DOW CHEMICAL
ALLYN'S POINT PLANT

RCRA VOLUNTARY
CORRECTIVE ACTION PROJECT

DATA QUALITY ASSURANCE PLAN

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OVERVIEW OF THE DATA QUALITY ASSURANCE PLAN

Introduction

The Data Quality Assurance Plan has been prepared as part of the Voluntary Corrective Action (VCA) Plan to assure that sampling, field and laboratory analysis, data measurements and reporting are to a degree of quality consistent with the technical approach and project objectives and prescribed end points.

Purpose

The data generated from sample collection and analysis, field observations and data measurements must provide information necessary for the preparation of a VCA Summary Report based on data that are accurate, precise, representative and complete.

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PROJECT OBJECTIVES AND DATA QUALITY

Project Objectives

The objectives of the VCA are to assess and characterize the nature and extent of soil and/or groundwater in the vicinity of the SWMUs at the Allyn's Point Plant in an effort to close the operation of these SWMUs. This Data Quality Assurance Plan has been prepared as part of the VCA Plan to assure that sampling, field and laboratory chain-of-custody, laboratory analysis, field and laboratory data measurement and reporting will provide data to a degree of quality consistent with its intended use. The data resulting from sample collection and analysis and other sources must provide the information necessary to allow the preparation of a VCA Summary Report based on data which are accurate, precise, and representative.

Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and/or quantitative statements regarding the quality and reliability of data needed to support the VCA activities. The intended use(s) of the data and the associated acceptance criteria for data quality will be determined before the data collection effort begins. Reported data will include, when appropriate, statements of precision, accuracy, representativeness, completeness, and comparability. Data processing procedures will be documented, reviewed, and revised, as required to meet the project data quality requirements.

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Data Quality Objectives (continued)

Specific analytical protocols are selected to meet the DQOs in the following ways:

- Compare Applicable or Relevant and Appropriate Requirements (ARARs), risk based criteria, and data needs for risk assessment or engineering purposes to the detection limits for available analytical methods.

- Select analytical methods to allow quantification of target chemical compounds at concentrations sufficiently below the ARARs to minimize the number of critical data points.

- Evaluate the maximum allowable variability in the data based on comparison with the ARARs.

- Develop site-specific acceptable data variability based on the intended data use and method-specific precision and accuracy information.

- Provide documented QA/QC procedures and data deliverables sufficient to assess the validity of analytical data and determine legal defensibility.

The Technical Approach/Project Objectives table presents a summary of the proposed sampling and analysis program for the VCA. The information in this table was developed to meet the project objectives, quality objectives, and to summarize the Sampling Plan.

PROJECT OBJECTIVES AND DATA QUALITY OBJECTIVES (continued)

The following table identifies the technical approach and project objectives to be used for investigating the SWMUs at the Allyn's Point Plant.

Name	Technical Approach	Target Parameters/ Quantity	Project Objectives
Old Plant Landfill "A"	Geophysical Survey/Conductivity Logging	1 1	Define waste boundaries, determine presence or absence and/or condition of drums in landfill.
	Install Shallow Monitoring Wells (30 ft. each) Install Deep Monitoring Wells[1] (90 ft. each)	4 4	Assess local stratigraphy; assess groundwater flow in stratified drift layer. Assess groundwater flow in the bedrock.
	Test Pits (depths: 10-15 feet)	8	Characterize waste material/drums in landfill
	Soil Gas Survey	50 points	Assess contamination migration between the landfill and River.
	Collect Soil Samples: Shallow (2 each) Deep (4 each)	VOAs 8260 - 24 Semi 8270 - 8 TCLP metals - 8	Assess chemical characteristics of soil in the landfill.
	Test Pit Soil Samples	VOAs 8260 - 4 Semi 8270 - 4 Appendix IX - 4	Characterize waste material/drums in landfill
	Collect Groundwater Samples	VOAs 8260 - 16 Semi 8270 - 16 Chloride 325.3 - 8 Anions/Cations- 8	Assess chemical characteristics of groundwater. Samples to be collected from 6 existing wells, 8 new wells installed by AWD, and from 2 packer tests.
	Slug Tests Pump Tests Packer Tests	8 3 16-48-Hour tests 2	Assess hydraulic characteristics of the stratified drift aquifer and the bedrock aquifer.
	Tidal Influence Test	1 - 3 days	Evaluate temporal relationship and magnitude of tidal influence on the upper and lower soil regimes and bedrock aquifer.
Latex Solids Compost Area "B"	Collect Soil Samples	VOAs 8260 - 3 Semi 8270 - 1	Characterize three compost piles.
	Review existing waste characterization data Review annual groundwater monitoring data		Evaluate existing groundwater data to assess need for additional testing.

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Name	Technical Approach	Target Parameters/ Quantity	Project Objectives
Latex Wastewater Lagoons 1 & 2 "C"	Drill soil borings (30 ft. each)	3	1 downgradient of lagoon 1, 1 in lagoon 2, 1 downgradient to lagoon 2.
	Collect soil samples at 5-foot intervals		Screen for volatile organics.
	Select soil samples for chemical analysis	VOAs 8260 - 3 Semi 8270 - 3	Select sample with highest headspace reading for submittal to the lab.
	Install temporary well (30 ft. each)	1	Install in downgradient borings, assess local groundwater flow conditions.
	Collect groundwater samples	VOAs 8260 - 1	Evaluate chemical characteristics of groundwater.
Latex Wastewater Lagoons 3 & 4 "D"	Soil Gas Survey	30 points	Accessible area on 20 foot centers at depth of 4 feet.
	Hand Auger Borings	2	Collect soil sample at a depth of 10 feet and/or at highest headspace reading. If volatiles not detected hand auger a boring in center of the pond. Highest headspace readings detected in soil at each location submitted for analysis.
	Collect Soil Samples	VOAs 8260 - 2	Assess constituents in soil
Contaminated Soil near Gravel Pit Area "E"	Soil Gas Survey	50 points	Identify nature and extent of residual soil contamination. Accessible area on 20 foot centers at depth of 4 feet.
	Drill Soil Boring (20 ft.)	1	Continuous samples to 20 feet at highest detected soil gas location. If volatiles not detected drill boring in center of the soil gas survey area.
	Install Temporary Well (20 ft.)	1	Assess presence or absence of DNAPL in groundwater
	Collect soil samples	VOAs 8260 - 1 Semi 8270 - 1	Highest headspace readings submitted for analysis.
	Collect groundwater sample	VOAs 8260 - 1 Semi 8270 - 1	Assess chemical characteristics of groundwater.
	Test Pit Trench Test Pit Soil Samples	1 Appendix IX - 3	Confirm limits of any visible soil contamination, starting at the road and moving towards the upper parking lot.

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Name	Technical Approach	Target Parameters/ Quantity	Project Objectives
Current Hazardous Waste Storage Building 22 "F"	Inspect and collect samples as required by facility closure plan	TCL+ Waste constituents	Close facility permit, and change building status to "less than 90 days".
Former Drummed Hazardous Waste Storage Area "G1"	Concrete coring through pad	2	Assess soil beneath the pad. 1 sample from soil in sump, 2 samples from the top 12-inches of soil underneath the pad.
	Collect Soil Samples	VOAs 8260 - 3	1 sample from soil in sump, 2 samples from the top 12-inches of soil underneath the pad.
Old Drum Storage Area "G2"	None planned	NA	Asphalt pad was never used.
Old Drum Storage Area "G3"	Collect soil samples	VOAs 8260 - 2	From top 12-inches of soil from around the asphalt pad or beneath the pad to assess potential soil contamination.
Possible Old Drum Storage Area "G4"	None planned	NA	Clean closure requested by Dow in 1988.
Old Drum Storage Area "G5"	Concrete coring through pad	2	Access soil beneath the pad at 2 locations.
	Drill soil boring	1	Drill to depth of groundwater.
	Install temporary piezometer	1	Evaluate groundwater gradient with temporary wells installed at SWMU C.
	Collect soil samples	VOAs 8260 - 2 Semi 8270 - 1	Soil samples collected from top 12-inches at 2 coring locations to assess potential soil contamination.
	Collect soil boring samples	VOAs 8260 - 1	Submit soil sample with highest headspace reading to lab.
	Collect groundwater samples	VOAs 8260 - 1	Assess chemical characteristics of groundwater.
Old Drum Storage Area "G6"	Concrete coring through pad	1	Access soil beneath the pad.
	Collect soil sample	VOAs 8260 - 1	Assess unit for potential soil contamination.
Hazardous Waste Storage Tank (1900 gallons) "H"	None planned for aboveground Hazardous Waste Storage Tank	NA	Routinely inspected as a RCRA-permitted unit.

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Name	Technical Approach	Target Parameters/ Quantity	Project Objectives
Underground separation tank (5000 gallons) "H"	Soil Gas Survey	15 points	In soil around the underground separation tank to evaluate potential soil contamination.
	Test Pit	1	In area of tank for location/identification purposes.
Prenco Incinerator, Drum Crusher "I"	Concrete coring through pad.	2	Access soils beneath the pad.
	Collect soil samples	VOAs 8260 - 3 Semi 8270 - 1 Appendix IX - 1	2 samples near the building, 2 samples from beneath the concrete to evaluate potential soil contamination. Select soil sample with highest headspace value.
Cooling Water Pond (Allyn's Cove) "J"	Collect sediment samples	VOAs 8260 - 4 Appendix IX - 1	Collect from top 6-inches of sediment, 3 samples from the internal outfalls, one from the center of the pond, one at the discharge point to assess potential sediment contamination from stormwater in the unit.
Old Reservoir Area & Bulky Waste Disposal Area "K and L"	Soil Gas Survey	60 points	Survey of accessible area on 50 foot centers at a depth of 4 feet. Evaluate potential soil contamination in the fill material.
Two Drywells and Two (5000 gallon) Concrete Tanks "M"	Drill soil borings around tanks if evidence for leakage. Install shallow monitoring well (35 ft.) Install deep monitoring well (70 ft.)	2 1 1	Evaluate potential soil and groundwater contamination in vicinity of the tanks.
	Drill soil borings adjacent to drywells. Install shallow monitoring well (35 ft.) Install deep monitoring well (70 ft.)	2 1 1	Evaluate potential soil and groundwater contamination adjacent to dry wells.
	Collect soil samples	VOAs 8260 - 4 Semi 8270 - 2	Soil samples selected based on highest headspace readings.
	Collect groundwater samples	VOAs 8260 - 4 Semi 8270 - 4	Evaluate chemical characteristics of groundwater at the site.
	Slug tests	4	Assess hydraulic characteristics of the aquifers encountered in the shallow and deep wells.
Old Sanitary Leach Field "N"	Soil Gas Survey	15 points	Accessible area on 40 foot centers at a depth of 4 feet.

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Name	Technical Approach	Target Parameters/ Quantity	Project Objectives
	Drill soil boring (10 to 20 ft.)	1	Continuous samples to water table at highest detected soil gas location. If volatiles not detected drill boring in center of the soil gas survey area.
	Collect soil samples	Appendix IX - 1	Highest headspace readings submit for analysis. Evaluate soil for residual wastewater constituents.
Sludge Tank, Oil Separator Tank "O"	Empty and remove oil separator tank.		Remove potential source of soil contamination.
	Screen soil samples with PID		Evaluate potential soil contamination.
	Collect soil samples	VOAs 8260 - 5 Semi 8270 - 1 Appendix IX - 1	Collect samples from remaining soil in excavation.
	Soil Gas Survey	10 points	In area near sludge tank. Evaluate soil for residual contamination.
Flare Pond "P"	Collect sediment samples	VOAs 8260 - 3 Semi 8270 - 1	One sample from the inlet, one from the middle of the unit, and one sample from the discharge point to evaluate potential residual contamination from stormwater.
New Stormwater Impoundment "Q"	Inspection of impoundment walls for cracks and holes.		Ensure the integrity of the impoundment.

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PARCC GOALS

QA objectives

Quality Assurance objectives for measurement data are usually expressed in terms of Precision, Accuracy, Representativeness, Completeness and Comparability. The quality of data for the VCA will be measured by these "PARCC's" parameters. Some of the parameters are expressed quantitatively, while others are expressed qualitatively.

Precision

Precision is a measure of the variability between individual sample measurements under prescribed conditions. The specific criteria for precision are defined within the individual analytical test methods. The measure of precision will be expressed as the Relative Percent Difference (RPD) as follows:

$$RPD = ((OR - DR) * 100\ \%) / (0.5\ (OR + DR))$$

Where: OR = Original Sample Result
DR = Duplicate Sample Result

Precision can be inferred through the use of duplicate and matrix spike duplicate samples. Matrix spike duplicates contain known component concentrations and any variability in the laboratory analysis is most probably the result of the variability induced by matrix heterogeneity or laboratory procedures. To assess precision, matrix spike duplicates will be analyzed at a rate of one per twenty (1:20) samples analyzed.

Matrix spike and matrix spike duplicates will be performed, as per method, for organic analyses. Unspiked duplicate pairs will be performed, as per method, for inorganic analyses.

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Accuracy

Accuracy measures the bias in a measurement system. Accuracy is defined as the degree of agreement of a measurement (or average measurement) with an accepted reference or true value. This is usually expressed as the difference between the two values, or the difference as a percentage of the true value, and sometimes as the ratio of the measurement to the true value. Sampling accuracy may be assessed by evaluating the results of field blanks; and analytical accuracy may be assessed through the use of matrix spikes and/or known QC samples.

Examples of accuracy expression are as follows:

$$X - T \qquad 100(X - T) / T \qquad X / T$$

Where: X = Measurement (or Average Measurement)
T = Reference Value (or True Value)

Accuracy will be defined as the percent recovery for the compounds of interest from a matrix spike sample. To assess accuracy, matrix spikes will be analyzed at a rate of one per twenty samples (1:20) analyzed. The specific criteria ranges of accuracy for each measurement parameter are defined within the individual analytical test methods. Acceptable accurate measures are also dependent on the matrix spike.

Representativeness

The representativeness of the data is the degree to which data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Data are considered representative if the sample distribution is within the statistically defined bounds of the population mean and variance.

Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Duplicate and field blanks will be collected as a means to assess field representativeness. The sampling sequence of the duplicates will be unknown to the analytical laboratory. Trip blanks will also be included in each sample shipment containing samples for volatile organics analysis to evaluate potential cross-contamination during transport. Representativeness will also be maintained during the sampling effort by performing all sampling activities in compliance with the procedures described in this document and the Sampling Plan. A summary of the duplicate and blank samples to be collected is included in the Quality Control Sample table.

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Completeness

Completeness is defined as the percentage of the total measurements made which are judged to be valid measurements. The completeness objective is essentially the same for all data uses: that a sufficient amount of valid data be generated.

Various types of samples will be collected and analyzed in order to meet the project objectives. The minimum number of sampling points needed to provide sufficient data are known as the critical data points. The critical data points required to meet project objectives for completeness criteria are established as follows:

- 80 percent for soil and sediment samples
- 80 percent for water samples
- 80 percent for soil gas samples

QUALITY CONTROL SAMPLES

Sample Area	No. of Samples	QC Sample Type	QC Sample Frequency	Total No. of QC Samples
Soil Gas	250 points	Duplicate Field Blank Lab Control Blanks	2/day 1/day 1 per compound/day	48
Sediment	8	Duplicate Rinsate Trip	2 Sediment 1/day for 1 day 1/day[1] for 1 day	4
Soil Samples	21	Duplicate Rinsate Trip	~~13~~ 10 Soil 1/day for 2 days 1/day[1] for 2 days	14
Soil Boring Samples	33	Duplicate Rinsate Trip	14 Soil 1/day for 9 days 1/day for 9 days	32
Groundwater	23	Duplicate Rinsate Trip	~~5~~ 9 Groundwater 1/day for 3 days 1/day[1] for 3 days	~~14~~ 15
Hydraulic Conductivity Tests	2	Not Required	Not Required	Not Required
Test Pit Samples	12	Duplicate Rinsate Trip	3 Soil 1/day for 3 days 1/day[1] for 3 days	9

[1] Trip Blanks will be included in each sample cooler containing samples for analysis of volatile organics. Coolers containing samples for volatile organics are assumed to be shipped at a frequency of one per day.

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PARCC GOALS (Continued)

Completeness (continued)

If completion goals are not met, the VCA Summary Report will contain a discussion explaining why the goal was not met and if the task can be considered complete.

Comparability

Comparability expresses the confidence with which one set of data can be compared to another. Comparability can be related to precision and accuracy since these quantities are measures of data reliability. Samples from the same media will be considered comparable if the procedures for collecting the samples are complied with, and if the units of measurement are the same.

Comparability is assured through the use of laboratories that use established and approved analytical methods, protocols, and laboratory quality programs designed to establish consistency in the performance of the analytical process. The program includes traceability of measurements to independent reference materials to establish comparability with other laboratory results, and internal controls to verify the consistency of a given laboratory's performance. Standard reporting units will be used for reporting the various parameter results. All data will be subjected to strict QA/QC procedures and reported in a consistent manner to allow comparison across data sets.

FIELD ANALYSIS QA/QC

Field QA/QC Program

This Data Quality Assurance Plan describes the QC measures to be implemented to meet the VCA project and data collection goals/objectives. This document must be used in conjunction with the Sampling Plan which includes descriptions of the following:

- Sample Collection Protocols;
- Field Measurement Protocols; and
- Field Documentation.

Information on sample volumes and container requirements is presented in the Sampling Techniques section of the Sampling Plan. Holding time requirements are tabulated for each sample media and analytical parameter and presented in the Sample Storage Procedures and Holding Times section of this document. In addition, field personnel must be cognizant that all aspects of sample collection and field measurement must be performed in accordance with the Sampling Plan and Laboratory Quality Assurance Plan (LQAP).

All personnel must read, understand, and comply with the requirements and protocols described in these documents. Records will be kept to document personnel training. To insure quality, the following sections provide additional discussions of these important topics.

Field measurements

Field QA objectives will be attained by assuring that field system audits are routinely performed and that instruments are properly calibrated and are included in a preventative maintenance program.

Measurement data will be generated in many field activities which occur prior to, or are incidental to, collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to, the following:

- Reviewing site background data and the Sampling Plan;
- Making a checklist of equipment requirements;
- Reviewing the Health & Safety requirements;
- Obtaining utility clearances;
- Documenting time and weather conditions;

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Field measurements (continued)

- Obtaining geophysical data from selected sites;
- Collecting soil gas survey data at selected sites;
- Locating and determining the elevation of sampling stations; and
- Determining depths in a borehole, piezometer, or monitoring well and static water levels.

The general QA objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the data use. This is accomplished through the use of standard operating procedures (SOPs). These procedures are presented in the Sample Collection and Field Records section of the Sampling Plan.

Field documentation

Documentation of field activities and all sample collection will include the use of field logbooks, field sample sheets, boring logs, and chain-of-custody forms. Photographs may also be used to document field activities.

Bound field logbooks with sequentially numbered pages will provide the means of recording all pertinent field activities performed or observations made. Since field activities are quite diverse, the documentation in the field logbook must be sufficient to reconstruct the sampling situation or field activity without relying on the memories of the field team members. To supplement the information recorded in logbooks, a field sample sheet will be completed for each sample collected.

Field logbooks are maintained by the Site Manager when not in use during field activities. The logbooks become part of the project file upon completion of the field investigation. Particular items recorded in the logbooks include all aspects of the sample collection, field measurements taken, health and safety documentation, and field management reports.

Each sample collected and shipped to a laboratory will be accompanied by the chain-of-custody (COC) record. The primary purpose of the COC procedure is to document the possession of samples from the point of collection through storage and analysis to reporting. COC forms will be completed in accordance with AWD SOP 9: *Chain of Custody* and become the permanent record of all sample handling and shipping.

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Sample identification

Each sample collected for the VCA will be assigned a unique sample tracking number. The tracking system will consist of the SWMU designation, an alpha-numeric code that identifies the sample medium, location, sample depth (for soil), and the sampling date. Any other pertinent information regarding sample identification will be recorded in the field logbooks.

The alpha-numeric coding to be used in the sample numbering system with subsequent definitions, and examples is explained as follows:

SWMU A, B, C,...U - SWMU Designation

Medium - Sample Point - Date - QA Designation

Medium = GW, Ground Water Sample
SS, Soil Sample
SD, Sediment Sample
SG, Soil Gas Sample

Sample identification

Sample Point = EW, Existing Wells will be labeled as identified in the field.
MW, New Wells
001, 002,.., Sample location #

Date = Day/month/year expressed as 00MON00

QA Designation = None, Actual Sample
D, Duplicate
T, Trip Blank
R, Rinsate Blank

An example of such a designation follows:

SWMU A-GW-MW001-09NOV94

This designates the actual sample from the newly installed ground water well at SWMU A, number MW001 collected on November 9, 1994.

SWMU A-GW-MW001-09NOV94-D

This is the designation for the duplicate of the above sample.

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Sample handling, packaging and shipping

Sample handling includes the field related considerations connected with the selection of sample containers and preservatives, allowable holding times, and indication on the COC of the analysis requested. The VCA Sampling Plan defines the sample handling requirements contained in AWD SOP 7. Samples to be analyzed off-site will be labeled, and transferred directly to the appropriate decontaminated shipping container, accompanied by the COC form. The only preservation requirement for the samples collected during this project is that they are maintained at a temperature of 4°C. This will be accomplished by placing either blue ice coolant packages or double-bagged wet ice around the samples bottles during shipment. Shipping containers will conform to all laboratory QAP requirements, which in turn must conform to all Department of Transportation (DOT) requirements.

Internal field QC checks

Field quality control checks will include the review and approval of all field documentation by the Site Manager and/or Project Manager. Signature or initial approval of field documentation will indicate that the provisions outlined in the DQAP, Sampling Plan, and SSHP have been appropriately implemented.

In addition, the Site Manager will perform continuous daily oversight of the field activities. Conformance with established procedures will be checked and documented in the field logbook. Non-conformance will be corrected and reported to the Project Manager orally followed by written documentation for inclusion into the project file.

Blank contamination assessment

A blank contamination assessment will be performed to determine the impact of contaminant contributions originating from non-point sources. These potential sources include field sampling procedures, sample shipment, and the laboratory environment. The potential field sampling contamination will be assessed through the evaluation of trip blanks and rinsate blanks.

Trip blanks are defined as a standard matrix sample that does not contain any of the chemical compounds/analytes of concern to the project, and are transported with the environmental samples to the laboratory to determine if contamination was introduced during shipment.

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Blank contamination assessment (continued)

Rinse blank samples will be collected to evaluate the effectiveness of sampling decontamination and to assess potential field cross-contamination. The associated contaminants and samples will be identified for each rinse blank.

A laboratory blank contamination assessment will be performed to determine potential sample contamination contributed by the laboratory environment.

Method blanks will be processed at the beginning of each analytical run by the laboratory to determine whether the internal laboratory environment, reagents used during analyses, analytical techniques, or the instrumentation system were sources of contamination that could affect the integrity of the sample.

The criterion for the evaluation of blank contamination applies to any blank associated with the samples and states that no contamination should be in the blank. If contamination is detected, all data associated with the blank will be carefully evaluated to determine if there is an inherent variability in the data for the lot, or if the problem is an isolated occurrence not affecting all samples in the lot. In cases where more than one blank is associated with a given sample, qualification will be based upon a comparison with the associated blank having the highest concentration of the contaminant.

Sample results greater than the Method Detection Limits (MDLs), for target analytes of concern but less than five times the concentration detected in any blank will be qualified as undetected for inorganic constituents.

The criteria for organic contamination will be dependent upon whether or not the contamination is a common laboratory contaminant. Contaminants are reported as non-detected when the sample concentration is greater than the MDL but less than five times the amount detected in the associated blank. Sample results will be qualified accordingly for organic constituents: (1) the sample result is reported as non-detected when the compound concentration is greater than the MDL but less than ten times the amount in any blank for common laboratory contaminants, (i.e., methylene chloride, acetone, toluene, 2-butanone (MEK), carbon disulfide, and common phthalate esters); and (2) the sample results for other contaminants are reported as non-detected when the sample concentration is greater than the MDL but less than five times the amount detected in the associated blank.

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Calibration procedures and frequency

The calibration and maintenance history of instruments used to take measurements and analyze samples is an important aspect of the project's QA/QC program. As an activity which affects data quality, instrument calibration and maintenance will be performed in accordance with established procedures, manufacturers guidelines and conducted by trained personnel.

Field instruments and equipment

The calibration and general maintenance of field instruments is the responsibility of the Site Manager or his designated personnel. A field logbook will be maintained by these individuals to document calibration, maintenance, and status of all instruments used during the VCA investigation. The calibration record will contain, but not be limited to, the following information:

- Date and time of calibration;
- Type of equipment and identification number (such as serial number);
- Reference standard used for calibration;
- Calibration procedure used;
- Name of person conducting the calibration; and
- A list of the field equipment scheduled for use during the investigation. A schedule of the equipment to be used, the frequency of calibration and field maintenance is presented in the Sampling Plan. Field instrument calibration will be performed following the manufacturer's directions.

Equipment that fails calibration or becomes questionable or inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to approved QA standards by the Site Manager or qualified personnel, as appropriate. Equipment that cannot be repaired will be replaced.

Results of activities performed, using equipment that has failed recalibration, will be evaluated by the Site Manager. If the activity results are adversely affected, the results of the evaluation will be documented, the project manager notified, and a decision made regarding the validity of the results.

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Laboratory instruments

Calibration of analytical instruments is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet the specified data quality objectives. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the range established for the analytical method. Frequency of calibration is discussed below. Concentration of standards is suggested by the manufacturers's guidelines and the established USEPA methods.

Calibration procedures for laboratory instruments will generally follow the frequency and procedures established by the manufacturer, the USEPA, and as outlined in the LQAP.

Detailed records will be maintained in a dedicated logbook for each piece of laboratory equipment. Calibration records may include, but are not limited to, the following:

- Type and identification number of instrument;
- Calibration dates;
- Identification of individuals or organization performing the calibration;
- Identification of calibration procedure used;
- Accepted calibration tolerance;
- Reference standards;
- Calibration data;
- Documents of calibration provided by the manufacturer and external agencies showing traceability to a national standard;
- Information on calibration acceptance or failure and any maintenance performed; and
- Required maintenance or repair work requiring recalibration or calibration checks.

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Laboratory documentation

Upon receipt of the environmental samples, all samples will go through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation. All samples will be carefully checked for proper COC records, broken or leaking sample containers, proper label identification, and any associated discrepancies. If any samples arrive leaking, broken, or the custody seal on the shipment coolers is not intact, the laboratory will immediately notify the Project Manager of the problem(s). The verbal communication will be followed with a written memo for inclusion into the project file.

If no discrepancies are identified, the sample COC record will be signed and the samples will subsequently be assigned a unique laboratory identification number through a computerized system which will be used to store and transfer all essential laboratory project information. The computerized system, coupled with an internal chain-of-custody procedure, will ensure that the samples are appropriately tracked from storage through the laboratory system until the analytical process is complete. If a discrepancy in the COC is identified, the laboratory will immediately contact the Project Manager. Upon completion of the analytical process, the original field COC will be returned with the analytical data for inclusion into the central project file.

Complete and accurate documentation of analytical and procedural information is also an important part of the QA/QC program. These activities will be documented with the use of Standard Operating Procedures (SOPs), a laboratory data management system, laboratory bench sheets, laboratory notebooks, and orderly project files.

Details of analytical and QC protocols are contained in laboratory-specific SOPs. SOPs are documents which contain detailed information on the requirements for the correct performance of a laboratory procedure or analysis. All SOPS are approved by the laboratory QA Department before being implemented. Four categories of laboratory SOPs may be utilized:

- SOPs for performance of an analytical method;
- SOPs for preparation of standards and reagents;
- SOPs for equipment operation, calibration, and maintenance; and
- SOPs for general laboratory procedures.

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Laboratory documentation (Continued)

Laboratory bench sheets are used to document information from routine laboratory operations including sample preparation and analysis. Bench sheets are used to ensure that the information is recorded in a complete and organized manner and that the analysis can be reconstructed, if necessary.

Information typically recorded in laboratory notebooks includes unusual observations or occurrences in the analysis of samples, or methods development information. Each page in a laboratory notebook is initialed and dated as information is entered.

Laboratory project files

A project file will be created by the laboratory. The project file will contain all documents associated with the project including correspondence from the client, copies of the COC records, raw data, copies of entries from laboratory notebooks which pertain to the project, and a copy of the final report. When a project is complete, all records are passed to the Document Custodian who inventories the file, checks for completeness, and puts the file into document archive.

A project file containing complete documentation will be maintained by the AWD Project Manager. This file will include project plans (i.e., Sampling Plan, DQAP), field logbooks, and data packages provided by the laboratory including all QC documentation, data review notes, pertinent references and literature citations, report notes and calculations, progress and technical reports, correspondences and other pertinent information. The project file system is discussed in Section 1 of the Data Management Plan.

Sample storage procedures and holding times

Sample storage procedures at the laboratory are designed to ensure that internal laboratory custody of the samples is maintained, thermal preservation requirements are satisfied, and any potential contamination during storage is minimized. After log-in, the samples are placed in primary refrigerated storage units until removed by authorized personnel for sample preparation or analysis. The refrigerator temperatures, which are maintained at 4°C (+/- 2°C), are monitored daily using properly calibrated thermometers, and appropriate corrective actions are taken if temperatures fall outside of the required range.

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Sample storage procedures and holding times (continued)

The bottles containing samples to be analyzed for volatile organic compounds are stored in a special refrigerator separate from other sample aliquots; the remaining sample bottles are stored in either of two large walk-in refrigerators. These units, and the primary extract storage unit, are equipped with air cleaning systems to remove any potential airborne contaminants. No reagents, standard solutions, or sample extracts are stored in refrigerators that are used for the storage of samples.

Samples collected on Saturdays and Sundays will be shipped to the laboratory on the following Monday. The laboratory will adhere to the sample holding times specified by the analytical methodologies as shown in the table below.

Holding Times for Soil, Sediment, and Aqueous Samples		
Analysis/Method	**Soil/Sediment**	**Aqueous**
Volatile Organics 8240	14 days	14 days
Semi-Volatiles 8270	7 days until extract, 40 days after extract	7 days until extract, 40 days after extract
Appendix IX VOAs Semi-Volatiles Pesticides/PCBs OP Pesticides Herbicides Dioxins/Furans Metals Cyanide Sulfide	 14 days 7 days until extract, 40 days after extract 7 days until extract, 40 days after extract 7 days until extract, 40 days after extract 7 days until extract, 40 days after extract 7 days until extract, 40 days after extract 180 days 14 days 7 days until extract, 40 days after extract	Not Applicable
TCLP Metals	180 days	180 days

Sample preparation

Sample preparation will be performed as described in the applicable analytical methodologies.

DATA REDUCTION, VALIDATION, AND REPORTING

Laboratory data packages

The laboratory will perform in-house analytical data reduction and validation of chemical analyses under the direction of the project management staff and laboratory QA officer. A case narrative, prepared by the analytical laboratory, describing any anomalies or data qualifications addressing the preliminary data quality will be submitted to AWD's Project Manager or designee with every data package transmitted.

Data reduction, validation, and reporting by the laboratory will be conducted as follows:

- Raw data produced by the analyst are reduced and checked by the analyst following laboratory SOPs.
- A designated second reviewer will independently review the data for attainment of quality control criteria.
- Upon acceptance of the data package by the independent reviewer(s), a technical report is assembled and reviewed by the work group manager prior to release.
- The QA Department will randomly review, at a minimum, 5 percent of the project reports.

Complete data reduction and reporting procedures will be those specified by the Laboratory Quality Assurance Plan.

Laboratory data reporting procedures

The reporting procedures at a minimum will be as follows:

- Preliminary data results will be prepared and faxed to the AWD Project Manager on an on-going basis. All final results will be submitted in formal Technical Reports, with statements of accuracy and precision, to the AWD Project Manager.
- AWD will review the submitted data package for completeness and validity.
- If the data are not acceptable because of non-conformance, the laboratory will be notified orally and in writing, and corrective actions will be instituted.

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Laboratory data reporting procedures (continued)

- If the data are unacceptable after the implementation of the required corrective action measures, the data will be reviewed by project management for inclusion in the VCA Summary Report and additional corrective actions may be implemented.

The laboratory will prepare and retain full analytical and QC documentation. Such retained documentation need not be hard (paper) copy, and may be in other storage media (e.g., magnetic tape).

The specific data items required in each analytical technical report submitted to AWD will include, but are not limited to the following items:

- Cover sheet listing the samples included in the report and narrative comments describing problems encountered during analysis;
- Tabulated results of the compounds identified and quantified;
- Analytical results for QC matrix duplicates, matrix spikes, matrix spike duplicates, field blanks, method blanks, initial and continuous calibration, verifications of standards and blanks, and laboratory control samples, where applicable;
- instrument chromatographs (or legible copies);
- Data system print outs (or legible photocopies) identifying date of analysis, analyst, comments, parameters analyzed, calibration curve, calibration verifications, method blanks, samples, and any dilutions, sample duplicates, spikes, and control samples, where applicable; and
- Photocopies of laboratory notebooks relevant to the analytical data set.

Chemical data assessment

AWD's assessment will be accomplished under direction of the Project Manager. The data assessment will be based on the criteria that the sample was properly collected and handled according to the Sampling Plan and DQAP, and the information submitted by the laboratory.

A project team member will conduct the review of all data packages upon receipt for compliance with the established QC criteria based on the spike, duplicate, and blank results provided by the laboratory.

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Chemical data assessment (continued)

The review will be initiated based on the case narrative supplied with each data transmittal by the analytical laboratory. The case narrative will identify problem areas (if any) encountered during the analytical process.

If any out-of-control data points or data omissions are identified, AWD will interact with the laboratory to correct data deficiencies before any data will be considered acceptable. Recommendations to repeat sample collection and analyses may be made by the Project Manager based on the extent of the deficiencies and their importance in the overall context of the project.

Corrective action

When errors, deficiencies, or out-of-control situations exist, the QA program provides systematic procedures, called corrective actions, to resolve problems and restore proper functioning to the sampling and/or analytical system.

Field corrective action

The Site Manager will review the procedures being implemented in the field for consistency with the established protocols. Sample collection, preservation, and labeling, etc., will be checked for accuracy and completeness. Where procedures are not strictly in compliance with the established protocol, the deviations will be documented and reported to the AWD Project Manager. Corrective actions will be defined by the Site Manager and Project Manager and documented as appropriate. Upon implementation of the corrective action, the Site Manager will provide the Project Manager with a written memo documenting field implementation. The memo will become part of the project file.

Laboratory corrective action

Data will be reviewed to ensure that all quality control samples have been run as specified in the protocol. This review will include calibration procedures, frequency, and results. Instrument maintenance logs may also be checked. Recoveries of matrix spike samples will be checked for consistency with method accuracy, and matrix spike duplicate samples will be checked with method precision. Where sample results fall outside of the acceptable ranges, deficiencies will be reported to the AWD Site Manager who will immediately report the discrepancies to the Project Manager. Corrective actions will be defined by the Site Manager in conjunction with the Project Manager and documented as appropriate.

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Laboratory corrective action (continued)

Laboratory personnel are trained to be alerted that corrective actions may be necessary if:

- QC data are outside the acceptable windows for precision and accuracy;
- Blanks, or control samples contain contaminants above acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by the QA Department during internal or external audits or from the results of performance evaluation samples; or
- Inquiries concerning data quality are received from clients.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, etc. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA Department for further investigation. Corrective action may include, but is not necessarily limited to:

- Re-analyzing suspect samples;
- Re-sampling and analyzing;
- Evaluating and amending sampling and/or analytical procedures;
- Accepting data with an acknowledged level of uncertainty;
- Re-calibrating analytical instruments; and/or
- Discarding the data.

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Laboratory corrective action (continued)

Once resolved, full documentation of the corrective action procedure is performed. Depending on the severity of the problem, a corrective action memo will be provided to the AWD Project Manager for inclusion in the project file. Routine corrective actions that are performed during sample preparation and analysis will be summarized in the technical report narrative.