Quality Assurance/Quality Control Program Plan

First Avenue Properties
New York, New York

Waterside Generating Station
708 Office Building
Kips Bay Fuel Terminal
Parking Lot

Prepared by

TRC Environmental Corporation
1200 Wall Street West
Lyndhurst, New Jersey 07071

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1.0 INTRODUCTION

This Quality Assurance/Quality Control Plan Program Plan presents the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with investigation and remediation Work Plans for the First Avenue Properties project in New York, New York. Task-specific addenda to this Plan will be provided for future investigations or remediation elements at these sites.

The Plan will describe specific protocols for field sampling, sampling handling and storage, chain-of- custody, laboratory analysis, and data handling and management. Preparation of the Plan was based on EPA Quality Assurance Project Plan (QAPP) guidance documents, including:

- *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5, October 1998), and*
- *Guidance for Quality Assurance Project Plans (EPA QA/G-5, February 1998).*

Each task-specific Plan addendum will accompany a task-specific work plan that will provide a description of the site and will list the project quality objectives and outline the proposed samples and analytical parameters. The data generated from the analysis of samples will be used to determine the extent of contamination, identify impacted targets, and to compare the results of the remedial actions to site-specific cleanup goals. A list of the potential parameters to be analyzed, including their respective quantitation limits (QLs), and data quality levels (DQLs), is shown in Tables 1a and 1b.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

TRC will coordinate and manage the First Avenue Properties sampling and analysis program, data reduction, QA/QC, data validation, analysis, and reporting. TRC will direct the sampling activities and coordinate laboratory and drilling activities. The TRC Project QA officer will be Ms. Elizabeth Denly.

Ms. Elizabeth Denly, TRC's QA Chemist, will insure that the QA/QC plan is implemented and will oversee data validation. Ms. Denly will provide oversight and technical support for the sampling and analytical procedures followed in this project. This individual has the broad authority to approve or disapprove project plans, specific analyses, and final reports. The TRC Project QA Officer is independent from the data generation activities. In general, the QA officer will be responsible for reviewing and advising on all QA/QC aspects of this program.

The laboratory will be Accutest Laboratories of Dayton, New Jersey. Accutest is a New York State Department of Health ELAP certified laboratory. The laboratory will communicate directly with TRC regarding the analytical results and reporting. Accutest will be responsible for providing all labels, sample jars, field blank water, trip blanks, shipping coolers, and laboratory documentation.

3.0 QA OBJECTIVES FOR DATA MANAGEMENT

All analytical data will be provided by the laboratory using the New York State Analytical Services Protocol (ASP) Category B deliverable format.

All analytical measurements will be made so that the results are representative of the media sampled (soil, groundwater and waste characterization) and the conditions measured. Data will be reported in consistent dry weight units for solid samples (i.e., µg/kg and/or mg/kg) and in µg/L or mg/L for aqueous samples. Table 2 presents the proposed samples, sampling and analytical parameters, analytical methods, sample preservation requirements and containers for the First Avenue Properties project.

Quantitation Limits (QLs) are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. Data Quality Levels (DQLs) are those reporting limits required to meet the objectives of the program (i.e., program action levels, cleanup standards, etc.). Data Quality Objectives (DQOs) define the quality of data and documentation required to support decisions made in the various phases of the data collection activities. The DQOs are dependent on the end uses of the data to be collected and are also expressed in terms of objectives for precision, accuracy, representativeness, completeness, and comparability.

The analytical methods to be used at this site provide the highest level of data quality and can be used for purposes of risk assessment, evaluation of remedial alternatives and verification that cleanup standards have been met. However, in order to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, and completeness.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide results that are scientifically valid, and the levels of which are sufficient to meet DQOs. Specific procedures for sampling, chain of custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, and corrective action are described in other sections of this Plan.

Tables 3a and 3b present the precision and accuracy requirements for each parameter to be analyzed. For quantitation limits for soil parameters, the laboratory will be required to attempt to meet or surpass the parameter-specific limits listed in the STARS and/or TAGM guidance, whichever is lower (Appendix A). Note, however, that NYSDEC is in the process of consolidating the STARS and TAGM guidance levels into one guidance document that largely reflects the TAGM standards. Given this development, TRC intends to interpret the analytical results primarily using the TAGM criteria.

In certain instances, if the STARS or TAGM criteria are not achievable due to analytical limitations, the laboratory will report the lowest possible quantitation limit (See Table 1a for affected analytes). For quantitation limits for groundwater parameters, the laboratory will be required to attempt to meet or surpass the parameter-specific limits for groundwater from the Division of Water Technical and Operational Guidance Series (1.1.1), June 1998 (TOGS) Ambient Water Quality Standards and Guidance Values or the TAGM Recommended Groundwater Standards/Criteria. It should be noted that the TOGS standards were first used to develop DQLs for groundwater. When TOGS standards did not exist for an analyte of interest, the TAGM groundwater standards were used. In certain instances, if the TOGS or TAGM criteria are not achievable due to analytical limitations, the laboratory will report the lowest possible quantitation limit (See Table 1b for affected analytes). The QA objectives are defined as follows:

- ***Accuracy*** is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

  Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being used (e.g., split spoons, groundwater sampling pumps).

  The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of "standards," materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic analyses, or %R of spiked compounds in matrix spikes (MSs), matrix spike duplicates (MSDs) and/or laboratory control samples (LCSs). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds. Tables 4a and 4b summarize the laboratory accuracy requirements.

- ***Precision*** is the agreement among a set of replicate measurements without consideration of the "true" or accurate value: i.e., variability between measurements of the same material for the same analyte. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation.

Precision in the field is assessed through the collection and measurement of field duplicates (one extra sample in addition to the original field sample). Field duplicates will be collected at a frequency of one per twenty investigative samples per matrix per analytical parameter, with the exception of the TCLP parameters. Precision will be measured through the calculation of relative percent differences (RPDs). The resulting information will be used to assess sampling and analytical variability. Field duplicate RPDs must be <50 for soil samples and <30 for aqueous samples. These criteria apply only if the sample and/or duplicate results are >5x the quantitation limit; if both results are <5x the quantitation limit, the criterion will be doubled.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic analyses, laboratory precision will be assessed through the analysis of MS/MSD samples and field duplicates. For the inorganic analyses, laboratory precision will be assessed through the analysis of matrix duplicate pairs and field duplicate pairs. MS/MSD samples or matrix duplicate pairs will be performed at a frequency of one per twenty investigative samples per matrix per parameter. Tables 4a and 4b summarize the laboratory precision requirements.

- ***Completeness*** is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. “Normal conditions” are defined as the conditions expected if the sampling plan was implemented as planned.

  Field completeness is a measure of the amount of (1) valid measurements obtained from all the measurements taken in the project and (2) valid samples collected. The field completeness objective is greater than 90 percent.

  Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95 percent.

- ***Representativeness*** is a qualitative parameter which expresses the degree to which data accurately and precisely represent either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data.

  Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plans and Plan are followed and that proper sampling, sample handling, and sample preservation techniques are used.

  Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample holding times.

- ***Comparability*** expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plans and Plan are followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

Comparability is dependent on the use of recognized EPA or equivalent analytical methods and the reporting of data in standardized units. Laboratory procedures are consistent with those used for previous sampling efforts.

Table 1a
Chemical Parameters, Quantitation Limits and Data Quality Levels for Soil Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
Volatile Organic Compounds (µg/kg) –STARS/TAGM[3]		
Acetone	5	200
Benzene	2	60
2-Butanone	5	300
Carbon Disulfide	5	2700
Carbon Tetrachloride	5	600
Chlorobenzene	5	1700
Chloroethane	5	1900
Chloroform	5	300
Dibromochloromethane	5	NS
1,2-Dichlorobenzene	5	7900
1,3-Dichlorobenzene	5	1600
1,4-Dichlorobenzene	5	8500
1,1-Dichloroethane	5	200
1,2-Dichloroethane	5	100
1,1-Dichloroethene	5	400
trans-1,2-Dichloroethene	5	300
1,3-Dichloropropane	5	300
Ethylbenzene	5	5500
Freon 113	5	6000
Methylene chloride	5	100
4-Methyl-2-pentanone	5	1000
Tetrachloroethene	5	1400
1,1,1-Trichloroethane	5	800
1,1,2,2-Tetrachloroethane	5	600
1,2,3-Trichloropropane	5	400
1,2,4-Trichlorobenzene	5	3400
Toluene	5	1500
Trichloroethene	5	700
Vinyl chloride	5	200
Xylenes	5	1200
Isopropylbenzene	5	5000
n-Propylbenzene	5	14,000
p-Isopropyltoluene	5	11,000
1,2,4-Trimethylbenzene	5	13,000
1,3,5-Trimethylbenzene	5	3300
n-Butylbenzene	5	18,000
sec-Butylbenzene	5	25,000
t-Butylbenzene	5	100[2]
MTBE	5	120

Table 1a
Chemical Parameters, Quantitation Limits and Data Quality Levels for Soil Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
Polynuclear Aromatic Hydrocarbons (µg/kg) –STARS/TAGM		
Acenaphthene	66	50,000
Acenaphthylene	66	41,000
Anthracene	66	50,000
Benzo(a)anthracene	66	224
Benzo(a)pyrene	**66**	**61**
Benzo(b)fluoranthene	66	1100
Benzo(g,h,i)perylene	66	50,000
Benzo(k)fluoranthene	66	1100
Chrysene	66	400
Dibenzo(a,h)anthracene	**66**	**14**
Fluoranthene	66	50,000
Fluorene	66	50,000
Indeno(1,2,3-cd)pyrene	66	3200
2-Methylnaphthalene	66	36,400
Naphthalene	66	13,000
Phenanthrene	66	50,000
Pyrene	66	50,000
Semivolatile Organic Compounds (µg/kg) –STARS/TAGM		
Acenaphthene	66	50,000
Acenaphthylene	66	41,000
Aniline	66	100
Anthracene	66	50,000
Benzo(a)anthracene	66	224
Benzo(a)pyrene	**66**	**61**
Benzo(b)fluoranthene	66	1100
Benzo(g,h,i)perylene	66	50,000
Benzo(k)fluoranthene	66	1100
Bis(2-ethylhexyl)phthalate	66	50,000
Butylbenzylphthalate	66	50,000
Chrysene	66	400
4-Chloroaniline	160	220
4-Chloro-3-methylphenol	160	240
2-Chlorophenol	160	800
Dibenzofuran	66	6200
Dibenz(a,h)anthracene	**66**	**14**
3,3'-Dichlorobenzidine	160	NS
2,4-Dichlorophenol	160	400
2,4-Dinitrophenol	**660**	**200**
2,6-Dinitrotoluene	66	1000
Diethylphthalate	66	7100

Table 1a
Chemical Parameters, Quantitation Limits and Data Quality Levels for Soil Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
Dimethylphthalate	66	2000
Di-n-butylphthalate	66	8100
Di-n-octylphthalate	66	50,000
Fluoranthene	66	50,000
Fluorene	66	50,000
Hexachlorobenzene	66	410
Indeno(1,2,3-cd)pyrene	66	3200
Isophorone	66	4400
2-Methylnaphthalene	66	36,400
2-Methylphenol	**160**	**100**
4-Methylphenol	160	900
Naphthalene	66	13,000
Nitrobenzene	66	200
2-Nitroaniline	160	430
2-Nitrophenol	160	330
4-Nitrophenol	**660**	**100**
3-Nitroaniline	160	500
Pentachlorophenol	660	1000
Phenanthrene	66	50,000
Phenol	**160**	**30**
Pyrene	66	50,000
2,4,5-Trichlorophenol	**160**	**100**
Metals (mg/kg) – TAGM		
Aluminum	20	NS
Antimony	1.0	NS
Arsenic	1.0	8.0
Barium	20	300
Beryllium	**0.5**	**0.16**
Cadmium	0.5	1.0
Calcium	500	NS
Chromium	1.0	10
Cobalt	5.0	30
Copper	2.5	25
Iron	10	2000
Lead	1.0	NS (background)
Magnesium	500	NS
Manganese	1.5	NS
Mercury	0.04	0.1
Nickel	4	13
Potassium	500	NS
Selenium	1	2

Table 1a
Chemical Parameters, Quantitation Limits and Data Quality Levels for Soil Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
Silver	1	NS
Sodium	500	NS
Thallium	1	NS
Vanadium	5	150
Zinc	2	20
PCBs (µg/kg)[4]		
Aroclor 1016	330	1000 Surface/ 10,000 Subsurface
Aroclor 1221	330	1000 Surface/ 10,000 Subsurface
Aroclor 1232	330	1000 Surface/ 10,000 Subsurface
Aroclor 1242	330	1000 Surface/ 10,000 Subsurface
Aroclor 1248	330	1000 Surface/ 10,000 Subsurface
Aroclor 1254	330	1000 Surface/ 10,000 Subsurface
Aroclor 1260	330	1000 Surface/ 10,000 Subsurface
TCLP VOCs (µg/L) – STARS/TAGM[7]		
Benzene	**5**	**0.7[5]**
2-Butanone	25	200,000[6]
Carbon Tetrachloride	5	500[6]
Chlorobenzene	10	100,000[6]
Chloroform	25	6000[6]
1,4-Dichlorobenzene	25	7500[6]
1,2-Dichloroethane	10	500[6]
1,1-Dichloroethene	10	700[6]
Ethylbenzene	5	5[5]
Tetrachloroethene	5	700[6]
Toluene	5	5[5]
Trichloroethene	5	500[6]
Vinyl chloride	5	200[6]
Xylenes	**25**	**5[5]**
Isopropylbenzene	**10**	**5[5]**
n-Propylbenzene	**25**	**5[5]**
p-Isopropyltoluene	**25**	**5[5]**
1,2,4-Trimethylbenzene	**25**	**5[5]**
1,3,5-Trimethylbenzene	**25**	**5[5]**
n-Butylbenzene	**25**	**5[5]**
sec-Butylbenzene	**25**	**5[5]**
t-Butylbenzene	**25**	**5[5]**
MTBE	5	50[5]
TCLP PAHs (µg/L) – STARS/TAGM[7]		
Acenaphthene	2	20[5]
Anthracene	2	50[5]

Table 1a
Chemical Parameters, Quantitation Limits and Data Quality Levels for Soil Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
Benzo(a)anthracene	**2**	**0.002[5]**
Benzo(a)pyrene	**2**	**0.002[5]**
Benzo(b)fluoranthene	**2**	**0.002[5]**
Benzo(g,h,i)perylene	**2**	**0.002[5]**
Benzo(k)fluoranthene	**2**	**0.002[5]**
Chrysene	**2**	**0.002[5]**
Dibenzo(a,h)anthracene	2	50[5]
Fluoranthene	2	50[5]
Fluorene	2	50[5]
Indeno(1,2,3-cd)pyrene	**2**	**0.002[5]**
Naphthalene	2	10[5]
Phenanthrene	2	50[5]
Pyrene	2	50[5]
TCLP Metals (µg/L) –PP[8]		
Arsenic	5	5000[6]
Barium	200	100,000[6]
Cadmium	4	1000[6]
Chromium	10	5000[6]
Lead	3	5000[6]
Mercury	0.2	200[6]
Selenium	5	1000[6]
Silver	10	5000[6]

[1] DQL based on TAGM Recommended Soil Cleanup Objectives (January 24, 1994) unless otherwise specified
[2] DQL based on STARS TCLP Alternative Guidance Values (August 1992)
[3] Includes QLs and DQLs for BTEX and MTBE when required individually for a particular sample
[4] DQL listed is for total PCBs
[5] DQL based on STARS TCLP Extraction Guidance Values (August 1992)
[6] DQL based on TCLP standards (SW-846 Chapter 7, Table 7-1)
[7] Analyte list based on STARS/TAGM compounds but only those compounds which exhibit TCLP standards based on the STARS document or SW-846
[8] Analyte list based on PP metals and barium but only for those metals which exhibit TCLP standards based on SW-846
QL=Quantitation Limit
DQL=Data Quality Level
NS = None specified
Compounds which will not achieve the DQL are highlighted.

Table 1b
Chemical Parameters, Quantitation Limits and Data Quality Levels for Groundwater Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
Volatile Organic Compounds (µg/L) –STARS/TAGM[2]		
Acetone	5	50
Benzene	1	1
2-Butanone	5	50
Carbon Disulfide	5	50[3]
Carbon Tetrachloride	1	5
Chlorobenzene	2	5
Chloroethane	5	5
Chloroform	5	7
Dibromochloromethane	5	50
1,2-Dichlorobenzene	2	3
1,3-Dichlorobenzene	2	3
1,4-Dichlorobenzene	2	3
1,1-Dichloroethane	5	5
1,2-Dichloroethane	**2**	**0.6**
1,1-Dichloroethene	2	5
trans-1,2-Dichloroethene	5	5
1,3-Dichloropropane	5	5
Ethylbenzene	1	5
Freon 113	5	5
Methylene chloride	2	5
4-Methyl-2-pentanone	5	50[3]
Tetrachloroethene	1	5
1,1,1-Trichloroethane	5	5
1,1,2,2-Tetrachloroethane	2	5
1,2,3-Trichloropropane	**5**	**0.04**
1,2,4-Trichlorobenzene	5	5
Toluene	1	5
Trichloroethene	1	5
Vinyl chloride	1	2
Xylenes	5	5
Isopropylbenzene	2	5
n-Propylbenzene	5	5
p-Isopropyltoluene	5	5
1,2,4-Trimethylbenzene	5	5
1,3,5-Trimethylbenzene	5	5
n-Butylbenzene	5	5
sec-Butylbenzene	5	5

Table 1b
Chemical Parameters, Quantitation Limits and Data Quality Levels for Groundwater Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
t-Butylbenzene	5	5
MTBE	1	10
Polynuclear Aromatic Hydrocarbons (µg/L) –STARS/TAGM		
Acenaphthene	2	20
Acenaphthylene	2	20[3]
Anthracene	2	50
Benzo(a)anthracene	**2**	**0.002**
Benzo(a)pyrene	2	ND
Benzo(b)fluoranthene	**2**	**0.002**
Benzo(g,h,i)perylene	2	5[3]
Benzo(k)fluoranthene	**2**	**0.002**
Chrysene	**2**	**0.002**
Dibenzo(a,h)anthracene	2	50[3]
Fluoranthene	2	50
Fluorene	2	50
Indeno(1,2,3-cd)pyrene	**2**	**0.002**
2-Methylnaphthalene	2	4.7
Naphthalene	2	10
Phenanthrene	2	50
Pyrene	2	50
Pesticides (µg/L) - TAGM		
Aldrin	0.02	ND
alpha-BHC	**0.02**	**0.01**
beta-BHC	0.02	0.04
delta-BHC	0.02	0.04
Chlordane	**0.5**	**0.05**
4,4’-DDD	0.02	0.3
4,4’-DDE	0.02	0.2
4,4’-DDT	0.02	0.2
Dieldrin	**0.02**	**0.004**
Endosulfan I	0.02	0.1[3]
Endosulfan II	0.02	0.1[3]
Endosulfan sulfate	0.02	0.1[3]
Endrin	0.02	ND
Endrin ketone	0.05	5
gamma-BHC (Lindane)	0.02	0.05
gamma-Chlordane	0.02	0.1[3]
Heptachlor	0.02	0.04
Heptachlor epoxide	0.02	0.03
Methoxychlor	0.05	35

Table 1b
Chemical Parameters, Quantitation Limits and Data Quality Levels for Groundwater Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
2,4'-DDD	0.02	NS
Semivolatile Organic Compounds (µg/L) –STARS/TAGM		
Acenaphthene	2	20
Acenaphthylene	2	20[3]
Aniline	2	5
Anthracene	2	50
Benzo(a)anthracene	**2**	**0.002**
Benzo(a)pyrene	2	ND
Benzo(b)fluoranthene	**2**	**0.002**
Benzo(g,h,i)perylene	2	5[3]
Benzo(k)fluoranthene	**2**	**0.002**
Bis(2-ethylhexyl)phthalate	2	5
Butylbenzylphthalate	2	50
Chrysene	**2**	**0.002**
4-Chloroaniline	5	5
4-Chloro-3-methylphenol	**5**	**1**
2-Chlorophenol	**5**	**1**
Dibenzofuran	5	5[3]
Dibenz(a,h)anthracene	2	50[3]
3,3'-Dichlorobenzidine	5	5
2,4-Dichlorophenol	5	5
2,4-Dinitrophenol	**20**	**10**
2,6-Dinitrotoluene	2	5
Diethylphthalate	2	50
Dimethylphthalate	2	50
Di-n-butylphthalate	2	50
Di-n-octylphthalate	2	50
Fluoranthene	2	50
Fluorene	2	50
Hexachlorobenzene	**2**	**0.04**
Indeno(1,2,3-cd)pyrene	**2**	**0.002**
Isophorone	2	50
2-Methylnaphthalene	2	50[3]
2-Methylphenol	**5**	**1**
4-Methylphenol	**5**	**1**
Naphthalene	2	10
Nitrobenzene	**2**	**0.4**
2-Nitroaniline	5	5
2-Nitrophenol	**5**	**1**
4-Nitrophenol	**20**	**1**

Table 1b
Chemical Parameters, Quantitation Limits and Data Quality Levels for Groundwater Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
3-Nitroaniline	5	5
Pentachlorophenol	**20**	**1**
Phenanthrene	2	50
Phenol	**5**	**1**
Pyrene	2	50
2,4,5-Trichlorophenol	**5**	**1**
Metals (µg/L) – TAGM		
Aluminum	200	NS
Antimony	**5**	**3**
Arsenic	5	25
Barium	200	1000
Beryllium	3	3
Cadmium	4	5
Calcium	5000	NS
Chromium	10	50
Cobalt	50	NS
Copper	25	200
Iron	100	300
Lead	3	25
Magnesium	5000	35,000
Manganese	15	300
Mercury	0.2	0.7
Nickel	40	100
Potassium	5000	NS
Selenium	5	10
Silver	10	50
Sodium	5000	20,000
Thallium	**5**	**0.5**
Vanadium	50	NS
Zinc	20	2000
PCBs (µg/L)[4]		
Aroclor 1016	**0.5**	**0.09**
Aroclor 1221	**0.5**	**0.09**
Aroclor 1232	**0.5**	**0.09**
Aroclor 1242	**0.5**	**0.09**
Aroclor 1248	**0.5**	**0.09**
Aroclor 1254	**0.5**	**0.09**
Aroclor 1260	**0.5**	**0.09**

Table 1b
Chemical Parameters, Quantitation Limits and Data Quality Levels for Groundwater Samples
First Avenue Properties Program

Parameter	QL	DQL[1]
Wet Chemistry (μg/L)		
Ammonia	100	2000
Nitrate	100	10,000
Nitrite	10	10,000
Carbonate	5000	NS
Bicarbonate	5000	NS
Sulfate	20,000	250,000
Cyanide	10	200
Total Dissolved Solids	10,000	NS
Chloride	20,000	250,000

[1] DQL based on TOGS Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (June, 1998) unless otherwise specified
[2] Includes QLs and DQLs for BTEX and MTBE when required individually for a particular sample
[3] DQL based on TAGM Recommended Groundwater Standards/Criteria (January 24, 1994)
[4] DQL listed is for total PCBs
QL=Quantitation Limit
DQL=Data Quality Level
NS = None specified
ND = Not detected when analyzed by method listed in Table 2
Compounds which will not achieve the DQL are highlighted.

Table 2
Analytical Parameters, Methods, Preservation and Container Requirements
First Avenue Properties Program

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Soil/Solid Waste	VOCs (TCL or STARS/TAGM)	Grab	TBD	SW 846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	BTEX	Grab	TBD	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	BTEX/MTBE	Grab	TBD	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil/Solid Waste	PCBs	Grab	TBD	SW 846 Method 8082	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Solid Waste	Pesticides (TCL)	Grab	TBD	SW-846 Method 8081A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Solid Waste	SVOCs (TCL)	Grab	TBD	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	PAHs or SVOCs (STARS/TAGM)	Grab	TBD	SW 846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	Lead	Grab	TBD	SW 846 Method 6010B	Cool to 4^0 C	6 months to analysis	(1) 300 mL amber glass jar
Soil	Metals (TAGM)	Grab	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Solid Waste	Metals (PP)	Grab	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation and Container Requirements
First Avenue Properties Program

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Soil	GRO	Grab	TBD	SW-846 Method 8015B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	DRO	Grab	TBD	SW-846 Method 8015B	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil/Solid Waste/Liquid Waste	TCLP VOC (STARS/TAGM or RCRA)	Grab	TBD	SW 846 Methods 1311/8260B	Cool to 4^0 C; no headspace	14 days to TCLP extraction; 14 days from TCLP extraction to analysis	(1) 60 ml VOC vial
Soil/Solid Waste	TCLP SVOC or PAHs (STARS/TAGM or RCRA)	Grab	TBD	SW 846 Methods 1311/ 8270C	Cool to 4^0 C	14 days to TCLP extraction; 7 days from TCLP extraction to SVOC extraction; 40 days from SVOC extraction to analysis	(1) 950 mL amber glass jar
Liquid Waste	TCLP SVOC (RCRA)	Grab	TBD	SW 846 Methods 1311/ 8270C	Cool to 4^0 C	7 days to TCLP extraction; 7 days from TCLP extraction to SVOC extraction; 40 days from SVOC extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Pesticides (RCRA)	Grab	TBD	SW-846 Methods 1311/8081A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to pesticide extraction; 40 days from pesticide extraction to analysis	(1) 950 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation and Container Requirements
First Avenue Properties Program

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Liquid Waste	TCLP Pesticides (RCRA)	Grab	TBD	SW-846 Methods 1311/8081A	Cool to 4ºC	7 days to TCLP extraction; 7 days from TCLP extraction to pesticide extraction; 40 days from pesticide extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Herbicides (RCRA)	Grab	TBD	SW-846 Methods 1311/8151A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to herbicide extraction; 40 days from herbicide extraction to analysis	(1) 950 mL amber glass jar
Liquid Waste	TCLP Herbicides (RCRA)	Grab	TBD	SW-846 Methods 1311/8151A	Cool to 4ºC	7 days to TCLP extraction; 7 days from TCLP extraction to herbicide extraction; 40 days from herbicide extraction to analysis	(1) 950 mL amber glass jar
Soil/Solid Waste/Liquid Waste	TCLP Metals (PP or RCRA)	Grab	TBD	SW 846 Methods 1311/ 6010B/7000 Series	Cool to 4^0 C	Hg: 28 days to TCLP extraction; 28 days from TCLP extraction to analysis Other Metals: 6 months to TCLP extraction; 6 months from TCLP extraction to analysis	(1) 500 mL amber glass jar
Soil	TCLP Lead	Grab	TBD	SW 846 Methods 1311/ 6010B	Cool to 4^0 C	6 months to TCLP extraction; 6 months from TCLP extraction to analysis	(1) 500 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation and Container Requirements
First Avenue Properties Program

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Soil/Solid Waste/Liquid Waste	Ignitability	Grab	TBD	SW-846 Method 1010	Cool to 4^0 C	None specified	(1) 500 mL amber glass jar
Soil/Solid Waste/Liquid Waste	Corrosivity	Grab	TBD	SW-846 Method 9045C	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Soil/Solid Waste/Liquid Waste	Reactive cyanide	Grab	TBD	SW-846 Chapter 7, Section 7.3.3	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Soil/Solid Waste/Liquid Waste	Reactive sulfide	Grab	TBD	SW-846 Chapter 7, Section 7.3.4	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Groundwater	VOCs (STARS/TAGM)	Grab	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Groundwater	BTEX	Grab	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Groundwater	BTEX/MTBE	Grab	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Groundwater	PCBs	Grab	TBD	SW-846 Method 8082	Cool to 4^0 C; no headspace	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jar

Table 2
Analytical Parameters, Methods, Preservation and Container Requirements
First Avenue Properties Program

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Groundwater	PAHs (STARS/TAGM)	Grab	TBD	SW-846 Method 8270C	Cool to 4^0 C; no headspace	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jar
Groundwater	SVOCs (STARS/TAGM)	Grab	TBD	SW-846 Method 8270C	Cool to 4^0 C; no headspace	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jar
Groundwater	Pesticides (TAGM)	Grab	TBD	SW-846 Method 8081A	Cool to 4^0 C; no headspace	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jar
Groundwater	Lead	Grab	TBD	SW-846 Method 6010B	pH<2 with HNO_3; Cool to 4^0 C	6 months to analysis	(1) 1L polyethylene container
Groundwater	Metals (TAGM)	Grab	TBD	SW-846 Method 6010B/7000 Series	pH<2 with HNO_3; Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1L polyethylene container
Groundwater	Ammonia	Grab	TBD	EPA Method 350.1 (350.2 for distillation)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 250 mL polyethylene container
Groundwater	Nitrate	Grab	TBD	EPA Method 353.2/SM 4500-NO_2B (18th edition)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 100 mL polyethylene container
Groundwater	Nitrite	Grab	TBD	SM 4500-NO_2B (18th edition)	Cool to 4^0 C	48 hours to analysis	(1) 100 mL polyethylene container
Groundwater	Sulfate	Grab	TBD	SW-846 9056	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 100 mL polyethylene container
Groundwater	Carbonate	Grab	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container

Table 2
Analytical Parameters, Methods, Preservation and Container Requirements
First Avenue Properties Program

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Groundwater	Bicarbonate	Grab	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Total Cyanide	Grab	TBD	EPA Method 335.3	pH>12 with NaOH; Cool to 4ºC	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Total Dissolved Solids	Grab	TBD	EPA Method 160.1	Cool to 4ºC	7 days to analysis	(1) 100 mL polyethylene container
Groundwater	Chloride	Grab	TBD	EPA Method 300.0	Cool to 4ºC	28 days to analysis	(1) 100 mL polyethylene container

[1] For soil samples, a six-inch sampling interval is the preferred sample size; however, sample volume recovery, analytical method requirements, and field conditions can affect the actual sample interval size. For these reasons, the actual sampling interval may change in order to obtain adequate volume.

[2] Actual number of samples may vary depending on field conditions, sample material availability, and field observations

[3] From date of sample collection

[4] I-Chem Series 300 bottles

[5] MS/MSDs require duplicate volume for all parameters for solid matrices; MS/MSDs require triplicate volume for organic parameters for aqueous matrices and duplicate volume for inorganic parameters for aqueous matrices

TBD = To Be Determined

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
VOCs (TCL or STARS/TAGM)	SW-846 Method 8260B	Soil/Solid Waste	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples	Field Duplicates RPD ≤50		Field Duplicates: One per 20 per soils
			1,2-Dichloroethane-d4	54-129				
			4-Bromofluorobenzene	58-137				
			Dibromofluoromethane	55-132				
			Toluene-d8	65-133				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			1,1-Dichloroethene	60-130		1,1-Dichloroethene	19	
			Trichloroethene	59-146		Trichloroethene	18	
			Benzene	64-132		Benzene	15	
			Toluene	48-145		Toluene	16	
			Chlorobenzene	56-137		Chlorobenzene	17	
BTEX and BTEX/MTBE	SW-846 Method 8260B	Soil	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples	Field Duplicates RPD ≤50		Field Duplicates: One per 20
			1,2-Dichloroethane-d4	54-129				
			4-Bromofluorobenzene	58-137				
			Dibromofluoromethane	55-132				
			Toluene-d8	65-133				
			Matrix Spikes		Matrix Spikes: One per 20	MS/MSDs	RPD	MS/MSDs: One per 20
			Benzene	64-132		Benzene	15	
			Toluene	48-145		Toluene	16	
			Ethyl Benzene	49-143		Ethyl Benzene	20	
			Xylenes (total)	45-146		Xylenes (total)	17	
			MTBE	60-132		MTBE	15	

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
PCBs	SW-846 Method 8082	Soil/Solid Waste	Surrogates % Rec. Decachlorobiphenyl 23-149 Tetrachloro-m-xylene 26-126 Matrix Spikes Aroclor 1016 60-130 Aroclor 1260 40-146	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20 per matrix type	Field Duplicates RPD ≤50 MS/MSDs RPD Aroclor 1016 26 Aroclor 1260 27	Field Duplicates: One per 20 per soils MS/MSDs: One per 20 per matrix type
PAHs (STARS/TAGM)	SW-846 Method 8270C	Soil	Surrogates % Rec. Nitrobenzene-d5 27-124 2-Fluorobiphenyl 27-127 Terphenyl-d14 29-157 Matrix Spikes Naphthalene 30-120 2-Methylnaphthalene 36-126 Acenaphthylene 38-110 Acenaphthene 32-122 Fluorene 31-133 Fluoranthene 35-128 Pyrene 25-139 Phenanthrene 24-135 Anthracene 28-132 Benzo(a)anthracene 32-129 Chrysene 29-128 Benzo(b)fluoranthene 34-139 Benzo(k)fluoranthene 24-137 Benzo(a)pyrene 35-126 Indeno(1,2,3-cd)pyrene 12-133 Dibenzo(a,h)anthracene 18-139 Benzo(g,h,i)perylene 10-135	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20	Field Duplicates RPD ≤50 MS/MSDs RPD Naphthalene 28 2-Methylnaphthalene 28 Acenaphthylene 31 Acenaphthene 30 Fluorene 29 Fluoranthene 27 Pyrene 33 Phenanthrene 29 Anthracene 29 Benzo(a)anthracene 24 Chrysene 30 Benzo(b)fluoranthene 31 Benzo(k)fluoranthene 30 Benzo(a)pyrene 29 Indeno(1,2,3-cd)pyrene 35 Dibenzo(a,h)anthracene 33 Benzo(g,h,i)perylene 33	Field Duplicates: One per 20 MS/MSDs: One per 20

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
SVOCs (TCL or STARS/TAGM)	SW-846 Method 8270C	Solid Waste	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples			
			Phenol-d5	24-123				
			2-Fluorophenol	21-127				
			2,4,6-Tribromophenol	14-156				
			Nitrobenzene-d5	27-124				
			2-Fluorobiphenyl	27-127				
			Terphenyl-d14	29-157				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			Phenol	22-115		Phenol	28	
			n-Nitroso-di-n-propylamine	34-122		n-Nitroso-di-n-propylamine	27	
			2-Chlorophenol	29-114		2-Chlorophenol	26	
			4-Chloro-3-methylphenol	36-121		4-Chloro-3-methylphenol	22	
			Acenaphthene	32-122		Acenaphthene	30	
			4-Nitrophenol	13-136		4-Nitrophenol	34	
			Pentachlorophenol	17-136		Pentachlorophenol	23	
			Pyrene	25-139		Pyrene	33	
			2,4-Dinitrotoluene	13-130		2,4-Dinitrotoluene	33	
Pesticides (TCL)	SW-846 Method 8081A	Solid Waste	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples			
			Decachlorobiphenyl	27-158				
			Tetrachloro-m-xylene	35-145				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			gamma-BHC	42-157		Gamma-BHC	31	
			Heptachlor	46-157		Heptachlor	30	
			Aldrin	46-158		Aldrin	32	
			Dieldrin	43-158		Dieldrin	31	
			Endrin	55-158		Endrin	35	
			4,4’-DDT	37-158		4,4’-DDT	35	

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
GRO	SW-846 Method 8015B	Soil	Surrogates % Rec. ααα-Trifluorotoluene 42-147	Surrogates: All samples, standards, QC samples	Field Duplicates RPD ≤50	Field Duplicates: One per 20
			Matrix Spikes GRO (C_6-C_{10}) 18-139	Matrix Spikes: One per 20	MS/MSDs RPD GRO (C_6-C_{10}) 15	MS/MSDs: One per 20
DRO	SW-846 Method 8015B	Soil	Surrogates % Rec. 0-Terphenyl 33-145 Tetracosane-d50 42-145 52-Androstane 32-141	Surrogates: All samples, standards, QC samples	Field Duplicates RPD ≤50	Field Duplicates: One per 20
			Matrix Spikes DRO 28-149	Matrix Spikes: One per 20	MS/MSDs RPD DRO 20	MS/MSDs: One per 20
Metals (PP or TAGM)	SW-846 Methods 6010B/7000 Series	Soil/Solid Waste			Field Duplicates RPD ≤50	Field Duplicates: One per 20 per soils
			Matrix Spikes 75-125% recovery	Matrix Spikes: One per 20 per matrix type	Matrix Duplicates RPD ≤20	Matrix Duplicates: One per 20 per matrix type

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
TCLP VOCs (STARS/TAGM)	SW-846 Methods 1311/ 8260B	Soil	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples			
			1,2-Dichloroethane-d4	68-124				
			4-Bromofluorobenzene	75-127				
			Dibromofluoromethane	81-118				
			Toluene-d8	85-119				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			1,1-Dichloroethene	72-134		1,1-Dichloroethene	17	
			Trichloroethene	77-132		Trichloroethene	13	
			Benzene	61-138		Benzene	11	
			Toluene	55-147		Toluene	12	
			Chlorobenzene	83-124		Chlorobenzene	12	
TCLP VOCs (RCRA)	SW-846 Methods 1311/8260B	Solid Waste	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples			
			1,2-Dichloroethane-d4	68-124				
			4-Bromofluorobenzene	75-127				
			Dibromofluoromethane	81-118				
			Toluene-d8	85-119				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			1,1-Dichloroethene	72-134		1,1-Dichloroethene	17	
			1,2-Dichloroethane	67-138		1,2-Dichloroethane	12	
			2-Butanone	41-141		2-Butanone	29	
			Chloroform	76-128		Chloroform	12	
			Carbon Tetrachloride	69-143		Carbon Tetrachloride	17	
			Benzene	61-138		Benzene	11	
			Trichloroethene	77-132		Trichloroethene	13	
			Tetrachloroethene	55-149		Tetrachloroethene	13	
			Chlorobenzene	83-124		Chlorobenzene	12	
			Vinyl chloride	63-138		Vinyl chloride	18	
			1,4-Dichlorobenzene	75-121		1,4-Dichlorobenzene	13	

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
TCLP PAHs (STARS/TAGM)	SW-846 Methods 1311/ 8270C	Soil	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples			
			Nitrobenzene-d5	42-127				
			2-Fluorobiphenyl	38-131				
			Terphenyl-d14	22-153				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			Naphthalene	47-116		Naphthalene	16	
			Acenaphthene	51-116		Acenaphthene	15	
			Fluorene	47-129		Fluorene	16	
			Fluoranthene	54-125		Fluoranthene	18	
			Pyrene	53-124		Pyrene	17	
			Phenanthrene	52-119		Phenanthrene	16	
			Anthracene	51-122		Anthracene	17	
			Benzo(a)anthracene	55-121		Benzo(a)anthracene	16	
			Chrysene	53-119		Chrysene	16	
			Benzo(b)fluoranthene	52-133		Benzo(b)fluoranthene	25	
			Benzo(k)fluoranthene	47-123		Benzo(k)fluoranthene	24	
			Benzo(a)pyrene	52-122		Benzo(a)pyrene	17	
			Indeno(1,2,3-cd)pyrene	42-134		Indeno(1,2,3-cd)pyrene	25	
			Dibenzo(a,h)anthracene	51-135		Dibenzo(a,h)anthracene	20	
			Benzo(g,h,i)perylene	49-128		Benzo(g,h,i)perylene	24	

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
TCLP SVOCs (RCRA)	SW-846 Methods 1311/8270C	Solid Waste	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples			
			Phenol-d5	10-93				
			2-Fluorophenol	10-112				
			2,4,6-Tribromophenol	37-159				
			Nitrobenzene-d5	42-127				
			2-Fluorobiphenyl	38-131				
			Terphenyl-d14	22-153				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			Hexachloroethane	41-120		Hexachloroethane	19	
			Nitrobenzene	52-107		Nitrobenzene	17	
			Hexachlorobutadiene	46-128		Hexachlorobutadiene	18	
			2,4,6-Trichlorophenol	45-129		2,4,6-Trichlorophenol	15	
			2,4,5-Trichlorophenol	40-126		2,4,5-Trichlorophenol	16	
			2,4-Dinitrotoluene	52-114		2,4-Dinitrotoluene	17	
			Hexachlorobenzene	54-119		Hexachlorobenzene	18	
			Pentachlorophenol	33-139		Pentachlorophenol	19	
			Pyridine	25-97		Pyridine	27	
			2-Methylphenol	24-118		2-Methylphenol	15	
			3&4-Methylphenol	32-120		3&4-Methylphenol	16	
TCLP Pesticides	SW-846 Methods 1311/8081A	Solid Waste	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples			
			Decachlorobiphenyl	22-147				
			Tetrachloro-m-xylene	48-136				
			Matrix Spikes		Matrix Spikes: One per 20 per matrix type	MS/MSDs	RPD	MS/MSDs: One per 20 per matrix type
			gamma-BHC	55-144		Gamma-BHC	35	
			Heptachlor	31-164		Heptachlor	35	
			Heptachlor epoxide	46-158		Heptachlor epoxide	28	
			Endrin	73-156		Endrin	34	
			Methoxychlor	55-166		Methoxychlor	35	
			Technical Chlordane	50-150		Chlordane		
			Toxaphene	50-150		Toxaphene		

Table 3a
Data Quality Objectives: Precision and Accuracy: Soil and Solid Waste Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
TCLP Herbicides	SW-846 Methods 1311/8151A	Solid Waste	<u>Surrogates</u> <u>% Rec.</u> 2,4-DCAA 57-158 <u>Matrix Spikes</u> 2,4-D 48-123 2,4,5-TP 54-143	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20 per matrix type	<u>MS/MSDs</u> <u>RPD</u> 2,4-D 21 2,4,5-TP 20	MS/MSDs: One per 20 per matrix type
TCLP Metals	SW-846 Methods 1311/ 6010B/7000 Series	Soil/Solid Waste	<u>Matrix Spikes</u> 75-125% recovery	Matrix Spikes: One per 20 per matrix type	<u>Matrix Duplicates</u> RPD ≤20	Matrix Duplicates: One per 20 per matrix type
Ignitability	SW-846 Method 1010	Soil/Solid Waste	<u>Not Applicable</u>	Not Applicable	<u>Matrix Duplicates</u> RPD ≤20	Matrix Duplicates: One per 20 per matrix type
Corrosivity	SW-846 Method 9045C	Soil/Solid Waste	<u>Not Applicable</u>	Not Applicable	<u>Matrix Duplicates</u> RPD ≤5	Matrix Duplicates: One per 20 per matrix type
Reactive cyanide	SW-846 Chapter 7, Section 7.3.3	Soil/Solid Waste	<u>Not Applicable</u>	Not Applicable	<u>Matrix Duplicates</u> RPD ≤20	Matrix Duplicates: One per 20 per matrix type
Reactive sulfide	SW-846 Chapter 7, Section 7.3.4	Soil/Solid Waste	<u>Not Applicable</u>	Not Applicable	<u>Matrix Duplicates</u> RPD ≤20	Matrix Duplicates: One per 20 per matrix type

Recovery criteria for laboratory control samples must be at least as stringent as MS/MSD criteria.
Laboratory control limits are periodically updated. The latest control limits will be utilized at the time of sample analysis.

Table 3b
Data Quality Objectives: Precision and Accuracy: Groundwater Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
VOCs (STARS/TAGM)	SW-846 Method 8260B	Groundwater	<u>Surrogates</u>	<u>% Rec.</u>	Surrogates: All samples, standards, QC samples	<u>Field Duplicates</u>		Field Duplicates: One per 20
			1,2-Dichloroethane-d4	68-124				
			4-Bromofluorobenzene	75-127		RPD ≤30		
			Dibromofluoromethane	81-118				
			Toluene-d8	85-119				
			<u>Matrix Spikes</u>		Matrix Spikes: One per 20	<u>MS/MSDs</u>	<u>RPD</u>	MS/MSDs: One per 20
			1,1-Dichloroethene	72-134		1,1-Dichloroethene	17	
			Trichloroethene	77-132		Trichloroethene	13	
			Benzene	61-138		Benzene	11	
			Toluene	55-147		Toluene	12	
			Chlorobenzene	83-124		Chlorobenzene	12	
BTEX and BTEX/MTBE	SW-846 Method 8260B	Groundwater	<u>Surrogates</u>	<u>% Rec.</u>	Surrogates: All samples, standards, QC samples	<u>Field Duplicates</u>		Field Duplicates: One per 20
			1,2-Dichloroethane-d4	68-124				
			4-Bromofluorobenzene	75-127		RPD ≤30		
			Dibromofluoromethane	81-118				
			Toluene-d8	85-119				
			<u>Matrix Spikes</u>		Matrix Spikes: One per 20	<u>MS/MSDs</u>	<u>RPD</u>	MS/MSDs: One per 20
			Benzene	61-138		Benzene	11	
			Toluene	55-147		Toluene	12	
			Ethyl Benzene	68-139		Ethyl Benzene	12	
			Xylenes (total)	57-146		Xylenes (total)	12	
			MTBE	35-151		MTBE	11	

Table 3b
Data Quality Objectives: Precision and Accuracy: Groundwater Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
Pesticides (TAGM)	SW-846 Method 8081A	Groundwater	Surrogates % Rec. Decachlorobiphenyl 22-147 Tetrachloro-m-xylene 48-136 Matrix Spikes gamma-BHC 55-144 Heptachlor 31-164 Aldrin 32-158 Dieldrin 48-167 Endrin 73-156 4,4'-DDT 46-163	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20	Field Duplicates RPD ≤30 MS/MSDs RPD gamma-BHC 35 Heptachlor 35 Aldrin 35 Dieldrin 35 Endrin 34 4,4'-DDT 35	Field Duplicates: One per 20 MS/MSDs: One per 20
PCBs	SW-846 Method 8082	Groundwater	Surrogates % Rec. Decachlorobiphenyl 14-150 Tetrachloro-m-xylene 25-134 Matrix Spikes Aroclor 1016 49-138 Aroclor 1260 25-133	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20	Field Duplicates RPD ≤30 MS/MSDs RPD Aroclor 1016 21 Aroclor 1260 35	Field Duplicates: One per 20 MS/MSDs: One per 20

Table 3b
Data Quality Objectives: Precision and Accuracy: Groundwater Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
SVOCs (STARS/TAGM)	SW-846 Method 8270C	Groundwater	Surrogates	% Rec.	Surrogates: All samples, standards, QC samples	Field Duplicates		Field Duplicates: One per 20
			Phenol-d5	10-93				
			2-Fluorophenol	10-112		RPD ≤30		
			2,4,6-Tribromophenol	37-159				
			Nitrobenzene-d5	42-127				
			2-Fluorobiphenyl	38-131				
			Terphenyl-d14	22-153				
			Matrix Spikes		Matrix Spikes: One per 20	MS/MSDs	RPD	MS/MSDs: One per 20
			Phenol	10-126		Phenol	16	
			2-Chlorophenol	44-105		2-Chlorophenol	13	
			n-Nitroso-di-n-propylamine	50-120		n-Nitroso-di-n-propylamine	16	
			4-Chloro-3-methylphenol	45-116		4-Chloro-3-methylphenol	14	
			Acenaphthene	51-116		Acenaphthene	15	
			4-Nitrophenol	28-131		4-Nitrophenol	25	
			2,4-Dinitrotoluene	52-114		2,4-Dinitrotoluene	17	
			Pentachlorophenol	33-139		Pentachlorophenol	19	
			Pyrene	53-124		Pyrene	17	

Table 3b
Data Quality Objectives: Precision and Accuracy: Groundwater Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
PAHs (STARS/TAGM)	SW-846 Method 8270C	Groundwater	Surrogates % Rec. Nitrobenzene-d5 42-127 2-Fluorobiphenyl 38-131 Terphenyl-d14 22-153	Surrogates: All samples, standards, QC samples	Field Duplicates RPD ≤30	Field Duplicates: One per 20
			Matrix Spikes Naphthalene 47-116 2-Methylnaphthalene 47-125 Acenaphthylene 53-108 Acenaphthene 51-116 Fluorene 47-129 Fluoranthene 54-125 Pyrene 53-124 Phenanthrene 52-119 Anthracene 51-122 Benzo(a)anthracene 55-121 Chrysene 53-119 Benzo(b)fluoranthene 52-133 Benzo(k)fluoranthene 47-123 Benzo(a)pyrene 52-122 Indeno(1,2,3-cd)pyrene 42-134 Dibenzo(a,h)anthracene 51-135 Benzo(g,h,i)perylene 49-128	Matrix Spikes: One per 20	MS/MSDs RPD Naphthalene 16 2-Methylnaphthalene 18 Acenaphthylene 16 Acenaphthene 15 Fluorene 16 Fluoranthene 18 Pyrene 17 Phenanthrene 16 Anthracene 17 Benzo(a)anthracene 16 Chrysene 16 Benzo(b)fluoranthene 25 Benzo(k)fluoranthene 24 Benzo(a)pyrene 17 Indeno(1,2,3-cd)pyrene 25 Dibenzo(a,h)anthracene 20 Benzo(g,h,i)perylene 24	MS/MSDs: One per 20
Metals (TAGM)	SW-846 Methods 6010B/7000 Series	Groundwater	Matrix Spikes 75-125% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30	Field Duplicates: One per 20
					Matrix Duplicates RPD ≤20	Matrix Duplicates: One per 20

Table 3b
Data Quality Objectives: Precision and Accuracy: Groundwater Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
Ammonia	EPA Method 350.1 (350.2 for distillation)	Groundwater	Matrix Spikes 60-134% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤24	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Nitrate	EPA Method 353.2/SM 4500-NO_2B (18th edition)	Groundwater	Matrix Spikes 56-129% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤6	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Nitrite	SM 4500-NO_2B (18th edition)	Groundwater	Matrix Spikes 71-122% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Sulfate	SW-846 9056	Groundwater	Matrix Spikes 80-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤20	Field Duplicates: One per 20 Matrix Duplicates: One per 20

Table 3b
Data Quality Objectives: Precision and Accuracy: Groundwater Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
Carbonate	SM 4500-CO_2D (18th edition)	Groundwater	Matrix Spikes 80-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Bicarbonate	SM 4500-CO_2D (18th edition)	Groundwater	Matrix Spikes 80-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤11	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Cyanide	EPA Method 335.3	Groundwater	Matrix Spikes 75-125% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Total Dissolved Solids	EPA Method 160.1	Groundwater	Not Applicable	Not Applicable	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤18	Field Duplicates: One per 20 Matrix Duplicates: One per 20

Table 3b
Data Quality Objectives: Precision and Accuracy: Groundwater Samples
First Avenue Properties Program

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
Chloride	EPA Method 300.0	Groundwater	Matrix Spikes 80-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD ≤30 Matrix Duplicates RPD ≤20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Recovery criteria for laboratory control samples must be at least as stringent as MS/MSD criteria. Laboratory control limits are periodically updated. The latest control limits will be utilized at the time of sample analysis.						

4.0 SAMPLING PLAN

Environmental sampling for the First Avenue Properties Project will include soil, groundwater, and waste characterization sampling. Direct push drilling (GeoProbe) and hollow-stem auger drilling will be the preferred methods for obtaining subsurface soil and groundwater samples; however, other drilling methods including mud rotary and drive and wash may also be used if warranted by site conditions. Performing grab or composite sampling by appropriate hand-held sampling equipment will be the preferred method for waste characterization sampling.

4.1 Grab/Composite Sampling

Grab soil/solid samples will be collected from the material or interval in question by retrieving a volume for analysis using a clean stainless steel, aluminum, plastic, or mild steel scoop, trowel, spoon, or bucket auger and placing the soil in a cleaned stainless steel pan for homogenization before inserting into the sample container. All parameters except volatile organic compounds will be homogenized. Samples for volatile organics analysis will be placed directly into the sample container. Composite samples will be collected in the same manner described above, except that the discrete sample volumes will be placed in a clean stainless steel pan and mixed to form the composite. Composites for volatile organics analysis will have the discrete sample volumes placed directly into the sample container without mixing.

4.2 Soil Sampling (Direct Push Drilling)

Sampling will be performed using four-foot-long acetate sleeves that will be advanced continuously to the desired depth below the surface. Soil samples from each sleeve will be screened using an organic vapor monitor (OVM), a photoionization instrument, to detect possible organic vapors. Organic vapor screening will be performed by slicing open the acetate sleeve, making a small slice in the soil column with a clean knife or sampling tool, inserting the OVM probe and pushing the slice closed, and monitoring the soil for approximately 5 to 10 seconds. This procedure will be repeated at intervals along the soil column at the field geologist's discretion.

The samples will be examined for staining, discoloration, odors, and debris indicative of contamination (ash, coal fragments, wood chips, cinders, petroleum staining, etc.) Samples for laboratory analysis will be collected from the six-inch interval most likely to be contaminated, based on OVM readings, discoloration, staining, and the field geologist's judgment (field conditions may require a section longer than six inches to make sufficient sample; however this decision will be field-based). The samples will be collected by cutting the soil in two places with a decontaminated steel, stainless steel, or aluminum trowel, spoon, or knife and homogenized in a decontaminated stainless steel pan before being placed in the sample bottles. VOC samples will go directly into the sample containers without homogenization. Samplers will wear phthalate-free gloves such as nitrile (no latex will be used) and will avoid contact of the gloves with the sample. Only clean metal instruments will be allowed to touch the sample. If there is insufficient soil volume in the spoon, then this will be made up by attempting a second direct push sleeve at the same depth, or by using the next immediate sample interval above or below this depth, if appropriate. If there is no recovery, then the sample from this depth will be skipped, and drilling will progress to the next four-foot depth.

4.3 Soil Sampling (Hollow-Stem Auger)

Soil samples will be collected continuously utilizing 2-inch-diameter by 2-foot-long split spoon samplers driven ahead of a hollow stem auger. Three-inch-diameter split spoon samplers may also be used. Augers with a minimum inside diameter of 4¼ inches shall be used for drilling where wells are proposed. If soil sampling below the groundwater table is required, augers will be equipped with center plugs and/or inert “knock out” plates to control sub-water table sediments from rising inside the auger flights and hampering collection of representative soil samples.

Each split spoon sample will be screened using an OVM to detect possible organic vapors. Organic vapor screening will be performed by opening the split spoon, making a small slice in the soil column with a clean knife or sampling tool, inserting the OVM probe and pushing the slice closed, and monitoring the soil for approximately 5 to 10 seconds. This procedure will be repeated at intervals along the split spoon soil column at the field geologist’s discretion.

The split spoons will be examined for staining, discoloration, odors, and debris indicative of contamination (ash, coal fragments, wood chips, cinders, petroleum staining, etc.) One sample will be collected from each split spoon, from the six-inch interval most likely to be contaminated, based on OVM readings, discoloration, staining, and the field geologist’s judgment. Note that due to sample recovery or field conditions, sample intervals other than six inches may be necessary to collect sufficient sample.

The samples will be collected by cutting the soil in two places with a decontaminated steel, stainless steel, or aluminum trowel, spoon, or knife and homogenizing in a decontaminated stainless steel pan before being placed in the sample bottles (refer to Table 2). VOC and GRO samples will go directly into the sample containers without homogenization. Samplers will wear phthalate-free gloves such as nitrile (no latex will be used) and will avoid contact of the gloves with the sample. Only clean metal instruments will be allowed to touch the sample. If there is no recovery, then the sample from this depth will be skipped, and drilling will progress to the next sampling interval.

4.4 Drive and Wash/Mud Rotary

Borings will be advanced vertically by driving 4-inch-diameter steel casing with a 300-pound hammer falling freely for 24 inches. The casing will be cleaned with water using a tri-cone roller bit and/or chopping bit. A 2-inch-diameter by 2-foot-long split spoon sampler will be driven ahead of the tri-cone roller bit and samples will be collected as described in Section 4.3. Any drilling fluids used to advance the drill bit will be contained within a steel trough and re-circulated into the drill hole. Uncontaminated drilling fluids containing drilling mud will be mixed with cement to form a grout that will be used to backfill the borehole where required; otherwise the mud will be pumped into 55-gallon drums for on-site storage and subsequent off-site disposal. In Drive and Wash drilling where only potable water will be used as the drilling fluid, the water will be allowed to diffuse into the borehole. Samples will be collected in the same manner as with hollow stem auger drilling. Where drilling mud is necessary, bentonite and/or Revert® will be used. Every effort will be made to collect samples for soil analysis before the addition of drilling mud. Only bentonite mixed with cement will be used to prepare grout for sealing the borehole.

4.5 Groundwater Sampling (Direct Push)

Groundwater samples will be collected utilizing dedicated screen point samplers, which utilize a screen with a slot size and length appropriate for the subsurface conditions. Polyethylene tubing, equipped with a check valve, is attached to the screen point sampler for retrieval of a groundwater sample to the surface. The screen point sampler is threaded onto a probe rod driven to the desired sampling interval. An O-ring on the screen head maintains a seal at the top of the screen during installation of the sampling unit. After reaching the desired sampling depth, a tool string is inserted into the probe rod and retracted to open the screen point sampler. A peristaltic or vacuum pump attached to the polyethylene tubing is then utilized to collect a representative groundwater sample.

Field parameters which will be monitored include temperature, conductivity, pH, dissolved oxygen (DO), and turbidity. Field parameters should generally be within ∀10 percent for two consecutive readings, one minute apart, so that it may be determined when the parameters stabilize.

4.6 Groundwater Sampling (Permanent Well)

Groundwater sampling of permanent monitoring wells is described according to the following distinct phases of this work: well installation/construction, well development, well purging, and well sampling.

4.6.1 Well Installation/Construction

To collect representative groundwater samples, previously installed soil borings will be converted into permanent two-inch or four-inch diameter monitoring wells. Groundwater monitoring wells will be constructed of threaded two-inch or four-inch-diameter PVC well casing and 20-slot well screen, such that the well screen extends approximately 8 feet below the water table. A minimum of one foot of well screen will be installed above the water table, depth to water and surface elevation permitting; however, optimally, two to three feet of well screen will remain above the water table. Clean silica sand, Morie No. 2, or equivalent, shall be placed in the annular space around the well to a minimum of one foot above the top of the well screen, two feet being optimal. For a two-inch diameter well, the annular space for the filter pack should be between 2 to 4 inches thick. (The 4 ¼ inside diameter hollow stem augers will have to be retracted as the filter pack is installed to yield the required annular space.) A two-foot bentonite seal shall then be placed above the sand pack and wetted with potable water for a minimum of 15 minutes before backfilling the remaining space with a cement-bentonite grout. If warranted by depth, backfilling will be completed using a tremie pipe placed below the surface of the grout. Solid PVC riser, attached to the well screen, will extend approximately to grade. A flush-mount protective casing with a locking water-tight well cap will then be installed and a measuring point marked on each PVC well riser. Well construction diagrams will be prepared for each well.

4.6.2 Well Development

Following their installation, the groundwater monitoring wells will be developed, using a two-inch diameter Grunfos submersible pump(s) (or equivalent) until the water is reasonably free of turbidity and field readings (pH, conductivity, temperature, and dissolved oxygen) sufficiently stabilize. Fifty nephelometric turbidity units (NTUs) or less will be the turbidity goal but not an absolute value. To minimize suspended material, the wells will be developed very carefully using low-flow submersible pump techniques. The wells will be developed gently at low pumping rates, on the order of 0.5 to one gpm. Bailers will not be used for developing these wells (nor will bailers be used for sampling except for VOC compounds). The wells will be allowed to equilibrate for 14 days prior to sampling. The volume of water removed, the well development time, and field instrument readings will be recorded in the logbook

4.6.3 Well Purging

The objective is to purge monitoring wells until turbidity stabilizes to a level as low as possible and this parameter will be given the greatest weight in determining when groundwater sampling may begin. The samples should have an absolute minimum amount of suspended material. This is to be achieved by slow, prolonged, and steady pumping. Fifty NTUs or less is the well purging goal, but not an absolute value before sampling. Other field parameters including temperature, conductivity, pH, and DO will also be monitored. As practical, all field measurements will be taken from the flow cell and will be recorded during and after purging, and before sampling. Field parameters should generally be within ±10 percent for two consecutive readings, one minute apart, so that it may be determined when the parameters stabilize.

Upon opening each monitoring well and point, the concentration of VOCs in the headspace will be measured using an OVM and water level measurements will be recorded using an electronic oil-water interface probe. The depth to product (if present), depth to water, and the total depth will be measured from the top of the marked PVC casings. Water level and free product (none anticipated) measurements will first be made and the volume of water in the well determined. The volume of water in the well will be calculated so that the number of well volumes purged and an estimate of the time required to purge the well can be made. Before sampling, the wells will be purged utilizing a low-flow submersible stainless steel pump using dedicated polypropylene, tygon, and/or Teflon tubing connected to a flow cell. Very low purging rates are proposed, on the order of 100 ml/minute to 500 ml/minute, so as to minimize suspension of particulate matter in the well.

Purging will be done with the pump placed near the top of the water column to insure that all stagnant water in the well is removed, while not stirring sediment that may have accumulated on the bottom of the well. Equipment will be lowered into the well very carefully so as to prevent suspension of bottom sediment and subsequent entrainment onto sampling equipment. Surging will be avoided. Pumps must be carefully cleaned between wells according to the procedures specified in Section 4.10. It is anticipated that no more than three well volumes will be purged in order for turbidity to reach a minimum and the other parameters to stabilize. During purging, TRC will actively monitor and track the volume of water purged and the field parameter readings. Data will be recorded in the field logbook. For example, TRC will record the running total volume purged from each well and note the readings for the corresponding field parameters.

4.6.4 Well Sampling

Once groundwater conditions have stabilized and groundwater levels have recovered, all samples except those slated for VOC analysis will be collected from the flow cell outlet (connected to the low-flow submersible pump). Samples for VOC analysis will be sampled using a micro stainless steel and/or Teflon bailer or some other appropriate VOC sampling method. All sampling equipment will be cleaned according to the procedures specified in Section 4.8.

Sampling will be performed by suspending the bottom of the pump and/or bailer a minimum of 15 inches above the bottom of the well and a minimum of 0.5 feet from the top of the water level, in order to minimize the amount of suspended sediment in the sample. Pumping rates for withdrawing the samples will be similar to those followed for well purging, 100 ml/minute to 500 ml/minute.

The samples will be collected in sample bottles (pre-preserved, if appropriate), placed in iced coolers and removed from light immediately after collection. In addition, all samples bottles must be filled to the top so that no aeration of the samples occurs during transport. All bottles will be filled so as to avoid cascading and aeration of the samples, the goal being to minimize any precipitation of colloidal matter.

4.7 Waste Classification Sampling

Waste classification sampling will be conducted for the purpose of characterizing a waste for its proper off-site disposal. Specific methods for sampling liquid and solid wastes are listed in Table 4 and briefly discussed below.

4.7.1 Solid Waste

As indicated by Table 4, solid sampling methods include utilizing dedicated stainless steel or Teflon scoops/shovels, triers, and thiefs. Scoops and shovels is the preferred method for sampling solids from piles or containers. Stainless steel triers are similar to a scoop and are used for the collection of a core sample of a solid material. Thiefs are long hollow tubes, with an inner tube, and are used for sampling of dry free running solids (e.g. pile of fine sand). To sample solid material at varying depths, a hollow stem auger or a core sampler in conjunction with an auger can be utilized (See Soil Sampling Section).

4.7.2 Liquid Waste

As indicated by Table 4, liquid sampling methods include utilizing dedicated dippers, glass tube samplers, pump and tubing, kemmerer bottles, and Bacon Bomb samplers. Dippers are used to collect samples from the surface of the liquid, and are appropriate for wastes that are homogeneous. Glass tube samplers consist of glass tubes of varying length and diameter used to collect a full-depth liquid sample from a drum or similar container. Pump and tubing (e.g. bladder pump or peristaltic pump) are used to collect liquid samples from a depth (up to approximately 20 feet below grade), and are typically relied upon for sampling subsurface structures, such as underground storage tanks. To minimize the loss of volatile organic components in the liquid, the lowest achievable flow rate is utilized for collecting the sample by this method. Kemmerer bottles and Bacon Bomb samplers are discrete-depth samplers. These samplers are lowered into the liquid and opened to collect a sample at a desired depth.

Table 4
Sampling Methods Summary For Waste Characterization
First Avenue Properties

	1	2	3	4	5	6	7	8	9	10	11
Waste Type/Unit Type	**Scoops/ Shovels**	**Triers**	**Thief**	**Sample Core**	**Auger**	**Core Sampler***	**Glass Tubes**	**Dipper**	**Pump/ Tubing**	**Kemmerer Bottle**	**Bacon Bomb**
Solid Wastes											
Waste Piles	X	X	X	X	X						
Drums	X		X	X							
Sacks/Bags	X	X	X								
Trucks	X	X	X			X					
Sludge Wastes											
Waste Piles	X	X		X		X					
Drums	X					X	X				
Tanks	X							X			
Surface Impoundment	X							X			
Trucks	X	X				X		X			
Liquid Wastes											
Drums							X	X	X		
Tanks									X	X	X
Surface Impoundment								X	X	X	X
Trucks								X	X	X	X

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

4.7.3 Grab versus Composite Sampling

Waste characterization of a liquid or a solid can involve grab or composite sampling depending upon the homogeneity and the volume of the waste. Grab sampling consists of collecting discrete sample or samples of a material, and submitting each sample for separate analysis. Grab sampling is appropriate for characterizing small quantities of waste as well as waste streams of varying content (e.g. drums of different contents). Composite sampling consists of taking discrete grab samples of a material and combining them into a smaller number of samples for analysis. Composite sampling generally is appropriate for large volumes of a homogenous waste material, such a pile of soil or construction debris. The specific number of composite and grab samples largely will depend upon the size and nature of the waste pile (i.e. cubic yards) as well as the analysis required for characterization of the waste.

4.8 QC Sample Collection

QC samples will include equipment blanks, trip blanks, field duplicates and MS/MSDs.

Equipment blanks will consist of distilled water and will be used to check for potential contamination of the equipment which may cause sample contamination. Equipment blanks will be collected by routing the distilled water through the sampling equipment prior to sample collection. Equipment blanks will be submitted to the laboratory at a frequency of one per 20 samples per matrix per type of equipment being used per parameter, with the exception of TCLP parameters; equipment blanks will not be submitted for the TCLP parameters.

Trip blanks will consist of distilled water (supplied by the laboratory) and will be used to assess the potential for volatile organic compound contamination of groundwater samples due to contaminant migration during sample shipment and storage. Trip blanks will be transported to the site unopened, stored with the investigative samples, and kept closed until analyzed by the laboratory. Trip blanks will be submitted to the laboratory at a frequency of one per cooler which contains VOC groundwater samples.

Field duplicates are an additional aliquot of the same sample submitted for the same parameters as the original sample. Field duplicates will be used to assess the sampling and analytical reproducibility. Field duplicates will be collected by alternately filling sample bottles from the source being sampled. Field duplicates will be submitted at a frequency of one per 20 samples for all matrices and all parameters, with the exception of TCLP parameters; field duplicates will not be submitted for the TCLP parameters.

MSs and MSDs are two additional aliquots of the same sample submitted for the same parameters as the original sample. However, the additional aliquots are spiked with the compounds of concern. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. MS/MSDs will be submitted at a frequency of one per 20 investigative samples per matrix for organic parameters. MSs will be submitted at a frequency of one per 20 investigative samples per matrix for inorganic parameters.

Refer to Table 5 for a summary of QC sample preservation and container requirements.

4.9 Sample Preservation and Containerization

The analytical laboratory will supply the sample containers for the chemical samples. These containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest U.S. EPA's *Specifications and Guidance for Contaminant-Free Sample Containers*. Certificates of analysis are provided with each bottle lot and maintained on file to document conformance to EPA specifications. The containers will be pre-preserved, where appropriate (See Table 2).

4.10 Equipment Decontamination

4.10.1 Sampling Equipment

Re-usable Teflon, stainless steel, and aluminum sampling equipment shall be cleaned between each use in the following manner:

- Wash/scrub with a biodegradable degreaser ("Simple Green") if there is oily residue on equipment surface
- Tap water rinse
- Wash and scrub with Alconox and water mixture
- Tap water rinse
- 10 percent HNO_3 rinse for non-dedicated groundwater sampling equipment for metals analysis only (excludes submersible pump and flow cell)
- Hexane rinse (optional, only if required to remove heavy petroleum coating)

- Distilled/deionized water rinse
- Air dry

Cleaned equipment shall be wrapped in aluminum foil if not used immediately after air-drying.

Groundwater sampling pumps will be cleaned by washing and scrubbing with an Alconox/water mixture, rinsing with tap water and irrigating with deionized water.

Table 5
QC Sample Preservation and Container Requirements
First Avenue Properties

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2,3]
Soil	VOCs (TCL or STARS/TAGM)	Field Duplicate	TBD	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	BTEX/MTBE	Field Duplicate	TBD	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	PCBs	Field Duplicate	TBD	SW-846 Method 8082	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	PAHs or SVOCs (STARS/TAGM)	Field Duplicate	TBD	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	Lead	Field Duplicate	TBD	SW-846 Method 6010B	Cool to 4^0 C	6 months to analysis	(1) 300 mL amber glass jar
Soil	Metals (TAGM)	Field Duplicate	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Soil	GRO	Field Duplicate	TBD	SW-846 Method 8015B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil	DRO	Field Duplicate	TBD	SW-846 Method 8015B	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Groundwater	VOCs (STARS/TAGM)	Field Duplicate	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Groundwater	BTEX/MTBE	Field Duplicate	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials

Table 5
QC Sample Preservation and Container Requirements
First Avenue Properties

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2,3]
Groundwater	Pesticides (TAGM)	Field Duplicate	TBD	SW-846 Method 8081A	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars
Groundwater	PCBs	Field Duplicate	TBD	SW-846 Method 8082	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars
Groundwater	SVOCs (STARS/TAGM)	Field Duplicate	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars
Groundwater	PAHs (STARS/TAGM)	Field Duplicate	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars
Groundwater	Lead	Field Duplicate	TBD	SW-846 Method 6010B	pH<2 with HNO_3; Cool to 4^0 C	6 months to analysis	(1) 1L polyethylene container
Groundwater	Metals (TAGM)	Field Duplicate	TBD	SW-846 Method 6010B/7000 Series	pH<2 with HNO_3; Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1L polyethylene container
Groundwater	Ammonia	Field Duplicate	TBD	EPA Method 350.1 (350.2 for distillation)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 250 mL polyethylene container
Groundwater	Nitrate	Field Duplicate	TBD	EPA Method 353.2/SM 4500-NO_2B (18th edition)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 100 mL polyethylene container
Groundwater	Nitrite	Field Duplicate	TBD	SM 4500-NO_2B (18th edition)	Cool to 4^0 C	48 hours to analysis	(1) 100 mL polyethylene container
Groundwater	Sulfate	Field Duplicate	TBD	SW-846 9056	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 100 mL polyethylene container

Table 5
QC Sample Preservation and Container Requirements
First Avenue Properties

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2,3]
Groundwater	Carbonate	Field Duplicate	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Bicarbonate	Field Duplicate	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Cyanide	Field Duplicate	TBD	EPA Method 335.3	pH>12 with NaOH; Cool to 4ºC	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Chloride	Field Duplicate	TBD	EPA Method 300.0	Cool to 4ºC	28 days to analysis	(1) 100 mL polyethylene container
Groundwater	Total Dissolved Solids	Field Duplicate	TBD	EPA Method 160.1	Cool to 4ºC	7 days to analysis	(1) 100 mL polyethylene container
Aqueous	Ammonia	Equipment Blank	TBD	EPA Method 350.1 (350.2 for distillation)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 250 mL polyethylene container
Aqueous	Nitrate	Equipment Blank	TBD	EPA Method 353.2/SM 4500-NO_2B (18th edition)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 100 mL polyethylene container
Aqueous	Nitrite	Equipment Blank	TBD	SM 4500-NO_2B (18th edition)	Cool to 4^0 C	48 hours to analysis	(1) 100 mL polyethylene container
Aqueous	Sulfate	Equipment Blank	TBD	SW-846 9056	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 100 mL polyethylene container
Aqueous	Carbonate	Equipment Blank	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container

Table 5
QC Sample Preservation and Container Requirements
First Avenue Properties

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2,3]
Aqueous	Bicarbonate	Equipment Blank	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Aqueous	Cyanide	Equipment Blank	TBD	SW-846 Method 9010B	pH>12 with NaOH; Cool to 4ºC	14 days to analysis	(1) 250 mL polyethylene container
Aqueous	Chloride	Equipment Blank	TBD	SW-846 Method 9250	Cool to 4ºC	28 days to analysis	(1) 100 mL polyethylene container
Aqueous	Total Dissolved Solids	Equipment Blank	TBD	EPA Method 160.1	Cool to 4ºC	7 days to analysis	(1) 100 mL polyethylene container
Aqueous	VOCs (TCL or STARS/TAGM)	Equipment Blank	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Aqueous	BTEX/MTBE	Equipment Blank	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Aqueous	Pesticides (TAGM)	Equipment Blank	TBD	SW-846 Method 8081A	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars
Aqueous	PCBs	Equipment Blank	TBD	SW-846 Method 8082	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars
Aqueous	SVOCs (STARS/TAGM)	Equipment Blank	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars

Table 5
QC Sample Preservation and Container Requirements
First Avenue Properties

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2,3]
Aqueous	PAHs (STARS/TAGM)	Equipment Blank	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1 L amber glass jars
Aqueous	Lead	Equipment Blank	TBD	SW-846 Method 6010B	pH<2 with HNO_3; Cool to 4^0 C	6 months to analysis	(1) 1L polyethylene container
Aqueous	Metals (TAGM)	Equipment Blank	TBD	SW-846 Method 6010B/7000 Series	pH<2 with HNO_3; Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1L polyethylene container
Aqueous	GRO	Equipment Blank	TBD	SW-846 Method 8015B	pH<2 with HCl; Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Aqueous	DRO	Equipment Blank	TBD	SW-846 Method 8015B	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 1L amber glass bottles
Aqueous	VOCs (TCL or STARS/TAGM)	Trip Blank	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Aqueous	BTEX/MTBE	Trip Blank	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials

[1] From date of sample collection

[2] I-Chem Series 300 bottles

[3] MS/MSDs require duplicate volume for all parameters for solid matrices; MS/MSDs require triplicate volume for organic parameters for aqueous matrices and duplicate volume for inorganic parameters for aqueous matrices

TBD = To Be Determined

5.0 DOCUMENTATION AND CHAIN-OF-CUSTODY

5.1 Sample Collection Documentation

5.1.1 Field Notes

Field team members will keep a field logbook to document all field activities. Field logbooks will provide the means of recording the chronology of data collection activities performed during the investigation. As such, entries will be described in as much detail as possible so that a particular situation could be reconstructed without reliance on memory.

The logbook will be a bound notebook with water-resistant pages. Logbook entries will be dated, legible, and contain accurate and inclusive documentation of the activity. The title page of each logbook will contain the following:

- Person to whom the logbook is assigned,
- The logbook number,
- Project name and number,
- Site name and location,
- Project start date, and
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, and names of all sampling team members present will be entered. Each page of the logbook will be signed and dated by the person making the entry. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field activities will be fully documented. Information included in the logbook will include, but may not be limited to the following:

- Chronology of activities, including entry and exit times,
- Names of all people involved in sampling activities,
- Level of personal protection used,
- Any changes made to planned protocol,
- Names of visitors to the site during sampling and reason for their visit,
- Sample location and identification,

- Changes in weather conditions,
- Dates (month/day/year) and times (military) of sample collection,
- Measurement equipment identification (model/manufacturer) and calibration information,
- Sample collection methods and equipment,
- Sample depths,
- Whether grab or composite sample collected,
- How sample composited, if applicable,
- Sample description (color, odor, texture, etc.)
- Sample identification code.
- Tests or analyses to be performed,
- Sample preservation and storage conditions,
- Equipment decontamination procedures,
- QC sample collection,
- Unusual observations,
- Record of photographs,
- Sketches or diagrams, and
- Signature of person recording the information

Field logbooks will be reviewed on a daily basis by the Field Team Leader. Logbooks will be supported by standardized forms.

5.1.2 Chain-of-Custody Records

Sample custody is discussed in detail in Section 5.2 of this Plan. Chain-of-custody records are initiated by the samplers in the field. The field portion of the custody documentation should include: (1) the project name; (2) signatures of samplers; (3) the sample number, date and time of collection, and whether the sample is grab or composite; (4) signatures of individuals involved in sampling; and (5) if applicable, air bill or other shipping number. Sample receipt and log-in procedures at the laboratory are described in Section 5.2.2 of this Plan.

On a regular basis (daily or on such a basis that all holding times will be met), samples will be transferred to the custody of the respective laboratories, via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures, and field chain-of-custody procedures are described in Section 5.2.1 of this Plan.

5.1.3 Sample Labeling

Immediately upon collection, each sample will be labeled with a pre-printed adhesive label, which includes the date and time of collection, sampler's initials, tests to be performed, preservative (if applicable), and a unique identifier. The following identification scheme will be used:

A. The sample ID number will include the soil sampling, soil boring, or monitoring well location, along with the sample depth, sample interval, and the depth interval at which it was collected.

Example:

Sample "KB-B22, 5.0 - 5.5' indicates the sample was taken at the Kips Bay boring location B-22, from the 6-inch interval in the spoon beginning at 5.0 feet below grade and ending at 5.5 feet below grade. (Use OB for 708, PL for Parking Lot and WS for Waterside Units.) Duplicate samples will be labeled as blind duplicates by giving them sample numbers indistinguishable from a normal sample.

Blanks should be spelled out and identify the associated matrix, e.g. Equipment Blank, Soil

MS/MSDs will be noted in the Comments column of the COC.

B. The job number will be the number assigned to the particular site.

Example: 28410-KB03-2210T

C. The analysis required will be indicated for each sample.

Example: SVOC

D. Date taken will be the date the sample was collected, using the format: MM-DD-YY.

Example: 3-22-01

E. Time will be the time the sample was collected, using military time.

Example: 1335

F. The sampler's name will be printed in the "Sampled By" section.

G. Other information relevant to the sample.

Example: Equipment Blank

An example sample label is presented below:

Job No:	28410-KB03-2210T
Client:	TRC
Sample No:	“KB-22, 5.0 - 5.5’
Matrix:	Soil
Date Taken:	3/22/01
Time Taken:	14:30
Sampler:	M. Burke
Analysis:	SVOC

Job No. ____________________
Client: ____________________
Sample Number ____________________
Date ____________________ Sample Time ____________________
Sample Matrix ____________________
Grab or Composite (explain) ____________________
Preservatives ____________________
Analyses ____________________
Sampler Signature____________________

This sample label contains the authoritative information for the sample. Inconsistencies with other documents will be settled in favor of the vial or container label unless otherwise corrected in writing from the field personnel collecting samples or the TRC Project QA Officer.

5.2 Sample Custody

Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample or evidence file is considered to be under a person's custody if

- the item is in the actual possession of a person;
- the item is in the view of the person after being in actual possession of the person;
- the item was in the actual physical possession of the person but is locked up to prevent tampering;
- the item is in a designated and identified secure area.

5.2.1 Field Custody Procedures

Samples will be collected following the sampling procedures documented in Section 4.0 of this Plan. Documentation of sample collection is described in Section 5.1 of this Plan. Sample chain-of-custody and packaging procedures are summarized below. These procedures will ensure that the samples will arrive at the laboratory with the chain-of-custody intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.

- All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system is presented in Section 5.1.3 of this Plan.

- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because the pen would not function in wet weather.

- Samples will be accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage location.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and placed in the project files.

- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the front right and back left of the cooler and covered with clear plastic tape after being signed by field personnel. The cooler will be strapped shut with strapping tape in at least two locations.

- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on chain-of-custody document as receiving the samples and signature of sampler as relinquishing samples.

5.2.2 Laboratory Custody Procedures

Samples will be received and logged in by a designated sample custodian or his/her designee. Upon sample receipt, the sample custodian will

- Examine the shipping containers to verify that the custody tape is intact,
- Examine all sample containers for damage,
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the chain-of-custody records,
- Compare samples received against those listed on the chain-of-custody,
- Verify that sample holding times have not been exceeded,
- Examine all shipping records for accuracy and completeness,
- Determine sample pH (if applicable) and record on chain-of-custody forms,
- Sign and date the chain-of-custody immediately (if shipment is accepted) and attach the air bill,
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the TRC Project QA Officer,
- Attach laboratory sample container labels with unique laboratory identification and test, and
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.
- The Laboratory Project Manager will be notified of sample arrival.

- The completed chain-of-custody, air bills, and any additional documentation will be placed in the final evidence file.

6.0 CALIBRATION PROCEDURES

6.1 Field Instruments

Field instruments will be calibrated according to the manufacturer's specifications. All calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, temperature at which the readings were taken, and the readings.

6.2 Laboratory Instruments

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and/or continuing calibration verification. Detailed descriptions of the calibration procedures for a specific laboratory instrument are included in the laboratory's standard operating procedures (SOPs), which describe the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration. These procedures are as required in the respective analytical methodologies (summarized in Table 2 of this Plan). The initial calibration associated with all analyses must contain a low-level calibration standard which is less than or equal to the quantitation limit.

7.0 SAMPLE PREPARATION AND ANALYTICAL PROCEDURES

No field analyses are anticipated for the First Avenue Properties project Work Plan. If site conditions were to warrant field analysis, TRC will prepare an addendum establishing the field analytical procedures. Analyses of all soil, groundwater and waste classification samples will be performed by Accutest Labs in Dayton, New Jersey. Table 2 summarizes the analytical methods to be used during this investigation.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project. Complete data packages suitable for data validation to support the generation of a Data Usability Summary Report (DUSR) according to NYSDEC requirements will be provided by the analytical laboratory.

For all analyses, the laboratory will report results which are below the laboratory's reporting limit; these results will be qualified as estimated (J) by the laboratory. The laboratory may be required to report tentatively identified compounds (TICs) for the VOC and SVOC analyses; this will be requested by TRC on an as-needed basis.

8.1 Data Evaluation/Validation

8.1.1 Field Data Evaluation

Measurements and sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Daily reviews of the field records by the Field Team Leader will ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the Plan, and that any deviations were documented and approved by the appropriate personnel.

8.1.2 Analytical Data Validation

TRC will be responsible for performing an independent validation of the analytical data. Project-specific procedures will be used to validate analytical laboratory data. The basis for the validation will be the USEPA CLP National Functional Guidelines for Organic Data Review (October 1999) and the USEPA CLP National Functional Guidelines for Inorganic Data Review (February 1994), modified to accommodate the criteria in the analytical methods used in this program, and Region II Standard Operating Procedures (SOPs) for CLP Organic Data review (Revision 11, June 1996) and Evaluation of Metals for the CLP Program (Revision 11, January 1992). Tables 1, 2, 3a, 3b and 5 highlight the QC criteria and holding time requirements for all analyses conducted under this program. These criteria will be used to evaluate and qualify the data during validation.

TRC will validate an appropriate number of soil samples collected for the purpose of characterizing the subsurface and/or delineating impacted areas to ensure that verifiable data are used to support decision making and endpoint documentation. Likewise, an appropriate number of groundwater samples will be validated to ensure that cleanup criteria have been achieved. Samples collected for waste classification will not be validated. Validation will include all technical holding times, as well as QC sample results (blanks, surrogate spikes, laboratory duplicates, MS/MSDs, and LCSs), tunes, internal standards, calibrations, target compound identification, and results calculations.

The overall completeness of the data package will also be evaluated by the data validator. Completeness checks will be administered on all data to determine whether full data deliverables were provided. The reviewer will determine whether all required items are present and request copies of missing deliverables.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any nonconformances with the established criteria, and validation actions. Data qualifiers will be consistent with EPA National Functional Guidelines. This report will be in a format consistent with NYSDEC's Data Usability Summary Report (DUSR),

8.2 Identification and Treatment of Outliers

Any data point which deviates markedly from others in its set of measurements will be investigated; however, the suspected outlier will be recorded and retained in the data set. One or both of the following tests will be used to identify outliers.

Dixon's test for extreme observations is an easily computed procedure for determining whether a single very large or very small value is consistent with the remaining data. The one-tailed t-test for difference may also be used in this case. It should be noted that these tests are designed for testing a single value. If more than one outlier is suspected in the same data set, other statistical sources may be consulted and the most appropriate test of hypothesis will be used and documented, if warranted.

Since an outlier may result from unique circumstances at the time of sample analysis or data collection, those persons involved in the analysis and data reduction will be consulted. This may provide an experimental reason for the outlier. Further statistical analysis may be performed with and without the outlier to determine its effect on the conclusions. In many cases, two data sets may be reported, one including, and one excluding the outlier.

In summary, every effort will be made to include the outlying values in the reported data. If the value is rejected, it will be identified as an outlier, reported with its data set and its omission noted.

9.0 INTERNAL QUALITY CONTROL

The subcontracting laboratory Quality Assurance Project Plan will identify the supplemental internal analytical quality control procedures to be used. At a minimum, this will include:

- Matrix spike and/or matrix spike duplicate samples
- Matrix duplicate analyses
- Laboratory control spike samples
- Instrument calibrations
- Instrument tunes for SW-846 8260B and 8270C analyses
- Method and/or instrument blanks
- Surrogate spikes for organic analyses
- Internal standard spikes for SW-846 8260B and 8270C analyses
- Detection limit determination and confirmation by analysis of low-level calibration standard

Field quality control samples will include:

- Equipment blanks as outlined in Table 5
- Field duplicate samples as outlined in Table 5
- Trip blanks as outlined in Table 5
- MS/MSDs described in Section 4.8

10.0 CORRECTIVE ACTION

The entire sampling program will be under the direction of TRC's Project QA officer. The emphasis in this program is on preventing problems by identifying potential errors, discrepancies, and gaps in the data-collection-laboratory-analysis-interpretation process. Any problems identified will be promptly resolved. Likewise, follow-up corrective action is always an option in the event that preventative corrective actions are not totally effective.

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by other means in the Plan. Corrective actions are likely to be immediate in nature and most often will be implemented by the contracted laboratory analyst or the TRC Program Manager. The corrective action will usually involve recalculation, reanalysis, or repeating a sample run.

10.1 Immediate Corrective Action

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the Plan), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The Field Team Leader will approve the corrective action and notify the TRC Program Manager. The TRC Program Manager will approve the corrective measure. The Field Team Leader will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field record book. Documentation will include:

- A description of the circumstances that initiated the corrective action,
- The action taken in response,
- The final resolution, and
- Any necessary approvals.

No staff member will initiate corrective action without prior communication of findings through the proper channels.

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample containers, omissions or discrepancies with chain-of-custody documentation, low/high pH readings, and potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with laboratory analysts and Laboratory Section Leaders, it may be necessary for the Laboratory QA Manager to approve the implementation of corrective action. The laboratory SOPs specify some conditions during or after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, automatic reinjection/reanalysis when certain QC criteria are not met, loss of sample through breakage or spillage, etc.

The analyst may identify the need for corrective action. The Laboratory Section Leader, in consultation with the staff, will approve the required corrective action to be implemented by the laboratory staff. The Laboratory QA Manager will ensure implementation and documentation of the corrective action. If the nonconformance causes project objectives not to be achieved, the TRC Project QA Officer will be notified. The TRC Project QA Officer will notify the TRC Program Manager, who in turn will contact all levels of project management for concurrence with the proposed corrective action.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to the TRC Program Manager. If the corrective action does not rectify the situation, the laboratory will contact the TRC Program Manager, who will determine the action to be taken and inform the appropriate personnel.

If potential problems are not solved as an immediate corrective action, the contractor will apply formalized long-term corrective action if necessary.

APPENDIX A

STARS AND TAGM GUIDANCE