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Division of Geological & Geophysical Surveys

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WATER QUALITY SAMPLING FOR THE TASK 2 DRILLING AND SAMPLING EXTENSION OF THE SUBSURFACE AND HYDROLOGIC FIELD INVESTIGATION IN THE RAILROAD INDUSTRIAL AREA, FAIRBANKS, ALASKA

by

Jim Vohden
Alaska Division of Water

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Division of Geological & Geophysical Surveys
794 University Avenue, Suite 200
Fairbanks, Alaska 99709-3645

INTRODUCTION

The Minnie Street Land Users Group (MSLUG) was formed in March, 1993 in an effort to coordinate the evaluation of hydrocarbon levels in the Railroad Industrial Area, in Fairbanks, Alaska. MSLUG is a private group comprised of current and former land users, primarily business operators and lessees. This project is a result of this coordination between the Alaska Railroad Corporation, the United States Geological Survey, the Alaska Division of Water, and the members of MSLUG. This report will not discuss the details of the project, but will present the water chemistry data collected between 15 August 1993 and 15 September 1993.

A total of 17 wells and 5 surface water sites were sampled for inorganic parameters during the study. Results of samples collected for organic analysis are reported by the U.S. Geological Survey elsewhere (to be published). As seen in Figure 1, the study area encompasses approximately 300 acres. One site is not located on the site map. The Tanana River was sampled at the USGS gage site located south of Fairbanks. Wells were chosen for sampling based on their spatial arrangement throughout the study area and on the absence of organic hydrocarbons as determined during a preliminary investigation. Four wells are designated as "nested" in the following tables. Located near the coal transfer station along Phillips Field Road, these wells were drilled as close as possible to each other; all are within a ten foot radius. This arrangement allows the water quality to be monitored for a veritcal gradient using these wells.

METHODS

Field

All sampling was done in accordance with methods established by U.S. Environmental Protection Agency (1982) and the U.S. Geological Survey. Wells were purged using a peristaltic pump attached to a section

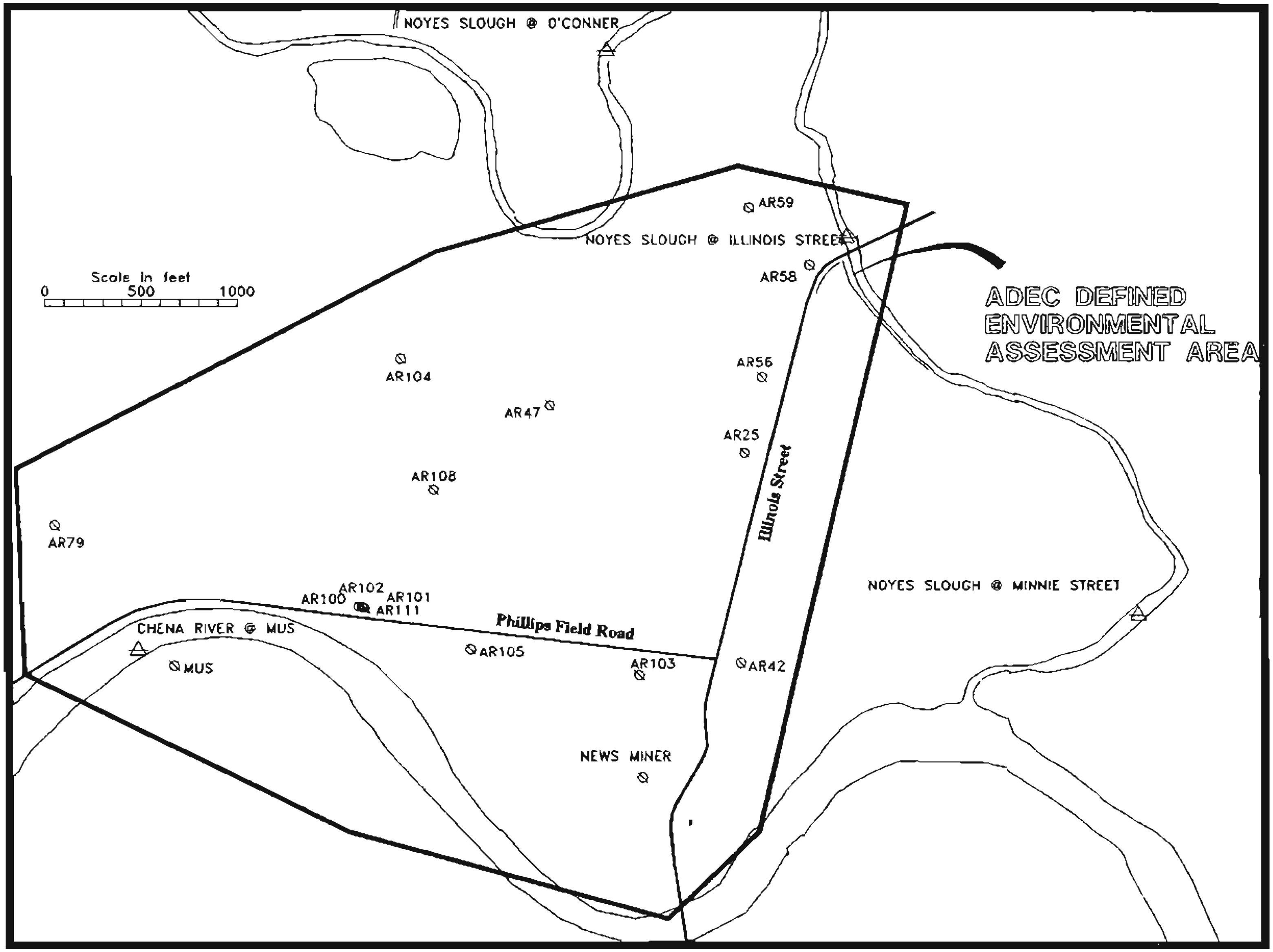

Figure 1. Well locations for inorganic sampling during August-September, 1993.

of 3/8" ID Teflon tubing which was decontaminated between sites. The wells were sampled as soon as the temperature, pH and conductivity values stabilized. These parameters were measured using a Hydrolab instrument with flow through cell and recorded by a laptop computer. Teflon bailers were lowered into the wells using disposable nylon string. Samples were collected using a controlled flow bottom attachment on the bailer. Alkalinity titrations were done in the field immediately after collecting the sample. Appendix A contains the Quality Assurance Program Plan as accepted by the Alaska Department of Environmental Conservation.

Analytical

All samples were analyzed by the Alaska Division of Water, Water Quality Laboratory located in Fairbanks, Alaska. The laboratory is a participant in the USEPA Performance Evaluation program as well as the USGS Standard Reference Water Sample Quality Assurance program. Analytical methods are listed in Table 1. For all parameters, calibrations were performed using NIST traceable standards where applicable. General data reduction procedures are described in Standard Methods (APHA, 1991).

Table 1. Analytical methods.

Parameter	EPA Method	Description	Detection Limit
Alkalinity	310.1	titration	0.1 mg/L as CaCO3
Fluoride	340.2	ion selective electrode	0.01 mg/L
Chloride	300.0	ion chromatography	0.01 mg/L
Conductivity	120.1	whetstone bridge	----
Nitrate	300.0	ion chromatography	0.02 mg/L as NO3
pH	150.1	electrometric	----
Phosphate	300.0	ion chromatography	0.05 mg/L
Sulfate	300.0	ion chromatography	0.01 mg/L
Calcium	AES 0029	DCP	0.01 mg/L
Magnesium	AES 0029	DCP	0.01 mg/L
Sodium	273.1	flame AA	0.1 mg/L
Potassium	258.1	flame AA	0.01 mg/L

RESULTS

The analytical results are presented in Tables 2 through 4. Three wells produced anomalous data. The water sampled at the Daily News-Miner has higher concentrations of phosphate, sodium and potassium than other wells of similar depth in the area. Unfortunately the well itself is inaccessible and the only available access point was downstream of a mechanical in-line addition of a phosphate solution. This solution is used to treat the iron in the water prior to its use in the printing process. Because of this anthropogenic input, the data from this site should not be compared to data from other wells. Well AR-105 has much higher chloride, nitrate, calcium and sodium than what was expected. Field observations indicate a deep brown color to the well water, and a close proximity to the end of a sewage collection line. No further investigation was made as to the presence or absence of sewage in the sample. Many parameters in well AR-59 are elevated, including calcium, magnesium, nitrate, sulfate, and alkalinity. At this time there is no known reason for this occurrence.

Table 2. Field parameters. Alkalinity in mg/L as $CaCO_3$.

Site ID	Date Sampled	Time	Alkalinity mg/L as $CaCO_3$	Temp °C	pH	Conductivity uMhos/cm
AR-79	30 Aug 1993	18:15	365	3.7	6.87	745
AR-47	30 Aug 1993	19:45	229	9.3	6.40	509
AR-58	31 Aug 1993	09:24	229	5.6	6.51	540
AR-42	31 Aug 1993	09:54	175	5.9	6.60	415
AR-25	31 Aug 1993	12:19	380	6.9	6.50	779
AR-59	31 Aug 1993	12:39	645	3.8	6.42	1480
AR-56	31 Aug 1993	13:49	253	6.5	6.73	527
AR-108	1 Sept 1993	10:40	231	4.8	6.86	417
AR-104	1 Sept 1993	11:41	363	4.7	6.69	689
MUS	1 Sept 1993	11:54	184	----	6.71	----
AR-103	1 Sept 1993	12:21	577	5.7	6.51	1020
AR-105	1 Sept 1993	15:14	646	4.9	6.90	753
AR-100 (nested, 53')	1 Sept 1993	16:05	163	5.1	7.09	329
AR-100 (duplicate)	1 Sept 1993	16:18	156	----	----	----
AR-102 (nested, 20')	1 Sept 1993	16:44	305	8.1	6.78	665
AR-102 (duplicate)	1 Sept 1993	16:55	315	----	----	----
Daily News-Miner	2 Sept 1993	09:15	185	—	6.96	392
AR-111 (nested, 86')	9 Sept 1993	12:09	154	4.6	7.00	316
AR101 (nested, 100')	9 Sept 1993	12:58	144	4.6	7.08	289
Tanana River @ USGS gage	2 Sept 1993	15:00	74.4	11.2	7.9	229
Chena River @ MUS	9 Sept 1993	13:20	68.1	8.2	7.1	168
Noyes Slough @ Minnie St.	9 Sept 1993	15:40	68.7	8.5	7.6	171
Noyes Slough @ O'Conner	9 Sept 1993	17:47	85.2	8.7	7.3	207
Noyes Slough @ Illinois St.	9 Sept 1993	17:00	73.0	8.1	7.4	180

Table 3. Anion results.

Site ID	Fluoride mg/L	Chloride mg/L	Nitrate mg/L as N	Phosphate mg/L as P	Sulfate mg/L
AR-79	0.10	20.2	<0.02	0.05	37.2
AR-47	0.35	10.2	4.41	<0.05	12.7
AR-58	0.10	16.5	0.75	<0.05	45.4
AR-42	0.10	2.76	0.43	<0.05	25.9
AR-25	0.09	8.81	3.21	<0.05	49.0
AR-59	0.08	7.65	13.8	<0.05	191
AR-56	0.11	7.28	0.54	<0.05	32.6
AR-108	0.10	3.91	<0.02	<0.05	5.99
AR-104	0.10	11.0	0.39	<0.05	28.8
MUS	0.12	3.25	<0.02	<0.05	12.1
AR-103	0.09	3.84	11.8	<0.05	25.0
AR-105	0.21	259	4.28	<0.05	57.8
AR-100 (nested, 53')	0.17	4.60	<0.02	<0.05	17.8
AR-100 (duplicate)	0.17	3.83	<0.02	<0.05	17.1
AR-102 (nested, 20')	0.15	19.4	0.14	<0.05	37.5
AR-102 (duplicate)	0.15	19.3	0.15	<0.05	36.8
Daily News-Miner	0.13	1.66	<0.02	13.8	7.61
AR-111 (nested, 86')	0.11	2.61	<0.02	<0.05	14.5
AR101 (nested, 100')	0.10	1.79	<0.02	<0.05	12.6
Tanana River @ USGS gage	0.11	1.06	0.10	<0.05	36.5
Chena River @ MUS	0.12	0.35	0.14	<0.05	16.1
Noyes Slough @ Minnie St.	0.12	0.30	0.24	<0.05	15.9
Noyes Slough @ O'Conner	0.12	1.17	0.11	<0.05	17.5
Noyes Slough @ Illinois St.	0.12	0.80	0.11	<0.05	16.2

Table 4. Cation results.

Site ID	Calcium mg/L	Magnesium mg/L	Sodium mg/L	Potassium mg/L
AR-79	132	10.9	9.49	5.76
AR-47	68.1	16.8	14.6	10.1
AR-58	76.9	26.4	6.26	4.92
AR-42	50.1	13.1	5.45	2.90
AR-25	115	30.0	10.6	6.04
AR-59	187	82.3	8.87	7.43
AR-56	81.2	17.9	14.1	5.37
AR-108	66.6	14.4	6.36	4.44
AR-104	124	24.7	9.23	6.34
MUS	52.2	11.4	5.98	3.65
AR-103	147	40.4	19.7	17.7
AR-105	304	22.2	212	8.62
AR-100 (nested, 53')	43.7	9.97	10.0	4.06
AR-100 (duplicate)	44.9	10.3	10.0	4.23
AR-102 (nested, 20')	89.0	21.4	28.9	6.42
AR-102 (duplicate)	91.9	21.5	29.0	6.61
Daily News-Miner	44.0	9.17	24.5	13.1
AR-111 (nested, 86')	42.1	9.30	5.21	3.53
AR101 (nested, 100')	39.1	8.36	5.01	3.74
Tanana River @ USGS gage	30.4	7.02	2.99	2.26
Chena River @ MUS	24.0	5.21	1.63	1.36
Noyes Slough @ Minnie St.	23.4	5.16	1.92	1.31
Noyes Slough @ O'Conner	28.6	6.29	2.65	1.61
Noyes Slough @ Illinois St.	28.8	5.67	1.92	1.43

REFERENCES CITED

U.S. Environmental Protection Agency, 1982, Handbook For Sampling and Preservation of Water and Wastewater: U.S. Environmental Protection Agency, EPA-600/4-82-029, September, 1982.

American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1991, Standard Methods for the Examination of Water and Wastewater, 18th edition: APHA, AWWA, WPCF, Washington, D.C.

Appendix A
Quality Assurance Program Plan

Quality Assurance Program Plan

Environmental Site Assessment and Hydrogeology of the Railroad Industrial Area, Fairbanks, Alaska

Jim Vohden
State of Alaska
Department of Natural Resources
Division of Water
3700 Airport Way
Fairbanks, Alaska 99709

Approvals

By signing this document, the signatories below are responsible for ensuring that all of the functions listed in this document will be carried out as described, and that the personnel listed herein and in subsequent site specific plans are adequately trained to perform the tasks assigned to them.

Michael Lilly Signed: ______________________________Date: ______
Principal Investigator

Jim Vohden Signed: ______________________________Date: ______
Quality Assurance Officer

When signed by the appropriate approving official, the Alaska Department of Environmental Conservation hereby approves this plan as meeting the requirements for a Quality Assurance Program Plan described by 18 AAC 78 and associated guidelines.

ADEC approval:

print name:_________________________title:________________

signature:__________________________date:________________

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Section 1 Program Description

1.1 Program objectives

The Minnie Street Land User's Group (herein referred to as MSLUG or the Group) is a team of business operators who have joined together for the sole purpose of addressing the need for an area-wide site assessment. The specifics of this project are outlined in the document entitled "Environmental Site Assessment -- Fairbanks Light Industrial Area, Scope of Work", on file with ADEC. Working in conjunction with the United States Geological Survey (USGS) and the State of Alaska, Department of Natural Resources, Division of Water (DOW), MSLUG is dedicated to evaluate the environmental concerns in the project area. **It is unlikely that all of the analyses identified in this QAPP will be undertaken by the Group**, rather it seeks to cover any sampling that may occur as a result of the review of environmental data collected to date. After approximately 1 July 1993, the Group will meet to decide exactly where and what sampling will be conducted. At that point, a sampling and analysis plan will be submitted to ADEC for approval, which will outline specifically what sampling will be conducted. An appropriate review period will be allowed before implementation of the approved plan. If it is determined that additional sampling not mentioned in this QAPP is necessary, an amendment to this plan will be written to include procedures specific to these parameters. The contents of this quality assurance program plan are tentative, pending review by USGS, DOW, and the MSLUG technical committee.

Section 2 Program Organization and Responsibilities

2.1 Personnel and Responsibilities

Attachment A includes an organizational chart showing lines of authority for persons involved in the Group's assessment activities. The key personnel responsibilities are listed below.

- The Group's Principal Investigator, Michael Lilly, is responsible for overall management of the site assessment/site investigation program and adherence to the procedures outlined in this plan.

- The Group's QA Officer, Jim Vohden, is responsible for overall Quality Assurance of the Group's sampling program. Unless otherwise noted, the QA Officer will be responsible for conducting scheduled field and laboratory audits and will provide ongoing review, monitoring and evaluation of the field and laboratory activities. The QA Officer will validate or supervise validation of all reports.

Attachment B contains the position requirement qualifications for people involved through the mission of the Group's sampling directive. Note that as the sampling format becomes more clearly identified, additional personnel might be added to this section as an amendment. Similarly, Attachment C will be furnished at a later date when a complete list of qualified persons as required by 18 AAC 78 is compiled. Information will accompany this Qualified Person's list sufficient to document that the individuals on the list are qualified. A qualified person will be on-site during the performance by personnel of any activity under the jurisdiction of the Group.

2.2 Qualified Personnel

The collection, interpretation, and reporting of data will be conducted or directly supervised by a qualified person, who also will be on site during any field activities under the jurisdiction of the Group. A qualified person is as defined in 18 AAC 78.

2.3 Changes in Personnel or Responsibilities

If there is a change in the organization, personnel, or responsibilities from the information contained in this document, the new organization, personnel, or responsibilities must be reported to ADEC either via amendments to this document or within individual site specific project plans or site assessment reports. Amendments to this document listing personnel, organization, or responsibility changes must be received by ADEC prior to or concurrently with any site specific project plans or site assessment reports that are submitted subsequent to the personnel change.

Section 3 Quality Assurance Objectives

3.1 Quantitative QA Objectives

Quantitative QA objectives are precision, accuracy and completeness. They are defined below, and the acceptable numeric values are shown in Table 1. Calculation of QA objectives is discussed in Section 10:

- Precision: a measure of the variability or random error in sampling, sample handling, preservation, and laboratory analysis. For purposes of this plan, precision is indicated by the relative percent difference (RPD) in concentrations between duplicate samples.

- Accuracy: a measure of the closeness of an individual measurement or an average of a number of measurements to the true value. For purposes of this plan, accuracy is indicated by matrix analyte spiked samples.

- Completeness: a measure of the amount of data obtained compared to the amount expected. For purposed of this plan, completeness is calculated as the amount of usable samples divided by the minimum number of required samples, expressed as a percentage.

3.2 Qualitative QA Objectives

Qualitative QA objectives are representativeness and comparability as defined below:

- Representativeness: describes the degree to which data characterize the actual conditions at the site. To assure that measurements are as representative as possible, the sampling procedures described in Section 4 will be used. These procedures are intended to ensure proper choice of sample locations and the collection of sufficient numbers of samples.

- Comparability: expresses the confidence with which one data set can be compared with another. To assure comparability, standard operating procedures will be used for the collection, preservation, and analysis of samples. Data will be reported in the same units of quantification and in accordance with ADEC reporting requirements. Sampling and laboratory reports and procedures will be audited (as described in Section 12) to assure that they follow these standard procedures and reporting formats.

Table 1. Data Quality Objectives[a].

Parameter	Matrix	Method (Extraction/ Analytical)	Practical Quantification Limit	Precision (+/-%)	Accuracy (%)	Completeness (%)
Diesel Range Petroleum Hydrocarbon	Soil	3540/8100M[b] 3550/8100M[b]	10 mg/kg	50	50-140	85
	Liquid	3510/8100M[b] 3500/8100M[b]	1 mg/l	30	60-130	85
Gasoline Range Petroleum Hydrocarbons	Soil	5030/8015M[c]	1 mg/kg	50	50-140	85
	Liquid	5030/8015M[c]	1 mg/kg	30	60-130	85
Total Range Petroleum Hydrocarbons	Soil	3540/418.1[d]	25 mg/kg	50	50-140	85
	Liquid	418.1	1 mg/l	30	60-130	85
Total BTEX	Soil	5030/8020 5030/8240	0.05 mg/kg	40	60-130	85
	Liquid	5030/602	0.005 mg/l	30	60-130	85
Volatile Chlorinated Solvents	Soil	5030/8010 or 8240	0.05 mg/kg	40	40-140	85
	Liquid	5030/601	0.005 mg/l	30	40-130	85
PCB's	Soil	3550/8080	0.05 mg/kg	40	50-150	85
	Liquid	3550/8080	0.005 mg/l	30	60-140	85
Leachable Metals						
Arsenic	Soil	3050/7060	10 mg/l	40	75-125	85
	Liquid	3020/7060	0.1 mg/l	20	80-120	85
Cadmium	Soil	3050/6010	10 mg/l	40	75-125	85
	Liquid	3010/6010	1 mg/l	20	80-120	85
Chromium	Soil	3050/6010	10 mg/l	40	75-125	85
	Liquid	3010/6010	1 mg/l	20	80-120	85
Lead	Soil	3050/6010	10 mg/l	40	75-125	85
	Liquid	3010/6010	0.1 mg/l	20	80-120	85
Metals						
Mercury	Soil	245.1 or 245.2	0.2 mg/l	40	75-125	85
	Liquid	245.1 or 245.2	0.0002 mg/l	40	75-125	85

Legend: BTEX = Benzene, Toluene, Ethylbenzene, Xylene. PCB's = Polychlorinated Biphenyls

[a] Unless otherwise noted, all extraction and analytical methods refer to those contained in U.S. Environmental Protection Agency, Methods for Chemical Analysis fro Water & Wastes, EPA 600/4-79-020, revised March 1983.
The American Petroleum Institute/EPA 1992 consensus methods may also be used for diesel and gasoline range petroleum hydrocarbons - methods available from ADEC Laboratory, 10107 Brentwood Place, Juneau, AK 99801.

[b] EPA Method 8100 modified. Modification of method measures diesel range organics in the C_{10}-C_{28} range using solvent extraction methods with gas chromatography analysis with FID or FID with and in-line photoionization detector.

[c] EPA Method 8015 modified. Modification of method measures gasoline range organics in the C_6-C_{10} range using solvent extraction methods with gas chromatography procedure with a FID or FID with photoionization detector in series.

[d] EPA Method 418.1, modified for soil samples where soil is analyzed (see EPA reference in footnote a).

Section 4 Sampling Procedures

4.1 Overview of Sampling Approach

This schematic sampling approach will be used to assure that data collection activities will provide usable data:

- Sampling will begin after the compilation of background information, historical data and site conditions. This evaluation will be used to prepare a site-specific sampling strategy, based on the absence of historical samples in areas of major concern. This plan will be presented to the Minnie Street Land User's Group and submitted to ADEC. Upon approval of the plan by the Group and by ADEC, sampling will commence.

- Samples will be collected with appropriate clean tools according to standard practices. All decontamination of sampling equipment will follow the practices described in this section or where applicable, EPA or USGS recommended procedures.

- Sampling of groundwater will follow the standard procedures outlined in Section 4. Samples will be collected and preserved in appropriate sample containers, as listed in Table 2.

4.2 Documentation of Sampling Procedures

A field log book (or other type of field record) will be used to document the collection of samples and site data. This record will include:

- name(s) of qualified person(s) on site supervising or conducting the investigation;
- date and time of sampling;
- weather conditions, including temperature, wind speed, humidity or precipitation;
- names of personnel who physically collected the samples;
- any other pertinent information collected during pre-sampling or sampling activities.

4.3 Pre-Sampling Activities

Prior to beginning field work, an attempt will be made to collect and record the following data:

- the names, addresses, and phone numbers of the owner, operator, and business on the site;

- the present and potential uses or groundwater in the immediate vicinity of the site;
- history of known releases and available data from previous soil or groundwater sampling at the site;
- type and classification of native soil;
- location of wells on the site and in the immediate area;
- surface waters and wetlands in the immediate area;
- depth to groundwater or seasonally high groundwater level;
- surface drainage characteristics, including potential hydraulic connections with groundwater;
- property line locations;
- type and locations of below-ground utility lines;
- previous site uses, including historical waste handling procedures.

4.4 Collecting Soil Samples

The following procedures will be used to collect laboratory soil samples:

- Unless otherwise approved by the department, all laboratory soil samples will be grab samples and will not be composited prior to analysis, except that soil samples for leachable metals that are for screening purposes may be composited in the field or in the laboratory prior to analysis.

- Soil samples taken directly from surface excavations will be obtained from fresh, uncovered soil. A minimum of six inches of soil will be removed immediately prior to collection, and then the sample will be obtained from the newly uncovered soil. If the excavation has been open for longer than one hour, then a minimum of eighteen inches of soil will be removed immediately prior to collection.

- Soil samples collected from excavation equipment buckets will be obtained from the center of the bucket and away from the bucket sides; a minimum of six inches of soil will be removed immediately prior to collection. The back hoe bucket will be cleaned prior to obtaining soil for the sample, as outlined in Section 4.6 (Decontamination of Field Equipment).

- If soil samples will be collected from a soil boring, samples will be collected using a hollow stem auger and split spoon sampler or Shelby tube. Using an auger, the drill hole will be advanced to the desired depth. Then the auger will be withdrawn from the drill hole and the auger bit removed from the drill rod. The sampler will be attached to the correct length of drill rod and will be driven ahead of the auger flights in order to collect a relatively undisturbed sample. A liner will be used with split spoon samples to ensure a representative sample. After the split spoon or Shelby tube has been retrieved back out of the boring, the desired sample section will be immediately removed from the sampling device. Only soil from the middle portion of the spoon will be utilized for samples; soil from the ends of the spoon will be discarded as they often contain disturbed soils. A clean sampling tool will be used to quickly collect the sample from the undisturbed portion with a minimum of disturbance and the sample container will be quickly capped, sealed, and labeled.

Alternative methods to obtain soil samples will only be used if the methods have been approved by the department as part of this QAPP or are approved subsequent to approval of this QAPP.

These steps will be taken to minimize collection errors:

- All samples will be collected with disposable or clean tools that have been decontaminated as outline in Section 4.6 (Decontamination of Equipment)
- Disposable gloves will be worn and changed between sample collections.
- Sample containers will be filled quickly.
- Soil samples will be placed in containers in the order of volatilization sensitivity; i.e. VOA vials will be taken first, gasoline range petroleum organics next, heavier range petroleum organics next, and soil classification samples last.
- Containers will be quickly and adequately sealed. Rims will be cleaned prior to tightening lids. Tape will only be used if known not to affect sample analysis.
- Sample containers will be labeled as outlined in Section 4.7.2 (Labeling Sample Containers).
- Containers will immediately be preserved according to procedures in Section 4.7 (Sample Containers). Unless specified otherwise, at minimum the samples will be immediately cooled to 4^{0} C and this temperature will be maintained through delivery to laboratory and analysis.

If groundwater is encountered while soil sampling, the provisions of 18 AAC 78.090(d)(3) will be followed concerning sampling of the groundwater.

4.5 Obtaining Groundwater Samples from Borings / Wells

Groundwater samples may be required if contamination of the groundwater is suspected. Water sampled directly from an excavation is not necessarily representative of normal groundwater conditions and will not be evaluated as a representative groundwater sample. In such cases, installation and sampling of a groundwater monitoring well may be required, as determined by ADEC.

4.5.1 Installing Groundwater Monitoring Wells

Groundwater monitoring wells will be installed, developed, and abandoned in accordance with ADEC document "Recommended Practices for Monitoring Well Design, Installation, and Decommissioning" dated January 1991, or in accordance with other methods approved by ADEC. All well drilling equipment will be decontaminated as outlined in Section 4.6 (Decontamination of Equipment) prior to drilling at each new location. Wells will be driven with a hollow stem auger or cable drill. If other methods are used, department approval of the method will be obtained before the well is installed. The following details of well construction will be recorded in the field record:

- date and results of calibration of electronic depth measurement equipment;
- well location, determined by reference to site bench mark;
- total depth of boring;
- depth to groundwater at time of drilling;
- diameter of boring;
- depth to top and bottom of screened interval;
- diameter of screened interval;
- diameter of casing;
- well construction material;
- depth of packed filter interval;
- depth and thickness of seals;
- type of surface cap;
- names of drilling firms and drilling personnel;
- soil log completed using the Unified Soil Classification System, U.S. Soil Conservation Service classification, or another similar soil classification system.

4.5.2 Sampling Monitoring Wells

Prior to sampling wells, the depth to water will be determined by manual or electronic means. Measurement devices will be calibrated before use to an accuracy of at least 0.017 feet. Additionally, the column of water in the well casing will be checked for the presence of non-aqueous phase liquids. Non-aqueous phase liquids include free petroleum products that may either be floating on top of the water or in a separate layer at the bottom of the casing. Non-aqueous phase liquids will be identified:

- by carefully lowering a clear bailer into the well before purging and observing the liquids removed from the top and the bottom of the water column; or
- by using a paste type of detector; or
- by using an electronic device designed to detect non-aqueous phase liquids and to measure the thickness of the non-aqueous layer.

Well Purging

Monitoring wells will be purged prior to sampling using the following procedure (or equivalent):

- at least three casing volumes of water will be removed from the well before sample collection, or, for low yield wells, until the well bore is evacuated;
- measuring of the purge water temperature, pH, and conductivity until these parameters are stable to within 10% variability between measurements can be performed in lieu of purging three casing volumes of water;
- if possible, upgradient wells will be purged prior to downgradient wells to help minimize possible cross contamination.

Collecting Groundwater Samples with Bailers

If a bailer is used to collect samples, the following procedure will be used:

- After purging a well, sufficient time will be allowed for the well to equilibrate and fines to settle. Whenever full recovery exceeds two hours, samples will be extracted as soon as sufficient volume is available.
- The water level will be remeasured after purging has occurred and water level has returned to the static level.
- If decontamination equipment is used in collecting the water sample, the sampler will be rinsed with analyte-free distilled or deionized water. A portion of this rinsate will be collected into a container appropriate for the most volatile analyte suspected (typically BTEX). This equipment blank (also termed decontamination blank) will be contained, preserved, and analyzed according to the procedures outlined in this QAPP for that analyte.
- Bailers will be made of glass, Teflon, or stainless steel, or of disposable materials, and must be decontaminated as outlined in Section 4.6 (Decontamination of Equipment)
- The bailer will be fitted with a new bailer line for each well sampled. The bailer and line will only be handled by personnel wearing decontaminated or disposable gloves.
- The bailer will be slowly lowered to minimize disturbance of the well and water column. The bailing line will be prevented from contacting with the outside of the well, equipment, and clothing. Special care will be taken to minimize disturbance of the water table interface when inserting the bailer.
- Samples will be obtained as close as possible to the water level / air interface, unless analysis indicates that contamination is at a different depth.
- Discrete grab samples will be obtained.
- The bailer will be slowly lifted and contents transferred to a clean sample container with a minimum of disturbance and agitation to prevent loss of volatile compounds. If different analytes will be sampled, samples will be transferred to containers in the order of their volatility. Headspace in the

sample container headspace will be minimized by filling the sample jar until a positive meniscus is present.

- Containers will be quickly and adequately sealed. Container rims and threads will be cleaned prior to tightening lids. Unless otherwise specified, Teflon-lined screw caps will be used to seal the jar. Tape will only be used if it is known not to affect sample analysis.
- Sample containers will be labeled as outlined in Section 4.7 (Sample Containers)
- Containers will immediately be preserved according to procedures in Section 4.7 (Sample Containers). Unless specified otherwise, at minimum the samples will be immediately cooled to 4° C and this temperature will be maintained through delivery to laboratory and analysis.

Alternative Methods of Collecting Groundwater Samples

If positive displacement pumping systems or other systems are used instead of bailers, they will be clean or decontaminated as described in Section 4.6 (Decontamination of Equipment). Disturbance of the well, water column, and samples will be minimized. Only grab samples will be obtained (i.e. no composite samples). Samples will be obtained as close as possible to the water level / air interface, unless analysis indicates that contamination is at a different depth. If different analytes will be sampled, samples will be transferred to containers in the order of their volatility. Container headspace will be minimized by filling the sample jar until a positive meniscus is present. Containers will be quickly and adequately sealed. Rims will be cleaned prior to tightening lids. Tape will only be used if it is known not to affect sample integrity. Sample containers will be labeled as outlined in Section 4.7.2 (Labeling Sample Containers). Containers will immediately be preserved according to procedures in Section 4.7.4 (Holding Conditions and Methods of Preservation). Unless specified otherwise, at a minimum the samples will be immediately cooled to 4° C and this temperature will be maintained through delivery to laboratory and analysis.

4.6 Decontamination of Field Equipment

Decontamination of personnel, sampling equipment, and containers prior to and after sampling will be used to ensure collection of representative samples and to prevent the potential spread of contamination. Decontamination of personnel prevents ingestion and absorption of contaminants and will be done with a soap and water wash and water rinse.

All previously used sampling equipment will be properly decontaminated before sampling and between sampling locations to prevent introduction of contamination into uncontaminated samples and avoid cross-contamination of samples. Cross-contamination can be a significant problem when attempting to characterize extremely low concentrations of organic compounds or when working with soils that are highly contaminated.

Clean rubber gloves and appropriate protective equipment will be worn by individuals decontaminating tools and equipment.

4.6.1 Decontamination of Soil Sampling Tools

At a minimum, soil sampling tools will be cleaned and decontaminated by the following two-step procedure:

1. tool will be scrubbed with a stiff brush in a solution of hot water and laboratory solution (such as Alconox or similar product);
2. tool will be thoroughly rinsed with deionized water.

If concentrated petroleum products or highly contaminated soils are encountered during sampling, then an appropriate solvent will be used to remove heavy petroleum residues from the sampling tools. This will be followed by the minimum cleaning procedure outlined above.

4.6.2 Decontamination of Water Sampling Tools

Drill auger sections, split spoons and drive hammers that come in contact with the bore holes will be cleaned prior to use and between borings using the following two-step procedure:

1. tool will be scrubbed with a stiff brush in a solution of hot water and laboratory solution (such as Alconox or similar product); or tool will be cleaned with steam and a laboratory solution;
2. tool will be thoroughly rinsed with distilled or deionized water.

Steel tapes, well sounders, transducers, and water quality probes will be rinsed with clean water and then distilled or deionized water. Bailers will be washed in Alconox or other laboratory grade detergent solution, rinsed twice in clean water, and then rinsed with distilled or deionized water.

4.6.3 Decontamination of Excavation Equipment

Excavation equipment will be cleaned before each site excavation begins. If laboratory samples will be taken from equipment buckets, then the buckets will be steam cleaned immediately before obtaining soil from which samples will be taken.

4.6.4 Cleaning Sample Containers

Sample containers will be cleaned and prepared by an analytical laboratory. The exterior of the sample containers will be cleaned after the samples are collected and the container lids are tightly sealed. Solvents will not be used for this procedure because of the potential to contaminate the sample.

4.6.5 Disposal of Washwater, Rinsate, and Disposable Sampling Tools

Washwater and rinsate solutions will be collected in appropriate containers and disposed of properly in accordance with federal, state, and local regulations. Bailing strings and wires and other disposable sampling tools will be properly discarded after use at each well.

4.7 Sample Containers and Holding Conditions

Containers used to collect samples will be chosen based on their suitability for the analyte of interest and may vary according to the laboratory contracted to perform the analysis. Preservation methods and maximum holding times are based on EPA and laboratory consensus on appropriate holding conditions. A sealed jar of water will be included in the shipping container with instructions for the receiving agent to record its temperature to ensure that samples have arrived at the laboratory cool.

4.7.1 Sample Containers

Most containers will be glass jars with Teflon lined lids. Sample jars of the acceptable type of material, size, and type of lid are shown in Table 2. Use of sample containers will conform to these specifications. Also shown in this table are the preservation methods and maximum holding times for each analyte of interest.

All sample containers will be inspected before transit to the site to ensure that they have undamaged lids and are tightly sealed. Jars will be placed into containers that will be secured to prevent damage or tampering in transit to the site. Containers and lids will be re-inspected at the job-site; containers which have lost lids or that have been damaged will not be used for sample containment.

4.7.2 Labeling Sample Containers

Indelible / waterproof ink will be used, and labels, if used, will be securely fastened to the container. All information entered onto the label or container will also be duplicated into the field record or log book. Information on the containers or labels will include:

- unique identifying number assigned to the sample for laboratory analysis;
- date and time of collection;
- name of person collecting the sample;

- the intended laboratory analysis for the sample.

If possible, this information will also be included on the container or label:

- project name and location of sample;
- maximum holding time (or date by which sample must be extracted or analyzed)
- preservation method.

4.7.3 Holding Times

Sample handling, transport, and analysis will be arranged so that the recommended maximum holding times established by EPA and other laboratories, shown in Table 2, will not be exceeded. Also, most volatile compounds will be extracted and analyzed as quickly as practical after collection.

4.7.4 Holding Conditions and Methods of Preservation

All samples will be immediately cooled and maintained at 4^{0} C through delivery to the laboratory and subsequent analysis to minimize biodegradation and volatilization. Appropriate acidic preservation of samples will be provided where called for in Table 2.

Table 2. Sample Containers and Holding Conditions[a].

Parameter	Matrix (Soil or Liquid)	Method (Extraction/ Analytical)	Volume of Container	Container Description	Preservation of Sample	Maximum Holding Time
Diesel Range Petroleum Hydrocarbon	Soil	3540/8100M[b] 3550/8100M[b]	50 g or 4-8 oz	glass w/TLC		14 days to extract 40 days to analysi
	Liquid	3510/8100M[b]	1 liter	glass w/TLC		same
Gasoline Range Petroleum Hydrocarbons	Soil	5030/8015M[c]	50 g or 4-8 oz	glass w/TLC		extract ASAP/ 14 days to analysi
	Liquid	5030/8015M[c]	40 ml	glass VOA w/TLS	HCl to pH<2	same
Total Range Petroleum Hydrocarbons	Soil	3540/418.1[d]	50 g or 4-8 oz	glass w/TLC		14 days to extract 40 days to analysi
	Liquid	418.1	1 liter	glass w/TLC	H_2SO_4 to pH<2	same
Total BTEX	Soil	5030/8020 5030/8240	10 g or 4 oz	glass w/TLC		extract ASAP/ 14 days to analysi
	Liquid	5030/602	40 ml	glass VOA w/TLS	HCl to pH<2	extract ASAP/ 14 days to analysi
Volatile Chlorinated Solvents	Soil	5030/8010 or 8240	50 g or 4-8 oz	glass w/TLC		14 days to extract 40 days to analysi
	Liquid	5030/601	40 ml	glass VOA w/TLS	H_2SO_4 to pH<2	extract ASAP/ 14 days to analysi
PCB's	Soil	3550/8080	50 g or 4-8 oz	glass w/TLC		extract ASAP/ 14 days to analysi
	Liquid	3550/8080	1 liter	glass w/TLC		14 days to extract 40 days to analysi
Leachable Metals						
Arsenic	Soil	3050/7060	10 g or 4-8 oz	glass w/TLC		6 months
	Liquid	3020/7060	100 ml - 1 liter	glass, plastic	HNO_3 to pH<2	6 months
Cadmium	Soil	3050/6010	10 g or 4-8 oz	glass w/TLC		6 months
	Liquid	3010/6010	100 ml - 1 liter	glass, plastic	HNO_3 to pH<2	6 months
Chromium	Soil	3050/6010	10 g or 4-8 oz	glass w/TLC		6 months
	Liquid	3010/6010	100 ml - 1 liter	glass, plastic	HNO_3 to pH<2	6 months
Lead	Soil	3050/7421	10 g or 4-8 oz	glass w/TLC		6 months
	Liquid	3020/7421	100 ml - 1 liter	glass, plastic	HNO_3 to pH<2	6 months
Metals						
Mercury	Soil	245.1 or 245.2	10 g or 4-8 oz	glass w/TLC		38 days
	Liquid	245.1 or 245.2	500 ml - 1 liter	glass	HNO_3 to pH<2	38 days

Legend: BTEX = Benzene, Toluene, Ethylbenzene, Xylene. PCB's = Polychlorinated Biphenyls

[a] Unless otherwise noted, all extraction and analytical methods refer to those contained in U.S. Environmental Protection Agency, Methods for Chemical Analysis for Water & Wastes, EPA 600/4-79-020, revised March 1983.

The American Petroleum Institute/EPA 1992 consensus methods may also be used for diesel and gasoline range petroleum hydrocarbons - methods available from ADEC Laboratory, 10107 Brentwood Place, Juneau, AK 99801.

[b] EPA Method 8100 modified. Modification of method measures diesel range organics in the c10-c28 range using solvent extraction methods with gas chromatography analysis with FID or FID with and in-line photoionization detector.

[c] EPA Method 8015 modified. Modification of method measures gasoline range organics in the C6-C10 range using solvent extraction methods with gas chromatography procedure with a FID or FID with photoionization detector in series.

[d] EPA Method 418.1, modified for soil samples where soil is analyzed (see EPA reference in footnote a).

Section 5 Sample Transfer Log

5.1 Sample Transfer Log

Requirements in this section apply only to final verification samples, that is, those samples being collected to verify that a site meets cleanup requirements of 18 AAC 78.

A transfer log is required for each verification sample taken, including all associated field QC sample. A transfer log will consist of a document or label that physically accompanies each sample bottle and sample, and which provides for the name of each individual that has been assigned control of the sample and the period covered by the individual's assignment. Sufficient space will be provided on the form to accommodate several different control individuals.

The transfer log for each final verification sample will be retained by the laboratory receiving the samples for a period of two years following the date of receipt in the laboratory.

The laboratory receiving final verification samples will process the samples via control procedures documented in their QA/QC plans and Standard Operating Procedures. Therefore, except for the retention of the transfer log from the field, the requirements of this section do not apply to internal laboratory procedures.

Section 6 Analytical Procedures

6.1 Identification of Laboratory(s) conducting analysis

Only results from those laboratories which meet one of the following criteria will be accepted by the Group and ADEC for use in reports prepared under the provisions of this QAPP:

a) laboratories which have a current accreditation by ADEC at or following the time that ADEC's laboratory accreditation regulations become effective; OR
b) prior to the effective date of ADEC accreditation regulations, laboratories which have a Quality Assurance / Quality Control plans and Standard Operating Procedures on file with ADEC.

While laboratories will be expected to assure satisfactory levels of quality control within the laboratory, the Group will be responsible for ensuring that analytical testing meets the objectives of this QAPP. The Group will select a laboratory based on its ability to meet these objectives and will audit laboratory results and performance to ensure that the objectives are met. The Group will be responsible for reporting in any project report connected with this QAPP any deviation by the laboratory from the laboratory methods and procedures required by this QAPP, or any other deviation from standard laboratory procedures that it becomes aware of. If any questions or problems arise with the laboratory analysis, the Group will take appropriate corrective actions as outlined in Section 11 (Corrective Actions).

6.2 Determination of analyses for petroleum hydrocarbons

Selection and use of all laboratory analyses will conform to the provisions of Table 3 and appropriate sections of this plan, unless approval to deviate from these specifications is obtained in advance from ADEC. The identity of a released refined petroleum product will be assumed to be unknown unless an analysis shows that a contaminant is only a gasoline range refined product, only a diesel range refined petroleum product, or only a residual range refined petroleum product. If a laboratory hydrocarbon analysis clearly identifies that a contaminant is only a:

- gasoline range refined petroleum product, then at a minimum, the soil samples will be analyzed for total BTEX and Gasoline Range Petroleum Hydrocarbons as shown in Table 3.
- diesel range refined petroleum product, then at a minimum, the soil samples will be
analyzed for Diesel Range Petroleum Hydrocarbons as shown in Table 3.
- residual range refined petroleum product, then, at a minimum, the soil samples will be analyzed for Total Range Petroleum Hydrocarbons, Gasoline Range Petroleum Hydrocarbons, and Diesel Range Petroleum

Hydrocarbons as shown in Table 3. The amount of residual range refined petroleum product is calculated by subtracting the values of Gasoline and Diesel Range Petroleum Hydrocarbons from the Total Range Petroleum Hydrocarbons.

The analysis method for Total Range Petroleum Hydrocarbons includes the measurement of gasoline as one of the components. Because the method is not capable of measuring all of the gasoline present in the sample, any reporting of the gasoline portion of this analysis will have a qualifying indicator or statement co-located with the numeric value to the effect that the results reported do not accurately represent the actual gasoline content of the soil.

Table 3. Determination of laboratory analyses.

Parameter	Matrix (Soil or Liquid) Unknown	Method (Extraction/ Analytical)	Product(s) Stored at Facility				
			Gasoline			Waste	
			Leaded	Unleaded	Diesel	Oil	
Diesel Range Petroleum Hydrocarbon	Soil	3540/8100M^a 3550/8100M^a API-EPA DRO^c	–	--	X	X	X
	Liquid	3510/8100M^a 3500/8100M^a API-EPA DRO^c					
Gasoline Range Petroleum	Soil	5030/8015M^b API-EPA GRO^d	X	X	–	X	X
Hydrocarbons	Liquid	5030/8015M^b API-EPA GRO^d					
Total Range Petroleum	Soil	3540/418.1^e 3550/418.1^e	--	--	--	X	X
Hydrocarbons	Liquid	418.1					
Total BTEX	Soil	5030/8020 5030/8240	X	X	–	X	X
	Liquid	5030/602					
Volatile Chlorinated Solvents	Soil	5030/8010 5030/8240	--	--	--	X	X
	Liquid	5030/601					
PCB's	Soil	3550/8080	--	--	--	X	X
	Liquid	3550/8080					
Leachable Metals							
Arsenic	Soil	3050/7060	--	--	--	X	X
	Liquid	3020/7060					
Cadmium	Soil	3050/6010	--	--	--	X	X
	Liquid	3010/6010					
Chromium	Soil	3050/6010	--	--	--	X	X
	Liquid	3010/6010					
Lead	Soil	3050/7421	X	--	--	X	X
	Liquid	3020/7421					

Legend:

X	Analysis performed. Extraction/analysis method numbers refers to methods in 1983 USEPA Methods for Chemical Analysis of Water and Wastes.
--	Analysis not required.
BTEX	Benzene, Toluene, Ethylbenzene, Xylene.
PCB's	Polychlorinated Biphenyls.

[a] EPA Method 8100 modified. Modification of method measures diesel range organics in the C_{10}-C_{28} range using solvent extraction methods with gas chromatography analysis with FID or FID with and in-line photoionization detector.

[b] EPA Method 8015 modified. Modification of method measures gasoline range organics in the C_6-C_{10} range using solvent extraction methods with gas chromatography procedure with a FID or FID with photoionization detector in series.

[c] Method for Determination of Diesel Range Organics, American Petroleum Institute/USEPA, Consensus method, 1992.

[d] Method for Determination of Gasoline Range Organics, American Petroleum Institute/USEPA, Consensus method, 1992.

[e] EPA method 418.1 modified for soil samples where soil is analyzed.
Reporting of analytical data for this analysis must qualify it to advise of the loss of gasoline during analytical process.

Section 7 Calibration and Maintenance of Equipment

7.1 Calibration and Maintenance of Field Instruments

To assure that field instruments will be properly calibrated and remain operable in the field, the following procedures will be used:

- PID and FID field instruments will be calibrated before each testing session. For volatile and unknown potential contaminants, these instruments will be calibrated to yield "total organic vapors" in parts per million (v/v) to a benzene equivalent. PID's will be operated with a 10.2 eV (+/-) lamp source. If the potential contaminant is known to be a diesel or heavier range petroleum hydrocarbon and the instrument's operation manual recommends different span settings, calibration gasses, or lamp sources, then the recommended modifications will be followed.
- At a minimum, operation, maintenance and calibration will be performed in accordance with the instrument manufacturer's specifications.
- All standard's used to calibrate field instruments will meet the minimum requirements for source and purity recommended in the equipment's operation manual. Standards will be traceable to EPA or National Institute of Standards and Technology (NIST).
- If the instrument's operation manual recommends specific calibration requirements for other criteria in calibrating the instrument (such as pH, conductivity, temperature, etc.), those criteria will be adhered to.
- Acceptance criteria for calibration will be set depending on the potential contaminant(s) and will be within the limits set in the operations manual.
- The dates, times, and results of all calibrations and field repairs to field instruments will be recorded in the field record and in the instrument's log.
- In order to avoid and/or minimize breakdown of instruments in the field, the following procedures will be followed:
  - all users of the instrument will be trained in the proper calibration and operation of the instrument and will be required to read the operation manual prior to initial use;
  - all users of the instrument will be trained in routine maintenance, including battery and lamp replacement, lamp and sensor cleaning, and battery charging;
  - each instrument's operation and maintenance manual will be brought to the field;
  - field instruments will be calibrated and inspected prior to departure for the site. Instrument battery charge will be inspected far enough ahead of time to bring the instrument up to full charge prior to departure for the site;
  - at a minimum, a source of extra batteries and lamps (if applicable) will be readily available.

7.2 Calibration and Maintenance of Laboratory Equipment

Should an on-site audit of the laboratory's facilities be performed by the Group as discussed in Section 12.2.2, the Group will validate that laboratory instruments were calibrated and maintained in accordance with procedures listed in the lab's QA/QC and Standard Operating Procedures on file with ADEC. Failure of a laboratory to follow these procedures will result in implementation of corrective actions, as discussed in Section 11 (Corrective Actions).

Section 8 Data Reduction, Validation, and Reporting

8.1 Responsibility for Laboratory Data Reduction, Validation, and Reporting

While the laboratory will conduct these activities on data that is processed within the laboratory, the Group recognizes its overall responsibility for data reduction and validation. In order to meet this responsibility, the Group will:

- select a laboratory based on their demonstrated ability to properly reduce, validate, and report data;
- review all laboratory results and performance to ensure that the objectives are met. If any questions or problems arise with the laboratory analysis, the Group will take appropriate corrective actions as outlined in Section 11 (Corrective Actions).

8.2 Data Reduction

Data reduction is the compilation, condensation, and simplifying of information into a more easily understood product. Much of data reduction will occur in the laboratory, using procedures outlined in the accepted laboratory's QA/QC procedures on file with the department. Following this process, the product furnished by the laboratory will be examined, using standard statistical techniques, by the Group's personnel who have the necessary professional education, experience, and training necessary to meet a project's technical and regulatory requirements. These personnel will conduct or supervise any further reduction of field and laboratory data into the final report.

8.3 Data Validation

Validation of field and laboratory data by the Group will occur before the data are inserted into a report. The results of the evaluations discussed in this subsection will be documented in the report and will be used in data interpretation. They may also be used to initiate corrective actions outlined in Section 11 (Corrective Actions).

8.3.1 Validation of Field Reports

The Group's QA Officer will examine all information collected through the field documentation process (Section 4.2). This information will be checked for its:

- completeness;
- accuracy (transcription errors, internal consistency);
- unexpected results with accompanying possible explanations;
- adherence to sampling procedures outlined in Section 4;
- comparison of field instrument results with laboratory results.

8.3.2 Validation of Laboratory Data

In addition, the steps outlined in Section 12 will be used to determine if a sample result is valid. Four levels of data validation will occur on laboratory data:

1) the sample analyst will document and evaluate the analytical results using the laboratory's QA/QC procedures;
2) the supervisor of the laboratory section will examine the sample results and any attached documentation or explanations of the sample analyst;
3) the laboratory QA officer, or other appropriate individual in the laboratory, will review the data a final time before providing it to the Group;
4) the Group's personnel whom have the professional education, experience, and training necessary to meet a project's technical and regulatory requirements will conduct a final review.

The reviews of laboratory data will consider the data's:

- completeness;
- adherence to the laboratory's Standard Operating Procedures for the analyte of concern;
- adherence to the laboratory's QA/QC procedures.

The reviewers will pay special attention to the establishment of detection and control limits and deviations from them; if deviations are identified they will be flagged for discussion in final reports and possible corrective action. Such items include, but would not be limited to:

- any limits outside of the acceptable range;
- lack of documentation showing the establishment of necessary controls;
- unexplainable trends.

8.3.3 Determining the Validity of Samples

Samples collected in accordance with the procedures outlined in this QAPP will be considered to be valid unless otherwise indicated. Samples not collected in accordance with this QAPP will be considered invalid; in particular, a sample will be considered invalid if:

- the sample was collected before the Group had an approved QAPP on file with the department;
- the sample was collected when a qualified person was not on site conducting or supervising sample collection;
- the sample was collected with previously used tools that were not decontaminated using the procedures outlined in this QAPP;
- the sample was not taken at the location or depth specified by this QAPP;
- the sample was not taken at a location determined by a correctly calibrated and operated field instrument or by other documented observation to be representative of the most likely areas of contamination;
- the sample was composited before analysis, unless explicitly specified by this QAPP or ADEC;
- the sample jar was not clean before soils or water were deposited into it;
- the sample was incorrectly labeled (or not labeled) and field records cannot show the site location where the sample was collected;
- a water sample from a boring or well was not collected in accordance with the procedures outlined in Section 4.5 of this QAPP;
- an improper analysis of the sample was conducted by a laboratory that did not have acceptable documentation on file with ADEC.

In certain cases a sample otherwise considered invalid may be considered valid if the laboratory QA officer will provide a written explanation justifying the validity of the sample; if given, then this documentation will accompany the report. Also in such cases, appropriate training will be given to the sample collector to ensure that the procedures follow this QAPP. The only situations in which this approach may be used are as follows:

- the sample was collected into a container not specified in Table 2;
- excessive headspace was allowed in the soil sample jar;
- the maximum holding times shown in Table 2 were exceeded;
- analysis of trip or decontamination blanks indicate that the sample is invalid;
- the sample jar was not tightly sealed and immediately refrigerated after collection, or did not arrive at the laboratory at the temperature specified in Table 2.

Final verification samples that did not have a proper or complete transfer log will be considered invalid unless:

- all field instrument results, observations logged into the field record, and analytical results indicate that no contamination was detected, then the sample will be considered valid and an explanatory note of the deviation from the QAPP will accompany the report;
- sample analyses at the site indicate that cleanup levels have been above allowable cleanup limits, and corrective actions are required to remediate soil or groundwater contamination. If this is the case, then the sample will

be considered valid and explanatory note of the deviation from the QAPP will accompany the report;

- other documentation clearly shows the location where the sample was collected and that it was properly collected, preserved, and analyzed; this documentation will be inserted into the final report.

Identification of any samples identified as invalid will accompany the data report and will result in appropriate corrective action, as outlined in Section 11.2 (Handling Invalid Samples).

8.4 Data Reporting

8.4.1 Information to be Included in Reports

Reports prepared for projects which require this QAPP will, as a minimum, contain all of the following:

a) the laboratory results of all samples (to include all field samples and field QC samples, whether rejected or not;

b) the laboratory's data deliverable package as require by Section 8.4.3 for each sample analyzed;

c) an interpretation of data and sampling results, as required by the tasks discussed in Section 8.3;

d) a completed Table 4, or similar format, that contrasts the required field quality control data (discussed in Section 9.1.1) with the limits specified by this plan;

e) for all final verification samples that are taken in conjunction with a clean-up plan to verify that clean-up levels have been achieved (samples required in Article 3 of 18 AAC 78 to verify that cleanup levels have been achieved), a completed Table 5, or similar format, that contrasts the required laboratory quality control data (discussed in Section 9.2) with the limits specified by this plan. For all sample types other than final verification samples the information listed in Table 5 is required to be completed, but in lieu of including it in the report, they may be kept on file by the laboratory for a period of two years following the date of analysis, and be made available to ADEC upon its request during this period.

f) a case narrative for the project;

g) a separate section or attachment that discusses all deviations from procedures outlined in this QAPP, and any relevant information compiled from field records, or other information required by 18 AAC 78. This includes, but is not limited to a discussion of any deviations form this QAPP for any sampling or analytical method and procedures, whether used by the Group or by the contract laboratory;

h) a separate section or attachment that discusses all corrective actions taken as required by Section 11 of this plan, and any other corrective action for other deviations from procedures outlined in this QAPP;

i) for reports prepared for site assessments:
  - a completed ADEC Site Assessment Report form with all information required by 18 AAC 78.090 (which may be used to report appropriate items listed above); and
  - a site assessment summary, consisting of a completed Site Assessment Summary form (see appendix B) or other format which includes the information on the ADEC Site Assessment Summary form; and

j) Other items required for reports by 18 AAC 78.

8.4.2 Reporting Format

Project reports will provide a completed Table 4 (and Table 5 for final verification samples), or a similar format which contrasts the field or laboratory quality control data with the limits specified in Tables 4 and 5 in this plan. For reports prepared for site assessments, this information may be reported on the ADEC Site Assessment form if convenient.

Precision, accuracy and completeness of laboratory QC methods will be calculated as per Section 10. Holding times and completeness will be reported for all field samples regardless of project type. Precision of the entire sampling process (field plus laboratory analysis) is derived utilizing field duplicate samples for its calculation.

Table 4. Field Quality Control Summary.

QC designation			Tolerance	Results
Holding time to:				
	extract diesel:	soil:	From Table 2.	
		liquid:	From Table 2.	
	analyze diesel:	soil:	From Table 2.	
		liquid:	From Table 2.	
	extract gasoline:	soil:	From Table 2.	
		liquid:	From Table 2.	
	analyze gasoline:	soil:	From Table 2.	
		liquid:	From Table 2.	
	etc.		From Table 2.	
Precision:				
	Sample group A:			
	diesel:	soil:	From Table 1.	
		liquid:	From Table 1.	
	gasoline:	soil:	From Table 1.	
		liquid:	From Table 1.	
	etc.			
Completeness:			From Table 1.	
Decontamination Blank(s):			Analytical method detection limit	
Trip Blank(s):			Analytical method detection limit	
Background Sample(s):			Assess background influence on final verification samples	

Table 5. Laboratory Quality Control Summary.

QC Designation				Tolerance	Results for this project
Surrogate recovery, diesel:					
	soil:			+/-50%	
	liquid:			+/-40%	
Surrogate recovery, gasoline:					
	soil:			+/-50%	
	liquid:			+/-40%	
Alkane standard pattern match:		diesel:		Match w/ all field samples	
		gasoline:		Match w/ all field samples	
Column performance:		diesel:		Separation no. >20	
		gasoline:		Separation no. >20	
Precision of lab analyses:		diesel:			
			soil:	From Table 1	
			liquid:	From Table 1	
		gasoline:			
			soil:	From Table 1	
			liquid:	From Table 1	
		etc.			
Accuracy of lab analyses:		diesel:			
			soil:	From Table 1	
			liquid:	From Table 1	
		gasoline:			
			soil:	From Table 1	
			liquid:	From Table 1	
		etc.			
Reagent blank:	Sample set A:				
		diesel:			
			soil:	No analyte detected	
			liquid:	No analyte detected	
		gasoline:			
			soil:	No analyte detected	
			liquid:	No analyte detected	
		etc.			
Reference sample:	Sample set A:				
		diesel:			
			soil:	Within acceptance range of reference	
			liquid:	Within acceptance range of reference	
		gasoline:			
			soil:	Within acceptance range of reference	
			liquid:	Within acceptance range of reference	
Bottle blank:				Below method detection limit	
Method detection limit:				From Table 1	

8.4.3 Data Deliverables for Samples

For each project conducted under the provisions of this QAPP, a data deliverable package will be provided for each sample analyzed by the laboratory, including all field and laboratory QC samples, whether the samples are rejected or not. For all samples taken in conjunction with a site assessment under the provisions of 18 AAC 78.090 all items must be included in the report on the project:

1) laboratory name, address, phone number, fax number;
2) report date;
3) type of analysis (gasoline, diesel, etc.);
4) the extraction and analytical method used;
5) type of matrix;
6) field sample number;
7) laboratory sample number;
8) laboratory file identification number;
9) date sampled;
10) date received;
11) temperature of sample container upon receipt;
12) date extracted;
13) date analyzed;
14) location of the sample collection point;
15) site or project name;
16) concentrations of analyte (reported in micrograms per liter for liquids, micrograms per kilogram, dry weight basis for solids);
17) definitions of any characters used to qualify data.

8.4.4 Certification of Reports

Any reports submitted to ADEC under this QAPP will contain the following statement:

"I certify that except as specifically noted in this report, all statements and data appearing in this report are in conformance with the provisions of the Quality Assurance Program Plan (QAPP) prepared by the Group, dated 13 May 1993, and on file with ADEC".

This statement must be signed and dated by either the Principal Investigator or the Quality Assurance Officer designated by the Group in either the QAPP on file or in the report being submitted, as occupying these positions for the project covered by this report.

Section 9 Internal Quality Control Checks

9.1 Field Quality Control Checks

All field QC check samples will be analyzed, the results of their analysis used in calculation of data quality indicators, and summarized in Table 4 or a similar format. When used, QC measures will be performed, at a minimum, for the most volatile analyte under investigation.

9.1.1 Selection of Field QC Sample Types

There are two levels of sample QC scrutiny that will be applied to field sampling. Each succeeding level of detail increases the need for greater quality control, and therefore more QC samples. A description of each type of field QC sample appears in Sections 9.1.2 through 9.1.5.

a) Level 1: This is the lowest level of field QC sampling required. This level will be used for: 1) sampling programs associated with an initial site assessment; 2) other projects where only a rough qualification of the existence of contamination is required; 3) where contamination is known to be present due to results from preliminary laboratory analyses or field sampling devices, and it is desired to spatially define the extent of contamination and estimate the degree of contamination:

   Minimum Field QC Samples Required: Field duplicate (1 per set of 10 samples)
      Allowable Tolerance: Precision meets range given in Table 1.

b) Level 2: This level will be used where an accurate quantification of contamination is desired:

   Minimum Field QC Samples Required: Field duplicate (1 per set of 10 samples)
      Allowable Tolerance: Precision meets range given in Table 1.
      Decontamination Blank: 1 per set of 20 samples.
      Allowable Tolerance: Less than the analytical method detection limit.

9.1.2 Trip Blank

A trip blank is a sample of analyte-free media taken from the laboratory to the sampling site along with each batch of samples and returned to the laboratory unopened. A trip blank will be used to document contamination attributable to shipping and field handling procedures. This type of blank will be especially useful in documenting when trace volatile organic compounds are being investigated. At least one trip blank will accompany each shipping container of samples which contains volatiles.

9.1.3 Decontamination Blank (Equipment Blank)

A decontamination blank is a sample of analyte-free media used to rinse sampling equipment. It will be collected after completion of decontamination procedures and before sampling. Decontamination blanks for water samples will be collected as described in section 4.5.2 (Sampling Monitoring Wells). Those for soil will be collected in a similar manner. Where decontamination blanks are required, at least one decontamination blank will be collected and analyzed for each set of water samples which may contain volatiles. In addition, at least one decontamination blank will be collected and analyzed for every 20 soil samples.

9.1.4 Background Sample

A background sample is collected in an area judged to be free of a site contaminant, to document and assess analyte baseline or historical information. A background sample will be collected whenever in the judgment of the Quality Assurance Officer, it is required:

- to document the occurrence of naturally occurring organics, especially when their presence may interfere with analytical tests;
- to document the presence of contamination by migration of contaminants from off-site or non-UST related sources;
- it is required in a corrective action or treatment plan.

9.1.5 Field Duplicate Sample

Field duplicate samples are independent samples which are collected as close as possible to the same point in time and space. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. These duplicates are useful in documenting the precision (variability) of the sampling and analytical process. At a minimum, one field duplicate will be collected per 10 samples for each matrix sampled.

All field duplicates will be blind samples, given unique sample numbers just like any other field sample. Their collection should be adequately documented. The results from the field duplicate samples will be used to calculate a precision value for field sampling quality control, based on the formula in Section 10.

9.2 Laboratory Quality Control Samples

All laboratory quality control functions listed in Section 9.2.1 are required as a matter of standard operating procedure. However, the results from laboratory QC samples are required to be included in reports for final verification samples. The

Group will confirm that the laboratory analyzing samples for any project conducted under the provisions of this plan:

a) has standard operating procedures approved and on file with ADEC;
b) performs all laboratory QC functions listed below;
c) compiles the results of all laboratory QC functions listed below for each sample set. For final verification samples only, the laboratory will report this data to the Group at the same time analytical data from field samples are reported. For all other types of samples, the laboratory QC data described below will, at a minimum, be maintained on file at the laboratory for a period of two years following the date of the analyses, and will be made available upon request.

9.2.1 List of Laboratory Quality Control Samples

Surrogate: A surrogate will be added to every sample, including quality control samples, prior to sample preparation and analysis. The surrogate recovery, expressed as a percentage, is intended to indicate the percent recovery of the analyte.

Alkane Standard: A normal alkane standard (C_6 through C_{10} for gasoline or C_{10} through C_{28} for diesel) will be analyzed with each set not to exceed 20 samples per set. This standard us used to verify integration range and provides data for column performance. The elution pattern indicates expected boiling ranges for petroleum products that have boiling range production criteria.

Column Performance: Column performance will be evaluated by separation number, and should be greater than 20 for octane and nonane (gasoline) and tridecane and dodecane (diesel). Inadequate column performance can distort chromatograms, cause errors in quantitation and qualitative results, and produce distorted surrogate peaks.

$$\text{Separation Number} = \left| \frac{\text{retention time octane} - \text{retention time nonane}}{\text{W 1/2 of octane} + \text{W 1/2 of dodecane}} \right|^{-1}$$

where: retention time is in minutes
W 1/2 = width at half peak height

Performance Evaluation Samples: The lab will participate in performance evaluation samples provided by ADEC when made available. These will be used in part to determine if a laboratory can produce acceptable results using the gasoline and diesel range organic analytical methods.

Matrix Spike and Matrix Spike Duplicate Samples: These will be analyzed with each set not to exceed 20 samples per set. These will provide the percent recovery and relative percent difference to document the precision and accuracy of the analytical results. In analyte matrix spike / matrix spike duplicate analysis, predetermined quantities of stock solutions of target analytes are added to a sample matrix prior to sample extraction / digestion and analysis. Samples are split into duplicates, spiked and analyzed. These data are used to determine analytical precision from the calculation of relative percent difference.

Reagent Blank: Each set not to exceed 20 samples per set, shall be accompanied by a reagent blank and a calibration check sample. The reagent blank shall be carried through the entire analytical procedure. The reagent blank should be the first sample analyzed. It is used to evaluate possible contamination of analytical process by target analytes. No analyte should be present in the reagent blank at a concentration greater than the method detection limit.

Reference Samples: An EPA or NIST (National Institute of Standards and Technology) reference quality control sample or EPA or NIST traceable quality control sample will be analyzed with every set not to exceed 20 samples per set. This can take the place of the calibration check sample. These samples have acceptable ranges for analytical results that an analyst uses to evaluate system performance. Field sample data should not be reported if the reference sample data is out of control (outside the published acceptance range).

Bottle Blanks: At least one sample bottle from each case-lot of bottles containing analyte-free matrix media will be carried through the sampling and analysis scheme for each matrix type unless guaranteed analyte-clean bottles with written documentation are used. The analytical results for these samples must be below the method detection limits for the sample bottles in that lot to be acceptable for sampling.

Method Detection Limit: MDL's will be calculated in accordance with the procedure in 40 CFR Part 136, Appendix B, and reported in Table 5.

Pattern Match: The laboratory analyst will be responsible for evaluating the GC trace for each sample and comparing the pattern to that from the standards. Any significant deviation from the standards' patterns for any sample will be discussed as required in Section 8.3. An indicator of acceptability of pattern match will accompany the laboratory results reported for each sample.

Section 10 Calculation of Data Quality Indicators

10.1 Who Will Calculate Data Quality Indicators

The Group will be responsible for calculating the precision of the field sampling process utilizing values from field duplicate samples and the formula for precision in subsection 10.2, in addition to the completeness of the field samples from the formula in subsection 10.4. The laboratory will calculate or assess all items in subsection 9.2.1. Reporting of data quality indicators will be in accordance with subsection 8.4 and will be reported by the Group.

10.2 Precision

Precision is a measure of the variability or random error in sampling, sample handling, preservation, and laboratory analysis. For purposes of this plan, precision is indicated by the relative percent difference (RPD) in concentrations between duplicate samples, and will be calculated using the following formula:

$$RPD = [(D_1 - D_2) / (\text{average of } D_1 \text{ and } D_2)] \times 100$$

where: RPD = Relative Percent Difference
D_1 = first duplicate sample
D_2 = second duplicate sample

10.3 Accuracy

Accuracy is a measure of the closeness of an individual measurement or an average of a number of measurements to the true value. This measure will be based on surrogate and/or spike recovery and will evaluate the impact o matrix interferences. For purposes of this QAPP, accuracy is indicated by matrix analyte spiked samples and will be calculated using the formula:

$$R = [(SSR - SR) / SA] \times 100$$

where:
R = % recovery
SSR = analyte spiked sample result
SR = sample result
SA = amount of spike added

10.4 Completeness

Completeness is a measure of the amount of valid data obtained compared to the amount expected. For purposes of this QAPP, completeness is calculated as a percentage of the amount of usable samples divided by the minimum number of required samples and will be calculated using the following formula:

$$\%C = (V / N) \times 100$$

where:
%C = completeness

V = number of valid samples, as determined by above calculations and by procedures outlined in Section 8.3.3 (Determining Validity of Samples)
N = total number of measurements necessary to achieve a specified statistical level of confidence in decision making

10.5 Responsibility to Request Proper Laboratory QC Checks

The Group realizes that subcontractor labs may not routinely provide the necessary laboratory analyses to calculate these indicators. In order to assure that this information will be provided, the Group will specifically request the necessary QC analyses whenever samples are submitted to a laboratory.

10.6 Results of Calculations

If any of these calculations indicate that the data quality objectives have not been met, the data will be reviewed by the Group's QA Officer in conjunction with the Laboratory's QA/QC manager and the appropriate corrective actions will be taken as outlined in Section 11. Results outside acceptance criteria will be flagged in the data reports along with the resulting corrective action.

Section 11 Corrective Actions

11.1 Staff Training

Normally the need for training of sampling personnel will be determined through the auditing procedures outlined in Section 12.1 (Auditing of Sampling Personnel). If the corrective actions outlined in Section 12.1 do not result in acceptable performance, then the sampling personnel will be removed from the sampling activities until they can demonstrate adherence to the procedures of this QAPP.

The need for additional training of non-sampling personnel will be indicated through scheduled audits and data validation and reporting. The Group will contract or provide necessary training of the appropriate person whenever a potential problem with data quality is identified. Such training will occur before the individual(s) performs the activity again.

11.2 Handling Invalid Samples

If an invalid sample is taken, then:

- if the 85% completeness objective for samples at site is met (i.e. at least 85% of all samples at the site are valid) and observations and field screening do not indicate the invalid sample was collected at a location with higher than average contamination levels at the site, then an explanatory note of the deviation from the QAPP will accompany the report and no further corrective action for deviation will occur;

- if the 85% completeness objective for samples at site is not met or observations and field screening indicates the invalid sample was collected at a location with higher than the average contamination levels at the site, then the sample(s) will be recollected at the proper location on the site, properly analyzed, and reported and an explanatory note of the deviation from the QAPP will accompany the report.

11.3 Field Instrument Failure and Improper Use

If an audit of field sampling performance indicates that field instruments are being improperly used (or not used at all) then the instrument operators will be retrained and their activities audited as specified in Section 12.1.1.

11.4 Failures in Data Processing, Management, or Analysis

Problems with data processing, management, or analysis will be typically discovered during data reduction, validation and reporting, or during scheduled audits. If these problems occur, the QA Officer or other appropriate person will be notified. Upon review of the problem, the QA Officer or other appropriate person will:

- initiate steps to retrain the individual performing the task; or
- initiate actions to correct the improper procedure;
- adhere to procedures outlined for notifying the quality assurance officer and project manager of potential problems with data quality;
- adhere to procedures for documenting potential problems and non-compliance;
- adhere to procedures for determining when non-scheduled audits are necessary.

11.5 Corrective Actions with a Subcontracted Laboratory

Normally, any corrective actions necessary in a laboratory will be handled internally by a laboratory through its QA/QC procedures. The need for corrective action in the laboratory will be identified either by:

- the laboratory's internal QC checks;
- the validation review conducted by the Group;
- the performance audits of the laboratory.

If appropriate satisfactory corrective actions are not performed by the laboratory, then the Group will not contract the laboratory to perform future analyses until the problem is resolved.

11.6 Corrective Actions for Other Problems

Other problems not discussed above or in other sections of this document, may interfere with the Group meeting the data quality objectives of this QAPP. Appropriate corrective actions will be taken for these problems and will be initiated by the QA Officer, Principal Investigator, or the management of the Group

Section 12 Performance and System Audits

If time and resources permit, the Group will perform audits designed to evaluate the adequacy of sampling, analyzing, interpreting, and reporting activities. Activities described in this section will be used as a guideline in designing the audits.

12.1 Auditing of Sampling Personnel

All participants in field sampling who represent the Group will be properly trained and their performance audited before participating without supervision in sampling activities. At a minimum, before engaging in any sampling procedure for the first time, field personnel will:

- be trained by a qualified person who has conducted the procedure before;
- have read the expected procedures outlined in this QAPP, the relevant regulations of 18 AAC 78, and relevant operations manuals.

Following the initial instruction in the procedure, the trainer will audit the sampling activities that the field personnel engages in, performance will continue to be audited until the personnel can satisfactorily perform the activity in accordance with the expected procedures. At this time, each field personnel's procedures will be audited at least on an annual basis. All field sampling performance will be evaluated during this audit.

If any corrective actions result from the deviation from the expected field procedure, the performance on the activity that prompted the corrective action will be audited during the next sampling event and will continue to be audited until the activities can be performed satisfactorily in accordance with the expected procedures.

12.2 Auditing of Field Procedures

On at least an annual basis, the sufficiency of the sampling procedures in this QAPP will be audited by the QA Officer. This audit may be combined with an annual audit of field personnel.

12.3 Monitoring of Field Subcontractors

The Group's field personnel will routinely monitor the performance of:
- well drillers;
- excavation equipment operators;
- drilling or excavation equipment;
- removers of product;
- treatment facility operators;
- drilling, excavation, and treatment equipment.

If this monitoring indicates that changes in subcontractors or equipment quality will improve or lessen the quality of field sampling activities, the QA Officer or Principal Investigator will be notified and he or she will, if necessary, implement appropriate corrective measures.

12.4 Monitoring of Field Equipment

Field instruments will be maintained and calibrated as outlined in Section 7.1. In addition, the results of field instrument analyses will be compared with analytical results. Unexpected or unexplained discrepancies will be reviewed and if necessary, corrective actions will be implemented.

12.5 Auditing of Field Records

All field records and any other relevant field data will be audited by a qualified person prior to reports being submitted.

12.6 Personnel Conducting Field Audits

Auditing of all activities will be conducted by persons who have conducted or supervised the audited activities before. Unless otherwise noted in Section 2.1, this activity will be performed by the Group's QA Officer.

12.7 Documentation and Submission of Field Audits

Persons performing audits will document relevant observations and submit them to the QA Officer or Principal Investigator, who will be responsible for evaluating the observations and implementing appropriate corrective measures.

12.8 Routine Auditing of Laboratory Performance

Laboratory performance will be audited on an ongoing basis through review of the data packages as discussed in Section 8 (Data Reduction, Validation and Reporting).

12.9 Scheduled Auditing of Laboratory Performance

Laboratory performance will be audited on a schedule basis through one or more of the following means by the Group's QA Officer (or other professional within the Group with the necessary education and experience:

- blind QC samples or field duplicates will be submitted on 10% of samples and the results evaluated; these samples or duplicates may be the same field QC samples outlined in Section 9.1 (Field QC Checks).
- an on-site audit of each laboratory used will be conducted by the Group's QA Officer at least once per year and will include observation of facilities, equipment, sample transfer log procedures, equipment calibration and maintenance documentation, sample analysis, and data reduction, validation, and reporting procedures. These observations will be compared with the laboratory's QA/QC plan and its Standard Operating Procedures on file with the Group. In addition, the results of the laboratory's performance audits through external certification and proficiency programs will be requested and reviewed;
- replicate samples will be sent to another laboratory for comparison when questions have arisen about a laboratory's performance. At a minimum, replicate samples will be sent to another laboratory twice each year or for 5% of site events, whichever is greater. These samples or duplicates may be the same field QC samples outlined in Section 9.1 (Field QC Checks). The results of these comparisons will be documented and reviewed by the QA Officer.

12.10 Documentation and Submission of Laboratory Audits

Persons performing laboratory audits will document relevant observations and submit them to the QA Officer or Principal Investigator, who will be responsible for evaluating the observations and implementing appropriate corrective measures. The results of these laboratory performance audits will be documented and evaluated at least once each year in a system audit.

12.11 System Audits

At least once each year the QA Officer will examine:

- all field and laboratory audit reports;
- major corrective actions taken;
- and the adequacy of all elements of this quality assurance program plan.

At a minimum, the documentation of this audit will be submitted as part of a quality assurance report to management, as outline in Section 13.

Section 13 Quality Assurance Reports to Management

Should time and resources allow, a quality assurance report will be prepared for the Group's management which covers the Group's use of the procedures described in this QAPP, and which adheres to the protocols in this section.

13.1 Contents of Reports to Management

The report to management will be based on a review of data quality indicators, results of field and laboratory performance audits, any changes in the QAPP, reports on corrective action or sample alteration, or limitations on the use of measurement data and the effects on legal defensibility.

13.2 Preparation of Reports to Management

These reports will be prepared by those individuals who possess the professional education, experience, and training necessary to assess the quality of data being generated and to evaluate the results of field and laboratory audits and the sufficiency of corrective actions, and to recommend effective solutions to problems encountered.

13.3 Schedule of Reports to Management

At a minimum, these reports will be provided on an annual basis following completion of system audits. In addition, a report to appropriate management will be provided when significant quality assurance problems arise.

13.4 Who Receives Reports to Management

At a minimum, the Group's Chairman will review these reports. Additionally, the Group's Technical Review Committee may review the reports. They are for internal use and may be confidential, there is no obligation to submit these reports to ADEC. However, the Group may include information in these reports that may help document it's compliance with this QAPP or with 18 AAC 78.

Attachment A. Organizational Chart of Minnie Street Land User's Group:

Gwendolyn Burno →→→→→→→→→ MSLUG participants
Chairperson, Minnie Street Land Users Group

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↓
↓
↓

Michael Lilly →→→→→→→→→ USGS field personnel including those listed in Attachment B
U.S. Geological Survey
Fairbanks

↓
↓
↓
↓

Jim Vohden / Mary Maurer
Alaska Division of Water
Fairbanks / Eagle River

Gwendolyn Burno
Alaska Railroad Corp.
P.O. Box 107500
Anchorage, AK 99510
(907)265-2325

Michael Lilly
U.S. Geological Survey
800 Yukon Drive
Fairbanks, AK 99775
(907)479-5645

Jim Vohden
DNR / Division of Water
3700 Airport Way
Fairbanks, AK 99709
(907)451-2774

Mary Maurer
DNR / Division of Water
P.O. Box 772116
Eagle River, AK 99577
(907)696-0070

Attachment B. Position Requirement Qualifications:

1) James J. Vohden

B.S. Chemistry, Hartwick College, Oneonta, NY.

Chemist, Alaska Department of Natural Resources, Division of Water, Fairbanks, AK. Responsible for operation of Water Quality Laboratory which includes: field sampling for chemical constituents in surface and ground water, lab analysis of inorganic parameters using DCP, atomic absorption, graphite furnace, ion chromatography and wet chemical methods. Trace metals, anions, and sediment analyses are carried out on a regular basis following EPA and USGS methodology. 6/90 - present.

Research Assistant, Water Research Center, University of Alaska, Fairbanks, AK. Working towards M.S. Environmental Quality Science (currently, as of May 1993). Major concentration on determining the source of nitrate contamination in groundwater using stable isotopes. 9/87 - 6/90.

Chemical Analyst, Environment/One Corp., Schenectady, NY. Extensive training in field environmental sampling of water and air constituents. Laboratory analysis of water samples using atomic absorption spectrophotometer and graphite furnace methods; experience with gas chromatograph/mass spectrometer. 10/84 - 8/87

Laboratory Technician, C.R. Bard Corp., Murray Hill, NJ. Worked in manufacturing laboratory analyzing production samples using gas chromatography and wet chemical methods. 10/83 - 10/84.

2) Richard Snyder

Richard Snyder is the Chief Water Quality Technician, Alaska District, U.S. Geological Survey, Anchorage AK. He holds a B.S. degree in Agricultural Science from the University of Wisconsin and has worked on numerous aspects of water quality investigations in Colorado and Alaska over the past 30 years with the Geological Survey. On the Kodiak Coast Guard Base Study, a RCRA Facilities Investigation, he was the team leader for all sampling and provided direction and training in proper techniques of sampling. On a two year study of soil and water contamination at the National Petroleum Reserve -- Alaska, he set up the staging/cleanup/analytical areas in order to ensure that the methods were in compliance with CERCLA guidelines and devised sampling methods for the unique situation. He also participated in and provided advice to others on an Installation Restoration Program for Clear Air Force Station.

3) Michael R. Lilly

B.S. Geology, Texas A&M University

M.S. Hydrogeology, University of Alaska Fairbanks, Current Program

Hydrologist, U.S. Geological Survey, Water Resources Division, Fairbanks AK. Responsible for project work concerning ground-water investigations in the Fairbanks area. Project experience include a bioremediation project at the Fairbanks International Airport. Surface-water and ground-water interactions and modeling of ground-water flow are part of the objectives of the project. Other experience includes designing and conducting ground-water investigations for a project involving the University of Alaska and ground-water mapping in the Fairbanks floodplain area. February 1989 to present.