QUALITY ASSURANCE PROJECT PLAN FOR REMEDIAL INVESTIGATION WORK PLAN NEW YORK STATE TITLE 14 BROWNFIELD CLEANUP PROGRAM HUXLEY ENVELOPE SITE, 145 WEST STREET GREENPOINT, NEW YORK

Prepared For:

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Submitted To:

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APPENDICES

1. INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared as a supplement to the Remedial Investigation Work Plan for investigation of the site known as Huxley Envelope Industrial Site (the "Site"). The site has been accepted into the Brownfield cleanup program.

This site specific QAPP describes the measures to be taken in the field and in the laboratory to ensure that samples collected during the investigation are collected, handled, and analyzed in an appropriate manner. This QAPP was developed to assure that all environmental data generated for the New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation are scientifically valid, representative, and of known and acceptable precision and accuracy.

This QAPP builds upon prior work and earlier submissions. Familiarity with the Site and these prior submissions is assumed.

2. PROJECT DESCRIPTION

The site is located on the eastern shore of the East River; approximately 200 feet frontage.

The project is located in the Greenpoint Area of Brooklyn, New York. The project consists of a new 39 story residential tower with two 5-story wings and a 6-story building, totaling 716, 981 gross square feet on a 123,363 SF site, with 2 levels of above grade parking and a ground floor commercial and community areas. The 39-story tower, a Huron Street wing and a India Street wing will consist of market rate condo or rental apartments. The West Street building will consist of affordable rental housing and ground floor commercial space.

Development will include three residential lobbies, which include a main lobby to the market rate building and main and secondary lobby to Affordable Housings. In addition, the Market Rate building has two entrances/exits from Huron and India streets for move-in, service and egress. The Huron and India Street wings will have connections to the main lobby. The elevator/stairs core from these wings will also have egress exits / accessed from the Huron and India Street sidewalks. The 39 story tower lobby will be located on a private drive to be constructed between Huron and India streets between the building and the river. The lower income rental housing main lobby will be located on India Street and secondary lobby at Huron Street. There will be a full time concierge at the market Rate condominium/rental lobby, and security guard at the Affordable Housing lobbies, which will allow for 24 hour controlled access. The condominium/rental lobby at Market Rate building and Affordable Housing will be double height space and will include waiting areas, package rooms and mailrooms.

A retail space has been allocated on street level at West Street. In addition to this, the Community and Commercial spaces were allocated on a street level from Huron and India streets. These areas will be planed as open spaces for the future tenants fit-out. The commercial of 19,996 square foot and community spaces of 4096 square foot open area would allow for future division of the space and access from sidewalk grade level.

The development will include a waterfront promenade and park, accessible to the public during daylight hours via India Street and Huron Street.

Identification of areas of concern, sampling grid layout, sampling locations, and monitoring well locations will be as described in the Remedial Investigation Work Plan.

3. PROJECT ORGANIZATION AND RESPONSIBILITY

This section of the QAPP details the specific roles, activities, and responsibilities of key project participants, as well as the lines of responsibility and communication within and between organizations. Galli Engineering has been contracted by 145 West Street, LLC to provide services pertaining to the planning and implementation of remedial measures at the site, as required under the BCP.

Galli Engineering's technical program management responsibility resides with Mr. Richard Galli, President and Project Director. The Project Director will assign senior technical personnel to provide their expertise for the required technical activities and will assure consistency in technical approach and product deliverables. On a project specific basis, Mr. Galli is responsible for technical review of reports to ensure that the quality of data and reports are technically sound and complete, and suitable for the project objectives. Mr. Galli will report technical progress to communications recipients as specified in the Brownfield Cleanup Agreement (BCA).

The Galli Engineering project manager, a senior scientist or engineer, will supervise technical activities and will draw from Galli Engineering's staff of qualified specialists, which includes hydrogeologists, engineers, environmental scientists, to perform the specific project activities associated with this groundwater monitoring program. The organizational structure provided below assures that the Galli Engineering team is responsive and that there is a direct line of communication to senior management, the client and the NYSDEC. The project organization chart is presented in Figure 1. The project personnel and their responsibilities are indicated below.

- Project Manager (Ken Brooks, PE, Senior Vice President and Director of Environmental Services) – The Project Manager will ensure that the overall project objectives are met and that the work plan, QAPP and health and safety plan (HASP) are followed throughout all phases of this project. He will be responsible for the development and implementation of the sampling work plan, as well as the assignment of field sampling personnel and the coordination of all project activities and subcontractors. He will be responsible for the submission of samples to the analytical laboratory, and will be the recipient of analytical and field reports. He is responsible for the compilation of data and technical report preparation. He will convey data to the Quality Assurance Coordinator for review.

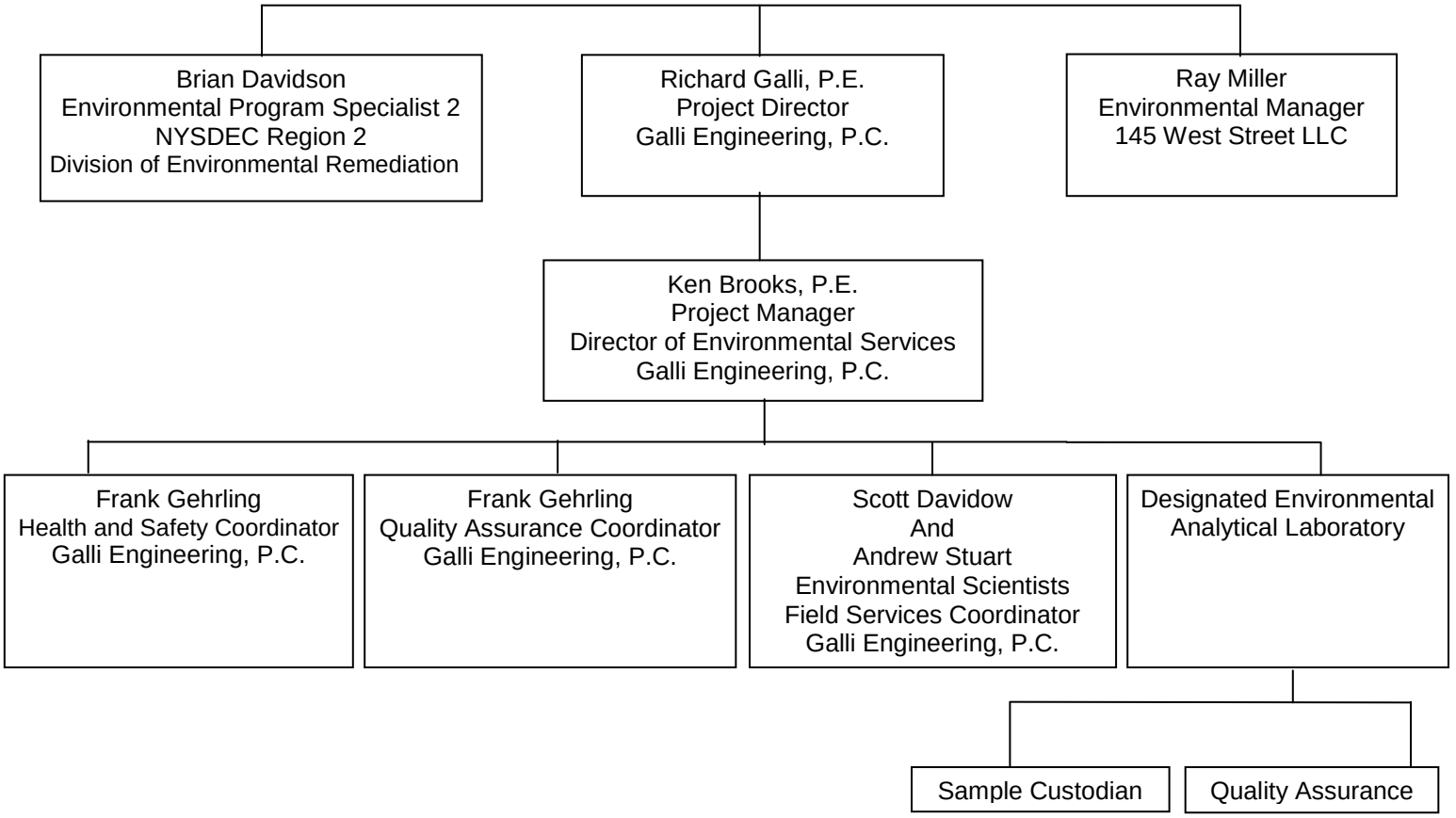
- Quality Assurance Coordinator (Mr. Frank Gehrling, Senior Geologist) – The Quality Assurance Coordinator (QAC) will be responsible for ensuring that the quality of the data and the reports are suitable for the project objectives. His primary QA responsibilities will be to provide review and guidance on all quality aspects of the project. He will review and validate all sample collection procedures and analytical results. As the QAC, he will have authority to approve or disapprove project work plans, specific analyses and final reports. The QAC will work closely with the laboratory, the project manager and field personnel to ensure that the QAPP is being implemented. The QAC will report to the Project Manager.

- Health and Safety Coordinator (Mr. Frank Gehrling, Senior Geologist) – The Health and Safety Coordinator (HSC) will be responsible for implementation of the Site Health and Safety Plan (HASP) that conforms to applicable health and safety requirements to ensure that health and safety is not compromised during on-site environmental activities. The HASP provides site task specific health and safety requirements that are to be followed during fieldwork to ensure that workers are properly protected while meeting the objectives of the QAPP.

- Field Services Coordinator (Mr. Scott Davidow, Environmental Scientist) – The Field Service Coordinator (FSC) will be responsible for sample collection and monitoring activities at the site. The FSC will ensure that sample collection is performed according to methods detailed in Section 5 of this report, entitled Sampling Procedures, and will ensure that the requirements and objectives of the QAPP for the collection are met.

- Laboratory Sample Custodian – The laboratory sample custodian will be responsible for receiving, logging and storing samples as they are submitted to the analytical laboratory from Galli Engineering. The sample custodian will ensure the completeness of the chain of custody form, which contains specific information such as sample collection data, analytical parameters, and analysis priority. The sample custodian will also ensure that holding times are within requirements and that sample custody is maintained.

Figure 1. Project Organization Chart



4. MEASUREMENT PERFORMANCE CRITERIA

4.1. DATA QUALITY OBJECTIVES

The overall objective of the sampling and analysis activities addressed herein is to achieve an acceptable level of confidence in the analytical data generated in order to evaluate the quality of soil and groundwater at the subject property. These data will be used to confirm the level of contamination on-site pursuant to the BCP; to characterize the soil for removal from the site; to determine if groundwater impacts have occurred; and to confirm that program-required cleanup objectives have been met. The methods and the procedures used to implement and achieve the data quality objectives (DQOs) are described throughout this QAPP.

Data Quality Objectives are qualitative and quantitative statements that specify the purpose, quality, and/or quantity of the environmental data required to support management and remedial decisions at the site. DQOs are predicated in accordance with the anticipated end uses of the data that is to be collected. Data collected typically will be used to meet the following DQOs:

- Determine if there is an immediate threat to public health or the environment.
- Locate and identify potential sources of contamination.
- Characterize the extent of impact from contamination.
- Determine if there is a long-term risk from exposure to the site.
- Determine potential remediation and long-term stewardship strategies (if necessary).

Data quality indicators (DQI) are qualitative and quantitative descriptors used to interpret the degree of acceptability or usability of data. The five principal DQIs are (1) precision, (2) accuracy, (3) representativeness, (4) comparability, and (5) completeness. Representativeness and comparability are qualitative parameters incorporated into the design and rationale of the sampling plan. Representativeness is achieved by selecting sampling locations that typify the survey areas. Comparability of data is accomplished by using only New York State Department of Environmental Conservation (NYSDEC) or United States Environmental Protection Agency (U.S. EPA) approved sampling and analytical methods. The three quantitative measurements, precision, accuracy, and completeness, are defined below.

When analyzing environmental samples, all measurements will be made so that results are

reflective of the medium and conditions being measured. The level of detail and data quality needed will vary with the intended use of the data. DQOs typically are assessed by evaluating the precision, accuracy, representativeness, completeness, and comparability of all aspects of the data collection process, defined as follows:

4.1.1. Data Precision

Precision is a measure of agreement among replicate measurements of the same property under similar conditions. Precision is achieved by using consistent sampling procedures and measurement techniques established for a parameter or an analyte ("prescribed similar conditions"). Precision is assessed through calculation of relative percent difference (RPD) or relative standard deviation (RSD). Precision is calculated for laboratory duplicates, field duplicate samples, and matrix spike/matrix spike duplicates (MS/MSD). Field duplicate samples will be collected at a frequency of one per sample batch.

Laboratory duplicate samples, separate from field duplicate samples, will be analyzed to gauge analytical precision. The designated laboratory will analyze duplicate samples for each matrix under investigation at the frequency specified in Section 10 of this QAPP. Representative samples will be selected and analyzed in duplicate, and two portions of a representative sample will be spiked with matrix compounds and analyzed in duplicate. The results of these two analyses will be compared to assess the precision of the analytical system. Table 4.1 lists acceptance criteria for accuracy, precision, and completeness for each of the analytical methods specified. The criteria (predetermined acceptance limits) are expressed as numerical values.

4.1.2. Accuracy

Accuracy is the measure of the propinquity of an individual measurement or average number of measurements to the true value (known concentration). Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations. Accuracy is expressed as the percent difference between a measurement and an accepted or true value.

4.1.3. Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected under ideal conditions. Completeness (percent) is calculated by dividing the number of valid measurements by the number of planned measurements and multiplying by one hundred. Valid measurements include unqualified and estimated results that are usable for data interpretation. Estimated results cannot be verified as precise and accurate, but may be usable as long as associated limitations are considered by the data users and project DQOs can be met. Rejected results or results not reported due to sample loss or error negatively impact completeness. Completeness goals for groundwater samples are more stringent due to the small number of groundwater samples scheduled for collection.

Completeness will be evaluated by carefully comparing project objectives with the proposed data acquisition scheme and the resulting potential data gaps in the required information. The goal for completeness for this project is greater than 95 percent.

4.1.4. Representativeness

Representativeness is the degree to which sampling data accurately and precisely depicts selected characteristics such as parameter variations at a sampling point or an environmental condition.

4.1.5. Comparability

Comparability is the degree of confidence with which one data set can be compared to another.

To assess if environmental measurements are of an appropriate quality, the general requirements above will be examined and compared to agency-recommended parameters when available. Calculation of precision and accuracy should be specified in the site-specific work plan and/or SSQA. Samples should be collected in a manner so they are representative of both the chemical composition and physical state of the sample at the time of sampling. To ensure comparability, all data will be reported as ^{o}Celsius (flash point), pH units, µg/l or mg/l for water and liquids, µg/kg or mg/kg for soil, sediment or other solids, and mg/m^3 for air. Comparability is further addressed by using appropriate field and laboratory methods that are consistent with current standards of practice as approved by EPA.

Table 4.1 Reporting Limits and Analytical Data Quality Objectives For Groundwater Analysis

Analysis	Reference Method	Units	Target Reporting Limits	Precision Objectives		Accuracy Objectives		Completeness (%)
				Field Duplicate Analysis (RPD)	MS/MSD Duplicate Analysis (RPD)	Matrix Spike Analyses (%Recovery)	Laboratory Control Sample Analyses (%Recovery)	
Cyanide	(SW846) EPA 335.2/9010	ug/l	10	< 50	< 20	80-120	80-120	95
Hexavalent Chromium	(SW846) EPA 218.5/7196	ug/l	10	< 50	< 20	85-120	85-120	95
Antimony	(SW846) EPA 204.2 or 200.7	ug/l	60	< 50	< 20	85-120	85-120	95
Arsenic	(SW846) EPA 206.2	ug/l	10	< 50	< 20	85-120	85-120	95
Beryllium	(SW846) EPA 210.2	ug/l	5	< 50	< 20	85-120	85-120	95
Cadmium	(SW846) EPA 213.2 or 200.7	ug/l	5	< 50	< 20	85-120	85-120	95
Chromium	(SW846) EPA 218.2 or 200.7	ug/l	10	< 50	< 20	85-120	85-120	95
Copper	(SW846) EPA 220.2 or 200.7	ug/l	25	< 50	< 20	85-120	85-120	95
Lead	(SW846) EPA 239.2 or 200.7	ug/l	3.0	< 50	< 20	85-120	85-120	95

Analysis	Reference Method	Units	Target Reporting Limits	Precision Objectives		Accuracy Objectives		Completeness (%)
				Field Duplicate Analysis (RPD)	MS/MSD Duplicate Analysis (RPD)	Matrix Spike Analyses (%Recovery)	Laboratory Control Sample Analyses (%Recovery)	
Mercury	(SW846) EPA 245.2	ug/l	0.2	< 50	< 20	85-120	85-120	95
Nickel	(SW846) EPA 249.2 or 200.7	ug/l	40	< 50	< 20	85-120	85-120	95
Selenium	(SW846) EPA 270.2 or 200.7	ug/l	5.0	< 50	< 20	85-120	85-120	95
Silver	(SW846) EPA 272.2 or 200.7	ug/l	10	< 50	< 20	85-120	85-120	95
Thallium	(SW846) EPA 279.2 or 200.7	ug/l	10	< 50	< 20	85-120	85-120	95
Zinc	(SW846) EPA 289.2 or 200.7	ug/l	20	< 50	< 20	85-120	85-120	95

ug/l – microgram per liter

MS/MSD – matrix spike, matrix spike duplicate

RPD – Relative Percent Difference

SW – Soild Waste

TABLE 4.2 DUPLICATE FREQUENCIES

ACTIVITY	FREQUENCY	BENEFIT
Field Duplicate	one in 20	Data shows precision of analytical scheme from sampling through analysis when compared with results of sample. This represents a blind QC sample to the laboratory. Collect an additional amount of sample.
Laboratory Duplicate	one in 20	Data shows precision of the analytical scheme within the laboratory. The difference between this precision and that of the field duplicate represents the precision of the analytical method.
Laboratory Spike	one in 20	Data shows how well the analysis of interest can be performed, and recovered from the sample matrix. Such information is useful when reported value is near an action level, but the sample exhibits poor recovery.
Matrix Spike Matrix Duplicate (inorganic)	one in 20	Data shows precision of laboratory analysis when compared with results of sample. Collect an additional amount of sample for each analysis. Analyzed as unspiked sample.
Matrix Spike (inorganic)	one in 20	Data shows matrix effects from recovery of spiked analysis. Collect an additional amount for each analysis. Analyzed as a spike sample.
Matrix Spike/Matrix Spike Duplicate	one in 20	Data shows precision of analysis when compared with matrix spike duplicate and matrix effects from recovery of spiked analysis. Collect an additional amount for each analysis. Analyzed as a spike.
Field Blank/Equipment Blank	As required by the DQOs	Data demonstrates that sampling equipment was clean prior to use. Pass a sample of reagent water through collection device. Submit for analysis of analytes of concern.
Trip Blank	As required by the DQOs	Data demonstrates that sample was not contaminated with volatile organics by other samples in shipping container, laboratory or outside influences.
Background or Reference Sample	As required by the DQOs	Data provides baseline information to evaluate environmental impact.
Split Samples/Inter-laboratory Split Sample	When required to meet DQOs	Compare the quality of laboratory procedures of the permittee with State contracted laboratory procedures. Collect an additional amount of sample for each analysis.

NOTE: This table is provided to serve as a guide only; AQA/AQC sample requirements should be developed on a site-specific basis. Laboratory blanks and surrogate spikes are method specific and are not included in this table (see NYSDEC ASP). For information on sampling refer to the *NYSDEC, Division of Water Sampling Manual.*

5. SAMPLING PROCEDURES

In order to achieve the Data Quality Objectives, soil and groundwater samples will be collected from a sampling grid.

The following sections describe the sampling procedures for the collection of groundwater samples at the subject site, as well as the quality control requirements.

5.1. SOIL SAMPLES

5.1.1. Soil Sample Collection

Soil boring sampling will be via a Macro-Core sampler utilizing single use, clear acetate liners. A new liner will be utilized each time the sampler is placed in the Geoprobe. The liner will be removed from the sampling tool and split by the driller. The soil in the split tube will be quickly screened with the PID to detect volatile organic compounds. Discrete soil samples will be taken from the tube either by gloved hand or utilizing single use scoops. Samples will be of two types: grab and borehole composite. A grab sample for Volatile Organic Compounds will be taken from the soil that generates the highest PID reading from the split sample tubes for that borehole. A grab sample of the area along the acetate liner with the elevated PID reading will be sampled and placed in a new 2-oz laboratory glass jar. The rest of the borehole sample soil will be placed in a new 1-gallon plastic freezer bag. This will be repeated until the push probe reaches the planned depth (approximately 8 to 12 feet), which is the base of planned excavation. Composite samples will be prepared from the bags of soil that represent the borings from each grid.

The above sampling method for VOCs in soil is meant to minimize the disturbance of the sample; and thereby maximize the amount of VOC retained in the sample. The grab sample retained with the highest PID reading would be analyzed for VOC. This sampling method would bias the sampling for VOC in soil toward the sample with the highest VOC reading in the multiple samples collected for the composite sample. Sampling for VOC from the bulk of the composite sample is not to be done to minimize VOC off gassing from mechanically working the sample. These PID readings are to be recorded, but not to be compared to any external standard.

5.1.2. Sampling Handling and Analysis

The samples from each boring in the one gallon sample bags will be combined by placing into a stainless steel bowl and forming a mixture of all the samples. A sample will be collected from the stainless steel bowl and placed in new 8 oz and 4 oz glass jars for laboratory analyses. The sample jars would be placed in a cooler on ice, with proper chain of custody and transported or shipped to a NYS DOH ELAP approved laboratory. These samples will be analyzed for:

Method 8260-Volatile Organic Compounds,
Method 8270-Semi-Volatile Organic Compounds,
Method 6010B/7471A-PP Metals,

The 2 oz sample jar with the highest PID reading will be analyzed for Method 8260-Volatile Organic Compounds. Additional environmental borings and waste characterization samples will be collected for Diesel Range Organics (DRO) analysis if there is evidence of a petroleum spill and the spill is reported to NYSDEC. Note: Soil Safe requires a higher rate of DRO sampling (1 per 100 cy) of petroleum spill contaminated soils for acceptance to their facility for disposal compared to a rate of 1 per 800 cy for the majority of the tests and is the preferred disposal facility for petroleum spill contaminated soils.

Some samples will be analyzed for additional parameters for waste characterization purposes. The frequency of such analyses will be determined by the anticipated disposal sites requirements, as will be the additional analytes, which could include:

Method 8082-PCB,
Method 8081-Pesticides,
Method 8015-Diesel Range Organics,
Full TCLP Method SW1311, and
Hazardous Waste Characteristics (Reactivity, Ignitability, and Corrosivity)
Paint Filter Test

Galli Engineering field sampling personnel will wear clean latex gloves (or equivalent) during all sample collection procedures and equipment decontamination. Gloves will be changed if they become soiled and at any time when starting at a new sample location to prevent cross

contamination. The contaminants present at this site will likely pose no significant risk due to the low level of contaminants; therefore, Level D personal protection is required.

5.2. GROUNDWATER SAMPLES

One set of groundwater samples will be collected from each of the four new monitoring wells and any existing monitoring wells that can be located and are deemed to be useable. The monitoring well locations are identified on the “”Boring and Monitoring Well Location Plan”, which is provided in Appendix A. All samples will be collected using methods consistent with Test Methods For Evaluating Solid Waste; SW-846, U.S. Environmental Protection Agency (EPA) Office of Solids Waste and Emergency Response, Washington, D.C. 3rd Edition 1986; and the U.S. EPA RCRA Ground Water Monitoring Technical Enforcement Guidance Document. Washington, DC. 1986.

Galli Engineering field sampling personnel will wear clean latex gloves (or equivalent) during all sample collection procedures and equipment decontamination. Gloves will be changed if they become soiled and at any time when starting at a new sample location to prevent cross contamination. The groundwater contaminants present at this site will likely pose no significant risk due to the low level of contaminants; therefore, Level D personal protection is required.

The monitoring well casings will be surveyed with reference to the nearest U.S. Geological Survey benchmark. The vertical and horizontal location of each well will be established to within 0.01 feet and 1-foot, respectively.

Water levels will be measured in the four new monitoring wells prior to sampling using a commercial electronic water level meter. The measurements are made by lowering a sensor slowly to the surface of water in the well. When the audible alarm sounds, the depth is recorded to the nearest 0.01 foot. This information will be used for well volume calculations and for determination of groundwater flow direction.

Once water level measurements have been recorded, the total volume of water in the well will be calculated (i.e., for a 2 inch well the volume is 0.16 gallons per one foot section of well casing which would be multiplied by the depth of water present in the well). This volume will be multiplied by the purging factor to determine the extraction volume. Galli Engineering’s

standard purging factor is five casing volumes; the exception to this standard is in the case of low yield wells. When purging low yield wells, the well is pumped to dryness once, and samples will be collected once sufficient sample volume is available. When full sample volumes cannot be collected due to time constraints or recharge rates, any samples will be collected within 24 hours of the end of the purge.

Galli Engineering will use either a stainless steel submersible pump or dedicated Teflon balers to purge the wells. If a pump is used, it will be selected to have a pump rate of less than one liter per minute. Dedicated drinking water grade polyethylene tubing will be used for pump discharges. If a submersible pump is used, it will be cleaned after use at each well according to the following parameters:

- Thorough wash of pump exterior with laboratory grade nonphosphate detergent in water;
- Laboratory grade nonphosphate detergent in water will be circulated through the pump for 5 minutes;
- Rinse the pump exterior and interior with deionized water;
- Rinse the pump exterior with laboratory grade isopropyl alcohol; and
- Air dry pump and cover with clean plastic.

The volume of purged water will be measured by discharging the pumped water to a volumetric container or measuring the time it takes to pump one container full, and determining the time necessary to purge five well volumes. The pump rate will be checked periodically, because it may decrease if the height of the water column changes. At no time during the purging will the pumping rate be high enough to cause the groundwater to cascade back into the well. This can cause excessive aeration.

In-situ field measurements for pH, specific conductivity, turbidity and temperature will be performed on ground-water samples from each monitoring well being sampled. These measurements will be taken at initiation of the well purge, throughout the purge, and at the end of the purge prior to the collection of samples for laboratory analysis. The parameters will be stabilized before measurements are recorded. The measurements for pH, specific conductivity, turbidity and temperature will be performed using a Horiba U-10 Water Quality Checker multiparameter instrument. All the reference parameters are automatically measured at once and the accuracy of the measurements for each parameter is provided in the following table.

TABLE 5.1

ACCURACY OF PH, SPECIFIC CONDUCTIVITY, TURBIDITY AND TEMPERATURE

Parameter	Range Of Measurement	Accuracy
pH	0-14 pH	0.1 pH
Conductivity	0-1 mS/cm 1-10 mS/cm 10-100 mS/cm	0.01 mS/cm 0.1 mS/cm 1.0 mS/cm
Turbidity	0-800 NTU	10 NTU
Temperature	0-50 ºC	1.0 ºC

The Horiba U-10 Water Quality Checker multiparameter instrument will be manually calibrated prior to the initial measurement of groundwater from each of the three monitoring wells, and will be automatically calibrated thereafter (instrument has auto-calibration procedure). The pH, specific conductivity, turbidity and temperature measurements will be recorded on the field data sheet designated for each monitoring well.

Since historical analytical data is available for the existing monitoring wells at the site, it has been determined that the groundwater will likely pose no significant risk due to the low level of contaminants; however, purge water will be containerized pending sample analysis. Purge water will be properly disposed in accordance with regulations based upon analytical results, including on-site release if appropriate.

Galli Engineering will use a dedicated single-use, bottom filling, environmental grade polypropylene bailer to obtain groundwater samples from each well. No field decontamination of bailers will be necessary. The bailers will be equipped with a new nylon line. A clean plastic surround will be used to cover the area around the well during sample collection. This plastic surround will prevent the nylon line from coming in contact with the ground, and will be disposed of after each use. Prior to sample collection, an aliquot of groundwater for in-situ measurements will be taken.

Samples collected from each of the monitoring wells will be analyzed for priority pollutant metals, VOCs, and SVOC,s.

Samples for dissolved metals analysis will not be filtered in the field consistent with guidelines presented in DER-10 at Subdivision 2.1(g). Permission to filter groundwater samples in the field may be requested in accordance with that subdivision in the event turbidity limits can not be achieved.

Sample containers to be used for the groundwater sample collection are specified by the analytical methodology. Galli Engineering will use new sample containers that are precleaned to U.S. EPA protocols, which are compatible with the analytes of interest. Chemical preservatives, where necessary, will be added by the laboratory prior to shipping sample containers. After a sample is collected, Galli Engineering's field personnel will take the necessary steps to preserve the chemical and physical integrity of the sample during shipment and storage prior to analysis. All samples will be capped immediately after sample collection and labeled. Table 5.2 lists the sample parameters, containers, preservation, holding times and the analytical methods.

TABLE 5.2

SAMPLING CONTAINERS, PRESERVATION AND HOLDING TIMES

PARAMETER	MATRIX	CONTAINER	PRESERVATION	HOLDING TIMES
TCL Volatiles	Aqueous	40 ml. VOA vial w/TFE lined septum cap	4°C (2)	5 days to extract, 40 days to analyze extract
TCL Semi-Volatiles	Aqueous	Amber glass w/TFE lined cap (1 liter)	4°C, 0.008% $Na_2S_2O_3$, store in dark	5 days until extraction 40 days from extraction until analysis (1)
TCL PCBs	Aqueous	Amber glass w/TFE lined cap (1 liter)	4°C, 0.008% $Na_2S_2O_3$, H_2SO_4 to pH 2-3, store in dark	5 days until extraction 40 days from extraction until analysis (1)
TCL Pesticides	Aqueous	Amber glass w/TFE lined cap (1 liter)	4°C, adjust pH to 5-9, store in dark	5 days until extraction 40 days from extraction until analysis (1)
TAL Metals (total)	Aqueous	Polyethylene 1 qt.	HNO_3 to pH<2.0 (2)	Hg 26 days All other metals 6 months
Chromium, Hexavalent	Aqueous	Polyethylene (100 ml)	4°C	24 hours
Total Phenols	Aqueous	Amber glass	4°C, 0.008%	5 days until extraction;

		w/TFE lined cap (1 liter)	$Na_2S_2O_3$	40 days from extraction until analysis
pH	Aqueous	None	None	Performed on-site
Conductivity	Aqueous	None	None	Performed on-site
Dissolved Oxygen	Aqueous	None	None	Performed on-site
Conductance	Aqueous	None	None	Performed on-site
Cyanide	Aqueous	1 liter polyethylene	4°C, NaOH to pH>12.0	12 Days
TPH by GC	Aqueous	Amber glass w/TFE lined cap (1 Liter)	4°C	14 days until extraction; 40 days from extraction to analysis

(1) Technical Times (time from sample collection until sample analysis) will be used to audit results.

(2) Acids will be procured from a chemical supplier, trace grade.

For solid samples being analyzed for any of the parameters listed in Table 3, the holding times are generally equal to or longer than the associated aqueous holding times. Given the Contract schedule for deliverables, it's recommended that the Contractor simply use the aqueous holding times as guidance for the timely analysis of samples. For exact holding time requirements, the laboratory should consult the applicable method documentation for the required holding times for matrices other than water. If the method documentation is unclear, the Contractor should consult with the NYSDEC BWAM.

Preservation for all solid samples for all analyses is limited to cooling to 4°C. Chemical preservation is only required for the low level analysis of volatile organics in soil using EPA Method 5035 (sodium bisulfate or methanol).

TCL Target Compound List

TAL Target Analyte List

Samples will be collected in the following order:

1. Volatile Organic Compounds
2. Semi-Volatile Organic Compounds
3. Priority Pollutant Metals (Total and Dissolved) - Antimony, Arsenic, Berylium, Cadmium, Chromium (total), Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc

Each set of groundwater samples will be packed in coolers inside separate, sturdy plastic bags to prevent cross contamination of samples. Ice, packed in separate plastic bags, will also be placed in the cooler. The samples will be packaged and cushioned to prevent breakage. The samples will either be shipped via overnight express delivery or will be hand delivered to the analytical laboratory.

6. DOCUMENTATION AND CHAIN OF CUSTODY

6.1. FIELD DOCUMENTATION

Galli Engineering field sampling personnel will collect and accurately record relevant sample collection information on a field sampling data sheet, which is legibly prepared and maintained for each sample location. The information documented on the field sampling data sheet includes the name of the person(s) performing the sample collection, the date, project information, site location information, time of collection, analytes to be tested, and other specific information as may be necessary. For groundwater samples, additional information will include monitoring well location and condition, well depth measurements, casing and screen interval information, top of casing elevation, depth to water in the well, volume of purged water for each sample location, etc. The pH, specific conductivity, turbidity and temperature with the time the measurement collection will also be recorded on the field sampling data sheets. The field sampling data sheets provide a record of tasks associated with sampling collection activities.

Galli Engineering field sampling personnel will prepare a label in indelible ink for each of the samples collected that includes the following information:

- Project Name
- Date And Time Of Sample Collection
- Sample Location
- Sample Number
- Sample Parameters And Matrix
- Name Of Sample Collector

A completed label will be affixed to each sample container and then covered with clear tape to help protect the label from moisture.

Documentation procedures should be conducted in accordance with EPA's record keeping requirements. Work plans and final reports will be generated and submitted to DEC for review and approval.

Field QA/QC documentation for site characterization reports and/or remedial action/risk management reports must consider the following details:

- Calibration and maintenance records for field instrumentation,
- Documentation of sample collection procedures,
- Reporting of any variances made in the field to sampling plans, SOPs or other applicable guidance documents,
- Reporting of all field analysis results,
- Documentation of sample custody (provide copies of chain-of-custody documents),
- Documentation of sample preservation, handling and transportation procedures,
- Documentation of field decontamination procedures (and if applicable, collection and analysis of equipment rinsate blanks),
- Collection and analysis of all required duplicate, replicate, background and trip blank samples, and
- Documentation of disposal of investigation-derived wastes.

6.2. SAMPLE CUSTODY

Proper Chain-of-Custody procedures will be implemented. Once a sample is collected, containerized, and labeled, Galli Engineering personnel will enter the appropriate information on the Chain-of-Custody form. This custody record will provide the necessary information to cross reference the sample number to the specific sampling location and will provide the date and time of collection as well as documentation of custody. The chain of custody document includes the following information:

- Project Name And Address
- Galli Engineering Project Manager
- Signature And Printed Name Of Sampler
- Date And Time Of Sample Collection
- Sample Type And Matrix
- Sample Number And Location
- Number Of Sample Containers Per Location
- Identification Of The Parameters For Which Sample Is To Be Analyzed
- Signature And Printed Name Of Relinquisher Of Samples
- Signature And Printed Name Of Receiver Of Samples
- Sample Turn Around Time

- QA/QC Type
- Any Comments And Special Instructions

A copy of a typical chain of custody document is provided in Appendix B.

All samples will be accompanied by a Chain of Custody form, which will be signed and dated with the time also referenced by Galli Engineering field sampling personnel. The Galli Engineering field sampling personnel will maintain custody of the samples until shipment or hand delivery to the analytical laboratory. Containers will be kept in a secure cooler, within visual contact of field sampling personnel, or in a locked vehicle or room. Only Galli Engineering field sampling personnel will have access to the samples. Chain of Custody documentation will accompany the samples to the analytical laboratory. If the samples are to be shipped, each sample container cooler will be affixed with a signed custody seal. The field chain of custody terminates upon laboratory receipt of the samples.

6.3. LABORATORY DOCUMENTATION

Once the samples reach the laboratory, the lab's sample custodian will accept custody of the samples and verify that the information on the sample labels matches that on the chain of custody form(s). The sample custodian will also check for any breakage or leakage that may have occurred during shipment or transport to the laboratory. The sample custodian will then enter the appropriate data into the laboratory tracking system during which a unique laboratory number will be assigned to each sample. The samples are then transferred to the appropriate analyst or the samples will be stored in a designated secure area.

Laboratory QA/QC documentation for site characterization reports and/or remedial action/risk management reports must consider the following details:

- If the published analytical method used specifies QA/QC requirements within the method, those requirements must be met and the QA/QC data reported with the sample results;

- At a minimum, QA/QC samples must consist of the following items (where applicable): method/instrument blank, extraction/digestion blank, initial calibration information, initial calibration verification, continuing calibration verification, laboratory fortified blanks/laboratory control samples, duplicate, and matrix spikes/matrix spike duplicates;

- Documentation of appropriate instrument performance data such as internal standard and surrogate recovery.

7. CALIBRATION PROCEDURES AND FREQUENCY

Calibration is the process of establishing the relationship of a measurement system output to a known stimulus or quantity. Generally, calibration procedures are required for both field and laboratory instrumentation. In essence, calibration is a reproducible reference point to which all sample measurements can be correlated. This section describes the calibration procedures and the calibration frequency.

7.1. FIELD INSTRUMENTS

The only field instrument to be used for groundwater sample collection at this site will be the Horiba U-10 Water Quality Checker multiparameter instrument for the measurement of pH, specific conductivity, turbidity and temperature. The Horiba U-10 will be manually calibrated according to manufacturer's instructions prior to the measurement of groundwater, and after data measurements are completed. Physical parameters (pH, temperature, conductivity, and turbidity) will be recorded. Calibration for pH, specific conductivity, and turbidity is done using commercially available laboratory grade standard solutions. The probe is rinsed with deionized water, and is then placed into a beaker containing the applicable standard solutions. The thermometric function does not require calibration.

The PhotoIonizationDetector is set up as follows:

Rae MiniRae 2000 P.I.D.
Operating Temp: 32 to 100°F or 0 to 43°C

Start-up/zeroing/Calibration

- Attach probe tip and hydrophobic filter by screwing it to the unit.
- Press the MODE button to turn the unit on and let it warm up for 5-10 minutes in clean ambient air.
- The unit will display its settings during the warm up sequence. NOTE: *If calibrating, now is a good time to fill a tedlar bag with isobutylene.*
- When the unit has finished its warm up it will display a ppm reading.
- To enter the calibration mode, simultaneously press the MODE and N/- buttons until the screen displays “Calibrate/ select Gas?”
- Press Y/+
- Ensure that the unit is drawing clean ambient air or from a zero air source.

- “Fresh air cal?” is displayed. Press Y/+.
- The unit will display “zero in progress” followed by “wait” and a 15 second countdown.
- When the unit is finished zeroing it will display “Zeroed! Reading 0.0 ppm.”
- Press Mode once.
- The unit comes from Pine Env. Set for 100 ppm Isobutylene. If your cal. Gas is 100 ppm isobutylene, skip the next five steps. If your gas is not 100 ppm, conduct the following:

Changing the span value

- From the “Span cal” screen, press the N/- button twice or until the screen reads
- “Change span value.” Press Y/+.
- The screen will read “Cal gas = isobutylene, Span value = 0100. “Press the Mode button to move to cursor, and the Y/+ and N/- buttons to increase/decrease the span value to match your cylinder.
- When finished changing the value, press and hold the MODE button.
- The screen will read “Save?” Press the Y/+ button to save. The screen will read “Saved.”
- Press the MODE button until “Span cal” is displayed.
- “Span cal? is displayed.
- Press Y/+. The screen will read “Cal gas = Isobutylene, Span value = 0100.0, Apply gas now!”
- Open and connect a full tedlar bag of isobutylene to the probe tip. If the pump sounds like its restricted, the bag is not enough. The unit will recognize the gas and start to span. The screen will read “Wait.” while it counts down from 30 seconds. Some newer units will display, “Update data” after the countdown.
- When the countdown is finished the screen will read “cal’ed reading = 100 ppm” It should read within a few ppm of the span value.
- Press MODE once. The screen will read “cal done turn off gas.” Remove and close the tedlar bag.
- Press the MODE button twice to return to the run mode. The unit should read 0.0 ppm without gas and 100ppm with gas.
- The P.I.D. is calibrated and now ready for use.

7.2. LABORATORY INSTRUMENTS

Laboratory instruments will be subject to all the QA/QC procedures stated in the lab's

qualifications and certifications packages. Before samples are analyzed on an instrument, chemical or physical calibration standards will be analyzed to establish that the instrument is functioning properly with the desired sensitivity. Calibration solutions will be documented with the preparer's initials, date of preparation, concentration of solution, and standard materials used to prepare the solution. All standard materials used in the preparation of calibration solutions conform to the U.S. EPA, National Bureau of Standards (NBS).

8. SAMPLE PREPARATION AND ANALYTICAL PROCEDURES

Groundwater samples will be collected at the subject property according to the procedures described in Section 5.0. All samples will be submitted to a laboratory NYSDOH ELAP certified for the parameters of interest and able to provide a Category B data package per the July 2005 NYSDEC ASP. These samples will then be analyzed to determine the presence of

1. Volatile Organic Compounds - analyzed by EPA Method 8260, method detection limit 1 ug/L
2. Semi-Volatile Organic Compounds - analyzed by EPA Method 8270, method detection limit 1 ug/L.
3. Priority Pollutant Metals - Antimony, Arsenic, Berylium, Cadmium, Chromium (total), Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc - analyzed by EPA Methods as outlined in Table 4.1.

The soil and groundwater samples collected by Galli Engineering will be prepared and analyzed by the laboratory according to the matrix specific methods listed above from the following references.

1. Test Methods for Evaluating Solid Waste; SW-846. USEPA Office of Solids Waste and Emergency Response, Washington, D.C. 3rd Edition, 1986.
2. Standard Methods for the Analysis of Water and Wastewater, American Public Health Association, Washington, D.C. 16th Edition, 1985
3. EPA Water and Wastewater 600/4-79-020

The laboratory does not anticipate the need to modify standard procedures for referenced methods. The laboratory may use more stringent criteria based on statistical evaluation or laboratory practice. In such instances the laboratory-specific criteria will be used for data validation purposes as long as the criteria are more stringent than the targets set for this project. The reporting limits have been previously listed in Table 4.1.

9. DATA REDUCTION, VALIDATION, AND REPORTING

Data management, including chain-of-custody review and correction, data review, reduction and transfer to data management systems, quality control charts, quality control procedures, and sample receipt, storage and disposal, will be in accordance with applicable SOPs and accepted industry practices.

Documentation will be in accordance with applicable SOPs and accepted industry practices, and will include the sampling reports, copy of the chain-of-custody, and field QA controls with the analytical results. All sample documents will be legibly written in ink. Any corrections or revisions to sample documentation shall be made by lining through the original entry and initialing and dating any changes. Data reduction will occur in accordance with contractor analytical SOPs for each parameter. If difficulties are encountered during sample collection or sample analyses, a brief description of the problem will be provided in the sampling report prepared by contractor. Data reporting will be in accordance with applicable SOPs and will include, at a minimum:

- Sample documentation (location, date and time of collection and analysis, etc.)
- Chain-of-custody forms
- Initial and continuing calibration
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantitation
- Quality Control sample results
- Duplicate results

Adequate precautions will be taken during the reduction, manipulation, and storage of data in order to prevent the introduction of errors or the loss or misinterpretation of data.

To ensure that measurement data generated when performing environmental sampling activities are of an appropriate quality, all data will be validated. Data validation is a systematic procedure for reviewing a body of data against a set of established criteria to provide a specified level of assurance of its validity prior to its intended use. The techniques used must be applied to the body of the data in a systematic and uniform manner. The process of data validation

must be close to the origin of the data, independent of the data production, and objective in its approach. The review will evaluate the data in terms of adherence to sampling and analysis protocols and to quality control criteria outlined in this QAPP. The criteria for data validation include checks for internal consistency, duplicate sample analysis, spike addition recoveries, instrument calibration and transcription errors. The acceptance or rejection of data, depending on the adherence to the quality control criteria, will be in a uniform and consistent manner based on the established validation criteria provided in this QAPP.

All data, as applicable, will be validated in accordance with EPA guidance, per Data Quality Objectives Process. Any deviations will be documented and provided with the analytical data report. When the individual who will prepare the Data Usability Summary Report (DUSR) is identified, that person's resume will be provided to DER for review and approval. The DUSR will be prepared in accordance with DER-10, Appendix 2B.

The raw data will be reported in concentrations to two significant figures. Premature rounding of intermediate results can significantly affect the final result. Therefore, the reported results will be rounded to the correct number of significant figures only after all calculations and manipulations are completed. As many significant figures as are warranted by the analytical method will be used in reporting calculations. Only data meeting the validation criteria will be reported. Percent recovery and relative percent difference values will also be reported using two significant figures. Compounds that are not detected will be reported as less than the analytical method detection limit.

The final analytical data reports will be submitted to the Galli Engineering Project Manager and Quality Assurance Coordinator for their review and acceptance of the data in terms of completeness with respect to technical requirements of the project. All data will be assessed for accuracy, precision, completeness, representativeness and comparability. This data will then be presented in a technical report prepared by Galli Engineering, P.C.

10. INTERNAL QUALITY CONTROL CHECKS

The work plan for this site contains quality control requirements as they apply to each sampling task. Matrix spikes and duplicates will be analyzed per matrix in a sample group. For the purposes of this investigation the following quality control measures will be utilized by the laboratory:

Measure	Parameter	Frequency
Matrix Spike/Matrix Spike Duplicate	Organics	As necessary
Matrix Spike/Replicate	Inorganics	As necessary
Reagent Blank Sample	Organics & Inorganics	As necessary
Surrogate Spike Sample	Organics	As necessary
Calibration	Organics & Inorganics	As necessary
Field Blanks	Organics & Inorganics	1 per sampling
Trip Blanks	Organics & Inorganics	1 per cooler
Equipment Blanks	Organics & Inorganics	N/A
Field Replicates	Organics & Inorganics	N/A

11. PEROFRMANCE AND SYSTEM AUDITS

Galli Engineering will document inspections and audits to confirm the quality or orderly progression of a portion of the work by outlining the procedures, acceptability of methods or personnel, qualifications, or other verifications of quality. Performance audits (performance samples) and system audits (site inspections) of the fixed laboratories are performed by the New York State Department of Health as part of the laboratory certification process. No audits for laboratories are scheduled as part of this project. Galli Engineering will perform audits of field sampling and analysis operations periodically throughout the project to document the implementation of the QA program. Galli Engineering will perform audits of the laboratory and field operations at the discretion of the NYSDEC and if deemed necessary as part of a corrective action for a problem encountered with sampling and analytical data.

12. PREVENTIVE MAINTENANCE

Preventive maintenance activities are performed in order to prevent loss of data due to malfunctions or delay. Critical functions are identified for field and laboratory and contingencies are accordingly established.

In order to minimize downtime of field sampling and monitoring equipment, all equipment will be cleaned and visually inspected before and after each day of use. Where applicable, all equipment will be charged when not in use and calibrated each day.

The subcontracted analytical laboratory employs a qualified technician for analytical instrument maintenance. An inventory of spare parts is maintained to minimize instrument downtime. Laboratory balances are under service contracts to the manufacturers.

12.1. FIELD ACTIVITIES

The critical functions in the field require that extra sampling containers be on hand in the field, ready for use. Field screening kits and reagents may also be maintained as appropriate. Alternative sources (such as an instrument rental agency) for field screening or health and safety related monitoring devices may be identified prior to going into the field. This contingency will prevent loss of data or delays.

12.2. LABORATORY ACTIVITIES

The laboratory QA/QC plan will outline a formal preventive maintenance program including contingencies for sending samples to an alternate NYS certified laboratory if samples requiring analysis within the regulatory holding times are going to be compromised. Major and critical equipment should be on a service contract or under a laboratory program staffed by equipment technicians capable of emergency service. Back-up instrumentation should be available for larger projects. Routine maintenance for equipment will be performed.

13. DATA ASSESSMENT PROCEDURES

The procedures used to assess the precision, accuracy, and completeness of the data generated will begin with a review of the field notes and documents that correspond to the laboratory data report being reviewed. Any unusual or questionable observations will be noted and compare to the corresponding data. The following will be considered for all data:

1. Shipping information.
2. Adherence to holding times.
3. Calibration documentation.
4. Comparison of field assigned sample numbers and laboratory assigned sample numbers.
5. Comparison of values assigned to QA/QC samples (field and trip blanks, duplicates, method blanks and laboratory spiked samples) and environmental samples.
6. Review of chromatograms/spectra for values and tentatively identified compounds.
7. Units of measure reported.
8. Laboratory calculations.
9. Laboratory determined method detection limits.
10. Sample documentation.

Any errors, mistakes or deviations from the analysis requested identified by the data assessment will be presented in a validation report developed by the QA/QC Officer. Based on the validation report, Galli Engineering, P.C., the data users, will determine whether the data is usable for their purposes.

14. CORRECTIVE ACTIONS

Once the final report is submitted, the DEC Project Manager will review the field duplicates to determine if they appear to indicate a problem with meeting quality objectives. If problems are indicated, the Project Manager will contact the contractor to discuss and attempt to reconcile the issue. Completeness will also be evaluated to determine if the completeness goal for this project has been met. If data quality indicators do not meet the project's requirements as outlined in this QAPP, the data may be discarded and re-sampling may occur. The Project Manager will determine the cause of the failure (if possible) and make the decision to discard the data and re-sample. If the failure is tied to the analyses, calibration and maintenance techniques will be reassessed as identified by the appropriate lab personnel. If the failure is associated with the sample collection and re-sampling is needed, the sampling methods and procedures will be reassessed as identified by the field audit process.

Corrective action will be undertaken by all parties to address specific problems as they arise. Corrective actions required will be identified through the use of control charts for chemical analyses, precision and accuracy data, through performance auditing, and through systems audits.

In the event corrective actions are required to rectify an out of control laboratory or field measurement system the following steps will be taken by the QA/QC Officer:

1. Identification and definition of the problem;
2. Assignment of responsibility for investigating the problem;
3. Investigation and determination of the cause of the problem;
4. Determination of a corrective action to eliminate the problem;
5. Assigning and accepting responsibility for implementing the corrective action;
6. Implementing the corrective action and evaluating its effectiveness; and
7. Verifying that the corrective action has eliminated the problem.

15. QUALITY ASSURANCE REPORTS TO MANAGEMENT

The QA/QC Officer will report the status of the QA/QC program to the program management on a monthly basis. Each monthly report will include the following components:

- Periodic assessment of measurement data accuracy, precision, and completeness
- Results of audits
- Significant QA/QC problems and recommended solutions
- Resolutions of previously stated problems

The reports to management will be prepared using information from periodic reports from the field and laboratory to the quality assurance management organization. Field reports will describe the status of the project, daily field progress reports, compiled field data sets, and corrective action documentation at appropriate intervals. Laboratory analytical reports will include a summary of all quality assurance activities and quality control data for the project as related to the sample analysis. The project manager will be notified immediately of any laboratory quality assurance situations requiring immediate corrective action.

The project management organization and the regulatory agency will be notified of all situations that indicate an imminent health risk. Written notification with supporting data will be forwarded within three business days.

APPENDICES

APPENDIX A

SAMPLING LOCATIONS PLAN

APPENDIX B

FORMS

APPENDIX C

GLOSSARY OF QA/QC TERMS

GLOSSARY OF QUALITY ASSURANCE AND RELATED TERMS

acceptance criteria — address the adequacy of existing information proposed for inclusion into the project. These criteria often apply to data drawn from existing sources ("secondary" data).

accuracy — a measure of the overall agreement of a measurement to a known value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; EPA recommends using the terms *"precision"* and *"bias*," rather than "accuracy," to convey the information usually associated with accuracy.

assessment — the evaluation process used to measure the performance or effectiveness of a system and its elements.

audit — a systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

bias — the systematic or persistent distortion of a measurement process that causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).

blank — a sample subjected to the usual analytical or measurement process to establish a zero baseline or background value. Sometimes used to adjust or correct routine analytical results. A sample that is intended to contain none of the analytes of interest. A blank is used to detect contamination during sample handling preparation and/or analysis.

chain-of-custody — an unbroken trail of accountability that ensures the physical security of samples, data, and records.

collocated samples — two or more portions collected at the same point in time and space so as to be considered identical. These samples are also known as field replicates and should be identified as such.

comparability — a measure of the confidence with which one data set or method can be compared to another.

completeness — a measure of the amount of valid data obtained from a measurement system.

conformance — an affirmative indication or judgment that a product or service satisfies the relevant specification, contract, or regulation.

corrective action — any measures taken to rectify conditions adverse to quality and, where possible, to prevent recurrence.

data quality — a measure of the degree of acceptability or utility of data for a particular purpose.

data quality assessment — the scientific and statistical evaluation of data to determine if data obtained from environmental operations are of the right type, quality, and quantity to support their intended use.

data quality indicators — the quantitative statistics and qualitative descriptors used to interpret the degree of acceptability or utility of data to the user. The principal data quality indicators are bias, precision, accuracy (bias is preferred), comparability, completeness, representativeness, and sensitivity.

data quality objectives — the qualitative and quantitative statements derived from the DQO Process that clarifies study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

data quality objective process — a systematic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use. DQOs are the qualitative and quantitative outputs from the DQO Process.

data reduction — the process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collating them into a more useful form. Data reduction is irreversible and generally results in a reduced data set and an associated loss of detail.

data validation — an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set.

data verification — the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual specifications.

design — the specifications, drawings, design criteria, and performance specifications. Also, the result of deliberate planning, analysis, mathematical manipulations, and design processes.

detection limit — a measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte; the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. DLs are analyte- and matrix-specific and may be laboratory-dependent.

document control — the policies and procedures used by an organization to ensure that its documents and their revisions are proposed, reviewed, approved for release, inventoried, distributed, archived, stored, and retrieved in accordance with the organization's specifications.

environmental conditions — the description of a physical medium (for example, air, water, soil, sediment) or a biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

environmental data — any measurements or information that describe environmental processes, location, or conditions; ecological or health effects and consequences; or the performance of environmental technology. For EPA, environmental data include information collected directly from measurements, produced from models. Compiled from other sources such as data bases or the literature.

environmental data operation — work performed to obtain, use, or report information pertaining to environmental processes and conditions.

environmental monitoring — the process of measuring or collecting environmental data.

environmental processes — any manufactured or natural processes that produce discharges to, or that impact, the ambient environment.

environmental technology — an all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be used to remove pollutants or contaminants from, or to prevent them from entering, the environment. Examples include wet scrubbers (air), soil washing (soil), granulated activated carbon unit (water), and filtration (air, water). Usually, this term applies to hardware-based systems; however, it can also apply to methods or techniques used for pollution prevention, pollutant reduction, or containment of contamination to prevent further movement of the contaminants, such as capping, solidification or vitrification, and biological treatment.

field blank — a clean analyte-free sample which is carried to the sampling site and then exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample. This blank is used to provide information about contaminants that may be introduced during sample collection, storage, and transport.

financial assistance — the process by which funds are provided by one organization (usually governmental) to another organization for the purpose of performing work or furnishing services or items. Financial assistance mechanisms include grants, cooperative agreements, and governmental interagency agreements.

graded approach — the process of applying managerial controls to an item or work according to the intended use of the results and the degree of confidence needed in the quality of the results.

guidance — a suggested practice that is not mandatory, intended as an aid or example in complying with a standard or specification.

holding time — the period of time a sample may be stored before analysis. While exceeding the holding time does not necessarily negate the veracity of analytical results, it causes the qualifying or “flagging” of any data not meeting all of the specified acceptance criteria.

independent assessment — an assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

inspection — the examination or measurement of an item or activity to verify conformance to specifications.

matrix spike sample — a sample prepared by adding a known amount of the target analyte to a specified amount of a matrix. Spiked samples are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

measurement quality objectives — the individual performance or acceptance goals for the individual Data Quality Indicators such as precision or bias.

metadata — information that describes the data and the quality criteria associated with their generation.

method — a body of procedures and techniques for performing an activity (for example, sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.

method blank — a blank prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and quality control (QC) samples. Results of method blanks provide an estimate of the within-batch variability of the blank response and an indication of bias introduced by the analytical procedure.

outlier — an extreme observation that is shown to have a low probability of belonging to a specified data population.

parameter — a quantity, usually unknown, such as a mean or a standard deviation characterizing a population. Commonly misused for “variable,” “characteristic,” or “property.”

performance criteria — address the adequacy of information that is to be collected for the project. These criteria often apply to new data collected for a specific use (“primary” data).

precision — a measure of agreement among repeated measurements of the same property under identical, of substantially similar, conditions; expressed generally in terms of the standard deviation.

process — a set of interrelated resources and activities that transforms inputs into outputs. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

proficiency test — a type of assessment in which a sample, the composition of which is unknown to the analyst, is provided to test whether the analyst/laboratory can produce analytical results within the specified acceptance criteria.

quality — the totality of features and characteristics of a product or service that bears on its ability to meet the stated or implied needs and expectations of the user.

quality assurance — an integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer.

quality assurance project plan — a formal document describing in comprehensive detail the necessary quality assurance procedures, quality control activities, and other technical activities that need to be implemented to ensure that the results of the work performed will satisfy the stated performance or acceptance criteria.

quality control — the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the specifications established by the customer; operational techniques and activities that are used to fulfill the need for quality.

quality control sample — an uncontaminated sample matrix spiked with known amounts of analytes from a source independent of the calibration standards. Generally used to establish intra- laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system.

quality management plan — a document that describes the quality system in terms of the organization's structure, the functional responsibilities of management and staff, the lines of authority, and the interfaces for those planning, implementing, and assessing all activities conducted.

quality system — a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out quality assurance procedures and quality control activities.

readiness review — a systematic, documented review of the readiness for the start-up or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and before initiation of a major phase of work.

record — a completed document that provides objective evidence of an item or process. Records may include photographs, drawings, magnetic tape, and other data recording media.

recovery — the act of determining whether or not the methodology measures all of the analyte contained in a sample.

representativeness - the measure of the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

self-assessment — the assessments of work conducted by individuals, groups, or organizations directly responsible for overseeing and/or performing the work.

sensitivity — the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest.

spike — a substance that is added to an environmental sample to increase the concentration of the target analyte by known amount; used to assess measurement accuracy (spike recovery). Spike duplicates are used to assess measurement precision.

split samples — two or more representative portions taken from one sample in the field or in the laboratory and analyzed by different analysts or laboratories. Split samples are quality control samples that are used to assess analytical variability and comparability.

standard operating procedure — a document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps to be followed. It is officially approved as the method for performing certain routine or repetitive tasks.

surveillance (quality) — continual or frequent monitoring and verification of the status of an entity and the analysis of records to ensure that specifications are being fulfilled.

technical systems audit — a thorough, systematic, on-site qualitative audit of facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a system.

validation — an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractural compliance (i.e., data verification) to determine the analytical quality of a specific data set.

verification — the process of evaluating the completeness, correctness, and conformance / compliance of a specific data set against the method, procedural, or contractural specifications.

APPENDIX D

RESUMES