APPENDIX 2

Environmental Media

Air, soil, and water are the environmental media through which exposure to toxic substances occurs. Awareness of the properties of each medium aids in evaluating routes of exposure and in determining sample locations. In making these determinations, it is also important to consider the impact the prevailing weather conditions in an area have on the air, soil, and water on site.

Air

Air contaminants may pose an inhalation, ingestion, and direct contact threat to the public over very large areas downwind of the site. Sudden, unexpected shifts in wind direction are of particular concern because they can cause exposure to site workers and the public in areas previously considered to be safe. Wind direction and speed are the primary factors governing transport of air contaminants -- both gases and particulates. Winds arise from horizontal pressure gradients in the atmosphere and can change rapidly in direction and speed in the vicinity of fronts. Some locations, such as mountainous areas and areas along large lakes, experience diurnal fluctuations in wind direction caused by daily temperature changes. These daily changes also enhance contaminant dispersion.

Air releases include volatilization from contaminated soils, covered landfills (with and without internal gas generation), spills and leaks from containment facilities, and lagoons. Contaminant releases into the atmosphere may also consist of fugitive dusts resulting from wind erosion of contaminated soils and from traffic over contaminated, unpaved roadways. When a stable suspension of dust or other solid particles or of liquid droplets in air occurs, it is called an aerosol.

Temperature and atmospheric pressure influence the rate of air releases. With increasing temperature, the rate of volatilization of compounds tends to increase. Volatiles may be released from liquids even on cold days because solar radiation can increase the temperature of a liquid more rapidly than the temperature of air. Temperature also governs atmospheric stability, which is the degree to which the atmosphere dampens vertical motion. In an unstable atmosphere, the temperature decreases rapidly with increasing elevation, resulting in turbulence (wind). In a stable atmosphere, the temperature may remain constant throughout the column of air or, in the case of an inversion, even increase with elevation. Stable conditions typically occur in late afternoon through early morning under clear skies with light winds. Atmospheric pressure tends to affect the migration of landfill gases, causing a landfill to offgas at a higher rate following low atmospheric pressures. When the atmospheric pressure is high, the landfill may cease offgassing entirely.

Humidity is not a factor in the generation and transport of air contaminants. It can influence the hazards of a release, however. In the case of a release of hydrogen chloride gas, for example, the hazards posed by hydrochloric acid should be considered, especially on an extremely humid day.

DISPERSION MECHANISMS

The relative directional frequencies of wind over a site determine the primary direction of movement of airborne contaminants - both gases and particulates. Wind speed and direction are influenced not only by meteorological conditions, but also by the topography of an area. Even tall buildings and other large structures can influence wind speed and direction in small, localized areas.

Atmospheric stability and wind speeds determine the off-site areas to be affected by ambient concentrations of gases. In general, high stability and low wind speeds result in higher atmospheric concentrations of contaminant gases close to the site. High stability and moderate wind speeds result in moderate concentrations over a large area downwind of the site. Low stability or high wind speeds cause greater dispersion and dilution of contaminants, resulting in lower concentrations over larger areas.

Wind speed is a critical factor in generating airborne contaminated particulate material. At higher speeds, the turbulence of the air and its forward motion lifts particles into the windstream for transport. Under windy conditions, transport of contaminated particulates, especially of metals, dioxin, and PCB contamination, can pose significant health threats downwind of the site. Transport of contaminated particulates is generally not a concern when the soil is wet because of the increased threshold wind speed required to make the particles airborne.

Ambient concentrations of particulate contaminants are controlled by particle size distribution as well as by windspeed and stability. Large particles settle out rapidly, resulting in decreased atmospheric concentrations with distance from the site. Smaller particles remain airborne longer and approximate the behavior of gaseous contaminants.

INTERMEDIA TRANSFER MECHANISMS

Settleout and rainout are mechanisms of contaminant transfer from the atmosphere to surface soils and waters. Contaminants dissolved in rainwater may percolate to groundwater, run off or fall directly into surface waters, and adsorb to uncontaminated soils. Contaminants can enter the food chain through direct intake of the atmosphere by plants and animals and through intake of secondarily contaminated soils and water.

Soils

Soil represents a medium of direct contact and ingestion threats and may be the main source of contaminants released into other media (air, water). Direct soil contamination occurs from leaks or spills from containers and containment facilities. The spilled liquids and solids may be transported through soil or may be partially or fully retained within the soil to provide a continuous environmental and/or public health threat. At the site of a release and along the release pathway, discolored soils, stressed or dead vegetation, and uncharacteristic odors may be preliminary indicators of soil contamination.

DISPERSION MECHANISMS

To predict the fate and transport of a hazardous substance released onto the soil surface, the properties of both the substance spilled and the soil must be considered. The mobility of a material in soil is influenced by many factors, such as soil type, temperature, porosity, and biological and chemical activity, along with the water solubility, vapor pressure, and physical state of the substance released. Liquid movement is the most significant dispersion mechanism in soils. Liquid contaminants percolate directly into soils, and contaminants of lower viscosity and/or higher density than water can have percolation rates much greater than that of water. Dry, soluble contaminants dissolved in precipitation, or in runon or irrigation water can also migrate through percolation into the soil and through runoff. The rate of movement of solid contaminants through soil is a function of net groundwater recharge rates and of contaminant solubility.

Contaminants with high soil adsorption coefficients (e.g., benzo-a-pyrene) may bind (adsorb) to the surface of soil particles through ion exchange and become relatively immobile under certain conditions. However, adsorbed contaminants may later be desorbed by percolating waters, causing the contaminants to become mobile again. Movement of airborne or waterborne soil particles with hazardous substances adsorbed to the surface also contributes to spread of contamination.

To determine in detail how a release may behave, it is necessary to establish the predominant nature of the soils on site. It is also

important to establish whether such underground features as clay layers, sink holes, and fractures are present. These and other subsurface features can greatly facilitate or retard the spread of contamination and influence the direction of movement.

INTERMEDIA TRANSFER MECHANISMS

Releases which occur on soils with low runoff potential, such as well-drained sandy or gravely soils, have a high infiltration rate. Spills on these types of soils will migrate off site rapidly and may present a threat to groundwater. Loamy and clay soils with a moderate to high runoff potential provide a low infiltration rate and a surface conducive to overland flow. Releases occurring on these types of soils may create a hazard at some distance to the site as the spilled substance travels overland to surface waterways, or as vapors from the substance volatilize into the atmosphere or collect in such confined spaces as culverts and sewers. Biouptake by plants and soil organisms is another transfer mechanism of soil contaminants and one which introduces the contaminants to the food chain.

Water

Water contamination poses ingestion and direct contact threats. Water also transports contaminants through soil and acts as a vehicle for intermedia transfer of contaminants to air and soil. Water has two important characteristics, its strongly dipolar nature and the ability of water molecules to form hydrogen bonds with the oxygen ends of adjacent water molecules. The dipolar nature of water is the reason for its solvent properties; the force of attraction between the dipole and ions on the surface of a contaminant or other substance can cause the contaminant to form a solution with water.

The ability of water molecules to form hydrogen bonds with each other accounts for the high dynamic viscosity and high surface tension of water, as well as its melting and boiling points. Both the viscosity and surface tension of water affect transport of particulate material and

material and the movement of groundwater. Viscosity and surface tension each decrease as temperature increases.

The properties of the contaminant are important to consider when assessing the threat posed by water contamination. Such characteristics as solubility, vapor pressure, specific gravity, and dispersability affect the behavior of the contaminant in water and influence cleanup techniques.

DISPERSION MECHANISMS

Direct surface water contamination occurs from releases into a body of water or from contaminated runoff. Dispersion of contaminants through surface waterways is affected by currents and eddies in rivers, streams, lakes, and estuaries, and also by thermal stratification, tidal pumping, and flushing. Contaminant concentrations in rivers or streams can be estimated on the basis of rate of contaminant introduction and dilution volumes. Estimates of contaminant concentrations in estuaries and impoundments are more difficult to make because of the variety of transport mechanisms that may be involved, causing contaminants to remain concentrated in local areas or to disperse rapidly.

Direct groundwater contamination can occur from liquids and solids in lined or unlined landfills, lined or unlined lagoons, underground storage tanks, injection wells, or long-term surface dumping. Dispersion of contaminants through groundwater is influenced by a variety of factors such as the hydraulic conductivity of soils; the hydraulic gradient; the presence of impermeable subsurface barriers; the presence of discharge areas (e.g., streams that intercept ground water flow), and the presence of fissures, cavities, or large pores in the bedrock.

INTERMEDIA TRANSFER MECHANISMS

An important intermedia transfer mechanism in surface water is contaminant transfer to bed sediments, especially in cases where

contaminants are in the form of suspended solids or are dissolved, hydrophobic substances that can be adsorbed by organic matter in bed sediments. Transfer between surface water and bed sediments is reversible, and the sediments can act as temporary repositories for contaminants, gradually releasing contaminants to surface water. In addition, adsorbed or settled contaminants can be transported through migration of bed sediments.

Transfer of contamination between surface water and groundwater occurs in areas of substantial surface-groundwater exchange, such as in swamps and marshes. Surface water contamination enters the food chain through biouptake by plants and animals. Transfer to the atmosphere occurs where the surface water is contaminated with volatile substances. Such transfer can pose a threat of explosion as vapors collect in sewers and other enclosed spaces. High temperatures, high surface area-to-volume ratios, high wind conditions, and turbulent stream flow increase volatilization rates. Volatiles in groundwater can be transferred to the atmosphere at household taps. Inhalation of volatiles while bathing may be a potentially significant route of exposure for residents whose potable water is contaminated with volatile organic compounds.

APPENDIX 3

Sampling and Basic Data Interpretation

Together, sampling, sample analysis, and basic interpretation of analytical results form the most effective mechanism for obtaining definitive information to characterize site conditions, evaluate the threats to human health and the environment, support compliance and enforcement activities, justify site cleanup activities, and determine cleanup effectiveness.

The type and number of samples collected, the manner in which the samples are collected, and the analyses chosen depend on what the EPA investigator wants to ascertain. The sampling plan is the vehicle for securing a set of quality-controlled samples that reflect site conditions accurately and provide the information desired. The sampling plan outlines all sample locations, collection procedures, and analytical methods to be used in a sampling episode.

Once the samples have been analyzed by a laboratory, basic interpretation of the results can be confusing because of the different formats used by various laboratories to report analytical results. Nevertheless, there are a few standard terms used by laboratories to report the concentrations of the analytes. In addition, quality assurance parameters have been established through common laboratory practices to provide a means of measuring both the accuracy and precision of analysis and of ensuring that no external contamination was introduced by sample collection and analysis procedures.

This appendix is divided into four sections. The first section covers the topics addressed in the sampling plan. The second defines the types of quality assurance samples and a few additional sampling terms. The third section covers basic data interpretation, including qualifier codes used in sample analysis reports produced by laboratories in EPA's Contract Laboratory Program (CLP). The fourth section deals with data validation procedures.

Sampling Plans

Complete site sampling plans should address each of the following topics to ensure that the appropriate protocols are observed during the sample collection and analysis processes and to enable the sampling procedures to be duplicated, if necessary. Samples are not only used as a source of information for making site decisions, they may also be used for legal purposes, so complete documentation of the actual sampling event is important.

- Representative Sample Locations. Representative sampling locations depend on the purpose of the sampling activity. The intended data use will guide determination of the sampling locations and pattern and total number of samples. Contamination verification requires fewer samples biased toward suspected areas of contamination; such samples may not give an accurate presentation of the overall site characterization, however. A better overall characterization may be achieved using a grid pattern to determine sample locations. Use of a grid system generally increases the number of samples collected, thus increasing analytical costs. For further information, consult guidance documents published by the EPA Office of Solid Waste and Emergency Response on representative sampling of soil, water, and hazardous wastes and on sample collection and handling techniques.

- Analysis Selection. Specific parameters for analysis must be established while assembling the sampling plan. The laboratory should be notified and given the EPA-approved method number

and the desired QA/QC information. The analysis selected influences the choice of sample equipment, volume, preservation, and holding time. A summary of sample container types, preservatives, holding times, and analytical methods is included at the end of this section. The EPA publication Solid Waste 846 (SW-846), "Test Methods for Evaluating Solid Waste," gives information on analysis methods for hazardous wastes, soils, and non-aqueous phase liquids. EPA 500 and 600 publications cover test methods for water.

- Quality Assurance Level. The level of quality assurance (QA) that the sampling event must meet should be established at the outset, as the level selected affects the sample handling, documentation, and analysis procedures used. QA Level 1, the least stringent level, requires sample documentation and instrument calibration/ performance checks; samples are field screened.

  QA 1 applies when a large amount of data is needed quickly and relatively inexpensively, or when preliminary screening data does not need to be analyte or concentration specific. Examples of activities where QA 1 is appropriate include assessing preliminary on-site health and safety, assessing waste compatibility, characterizing hazardous waste, and determining extent of contamination.

  QA 2, which verifies analytical results, requires external laboratory analysis of at least 10 percent of field-screened samples, sample documentation, chain-of-custody documentation, documentation of sample holding times, and raw instrument data. To meet the QA 2 objective, samples are analyzed using rigorous methods that provide quantitation and analyte-specific information. Examples of activities where QA 2 is appropriate include verifying preliminary screening, defining extent and degree of contamination, and verifying site cleanup.

  QA 3, the most stringent level, assesses the identity of the analyte of interest and the analytical error of the concentration level. QA 3 incorporates the specifications for QA 2 and also requires the analysis of eight replicate samples to determine analytical error and analysis of a performance evaluation sample. This level of quality assurance is used when determination of

analytical precision in a certain concentration range is crucial for decision making. Examples of activities where QA 3 is appropriate include evaluating health risk or environmental impact, identifying the source of pollution, and verifying cleanup.

- Sampling Equipment Selection. The type of sampling equipment is dictated by the analysis selection, required sample volume, ability of decontamination, equipment composition, and cost. The sampling equipment should not introduce contamination into the sampling procedure. To avoid this, sampling equipment should be disposable or easily decontaminated. Disposable equipment must be economical or used when extensive decontamination would be required for durable sampling equipment. The equipment must also be functional, allowing a sampling team to collect samples quickly and efficiently. The composition or construction materials of sampling equipment may affect the samples collected and so must be considered when selecting equipment.

- Sampling Volumes. Sampling volumes are directly related to the types of chemical analyses that are requested. The laboratory requires a precise amount of a sample unique to the specified EPA-approved analysis or method. Providing the laboratory with an excess of sample volume increases the eventual disposal costs to the laboratory and in turn to the samplers. Providing the laboratory with insufficient volume can lead to increased field sampling costs and to delays.

- Sampling Containers. The type, size, and composition of sampling containers are directly related to the chemical analysis which is requested. The size of the container must conform to volume requirements specified in the EPA-approved method. The container must not release contaminants into the sample or absorb material from the sample. The container must ensure that ambient air cannot enter into the sample, and conversely, that gas from the sample cannot escape to the ambient air.

- Sample Preservation. Samples are preserved by means of environmental controls (e.g., cold storage) or chemical additives

(e.g., nitric acid or sodium hydroxide). The preservation method is directly related to the chemical analysis requested. The purpose of preservation is to keep the chemical constituents of the samples static during handling, packing, and shipment to the laboratory. Highly concentrated samples do not usually require preservation.

- Sample Holding Times. The elapsed time between sample collection and laboratory analysis must be within a predetermined time frame known as the sample holding time. Each sample parameter has a prescribed holding time. Samples analyzed beyond the holding time are not truly representative of the sampled material.

- Sample Identification. Each sample must be identified and documented to ensure sample tracking is performed. A label is made for each sample, reflecting the site name, site location, sample number, date and time of sampling, sampler identification, preservative used, required analysis, and sampling location description.

- Sample Custody. Chain-of-custody forms are used to track the handling of samples once the samples are collected. The samples are documented as they are transferred from each handler or to the laboratory. The procedure is used to prevent sample tampering and to trace the path of a sample in the event of contamination off site. Chain-of-custody seals are applied as directed by protocol.

- Sample Transportation. Samples may be hand delivered to the laboratory using government vehicles or they may be shipped by a common carrier. Regulations for packaging, marking, labeling, and shipping of hazardous materials and wastes are promulgated by the U.S. Department of Transportation (DOT). Air carriers which transport hazardous materials, in particular, Federal Express, require compliance with the current International Air Transport Association (IATA) Regulations, which applies to the shipment and transport of hazardous materials by air carrier. Hazardous waste site samples should not be transported in personal vehicles.

Analytical Parameter	Matrix	Container Type and Volume (# containers req'd)	Preservative degrees Celsius	Holding Times	Trip Blanks (VOAs)	Analytical Method Ref.
VOA	S	40 ml Vial (2)	4	14 Days	Yes	8240 or 8260/ SW846
VOA	W	40 ml Vial (3)	4*	14 Days	Yes	624/CLP
BNA	S	8 oz Glass (1)	4	7 - 40 Days		8250 or 8270 SW-846
BNA	W	32 oz Amber Glass (1)	4	7 - 40 Days		625/CLP
Pesticide	S	8 oz Glass (1)	4	7 - 40 Days		8080/SW-846
Pesticide	W	32 oz Amber glass (1)	4*	7 - 40 Days		608
PCB	S	8 oz Glass	4	7 - 40 Days		8080/SW-846
PCB	W	32 oz Amber Glass (1)	4*	7 - 40 Days		608
P.P. Metals	S	8 oz Glass	4	6*** Months		SW-846
P.P. Metals	W	1 liter Glass or poly-ethylene (1)	HNO_3 pH<2 4	*** 6 Months		EPA-600/ CFR 40
Cyanide	S	8 oz Glass (1)	4	14 Days		SW-846
Cyanide	W	1 liter Poly-ethylene (1)	NaOH to pH > 12 4	14 Days		SW-846

One Bottle Per Medium to test Pes/ PCBs Together

* If residual chlorine is present, preserve with 0.008% $N_2S_2O_3$.

** Only required if dedicated sampling tools are not used.

*** Exceptions - mercury (28 days) and hexavalent chromium (24 hours - water).

NOTE: Nitric acid (HNO_3); Sodium thiosulfate ($N_2S_2O_3$); Hydrochloric Acid (HCl)

Terminology

- Accuracy. Accuracy may be defined as the measure of the closeness to a true or accepted value.

- Background sample. A background sample is a sample collected upgradient of the area of contamination (either on or off site) where there is little chance of migration of contaminants. Properly collected background samples indicate the natural composition of the matrix and should be considered clean samples.

- Collocated Sample. A sample collected adjacent to the basic field sample, typically one-half to three feet away from the sample location. Collocated samples are used to assess variation in the immediate area of the basic sample.

- Field Blank. A field blank is a sample of laboratory pure water or certified clean soil which is prepared in the field prior to any sampling activities. Analysis of the sample will indicate whether contamination was introduced into the samples during the collection process.

- Field Duplicate. A field duplicate (or replicate) is a second sample (or set of samples) collected from one sample location and labeled for the laboratory as if it were a unique sample. Field duplicates are primarily used to check the precision and consistency of the sampling procedures used. The field duplicate can also act as a check on the analytical procedures.

- Holding Times. Holding times are the timeframe within which the sample must be analyzed to ensure accurate measurement of the analytes. Holding times vary depending on the type of analysis to be performed.

- Laboratory Duplicate. Laboratory duplicates are samples prepared by the laboratory and analyzed in duplicate to measure analytical reproducibility.

- Matrix Spike/Matrix Spike Duplicate. A matrix spike sample is a sample to which a target compound at a known concentration is added during laboratory preparation to measure the accuracy of the analysis procedure. A matrix spike duplicate is a second run to determine the precision of analysis. Such samples are primarily used to check sample matrix interferences, but can be used to monitor laboratory performance.

- Method Blank. A method blank is a sample which is prepared by the laboratory to determine if any contamination is being introduced during the extraction or analysis procedures.

- Method Detection Limit. The method detection limit (MDL) is the lowest concentration that can be measured if a sample is analyzed according to the method procedures.

- Performance Evaluation Samples. Performance evaluation (PE) samples are samples of known concentrations that are available from either the EPA or the U.S. Bureau of Standards for submission with the field samples to the laboratory. PE samples should be of the same or similar matrix as the field samples. PE samples are used to check the overall bias of the laboratory and to detect any error in the analytical method used.

- Precision. Precision may be defined as the agreement between the numerical values of two or more measurements made in an identical fashion.

- Relative Percent Difference. The relative percent difference (RPD) is used to assess the variability of a measurement process. Typically, the value represents the difference between the matrix spike and the matrix spike duplicate. It can also represent the difference between two analysis runs.

- Rinsate Blank. A rinsate blank is a sample of laboratory pure water run over sampling equipment following decontamination. Rinsate blanks are used to check decontamination effectiveness.

- Split Samples. Split samples are derived from one large volume sample obtained from one location, then thoroughly homogenized, and divided into separate portions. Each portion, or split, is placed into a separate container and treated as a separate sample. Samples can be split two or more ways, and the total sample volume depends on the number of splits and the analytic method to be used. Split samples are usually collected when a responsible party and EPA Enforcement Section or several government agencies are involved. Split samples, which typically are sent to different laboratories for analysis, act as a check on the laboratory.

- Surrogate Spike. A surrogate spike refers to a procedure in which a non-target compound is added to the sample during laboratory preparation to determine the extraction efficiency. Surrogate spikes are usually used only with organics.

- Trip Blank. A trip blank is a sample which is prepared prior to the sampling trip using laboratory pure water or certified clean soil. This sample travels to the assessment and is kept with the other samples but is not opened in the field. Analysis of the trip blank will indicate whether the sample containers were contaminated prior to the assessment.

Basic Data Interpretation

CONCENTRATION UNITS FOR ANALYSIS

Water (Aqueous)	ppm = ug/mL or mg/L ppb = ng/mL or ug/L ppt = ng/L
Soil or Sediment	ppm = ug/g or mg/kg ppb = ng/g or ug/kg ppt = ng/kg
Air	mg/m^3, ng/m^3 (temperature and pressure dependent) ppm or ppb (unitless measurement)
Oils or Organics	The concentrations of oils or organics should be expressed using the soil units listed above. Laboratory results that report concentrations for oils or organics using water units should be questioned.

GLOSSARY OF SOME COMMON DATA QUALIFIER CODES AND TERMINOLOGY USED IN THE EPA CONTRACT LABORATORY PROGRAM (CLP)

CODES RELATING TO IDENTIFICATION
(indicate confidence concerning presence or absence of compounds)

U = Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unreliable result. Analyte may or may not be present in the sample. Supporting data is necessary to confirm result.

N = Tentative identification. Consider analyte present. Additional sampling and special methods may be needed to confirm its presence or absence.

(NO CODE) = Confirmed identification

CODES RELATED TO QUANTITATION
(indicate positive results and sample quantitation limits)

J = Analyte present; reported value may not be accurate or precise.

K = Analyte present; reported value may be biased high. Actual value is expected to be lower.

L = Analyte present; reported value may be biased low. Actual value is expected to be higher.

UJ = Not detected; quantitation limit may be inaccurate or imprecise.

UL = Not detected; quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Data Validation Procedures

Data validation is the process by which a qualified data reviewer ensures the quality of the laboratory analysis and the reported results. The procedures used to validate a data package vary slightly according to the type of analysis performed and the instrumentation used. Many times, data validation requires the reviewer to draw upon his or her analytical experience and expertise to make subjective decisions about the quality of a set of results. For this reason, data validation should be completed only by qualified persons.

Data validation procedures vary, depending on the type of instrumentation and methods used for analysis. For the sake of simplicity, the example below outlines the validation procedures for analytical results from a Gas Chromatograph/Mass Spectrometer (GC/MS). While validation of analyses performed on other types of instruments would not be an identical process, it would be similar.

EXAMPLE DATA VALIDATION PROCEDURES FOR GC/MS

1. **Did the laboratory meet the holding times outlined by the sampling protocol?**
   - If yes, accept data.
   - If no, data should be accepted as estimates only.

2. **Was the GC/MS properly tuned?**
   - If yes, accept the data.
   - If no, reject all GC/MS data because compounds may be misidentified.

3. **Was the instrument properly calibrated?**
   - If yes, accept the data.
   - If no, data should be accepted as estimates only.

4. **Were method blanks free of contamination?**
   - If yes, accept the data; further action is not required.
   - If no, determine if the contamination was the result of a common laboratory chemical. Sample data should only be rejected if the analyte concentration is less than three times the contaminant concentration in the blank.

5. **Were field blanks free of contamination?**
   - If yes, accept the data; further action is not required.
   - If no, determine if the contamination was the result of a common laboratory chemical. Sample data should only be rejected if the analyte concentration is less than three times the contaminant concentration in the blank.

6. **Were the surrogate spike recoveries for all organics acceptable?**
   - If yes, accept the data.
   - If no, evaluate each sample on an individual basis and accept or reject the data as necessary.

7. **Were the matrix spike recoveries and the relative percent differences values acceptable?**
   - If yes, the laboratory has demonstrated good precision and accuracy; accept the data.
   - If no, evaluate on per compound basis.

Additional Guidance Documents

1986. EPA. "Test Methods for Evaluating Solid Waste," SW-846. Office of Solid Waste and Emergency Response. Washington, DC. November.

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1993. EPA. "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses." EPA Region III Office of Analytical Services and Quality Assurance. Annapolis, MD. April.

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