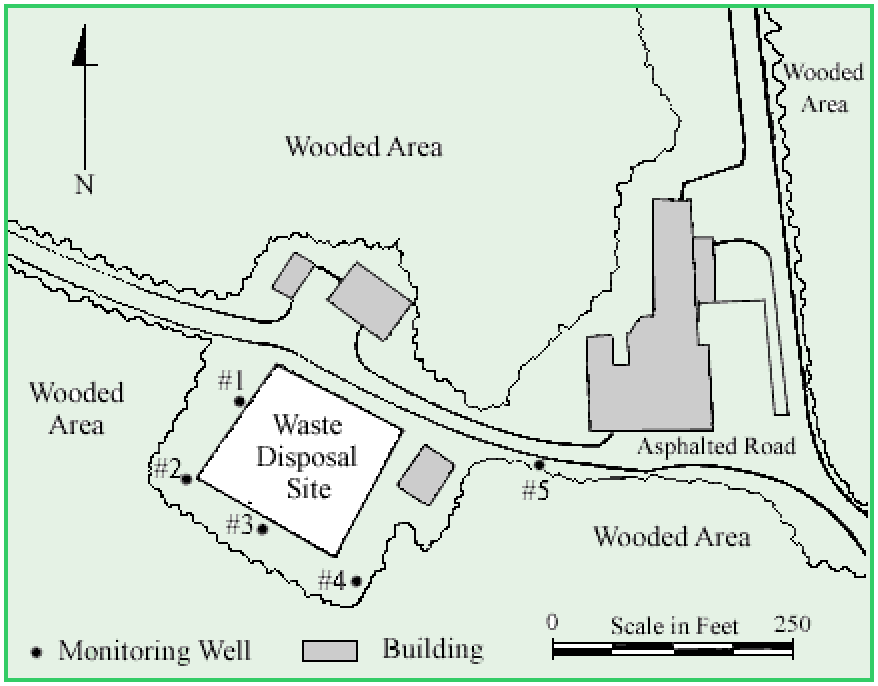

Figure 2: Location of Initial Monitoring Wells Installed around the waste Disposal Site

About a month after installation, the State RPA collected groundwater samples from the five monitoring wells for radiological analysis. A year later, an additional groundwater sample was collected from Well No.3 for radiological and organic chemical analyses. The radiological analyses indicated that some of the groundwater samples in the immediate surroundings of the restricted area had elevated Tritium activities. It also appeared that organic chemical contamination may be present in the groundwater in the vicinity of the waste disposal area. Discovery of both chemical and radiological contamination outside the fenced burial area prompted the State RPA to require the Institute to design and implement a comprehensive investigation program to gain a better understanding of the prevailing conditions at the site. The Institute issued a Request for Proposals (RFP) to environmental and engineering firms to retain the services of a technical services consultant (Consultant). The winning bidder, Consultant, reviewed existing information on file at the Institute and developed an estimate of the inventory of the waste that was disposed of at the site and re-evaluated all existing soil, vegetation, groundwater and surface water test results that were conducted thus far. The Consultant issued a Preliminary Site Condition Report summarizing the results of these initial findings. These aspects of the project are covered in Parts 1 and 2 of this series of courses.

The State RPA and other State Environmental Protection Agencies then requested the installation of additional groundwater monitoring wells and the collection and analysis of additional soil, groundwater and surface water samples in order to determine the size, extent, and characteristics of the contaminant plume that extends beyond the fenced area of the waste disposal site. In addition, they also wanted the Consultant to define the nature and characteristics of the local geology and hydrology of the area.

Development of Project Plans and Procedures

Because the waste disposal site contains hazardous chemicals and radioactive isotopes, no additional field investigations could be started until a project-specific Health and Safety Plan could be developed. A project-specific Quality Assurance Plan was also created, and the technical requirements were developed as part of the Sampling and Testing Plan for the project. A set of Project Procedures was then written to guide the field sampling and analysis programs. The relationship of the various plans, procedures and the field and laboratory activities is shown on the following flowchart.

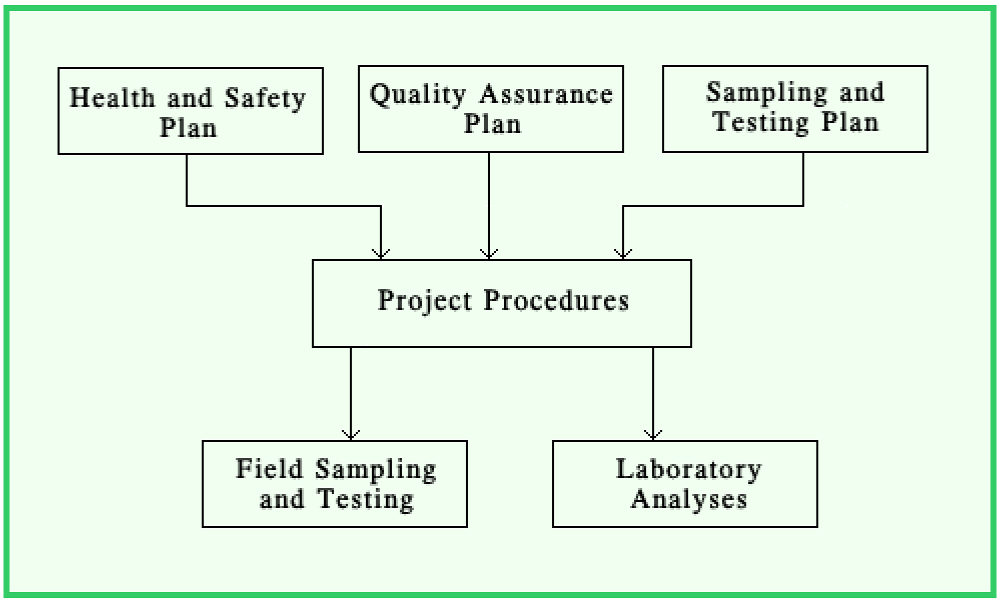

Figure 3: Relationship of the Various Project Plans, Procedures, Field and Laboratory Activities

Health and Safety Plan

The Health and Safety Plan (HSP) follows the format and requirements of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). Although OSHA requirements are typically thought of as applying only to the workplace, they also apply to any field activities where hazardous chemicals and/or radionuclides may be present, including work at old hazardous waste sites. The applicable standards are spelled out in the Code of Federal Regulations (29 CFR 1910.120), entitled "Hazardous Waste Operations and Emergency Response". In addition to the 40 hours basic training in the principles of Health and Safety protection when working with hazardous materials, 29 CFR 1910.120 requires supervisors and employees to also receive eight hours of refresher training annually. The training should be of sufficient content and duration to demonstrate competency and the employer is required to keep a record of the methodology used to demonstrate competency.

The standards do not require the development of a complete Health and Safety Plan for a specific project if there is an existing corporate or institutional umbrella plan that can be referenced. In this case, the Consultant had a corporate Health and Safety Plan, which was the oversight document for all projects involving hazardous waste investigations. The project-specific Health and Safety Plan presented here focused on those items that were applicable to this particular investigation, and in all cases conformed to the requirements of the Consultant's corporate Health and Safety Plan.

Compliance with the Health and Safety Plan is required of all of the Consultant's personnel that will perform work at the site, as well as any subcontractor or sub-consultant that would provide services. The project specific Health and Safety Plan consisted of the following sections:

- Organization and Responsibilities
- Emergency Procedures
- Scope of Work
- Management of Waste Generated
- Hazard Identification
- Levels of Protection
- Safety Equipment
- Instrumentation and Action Levels
- Training and Medical Requirements
- Authorizations and Approvals

Each of these topics is addressed in the following subsections.

Organization and Responsibilities

Due to the limited size of the field sampling and testing program, the Consultant determined that a full-time Health and Safety Officer was not required for this project. As such, the Field Operations Manager was also assigned the duties of the Health and Safety Officer. This is allowed by the regulations as long as the person assigned as the Health and Safety Officer has the requisite training and current certification to perform this function.

The Field Operations Manager designated for this project had been trained in the principles of health and safety protection and passed the required tests and received the annual eight hours refresher training on a regular basis. His training was, therefore, demonstrably current. Based on these considerations, he was assigned responsibility to oversee the field health and safety procedures to be followed by all investigators that may be present on site during the sampling events. In addition, the Field Operations Manager was responsible for reporting any incident or accident, modification to the scope of work and/or adjustment to this health and safety plan to the Project Manager and Corporate Manager of Health and Safety. It should be noted that health and safety on the site is everyone's responsibility. The Health and Safety Officer is assigned as a resource, not as a policeman.

It should always be remembered that OSHA inspectors could show up at any time in the field unannounced to conduct an audit. Therefore, it is the responsibility of the Field Operations Manager to ensure that all the required forms and certifications of training for all persons working under his supervision are up-to-date and available for on-site inspection.

Emergency Procedures

All needs for emergency services will be coordinated with the Institute’s safety program, in order to ensure that appropriate emergency services could be provided in a timely fashion during field operations. The Institute would be notified in advance of the date and nature of work to be performed at the site. Back-up arrangements will also be made with the nearest equipped medical facility that could provide emergency services. The phone number and address of the medical facility and directions to the facility from the site will be provided to all personnel working on the project. The medical facility will also be notified about the type of work that would be going on at the site.

Scope of Work

The scope of work has been divided into Phase 1 and Phase 2. Phase 1 will consist of sampling existing wells and collecting a limited number of soil samples. Depending on the results of Phase 1, Phase 2 would likely include installation of additional groundwater monitoring wells and additional soil and surface water sampling. The specific details of the Phase 2 scope of work will be defined at a later date, and the HSP would be updated accordingly.

The Phase 1 field activities will consist of collecting samples from the five existing monitoring wells and from four soil hand auger borings. The field sampling team will consist of the Consultant’s Field Operations Manager and a technician from the analytical laboratory. The laboratory personnel will follow their own Health and Safety Plan specifically developed for this work and approved by the Consultant’s Corporate Health and Safety Officer. The Consultant kept training records for all personnel working at the site on file.

Management of Waste Generated

Purged groundwater from the monitoring wells will be placed in metal drums provided by the Institute. The Institute will be responsible for proper disposal of the drums and contents. All disposable materials which may become contaminated during work (such as plastic sheets, personal protective equipment, bailing cord, and paper towels) will be placed in plastic bags and transferred to the Institute for proper disposal. The field team will use sampling equipment provided by the analytical laboratory. The equipment will be either new or laboratory cleaned in accordance with the steps specified by the Consultant and presented here under the section on “Project Procedures”. The initial sampling effort is anticipated to be completed within a few days.

Hazard Identification

It is important to note that the intent of the initial field activities is not to characterize the waste in the trenches or evaluate the extent of soil and groundwater contamination under the disposal area itself. All field activities are designed to characterize the nature and extent of contamination outside the fence surrounding the waste disposal area. As such, there is no risk of direct exposure to the waste or any hazards from the waste, including radioactive exposure or potentially flammable and explosive situations. Direct sampling of the waste or drilling through the waste to reach the underlying groundwater can be a dangerous activity which was not called for in this instance.

The Preliminary Site Condition Report identified the organic chemicals and radio nuclides that were detected in the sampling completed previously by the State RPA. The main route of exposure during field work would be by inhalation and skin contact (absorption). The contaminants of greatest concern were the volatile organic compounds and Tritium. The only organic compounds and their concentrations in parts per billion (ppb) that had previously been detected by the State RPA were: 1,4-dioxane (12,261 ppb), chloroform (3,812 ppb), and diisopropyl ether (166 ppb). These organic solvents can volatilize and provide vapors that may be inhaled. Vapor concentration was to be checked at each well prior to sampling. Work would proceed only after the measured concentration in air would be below the accepted level of 5 parts per million (ppm).

Only one sample of the groundwater tested by the State RPA had Tritium concentrations above the regulatory standard. Also, Tritium is a low energy beta-emitter. Therefore, Tritium is considered to be a low hazard outside the restricted waste disposal area. Nonetheless, the proper use of personal protective equipment and adhering strictly to the standard operating procedures should effectively reduce the possibility of exposure by inhalation or skin absorption.

Levels of Protection

The OSHA Standards define four levels of protection, identified as Levels A through D, with Level A requiring the highest degree of protection. As part of the Health and Safety Plan, the level of Personal Protective Equipment (PPE) is defined for the work, based on the hazard identification and the activities to be performed. The levels are fully explained in the Code of Federal Regulations 26 CFR 1910.120 Appendix B, and summarized here as follows:

Level (A) protection should be used when a hazardous substance has been identified that requires the highest level of protection for skin, eyes, and the respiratory system. When substances with a high degree of hazard to the skin are known or suspected to be present and skin contact is possible, or operations must be conducted in a confined, poorly ventilated area, then level “A” protection should be used. Also, level “A” protection is required in the absence of a positive determination that existing conditions are below the threshold.

Level (A) PPE includes: positive pressure, full face-piece Self-Contained Breathing Apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA; totally-encapsulating chemical-protective suit; chemical-resistant outer and inner gloves, and chemical-resistant boots with steel toe and shank.

Level (B) protection should be used when the type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection; and/or the atmosphere contains less than 19.5% oxygen. Also, if incompletely identified organic vapors are detected by a direct reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to or being absorbed through the skin, then level “B” protection is sufficient.

Level (B) PPE includes: positive pressure, full face-piece Self-Contained Breathing Apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA; hooded, chemical-resistant clothing such as overalls and long sleeve jacket, one or two piece chemical-suit or disposable chemical-resistant overalls. Chemical-resistant inner and outer gloves and chemical-resistant boots with steel toe and shank are also required.

Level (C) protection should be used when atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin. Also, level "C" protection should be used when the types of air contaminants have been identified, concentrations measured and an air-purifying respirator is available that can remove the contaminants; and all criteria for the use of air-purifying respirators are met.

Level (C) PPE includes: full-face or half-mask air purifying respirator; hooded chemical-resistant clothing, and gloves and boots as in Level "B".

Level (D) protection should be used when the atmosphere contains no known hazard, and work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Level (D) PPE includes coveralls and chemical-resistant boots with steel toe and shank, with optional gloves, hood, safety glasses or chemical splash goggles, and an escape mask, as appropriate.

It is noted by OSHA that a combination of personal protective equipment other than those specified above may be more appropriate and may be used to provide the proper level of protection. OSHA also notes that:

"The use of PPE itself can create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility and communication. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. However, over-protection, as well as under-protection, can be hazardous and should be avoided where possible" (29 CFR 1910.120 Appendix B).

The following figure is an example of a modified level (A) PPE worn by field personnel sampling the buried waste at a commercial low-level radioactive waste disposal facility. Note that in this case the use of a full face-piece Self-Contained Breathing Apparatus (SCBA) was not required.

Figure 4: Example of Modified Level "A" PPE Used during the Field Sampling of low-level radioactive Waste

With these points in mind, and the relatively low concentrations and hazards of the radionuclides and chemicals present in the monitoring wells, it was decided that all field work would be initially conducted utilizing Level "D" PPE. Required Level "D" PPE includes:

- Cotton coveralls
- Gloves (chemical resistant)
- Safety boots/shoes

Based on site conditions, Level "D" PPE may also be modified as follows:

- Hard hat, to protect from overhead hazards
- Boot covers, if surface contamination is detected
- Safety glasses/goggles, if particle or splash hazard to eyes is present
- Splash apron or tyvek suit, to protect from splashing during groundwater sampling

Note: Level "D" PPE does not include respiratory protection.

It was also the corporate policy of the Consultant's firm to be prepared, on site, with additional personal protective equipment. For this project, required Level "C" PPE was available but would only be used if needed, and included the following:

- Chemical protective suit, for example Poly-coated tyvek
- Inner gloves, surgical type
- Outer gloves, chemical resistant
- Full-face air purifying respirator with a combination vapor cartridge

Safety Equipment

At the project site, all groundwater and soil sampling locations were readily accessible by vehicle. As such, the vehicle could be used to transport any staff should there be an emergency. Also, all sample points were outdoors and accessed from the ground surface, so no staff members would be entering confined spaces or be in a position to not move quickly from a sample location if necessary. Since staff would always be near a vehicle and all work will be done outdoors in an open area, no specialized safety equipment was needed for rescue or transporting injured persons.

Basic first aid equipment and distilled water for eye washes were carried into the field and were available for emergency use. Also, the Institute's campus had a fully equipped and staffed first aid station on the premises.

Instrumentation and Action Levels

Monitoring for organic vapors will be conducted during all groundwater sampling activities using an Organic Vapor Analyzer (OVA). Specific emphasis will be placed on monitoring vapor concentrations immediately after the monitoring well is initially opened. This is important because vapors may concentrate within the well casing and be released into the breathing zone when first opened. Personnel will be instructed to stand upwind of the well during the initial testing. Monitoring will also be conducted periodically between the various sampling activities at the well to ensure that an adequate level of protection is used at all times. The criteria listed in the next paragraph will be used to upgrade the level of respiratory protection if required. The action levels that are listed are based on a conservative estimate of the expected organic vapor concentrations as they relate to the occupational exposure limits of the major contaminants.

The relative response of the OVA to the volatile organic compounds of interest is 1,4-dioxane (30%), chloroform (65%), and diisopropyl ether (65%). The Time Weighted Average (TWA) - Permissible Exposure Limits (PELs) for these compounds are: 1,4-dioxane (25 ppm), chloroform (2 ppm), and diisopropyl ether (500 ppm). Using chloroform as the indicator compound, a response of 1.3 ppm on the OVA would constitute the detection from a chloroform concentration of 2 ppm. At this level, there is confidence that the TWA-PEL would not be exceeded. Level C protection would be used at levels, which exceed 1.3 ppm on the OVA in the breathing zone. The following table summarizes the content of this paragraph using chloroform as indicator:

Instrument	Action Level (15 minutes Duration)	Level of Respiratory Protection/Action
OVA	Background to 1.3 ppm above background in the breathing zone	Level D
OVA	1.3 ppm to 30 ppm above background in the breathing zone	Level C
OVA	Above 30 ppm in the breathing zone	Discontinue work, let well vent

Training and Medical Requirements

The following is a summary of the requirements, which must be fulfilled by the Consultant's personnel working at the Site:

- 40 hours of Health and Safety training for Hazardous Waste Operations
- 8 hours refresher training course, provided annually
- Review of this site specific Health and Safety Plan (HASP)
- Completion of Medical Data Sheet and certification of the HASP review.

A sample Medical Data Sheet and Certification of the HASP Review Form are included in the Appendix at the end of this course.

Authorizations and Approvals

Each member of the project management team had to certify that he/she has reviewed and approved the Health and Safety Plan. The exact wording of this section is as follows:

"By their signatures, the undersigned certify that this HASP has been reviewed, approved and will be utilized for the protection of the health and safety of the Consultant's personnel who will conduct the sampling activities at the Institute's waste disposal site." The signatories are:

- The Corporate Health and Safety Manager
- The Project Manager
- The Project Field Operations Manager (as acting Field Health and Safety Manager)

For additional guidance in the preparation of Health and Safety Plans, the student is referred to Appendix B (Generic Site Safety Plan) of the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" prepared by the National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG) and U.S. Environmental Protection Agency (EPA).

Quality Assurance Plan

In addition to a Health and Safety Plan, a Quality Assurance (QA) plan was also developed for the project. As with the Health and Safety Plan, the Consultant's corporate QA plan was the controlling document. The project-specific QA plan was developed to address those issues that were specific to the waste disposal site investigation. The elements of the project-specific QA plan were developed to ensure the proper planning, execution and documentation of the field, laboratory and office activities. Note that the Consultant, the Institute and the State Regulators would be making important and potentially costly decisions based on the results of the field activities, laboratory analyses and the interpretations presented. Having a well-planned and documented process ensures that the information used as the basis for these decisions would be reliable and reproducible.

The elements of the site-specific QA plan include:

- Definition of line of authority and responsibility,
- Objectives for field sampling and laboratory analysis,
- Activities requiring formal procedures,
- Types of analyses
- Verification of laboratory results,
- Documentation requirements,

Each of these elements is presented in the following subsections

Definition of Line of Authority and Responsibility

Ultimate responsibility for the quality of the information gathered rests with the Project Manager. Should there be any concerns or questions from the Institute or a State Regulatory Agency, the Project Manager takes the lead in addressing these issues. The Project Manager designated the Field Operations Manager as the individual with the authority and responsibility to implement the field sampling program. This individual was also assigned the duties of Field Health and Safety Manager, and was charged with the oversight of the analytical laboratory selected for sample processing.

Objectives for Field Sampling and Laboratory Analysis

The objectives of the field sampling and laboratory analysis program are to provide additional characterization of the geology and hydrology of the area surrounding the waste disposal site, and to more fully define the size and nature of the contaminant plume originating from the waste disposal area. This information would then, in turn, be used to assess the risk to potential human receptors and to evaluate engineering alternatives for site remediation and final closure.

The stated objectives would be met by a program of: 1) sampling and testing of the existing monitoring wells around the disposal area, 2) identification of additional locations for well installation, hydrologic testing and soil and groundwater sampling, and 3) selection of additional locations for surface water sampling.

Activities Requiring Formal Procedures

Activities on this project that require formal procedures are listed below:

- Management
- Scope of Sampling Program
- Preparation of Sample Containers
- Equipment Decontamination
- Laboratory Cleaning Procedure
- Water Level and Well Depth Measurement
- Groundwater Sampling
- Surface Water Sampling
- Soil Sampling

Each of these elements is presented in a later section of this course titled: Project Procedures.

Types of Analyses

Based on the preliminary results obtained by the State RPA, the groundwater samples will be analyzed for a wide spectrum of chemical compounds and elements specified below:

- Volatile organic compounds
- Semi-volatile organic compounds
- Priority Pollutant metals
- Cyanide
- Phenols
- Tritium
- Carbon-14
- Gamma Scan

Initially surface water samples will be analyzed for some of the mobile contaminants identified in the groundwater. If contamination is detected, then a full spectrum analysis comparable to that performed on the groundwater will be conducted.

Soil samples will be analyzed for:

- Volatile organic compounds
- Diisopropyl ether
- Tritium

The protocols and standards for the testing of each of these analyses are specified in the Project Procedures section, presented in a later part of this course.

Verification of Laboratory Results

The laboratory results are typically verified by submitting at least one duplicate sample for each type of analysis requested, using a different sample number so the lab will not know which the duplicate is. Once the analyses are complete, the Consultant will compare the results of the duplicate samples to verify the quality and precision of the analytical procedures. For the initial round of sampling at the site, duplicate samples from Well #3 will be submitted for analysis.

Documentation Requirements

Documentation requirements address 1) the records of daily activities at the site, 2) the chain-of-custody forms for sample transfer to the laboratory for analysis, and 3) data management. Each of these topics is addressed below.

Records of Daily Activities

A record of daily activities during the field groundwater and soil sampling program will be recorded in a sturdy log book approved by the Field Operations Manager. Information to be included as part of this documentation includes:

- Date and time
- Personnel present
- Weather conditions
- Task performed
- Field observations

For measurement of groundwater levels in wells or sampling of groundwater, the following will also be documented in the field notebook:

- Well identification
- Any unusual condition pertaining to the well site
- Reading from the Organic Vapor Analyzer (OVA)
- Ground elevation at well location
- Static water level and total well depth
- Well casing diameter
- Well volume calculations
- Purging procedure, rate and total volume
- Sampling procedure
- Sample identification number
- Parameters to be analyzed for
- Preservatives used
- Field Analysis data and methods (pH, conductivity and temperature)
- Notation that a chain-of-custody form was filled out

For surface water samples, the following information will be included:

- Identification of sample location
- Sampling procedure
- Sample identification number
- Parameters to be analyzed for

- Preservatives used
- Notation that a chain-of-custody form was filled out

For soil samples, the following information will be included:

- Location and depth of soil sample
- Geologic description of the soils encountered by depth.
- Sample identification number
- Parameters to be analyzed for
- Notation that a chain-of-custody form was filled out

Chain-of-Custody

Custody of the groundwater, surface water and soil samples obtained by the sampling team during a work day will be transferred from the Consultant to the technician from the analytical laboratory at the end of each day. This transfer will be documented by the completion of a chain-of-custody form to be provided by the laboratory.

The chain-of-custody form will have a unique identification number and will be filled in multiple copies to allow both the Consultant and the laboratory to retain a copy. The chain-of-custody form should contain the following type of information:

- The date and time the sample was collected.
- The station identification number.
- The total number of containers collected.
- The type of sample (water or soil).
- The parameters to be analyzed for and the requested methods of analysis.

The chain-of-custody form will be signed and dated by a representative of the Consultant and a representative of the laboratory when the samples are transferred. The following is an example of a chain-of-custody form.

Chain of Custody Form

Laboratory Name
Laboratory Address

Serial No.
XXXXXX

Project ID:
Sampler's Name:

Date	Time	Sample ID	Sample Type	Matrix	# of Containers	Parameters for Analysis A	B	C	D	E	F			
9/4/02	12:15	GW-W3	G	W	12	6	1	1	2	1	1			

Explanation
Sample Type: Composite (C), Grab (G)
Matrix: Soil (S), Water (W)

Field Notes: ______________________

Relinquished by: Date: Time:

Received for Lab. by: Date: Time:

Figure 5: Example Chain-of-Custody Form. Note that each of the parameters for analysis may require different volumes of groundwater for analysis.

Data Management

Data management will follow the standard Consultant's practice for projects of this nature and will include as a minimum the maintenance of all data and information related to this project in clearly labeled and secure files. In addition, chain-of-custody documentation will be maintained for all samples collected in the field. These records will be appended to the analytical results as they are received from the analytical laboratory. Access to the files will be limited to project personnel and a running log listing the retrieval and return of records will be maintained and kept current at all times.

Additional information about the principles of Quality Assurance and how they are used to control project activities the student is referred to course P-123 titled "Quality Assurance".

Project Procedures

The purpose of having clearly written project procedures is to protect the health and safety of personnel assigned to work on the project and ensure the quality of the data obtained from the sampling program. Sampling will be performed in accordance with accepted federal and state protocols. The following series of project instructions and procedures were prepared:

- Management
- Selection of Analytical Methods
- Scope of Sampling Program
- Preparation of Sample Containers
- Equipment Decontamination
- Laboratory Cleaning Procedure
- Water Level and Well Depth Measurements
- Groundwater Sampling
- Surface Water Sampling
- Soil Sampling

Each of these procedures is presented below.

Management

All work at the Site will be carried out under the supervision of a Project Manager who will be responsible for the overall performance of the project team. A Field Operations Manager, who will report to the Project Manager, will supervise the day-to-day activities of the field sampling team. An EPA-approved analytical laboratory will be selected and assigned the responsibility for the analysis of the samples collected from the site. Prior to the initiation of any site activity, the Field Operations Manager will ensure that the sampling team is properly equipped to collect the samples and contain all discarded materials according to the protocols spelled out in these procedures. The Field Operations Manager will also be responsible to ensure that all Health and Safety precautions described in the Health and Safety Plan are adhered to.

Selection of Analytical Methods

For any given element or compound there is generally more than one method of analysis that can be employed to detect the presence and concentration of that element or compound. Some methods are used to test for one particular element or compound only. These methods usually have very low detection limits (that is, they can identify the element or compound in very small concentrations). Alternatively, there are other methods that are designed to identify a number of elements or group of compounds at the same time. These methods generally have somewhat higher detection limits and are more useful for screening samples for the presence of a number of elements or compounds simultaneously. The selection of which analytical method to use is therefore dependent on the goals of the program and what is already known about the contamination. There are also cost considerations that need to be taken into account, since using a separate test for every element or compound is much more expensive than using a method that identifies a number of elements or compounds at the same time.

For this project, both types of analytical methods will be used. For example, previous studies had shown elevated levels of Tritium and Carbon-14. Therefore, analytical methods designed specifically for these two elements were selected to provide the lowest detection limits and highest accuracy. On the other hand, the Institute and the Consultant wanted to assure the regulatory agencies that they had done a complete screening for a wide spectrum of organic compounds. Therefore, in this case appropriate analytical methods were selected to yield the identification of a large number of organic compounds at a reasonable cost. In all cases, only EPA-approved methods were used, in order to avoid having to defend the selection of certain testing procedures.

Scope of Sampling Program

The initial waste disposal site sampling program will consist of collecting and analyzing six groundwater samples, one from each of the five existing monitoring wells plus a duplicate sample from well No.3. Four soil samples will also be collected and analyzed, from the sloping ground down-gradient of the waste disposal area. The location of the soil samples will be selected in the field. Each location will be identified using a wooden stake driven into the ground and marked with the sample location, identification number, and flagged.

Following are the suggested parameters and analytical procedures to be used on the groundwater samples that will be collected at the site. All of these procedures conform to the guidelines provided by the Environmental Protection Agency (EPA) as listed in the Code of Federal Regulations (40 CFR, Part 136).

Parameters	**Method**
Volatile Organic Compound	SW-846-8240
Semi-volatile Organic Compounds	SW-846-8270
Priority Pollutant Metals, including:	
Antimony	SW-846-6010
Arsenic	206.2 CLP-M
Beryllium	SW-846-6010
Cadmium	SW-846-6010
Chromium	SW-846-6010
Copper	SW-846-6010
Lead	239.2 CLP-M
Mercury	245.1 CLP-M
Nickel	SW-846-6010
Selenium	270.2 CLP-M
Silver	SW-846-6010
Thallium	279.2 CLP-M
Zinc	SW-846-6010
Cyanide (total)	EPA-335.2
Phenols (total)	SW-846-9065
Radioactivity, including:	

Tritium (H-3) Carbon-14 Gamma Scan (for 21 isotopes)	EPA-2476 ASTM-D3085 EPA-901.1

Note that each of the separate analytical methods may require different volumes of groundwater. The volume required for each type of analysis should be matched to the requirements of the analytical laboratory.

Four shallow soil samples will be collected from locations down-gradient of the waste burial area. The locations of the soil samples will be selected to intercept the likely pathways of down-gradient contaminant migration. The following factors will be taken into account:

- The lowest bottom trench elevation within the restricted waste disposal area.
- The elevation of the groundwater table below the trenches.
- The desire to sample at several lower topographic elevations down-slope of the site to maximize the possible interception of contaminants emerging in the small local drainage basin south of the waste disposal area.

Following are the suggested parameters and analytical procedures for the soil samples that will be collected at the site. The procedures conform to the guidelines provided by the Environmental Protection Agency (EPA) as listed in the Code of Federal Regulations (40 CFR, Part 136).

Parameters	**Method**
Volatile Organic Compounds	EPA-601, EPA 602
Diisopropyl ether (as an additional compound)	EPA-602
Tritium (H-3)	ASTM 2476

A blank soil sample, from a background area, will also be collected and analyzed to verify the accuracy of the laboratory results.

During the initial field work, no surface water sampling is planned. However, during the additional field investigations, surface water samples may be collected. In this case, surface water samples will be analyzed for some of the same contaminants identified in the groundwater, using the same methods listed under groundwater. If contamination is detected, then a full spectrum analysis comparable to that performed on the groundwater will be conducted.

Preparation of Sample Containers

The containers that will receive the samples have to be thoroughly cleaned in the laboratory, before they are brought to the site. In some cases the containers will need to be pre-filled with an appropriate preservative to stabilize the sample for laboratory analysis. In addition, proper labeling of each individual sample container must be done with great care at the time of sampling.

The analytical laboratory will provide the sample containers. The following procedures will be followed by the laboratory to prepare the sample containers:

For Organic Parameters:

- Wash containers, caps and cap liners with a non-phosphate detergent and strongly scrub with a brush.
- Rinse with tap water followed by a methanol rinse.
- Perform three additional rinses with de-ionized water.
- Place in a drying oven for at least two hours at 100 degrees C for glass and 80 degrees C for Teflon.
- Visually inspect each container for contaminants prior to storage.

For Inorganic and Radiological Parameters:

- Wash containers, caps and cap liners with a non-phosphate detergent and strongly scrub with a brush.
- Rinse with tap water followed by a dilute nitric acid rinse.
- Perform three additional rinses with de-ionized water.
- Place in a drying oven for at least two hours at 100 degrees C for glass and 80 degrees C for Teflon.
- Visually inspect each container for contaminants prior to storage.

Sample preservation will be the responsibility of the on-site technician from the analytical laboratory. All samples will be placed in a cooler and surrounded with ice immediately after sample collection. In addition, some of the samples will require a pH adjustment for preservation. Sample containers for parameters that require a pH adjustment for preservation will contain a pre-measured amount of preservative. Extra preservative will be available to further adjust the pH as necessary in the field. The parameters that require pH adjustment, the type of preservative and the target pH reading are given in the following table:

Parameter	**Preservative**	**pH Reading**
Volatile Organic Compounds	HCl	<2
Metals	HNO3	<2
Cyanide	NaOH	>10
Phenols	H2SO4	<2
Gamma	HNO3	<2

Semi-volatile organic compounds do not need a preservative.

Proper labeling of each individual sample container must be done at the time of sampling. Labels should be durable and remain affixed to the bottle even when wet. The following procedure will be followed:

- The label will be filled with the information listed below.
- An indelible marker that does not smear or erase in contact with water will be used.

- The label will be affixed to the sample container and wrapped with a 2-inch wide clear plastic tape.
- The bottle is then filled with the sample and stored immediately in a cooler with ice in preparation for transport to the laboratory.

Sample Label Content:

- Sample Identification Number
- Name of Collector
- Date and Time of Collection
- Project Name
- Analytical Parameters
- Preservative Used

The sample identification number will be assigned in accordance with the following format:

- Type of Sample
  - GW = Groundwater
  - S = Soil
  - SW = Surface Water
- Location of Sample
  - W1 = Monitoring Well No.1
  - S1 = Soil Sampling Location No.1
  - SW1 = Surface Water Sampling Location No. 1
- Number of Sample
  - 01 = First Sample Collected from location
  - 02 = Second Sample, a duplicate sample

For example, GW-W2-01 indicates groundwater sample collected from monitoring well No.2, first sample collected from this location. The date the sample was collected should also be noted.

Equipment Decontamination

These procedures specify that no field decontamination will take place. This is desirable to eliminate the possibility of cross-contamination. In addition, equipment can be more thoroughly cleaned in the laboratory and sealed in protective wraps for transportation to the site. All sampling equipment will be provided by the analytical laboratory.

Meticulously washed, dried and wrapped sampling equipment is of utmost importance in the sampling of monitoring wells. Only devices that can be disassembled and are constructed of stainless steel and/or Teflon are recommended for use at the site.

Tubing used in pumping each well will be dedicated to that specific well. After the completion of purging, the tubing will be coiled and placed in a labeled plastic bag. Custody of the tubing will be transferred to the Institute for a decision to either save the dedicated tubing for future sampling events from the same well or for proper disposal. It should be noted that the nylon bailer cord is always disposed of and its custody transferred to the Institute with the remaining of the solid waste generated during the sampling event.

Laboratory Cleaning Procedure

Cleaning procedures for all washable sampling equipment (such as bailers, pumps, and hand augers) will follow the sequential procedure described below:

- Brush strongly and scrub with a solution of hot water and non-phosphate detergent.
- Rinse with tap water.
- Rinse with dilute hydrochloric acid.
- Rinse with de-ionized water.
- Rinse with isopropyl alcohol.
- Rinse with de-ionized water.
- Dry with forced hot air or allow drying naturally for at least 24 hours.
- Reassemble the equipment.
- Tightly wrap in aluminum foil.
- Seal in a plastic bag.

Water Level and Well Depth Measurements

Water level measurements will be obtained prior to well purging in preparation for sampling. Total well depth will also be measured to ensure that no excessive siltation has occurred. An electronic water sensing device will be used to take these measurements in accordance with the following procedure:

- Stand upwind and remove locked well casing cover and inner cap from the well.
- Sample the air in the well head for organic vapors using either a photoionization analyzer or an organic vapor analyzer (OVA) and record the readings. If the concentrations of organic vapors in the well are greater than 5 ppm above background readings, the technician will retreat to an upwind location and allow the well to vent for at least 10 minutes before continuing. After 10 minutes, if the levels of organic vapors are not above background levels, the technician may continue with the sampling program. If there are elevated levels of organic vapors in the breathing zone of the well, the condition must be further evaluated before continuing.

Under favorable conditions, proceed as follows:

- Rinse the depth probe sensor of the electronic water sensing device with de-ionized water.
- Switch the electronic selector to "battery check" position to determine if the electronics are operating properly.
- Switch the electronic selector to "well" position, and slowly lower the sensing probe in the well until the sensing light illuminates or the beeper sounds.
- Raise and lower the cable several times to determine the exact point of probe contact with the water.

- Take water level measurement from the top of the well casing and record the water level to the nearest hundredth (0.01) of a foot.
- Mark the location around the rim of the well casing that was used as the measuring point. This mark should be made with indelible marker and future readings should all be made using this same point as the reference.
- Measure the distance from the ground to the measuring point on the rim of the well casing.

Figure 6: Electronic Water Sensing Device to Measure Groundwater Level in Wells

The total well depth is determined in a similar fashion. However, the operator will use the weight of the probe to feel the bottom by the release of the tension on the cable. Again, the total depth is measured and recorded to the nearest hundredth of a foot from the same location along the rim of the well casing as was marked for groundwater depth.

The water level indicator cable and sensing probe will be thoroughly rinsed with de-ionized water between working on each monitoring well to prevent cross contamination. The rinse water will be placed in the drum containers provided for this purpose.

Groundwater Sampling

In preparation for sampling, clean plastic sheets should be spread around the well head area to prevent equipment contact with the ground and to catch inadvertent spills during sampling. At the completion of sampling, all discarded solid material used in the process, such as paper wipes, gloves, tubing and the plastic sheets, should be placed in plastic bags for proper disposal by the Institute.

Figure 7: A well being prepared for groundwater sampling at the waste disposal site.

Prior to sampling, each well must be purged. Federal and State regulatory guidance call for purging a well before sampling of three well-volumes in a fast recharge well. Purging to dryness should be carried out in slow recharging wells before sampling. Sometimes wells are purged a greater number of well-volumes to reduce turbidity and/or until pH, conductivity and temperature readings stabilize.

The well volume must be calculated to determine the volume of water necessary to be purged from each well prior to sampling. All monitoring wells around the waste disposal site have a 4.0-inch inner diameter well casing. A 4.0-inch well contains 0.6528 gallons per foot of water column. After obtaining the appropriate measurements, the well volume will be calculated as follows:

- (total depth - static water level) x (0.6528) = 1 well volume in gallons
- Total purge volume = 1 well volume x 3

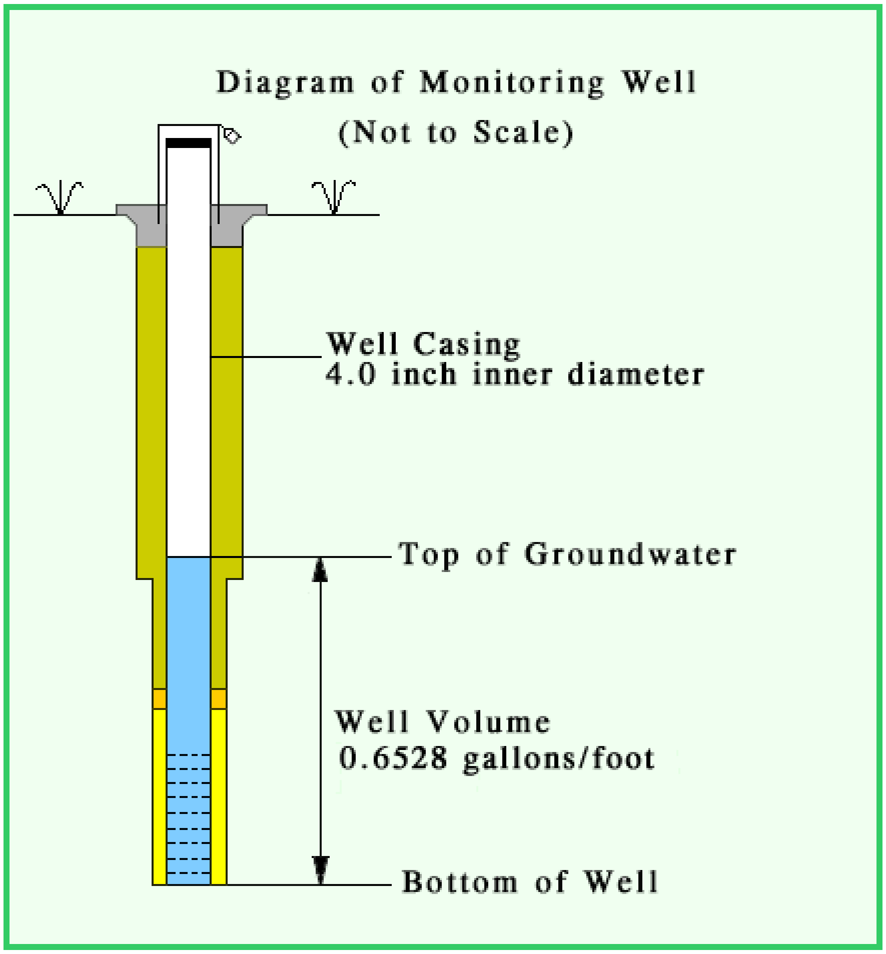

Figure 8: Illustration of Well Components for purge volume calculation

The wells at the site will be purged using bladder pumps. The use of automated bladder pumps for well purging is more efficient and less time consuming than hand bailing, especially in deep wells or wells that require the removal of a large volume of water. The bladder pumps that will be used are constructed of non-reactive stainless steel and Teflon. The procedure to follow is given below:

- Unwrap the clean bladder pump at the well site and attach new polyethylene tubing to the pump.
- Clean plastic sheets should already be spread around the well head area to prevent tubing contact with the ground while lowering and raising the pump.
- Lower the pump and tubing slowly to the bottom of the well. Cut the tubing and attach it to the tubing reel. Raise the pump to within approximately 5 feet below the top of the groundwater in the well.
- Attach the air line to the electrical controller and start the air compressor. Maximize the controller cycle and air pressure delivered to the pump to achieve the best water evacuation rate possible.

- If the pumping rate lowers the water table in the well, lower the pump in the well so that it continues to stay approximately 5 feet below the water table and resume pumping. This step may have to be repeated several times in a slow recharging well.
- To minimize contamination while purging, the compressor should exhaust downwind from the well.
- Field measurements of temperature, pH, and conductivity will be recorded at the initiation of purging and at the removal of every well volume thereafter.

Figure 9: The Bladder Pump with Attached Tubing is lowered into the Well to initiate purging

When purging a well, the following points should be considered:

- Wells should be purged from near the top of the water column to pull fresh formation water up from the screened area of the well.
- Wells should not be purged so quickly that fresh formation water cascades down the sides of the well
- Only dedicated or chemically cleaned devices, cords or tubing should be placed in a well.

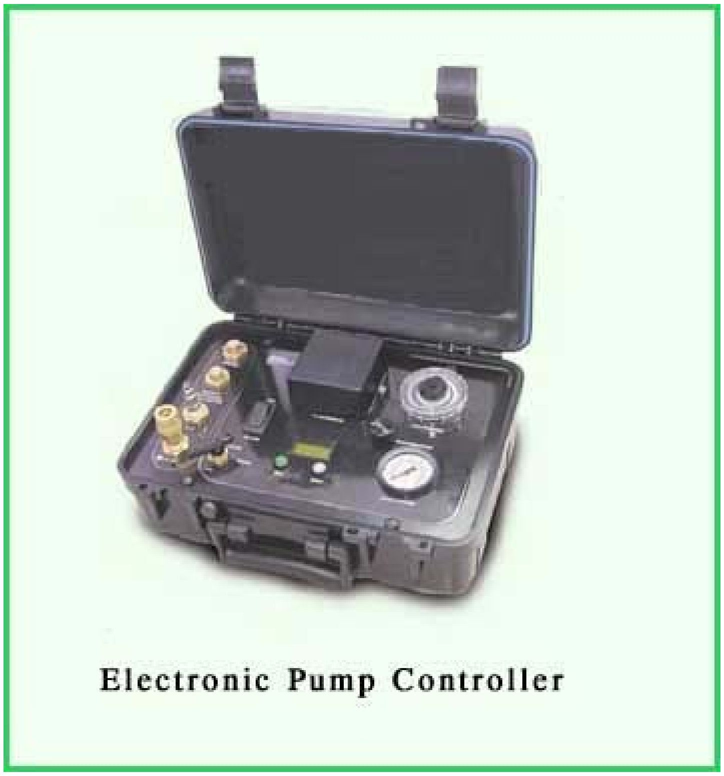

Figure 10: Some Electronic Controllers have a Low Flow Setting for Use in Sampling

Figure 11: The Air Compressor Line Attaches to the Electronic Controller to drive the pump.

The Institute will be responsible for placing a DOT-approved 55-gallon drum besides each monitoring well. The groundwater sampling team will be responsible for placing all water generated during the purging activities into the drums. The Institute will be responsible for the handling and disposal of all water removed from the wells by the purging procedures.

Once the well has been purged or allowed to recover (in the case of a slow recharging well), and the temperature, pH and conductivity have stabilized, it is ready for sampling. The sample collection procedure should use equipment and methods which do not alter the chemistry of the groundwater as it is collected. Only closed top Teflon bailers will be used for sample collection. The following points should be adhered to:

- Use only laboratory cleaned and prepared sampling devices and sampling vessels.
- Transfer of sample from the sampling device to the sample container should minimize agitation and aeration.
- Use sampling devices constructed of stainless steel or Teflon only.
- Sampling personnel should wear clean disposable gloves while sampling.
- Never place a clean sampling device directly on the ground or on other possibly contaminated surfaces, such as propping against the well casing.
- As a check of water stability during the sampling interval, pH, specific conductance and temperature should be measured before and after sampling.

- The sampler should collect the samples following the preferred collection order for the parameters listed below:

    1. Volatile organic compounds
    2. Semi-volatile organic compounds
    3. Priority Pollutant Metals
    4. Cyanide
    5. Phenols
    6. Tritium and Carbon-14, and
    7. Gamma Scan

Closed top Teflon bailers will be used for the sampling of wells. The closed top design prevents contaminants from falling inside the bailer and compromising sample quality. These bailers have a 1/2 inch hole cut in the side of the bailer, close to its top, to allow emptying of the contents. The procedures listed below will be followed:

- Unwrap a clean bailer and secure a new section of 1/8 inch nylon cord to the bailer hook.
- Lower the bailer into the uppermost portion of the water column to fill it. Care should be exercised to prevent the nylon cord from entering the water column.
- The sampler will wear clean vinyl disposable gloves and take care not to allow the bailer cord to touch the ground, well casing or clothing. This is done to reduce the possibility of sample contamination.
- After pulling the full bailer from the well, turn the spout so it is pointing upward.
- While holding the bailer over a receptacle to contain possible spillage, lift the bottom of the bailer up to a horizontal position.
- Rotate the bailer so that the spout begins to turn down and water begins to trickle down the side of the bailer.
- Place the lip of the sample container just below the discharge spout and continue to rotate the bailer until a steady, uniform water stream flows into the sample bottle.
- Slowly fill the bottles, starting with the volatile organic samples, until no air is left in the bottle. Cap the bottle and invert it to visually check that no air remains in the bottle. If any air bubbles remain, empty the bottle and restart the procedure.
- For parameters other than volatile organic compounds, the same collection procedure should be followed. However, the sampler does not have to take as great care in preventing splashing into the sample bottle or be overly concerned with zero head space.

Once filled and properly labeled, the sample bottle is stored immediately in a cooler with ice in preparation for transport to the laboratory.

Surface Water Sampling

Generally, the same procedures that apply to the collection of groundwater samples will also be followed in the collection of surface water samples. Personnel should wear clean disposable gloves while sampling. A new, clean Teflon sample container should be used to sample the surface water by dipping the container into the water as many times as needed to obtain sufficient volume. Before transferring the water from the sampling device to a sample container, ensure that any suspended silt or sand has precipitated to the bottom. Once sufficient water has been transferred to the sample container, the pH, specific conductance and temperature should be measured. Procedures for the use of preservatives are the same as those for groundwater samples. Note that agitation and aeration are less critical in the collection of a surface water sample since the water is already flowing and aerated in the creek.

Once filled and properly labeled, the sample bottle(s) should be stored immediately in a cooler with ice in preparation for transport to the laboratory.

Soil Sampling

Once a soil sampling location has been selected, the following steps will be followed for the collection of samples for analysis:

- A laboratory cleaned stainless steel soil hand auger will be used to drill the hole and obtain the soil sample. To avoid cross contamination, each hole will be drilled with a different laboratory cleaned stainless steel hand auger
- Clean plastic sheets should be spread next to the area to be sampled.
- The soil boring will be advanced to a depth of approximately five feet.
- The soil types encountered during the drilling of the hole will be recorded in a log book.
- The soil sample will be obtained from the depth interval between 3 and 5 feet.
- If a saturated zone is encountered before the final depth is reached, a sample of the saturated material will be collected and the boring will be terminated.
- The sampling parameters and order of obtaining the samples to be tested are volatile organic compounds and Tritium.
- Once sampling has been completed, the hole will be back-filled with the excavated material
- At the completion of sampling, all discarded solid material used in the sample collection process, such as paper wipes, gloves, and plastic sheets, should be placed in plastic bags for proper disposal by the Institute.

Summary

Prior to starting any field work at the waste disposal site, where personnel could be exposed to hazardous chemicals or radio nuclides, a required Health and Safety Plan needs to be developed. The elements of the Health and Safety Plan are dictated by OSHA regulations, and include hazard identification and the selection of appropriate Personal Protective Equipment (PPE) to be used. In order to ensure the quality of the data collected, a project-specific Quality Assurance Plan is also developed. These two plans, in conjunction with the specific technical Sampling and Analysis Plan are used to develop a suite of project procedures that will be followed by project personnel. By ensuring that all field staff are familiar with and will follow the project procedures, the Health and Safety and Quality Assurance requirements will automatically be met. This course used the planned hazardous waste investigation at the waste disposal site of the Institute as an illustration of the types of issues to be addressed by the Health and Safety and Quality Assurance Plans. These plans, plus the included project procedures, can be used as a "blueprint" by the students for developing similar documents for their own projects.

Glossary of Terms and Acronyms used in this Course Series

1,4-Dioxane	para-Dioxane (p-Dioxane), a hazardous chemical
AEC	Atomic Energy Commission
adsorption coefficient	measure of adherence of ions in solution to the surface of solids with which they come in contact
alluvial soil	a young soil on flood plains that is being actively deposited
ASTM	American Society for Testing and Materials
bailer	cylindrical container designed to remove water from a well
C-14	Carbon-14, a radioactive form of carbon
CFR	Code of Federal Regulations
cm/sec	centimeter/second
Curie	A unit of measurement of radioactivity, which is approximately equal to the decay rate of one gram of pure radium.
DOT	Department of Transportation
Down-gradient	A direction towards which groundwater is likely to flow
draw	A small natural watercourse or gully, also a dry streambed whose water results from periodic rainfall.
EPA	Environmental Protection Agency
ft.	feet
GC/MS	Gas Chromatograph/Mass Spectrometer
H&S	Health and Safety
HASP	Health and Safety Plan
H2SO4	Chemical formula of sulfuric acid
H-3	tritium, a radioactive form of hydrogen
HCL	Chemical formula of hydrochloric acid
HNO3	Chemical formula of nitric acid
in.	inches
mafic rock	igneous rock composed mainly of dark-colored minerals
mCi	milli-Curie, scale for the measurement of radioactivity
my	million years
NaOH	Chemical formula of sodium Hydroxide
OVA	organic vapor analyzer
pCi/L	pico-Curie/liter, scale for the measurement of radioactivity in liquids
pCi/gr	pico-Curie/gram, scale for the measurement of radioactivity in solids
permeability	capacity of a porous rock to transmit a fluid, ease of fluid flow
pH	hydrogen-ion activity in solution, a measure of acidity
pluton	A geologic igneous intrusion
potentiometric surface	a surface representing the total head of water in an aquifer
ppb	parts per billion
ppm	parts per million

purging	volume of water extracted from a well prior to sampling
QA/QC	Quality Assurance/Quality Control
Saprolite	A thoroughly decomposed rock, formed in place by the weathering of igneous, sedimentary or metamorphic rocks.
SCS	Soil Conservation Service
State RPA	State Radiation Protection Agency
State EPA	State Environmental Protection Agency
State GPA	State Groundwater Protection Agency
State WMA	State Waste Management Agency
Superfund	Acronym referring to the resources allocated by Federal or State Agencies for the clean-up of decommissioned waste disposal sites. The funds are disbursed by priority based on the degree of hazard
total head	the height of a column of water above a datum plane
ug/L	micro-gram/Liter
ug/kg	micro-gram/kilogram
uS/cm	microsiemens per centimeter, a measure of specific conductivity
Up-gradient	A direction opposite to that in which groundwater is likely to flow
USDA	United States Department of Agriculture
US-DOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USNRC	United States Nuclear Regulatory Commission
USGS	United States Geological Survey
well screen	section of well casing perforated or slotted to allow water inflow

Appendix

This appendix includes samples of the following types of forms to be used on the project:

- Medical Data Sheet
- Certification that HASP has been reviewed
- Incident/Accident Report
- Incident Follow-up
- OSHA Poster

Medical Data Sheet

This brief medical data sheet will be completed by all on-site personnel and will be kept on file and available at all times in the field in the custody of the Field Operations Manager. This data sheet is not a substitute for the corporate medical surveillance program requirement that is conducted by the Consultant. This medical data sheet will accompany a person offsite if medical assistance or transport to a hospital is required.

MEDICAL DATA SHEET

Project Name:	
Person's Name:	
Address:	Home Phone:
Age:	
Height:	
Weight:	
Emergency Contacts (List 2 people)	
1. Name:	1. Phone:
2. Name	2. Phone:

Allergies/Drug Sensitivities:
Do You Wear Contact Lenses?
List Any Illness Resulting From Chemical Exposure:
Have You Been Hospitalized for a Chemical Exposure?
Date/Hospital/Length of Stay:
List Medications you are Presently Taking:
List any Medical Restriction:
Name of Personal Physician:
Phone of Personal Physician:

Certification that HASP has been Reviewed

I have read the procedures of the site specific Health and Safety Plan. I understand the information contained in it and will comply with all of its provisions.	
Name:	
Project Assignment:	
Signature:	
Date	
Important Note: Before signing this form ensure that all your questions have been answered by the Corporate Health and Safety Officer, the Field Operations Manager, or the Project Manager.	

Incident/Accident Report

The following report should be filled as completely as possible immediately after the occurrence of a reportable event.

INCIDENT/ACCIDENT REPORT

	Date of Report:	
Project Name:	Project Location:	

Prepared By:	Title:	
Incident Category (check all that apply):		
___ Injury ___ Near Miss ___ Motor Vehicle ___ Mechanical	___ Illness ___ Fire ___ Site Equipment ___ Electrical	___ Heat Exposure ___ Chemical Exposure ___ Property Damage ___ Other
Date and Time of Incident:		
Narrative Report of Incident: (Provide sufficient detail so the reader can fully understand the actions leading to or contributing to the incident, the incident occurrence, and actions following the incident. Append as many sheets of paper as necessary.)		
Witnesses to Incident: 1.Name: Address: Phone: 2.Name: Address: Phone:	 Company: Company:	
Name and Address of Injured Person:		
SSN:	Age:	Sex:
Years of Service:	Time on Project:	Title:
Severity of Injury or Illness:		
___ Non-Disabling ___ Disabling	___ Require Treatment ___ Fatality	
Classification of Injury:		
___ Fractures ___ Dislocations ___ Sprains ___ Abrasions ___ Lacerations ___ Punctures ___ Faint/Dizziness ___ Respiratory Allergy	___ Dermal Allergy ___ Heat Burns ___ Chemical Burns ___ Radiation Burns ___ Bruises ___ Blisters ___ Inhalation Exposure ___ Cold Exposure	___ Frostbite ___ Heat Stroke ___ Heat Exhaustion ___ Concussion ___ Toxic Ingestion ___ Bites
Part of Body Affected:		
Degree of Disability:		
Date Medical Care Received:		
Where was Medical Care Received:		Address:
Name, Address and Phone No. of Hospital:		
Name, Address and Phone No. of Physician:		
Property Damage: (give brief description of property damaged and a $ estimate of damage)		
Incident Location:		

Incident Analysis (what is the causative agent most directly related to accident: object, substance, material, machinery, equipment, conditions)		
Was Weather a Factor?		
Any Unsafe Conditions? (unsafe mechanical, physical, environmental condition at time of incident) (unsafe act by the injured individual and/or others contributing to incident) (Personal factors such as: lack of knowledge or skill, slow reaction, fatigue, improper attitude.)		
Conditions at Time of Incident: (Level of personal protection equipment required in site safety plan.) (list any modifications to the plan) (Was injured person using required equipment?) (If not, how did actual equipment used differ from the plan?)		
Action Taken to Prevent Recurrence: (What has or will be done? when will it be done? who is the responsible party to ensure that the correction is made?)		
Incident Report Completed By:		
HSO Name Printed:		HSO Signature:
Others Participating in Investigation:		
Name Printed:	Signature:	Title:
Name Printed:	Signature:	Title:
Name Printed:	Signature:	Title:

Incident Follow-up Form

Following the recovery and discharge of the patient, the following form should be filled and the completed form filed with the project records.

INCIDENT FOLLOW-UP FORM

		Date of Incident:
Project Name:	Project Location:	
Prepared By:	Title:	Signature:
Brief Description of Incident:		
Outcome of Incident:		
Physician's Recommendations:		
Date Injured Person Returned to Work:		
Attach Any Additional Information to this Form:		

OSHA Poster

The following OSHA poster should be displayed prominently in an easily accessible space so that all project personnel can readily familiarize themselves with its contents.

JOB SAFETY & HEALTH PROTECTION

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

Employers

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

Employees

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

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

Inspection

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

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

Complaint

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

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

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

Citation

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

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

Proposed Penalty

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

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

Voluntary Activity

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

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

Consultation

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

More Information

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

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

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

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor

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

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