FINAL

WORK PLAN

MATANUSKA RIVER DEBRIS SITE ASSESSMENT

AND DEBRIS REMOVAL AND DISPOSAL PLAN

PALMER, ALASKA

Prepared for:

Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, Alaska, 99501

Prepared by:

OASIS Environmental, Inc.
807 G Street, Suite 250
Anchorage, Alaska 99501

May 18, 2004

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Under Contract No 18-5006-12, for the Alaska Department of Environmental Conservation (ADEC), OASIS Environmental, Inc. (OASIS) was tasked to prepare a work plan to perform a site assessment of a debris disposal area along a stretch of the Matanuska River just north of Eagle Avenue in Palmer, Alaska.

The first objective of the project is to assess, map, and determine the extent of debris as well as any potential pollutants in a debris disposal area along the Matanuska River. The focus of the site assessment is to estimate the volume of debris and collect information to determine potential impacts to water quality on the Matanuska River adjacent to the site.

The second objective of the project is to develop a debris removal and disposal plan that addresses permits needed, cost estimates, site logistics, and site safety concerns (from contents of debris pile such as contaminants and from the actual debris removal process).

2.0 PROJECT BACKGROUND

There is an unpermitted active dump located on and in the Matanuska River just north of Eagle Avenue in Palmer, Alaska. The disposal area is accessed from the old railroad bed off of Eagle Avenue. Debris is deposited along a stretch of the Matanuska River approximately ¼ to ½ mile upstream of Eagle Avenue and is mainly concentrated in an area approximately ¼ mile from Eagle Avenue. Visible contents of the dump at the time ADEC inspected it included railroad cars, vehicles, household refuse, fuel cans, possible 55-gallon drums with unknown contents, scrap metal, and other miscellaneous debris. River channels run through and next to the dump at all times of the year. Visible sheens have also been observed in the river. This open dump is within the Drinking Water Protection Area for a minimum of three public water systems.

Figure 1 is a May 2000 aerial photo that depicts the general site features and shows the debris disposal area. Figure 2 is a September 2003 aerial photo of the same area.

3.0 PROJECT DESCRIPTION

On submittal and ADEC approval of this work plan OASIS will coordinate a pre-project scooping and issues meeting with key stakeholders (ADEC, ADNR, ADFG, Alaska Rail Road, Mat-Su Borough, City of Palmer, and local community council members). Comments received during the stakeholder meeting will be incorporated into the final work plan.

The purpose of the site assessment is to determine the following items:

1. Map the extent of debris and estimate the volume of debris present. This task will also include determining land ownership(s) for the debris disposal area.

2. Sampling of visible contamination will be performed in accordance with ADEC contaminated site assessment procedures as outlined in 18 ACC 75 and associated guidance. Multiple areas will be screened using a photo-ionization detector (PID) and up to six soil or water samples will be collected from areas deemed most likely contaminated based on the screening. If evidence of a spill is found the extent of impact will be estimated based on PID results and surface staining.

3. Collect three surface water and sediment sample pairs from the Matanuska River's edge located upstream, adjacent, and downstream of the debris disposal area.

4. No HAZCAT sampling of drum contents will be performed during this site assessment.

5. If a release of hazardous contamination is found during the site assessment activities, OASIS will notify the ADEC project manager and Rich Sundet with the ADEC Contaminated Sites department within 48 hours, or immediately if the release is ongoing.

A site assessment report will be prepared that documents site assessment activities and findings. A draft report will be submitted for ADEC review and comment. OASIS will incorporate comments into the draft report and prepare a final report.

On acceptance of the site assessment report OASIS will develop a debris removal and disposal plan.

4.0 SITE ASSESSMENT AND SAMPLING

Site assessment activities are described in this section. The health and safety guidelines described in the Site Safety and Operations Plan (Appendix A) will be followed during all field activities.

4.1 SITE ASSESSMENT

A site assessment will be performed to visibly document the debris disposal area and estimate the volume of debris present. Site assessment documentation will consist of the following items.

- The extent of visible debris will be mapped and documented with differential GPS and photographs. A metal detector scan and/or shallow hand excavations will be performed around the perimeter of visible debris to ascertain if there is any near surface debris outside the visibly impacted area.
- Significant debris piles will be photographed and described as to the type and quantity of debris. Estimates of the debris volume will be made using a cloth tape or other means.
- If drums or other potential leaking containers are encountered, there location will be noted using a handheld GPS and recorded in the field logbook. Container markings or labels will also be recorded. Digital photographs will be used to assist with documentation of the container and the surrounding site conditions.
- Visual observations and PID screening will be used to determine if site contamination has occurred. Visual inspections for leaking drums, surface staining, and surface water sheens will be performed throughout the debris disposal area. PID readings will be collected from all areas of suspected contamination.
- Research to determine land ownership(s).
- The site assessment will be performed in early May 2004 when snow cover has melted but before significant rise in the river level associated with spring breakup occurs.

4.2 SAMPLING

Based on PID field screening results a total of six soil or water samples will be collected from inside the debris disposal area for laboratory analysis. Additionally three surface water and sediment samples will be collected from upstream, adjacent, and downstream of the site. The soil and sediment samples will be analyzed using AK Method 101 for GRO, AK Method 102/103 for DRO/RRO, EPA Method 8260B for volatile organic compounds (VOC), EPA Method 6010/7000 for RCRA metals, and EPA Methods 8081A/8082 for pesticides and PCBs (Table 1). The surface water samples will be analyzed using EPA Method 624 for VOC, EPA Method 610 for polynuclear aromatic hydrocarbons (PAH), EPA Method 608 for pesticides and PCBs, and EPA Method 6020/7000 for RCRA metals (Table 2). Proposed sample locations are discussed below.

- Six soil and or water samples will be collected from debris disposal locations deemed most likely contaminated based on field screening.
- Three surface water and sediment sample pairs will be collected at the river's edge. These sample locations will be upstream, adjacent to, and downstream of the debris

disposal area. The upstream and downstream locations will be approximately one hundred feet upstream and downstream, respectively.

- Two quality control (QC) duplicate samples will be collected, one for soil/sediment and one for water. The duplicate samples will be collected from a primary sample location that has observable contamination based on field measurements or visual observations.
- OASIS will request a 5 day turnaround time for the laboratory results.
- If evidence of a spill is found the extent of impact will be estimated based on PID screening and surface staining. The volume of contaminated soil will be estimated from aerial extent of staining and shallow hand excavations (if possible).

5.0 SAMPLE METHODOLOGY

Samples will be collected in accordance with the general sampling procedures outlined in the Standard Sampling Procedures and Quality Assurance Program Plan procedures detailed in the *ADEC Underground Storage Tank Procedures Manual* dated November 7, 2002. The project-specific sampling procedures are outlined below.

5.1 SOIL FIELD SCREENING PROCEDURES

The following headspace screening procedure is used to obtain and analyze soil field screening samples with a PID.

1. Partially fill (one-third to one-half) a clean ziplock bag with the sample to be analyzed; total capacity of the bag may not be less than eight ounces (app. 250 ml), but the container should not be so large as to allow vapor diffusion and stratification effects to significantly affect the sample.

2. If the sample is collected from a split spoon, it must be transferred to the bag for headspace analysis immediately after opening the split-spoon; if the sample is collected from an excavation or soil pile, it must be collected from freshly uncovered soil. The ziplock bag must then be quickly sealed shut.

3. Headspace vapors must be allowed to develop in the container for at least 10 minutes but no longer than one hour; containers must be shaken or agitated for 15 seconds at the beginning and end of the headspace development period to assist volatilization; temperatures of the headspace must be warmed to at least 40° F (approximately 5° C), with instruments calibrated for the temperature used.

4. After headspace development, the instrument sampling probe must be inserted to a point about one-half the headspace depth; the container opening must be minimized and care must be taken to avoid uptake of water droplets and soil particulates.

5. After probe insertion, the highest meter reading must be taken and recorded, which normally will occur between two and five seconds after probe insertion; if erratic meter response occurs at high organic vapor concentrations or conditions of elevated headspace moisture, a note to that effect must accompany headspace data.

6. Calibration of PID field instruments must follow the procedures outlined in the owner's manual from the instrument manufacture.

7. All field screening results must be documented in the field record or log book.

5.2 SAMPLING PROCEDURES

Detailed descriptions of the soil, surface water, and sediment sampling procedures are discussed below.

5.2.1 Soil Sample Collection

Surface soil samples will be collected by digging a small hole at the desired location and the soil samples will be collected from at least six inches below, but not more than 12 inches below, the ground surface. Soil characteristics and sampling information including material type, odor, depth, and location will be recorded on the Surface Soil/Sediment Sample Sheet (Appendix B, Figure B-1).

As required by 18 AAC 78, soil samples for all parameters listed in Table 1 must be collected in accordance method specifications and the following procedures must be used to collect soil samples for laboratory analysis.

1. Unless otherwise approved by ADEC, all laboratory soil samples must be grab samples and may not be composited before analysis, except that soil samples for total arsenic, cadmium, chromium, and lead that are for screening purposes may be composited in the field or in the laboratory before analysis.

2. Soil samples taken directly from the surface of excavations must be obtained from freshly uncovered soil; a minimum of six inches of soil must be removed immediately before collection, and the sample must be obtained from the newly uncovered soil; if the excavation has been open for longer than one hour, at least 18 inches of soil must be removed immediately before collection.

The following steps must be taken to minimize sample collection errors:

- All samples must be collected with disposable or clean tools that have been properly decontaminated.
- Disposable gloves must be worn and changed between sample collections.
- Soil samples must be placed in containers in the order of volatility; for example, volatile organic aromatic samples must be taken first, gasoline range organics next, heavier range organics next, pesticide and PCB samples next, and soil classification samples last.
- Containers must be quickly and adequately sealed, and rims must be cleaned before tightening lids; tape may be used only if known not to affect sample analysis.
- Sample containers must be labeled as outlined in Section 5.3 (Sample Labeling and Custody).
- Containers must immediately be preserved according to procedures in Table 3 and Table 4 of this work plan; unless specified otherwise, at a minimum, the samples must be immediately cooled to 4$\pm$2°C and this temperature must be maintained through delivery to laboratory until samples are analyzed.

5.2.2 Surface Water and Sediment Sample Collection

The surface water and sediment sample pairs will be collected moving from downstream to upstream to minimize impacts due to water turbidity. Surface water samples will be collected prior to sediment sampling to avoid entraining sediment in the water samples. The sediment samples will be collected from the edges of the freshly dug sample pits, using disposable sampling spoons.

SURFACE WATER: All surface water samples will be collected at least 12 inches below the surface away from any observable sheen. Grab samples will be collected by submerging the sample bottle in the surface water to collect the sample. Grab surface-water samples will be collected by placing a new laboratory-supplied sample bottle under the surface of the water with a minimum of sediment disturbance. Sample bottles with laboratory-supplied preservatives will be filled by transferring sample volume from another clean sampling container that was filled as described above. When filling a 40-millilter VOA, a **non-preserved** sample container (from the sample set) will be filled and slowly poured into each VOA with a minimum of disturbance. The VOA containers will be checked to ensure that there are no air bubbles after capping. If the water body is too shallow to allow for submerging of the sample bottles, the peristaltic pump will be used to pump water into each sample container.

Field measured water-quality parameters (including pH, conductivity, temperature, dissolved oxygen, and turbidity) will be measured and recorded at each surface water sample location on the Sample Data Sheet (Appendix B, Figure B-1). Prior to, and after each sampling location, all field meter probes will be rinsed with de-ionized water. The location of the sample will also be recorded on the Surface Water Sample Sheet using the diagram provided on the form.

SEDIMENT SAMPLES: Surface-water samples will be collected prior to sediment sampling to avoid entraining sediment in the water samples. Sediment samples will be collected from the upper three to six-inches of sediment using a pre-cleaned stainless steel sample spoon or disposable sample scoop. Samples for analysis of VOCs will be collected first and the container filled without headspace to avoid volatilization. The remaining parameters will be collected in the same order as specified for soil sample collection.

Sediment characteristics and sampling information including material type, odor, depth, and location will be recorded on the Sample Data Sheet (Appendix B, Figure B-1).

5.2.3 Methanol Preservation and Handling Procedure

Soil and sediment samples collected for volatile analyses will follow the previous sample collection techniques with the required specialized procedures that follow:

- Verify that the 4-ounce container has a septumated lid and is identified as pre-tarred. Two-ounce containers may also be substituted.
- Document the number located on the tarred container on the CoC and the field logbook. This corresponds to the weight of the container determined by the laboratory prior to shipment.
- Do not place a label on the pre-tarred containers. Each container should have a laboratory label. All sampling information shall be hand-entered on the existing label. If a container does not have a label, a separate label may be placed inside a zip lock bag

with the sample container. Bottles may be marked with waterproof markers for identification during sample collection.

- Because this is considered a volatile sample, the sample will not be collected from the homogenized fraction collected for metals analyses. This aliquot will be collected directly from the sample location.
- Enough soil (minimum 25-40 grams) will be added to the pre-tarred container to provide adequate volume to represent the site and ensure maximum reporting limits are achievable. This can be assured by filling the container one-third full (for coarse material) or one-forth full (for fine sands and silts) and adding one volume of methanol provided by the analytical laboratory. If one volume does not completely cover the sample, additional volumes shall be added until the soil is completely submerged. A minimum one-to-one soil to methanol ratio must be maintained to ensure the lowest possible detection limits.
- Complete sampling information on the container label, including the volume of methanol added. If more than one vial of methanol is added to a sample, note the number of vials added on the CoC form (2 vials would be labeled "2xM," 3 vials would be labeled "3xM," etc.). Double bag the sample container if a label is placed on an outside plastic bag.
- Mark the bottom of the meniscus of the methanol contained within the sample container. Initial and date the meniscus mark.
- Methanol trip blanks are supplied by the laboratory and consist of a 4-oz jar with sand and methanol.
- For each laboratory sample, collect a separate sample of soil in a two-ounce bottle for percent solids determination.

5.3 SAMPLE LABELING AND CUSTODY

This section summarizes the SOPs for sample identification, maintaining sample chain of custody (COC), proper sample packaging, and transportation of the samples from the field (collection site) to the analytical laboratory. The purpose of these procedures is to ensure that the quality of the samples is maintained during their collection, transportation, and storage through analysis.

Sample identification documents will be carefully prepared so that sample identification and COC can be maintained and sample disposition controlled. Sample identification documents include:

- Sample labels,
- Field notebooks, and
- COC records.

5.3.1 Sample Labeling

Sample labels will include the sample ID, date sampled, time sampled, sampler initials, analysis and any special instructions to the laboratory. All sample containers collected for laboratory analysis will be identified using a 9-digit alphanumeric code on a label fixed to the sample

container. Duplicate samples will be numbered sequentially without any additional identification. The sample code for laboratory samples is broken down as follows:

Group	Digits	Description	Code Examples
(1)	1-2	Calendar year	04
(2)	3-4	Project identification	MD
(3)	5-7	Sample number	019
(4)	8-9	Sample type:	Symbol:
		Soil	SO
		Surface Water	SW
		Sediment	SE
		Trip Blank	TB

Example: 04-MD-005-SD (2004, Matanuska Debris, Sample No. 005, sediment).

After a sample is collected, pertinent information such as sample identification number, date and time of sample collection, sample collection method, and sample description will be recorded in the field logbook, and the recorder will initial the entry.

5.3.2 Field Logbook

All field logbooks will be kept in a bound, waterproof notebook containing consecutively numbered pages. All entries will be made in waterproof ink. No pages will be removed for any reason. At a minimum, the following information will be recorded:

- Name of person making entry (signature);
- Names of team members on site;
- Documentation on samples taken, including:
- Sample identification numbers,

Sampling location and station numbers,
Sampling date and time, sampling personnel,
Type of sample, matrix, and
Number of samples collected;

- On-site measurement data;
- Field observations and remarks;
- Weather conditions, wind direction, etc.;
- Unusual circumstances or difficulties;

- Monitoring equipment used (brand, model, serial number);
- Monitoring equipment calibration;
- Initials of person recording the information; and
- Corrections to Documentation.

All entries for logbooks, sample identification labels, COC records, and other forms must be written in waterproof ink. Sampling forms will not be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. Any corrections will be made by drawing a single line though the original entry (so that the original entry can still be read), and writing the corrected entry alongside. The correction must be initialed and dated.

5.3.3 Photography

Digital photographs will be taken during fieldwork to document field work activities. Photographs of site conditions, debris piles, sample collection, and other relevant project features will be taken. A photograph will also be taken at each of the sample locations as well as perspective photos or where the sample locations are relative to the overall site.

A record of the photographs with picture identification, date and time, and brief description of the photograph will be incorporated into the field logbook.

5.4 SAMPLE CUSTODY

5.4.1 Chain-of-Custody

The primary objective of the COC procedures is to provide an accurate written record that can be used to trace the possession and handling of a sample from the time of collection through completion of all required analyses at the laboratory. A sample is in custody if the sample meets one of the following standards:

- In someone's physical possession,
- In someone's view,
- Locked up, or
- Kept in a secured area that is restricted to authorized personnel.

Chain-of-Custody Record: The COC record for the laboratory must be completed fully in triplicate. The person completing the COC record should note any analytical constraints in the remarks section of the custody record. The remarks section also should indicate whether the samples have been preserved, and should emphasize the most restrictive maximum holding time for one or more samples in the cooler. The COC may also indicate, for the laboratory's benefit, if the sample is suspected to contain elevated concentrations of any contaminants. Alternatively, this information could be supplied separately to the laboratory.

5.4.2 Transfer of Custody

Proper sample custody is maintained through adherence to the procedures listed below.

- The coolers in which the samples are packed must be accompanied by a COC record. When transferring samples, the individuals relinquishing and receiving the coolers must sign, date, and note the time on the record. This record documents sample custody transfer.
- Samples must be dispatched to the laboratory for analysis with a separate COC record accompanying each shipment.

5.5 SAMPLE PACKAGING AND SHIPPING

The transportation and handling of all samples must be accomplished in a manner that ensures the samples' integrity. Samples will be hand carried from Palmer to Anchorage by one of the OASIS field crew. Sample coolers will then be hand delivered to North Creek Analytical or SGS Environmental for analysis.

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. Adherence to the following sample package requirements is essential.

- Sample container lids must never be mixed. All lids must remain with their original container.
- Shipping coolers must be partially filled with inert packing materials to prevent sample containers from moving during packing.
- Environmental samples must be cooled to 4°C, +/- 2° C to preserve many chemical constituents. Wet ice double-packaged in sealable plastic bags or blue ice will be used to cool samples during shipment. Ice is not to be used as a substitute for packing material.
- Any remaining space in the cooler should be filled with inert packing material such as bubblewrap. Under no circumstances should material such as sawdust, sand, or Styrofoam peanuts be used.
- The original custody record must be placed in a plastic bag inside the cooler.

5.6 FIELD EQUIPMENT AND SUPPLIES

Field equipment and supplies to be used in this site assessment will include:

- Hand shovel or post hole digger,
- Metal detector,
- Digital camera,
- Differential handheld GPS unit,
- PID for screening soil samples,
- Horiba U-10 and YSI-55 for measure water quality parameters in the field,
- Disposable sample spoons,
- Appropriate sample containers (see Table 3 and Table 4),
- Soil/sediment sample preservative (40 mL septum vials of methanol), and

- Flexible measuring tape of minimum 100 foot length.

5.7 EQUIPMENT DECONTAMINATION

Disposable sampling and personal protective equipment (PPE) will be used during the site assessment field activities. The hand shovels will be brushed off and wiped with paper towels to remove any dirt between sample locations.

No investigation-derived wastes (IDW) are expected to be generated by this project.

6.0 ANALYTICAL PROGRAM

All soil, surface water, and sediment samples (including field duplicates) will be analyzed using State of Alaska (AK) or Environmental Protection Agency (EPA) analytical methods as specified in Tables 1 and 2.

Table 1: Matanuska River Debris Site Assessment Soil Sample Analyses Summary

Sample Number	Location ID Sample Point	Comments	Matrix	Location Type	Analytical Methods					
					Alaska Method AK102/103 DRO/RRO	Alaska Method AK 101 GRO	EPA Method 8260B VOCs	EPA Method 8081A/8082 Pest & PCB	EPA Method 6020/7000 RCRA metals	EPA Method SW3550 Percent Solids
04MD-001SE		Downstream	Sediment	Grab	1	1	1	1	1	1
04MD-002SE		Adjacent	Sediment	Grab	1	1	1	1	1	1
04MD-003SE		Upstream	Sediment	Grab	1	1	1	1	1	1
04MD-004SO			Soil	Grab	1	1	1	1	1	1
04MD-005SO			Soil	Grab	1	1	1	1	1	1
04MD-006SO			Soil	Grab	1	1	1	1	1	1
04MD-007SO			Soil	Grab	1	1	1	1	1	1
04MD-008SO			Soil	Grab	1	1	1	1	1	1
04MD-009SO			Soil	Grab	1	1	1	1	1	1
04MD-501SO	Duplicate Sample # 1		Soil	Grab	1	1	1	1	1	1
03MD-501SO	Duplicate Sample # 1	MS/MSD	Soil	Grab	2	2	2	2	2	
04MW-TB-801SO	Project Trip Blanks	Methanol Blank	Methanol	QA/QC		1	1			
SAMPLE ANALYSES TOTALS					**12**	**13**	**13**	**12**	**12**	**10**

Notes: * Sample numbers for these locations will be incremented by 1 for each succesive sample (e.g., 801, 802, 803, etc.)

Table 2: Matanuska River Debris Site Assessment Water Sample Analyses Summary

Sample Number	Location ID Sample Point	Comments	Matrix	Location Type	Analytical Methods					
						EPA Method 610 PAH	EPA Method 624 VOCs	EPA Method 608 Pest & PCB	EPA 6020/7000 RCRA metals	
03MD-001WS		Downstream	Surface Water	River		1	1	1	1	
03MD-002WS		Adjacent	Surface Water	River		1	1	1	1	
03MD-003WS		Upstream	Surface Water	River		1	1	1	1	
04MD-601WS	Duplicate Sample # 1		Surface Water	River		1	1	1	1	
04MD-601WS	Duplicate Sample # 1	MS/MSD	Surface Water	River		1	1	1	1	
04MD-TB-901WS *	Project Trip Blanks		Water	QA/QC		1	1			
WATER ANALYSES TOTALS					**0**	**6**	**6**	**5**	**5**	**0**

Notes: * Sample numbers for these locations will be incremented by 1 for each succesive sample (e.g., 901, 902, 903, etc.)
Method 624 will be used to determine TAH (benzene, toluene, ethylbenzene, and xylenes) based on ADEC 18 AAC 70
Method 610 will be used to determine TAqH (TAH + PAH) based on ADEC 18 AAC 70

7.0 QUALITY ASSURANCE AND QUALITY CONTROL

Quality control procedures are used to ensure that data are useable and legally defensible for their intended purpose. Specific objectives and procedures for quality assurance and quality control are provided in Appendix C – Quality Assurance Project Plan.

8.0 SITE ASSESSMENT REPORT

A site assessment report will be prepared that documents site assessment activities and findings. At a minimum the report will contain the following information:

- A brief description of the procedures used to implement the work plan and a description of any deviation from the approved scope of work.
- Photographic documentation of the site assessment activities.
- Figures showing land ownership and extent of debris along Matanuska River.
- Estimates on the amount of debris and contaminated soil.
- A summary of the results from the sampling effort, including summary tables, figures, laboratory analytical data, and additional information, as necessary. The report will include all appropriate quality assurance/quality control (QA/QC) data.

OASIS will prepare and submit a draft report to ADEC for review. OASIS will incorporate ADEC comments into the draft report and prepare a final report. Three unbound hard copies of the draft report will be submitted along with three CDs containing the report in both Microsoft Word and PDF formats. Photographs will be provided in the report and as separate JPEG files on the CD.

9.0 DEBRIS REMOVAL AND DISPOSAL PLAN

A draft plan will be developed to remove the debris. At a minimum the plan will contain the following elements:

- Estimate of the amount of debris present,
- A historical aerial photograph review,
- Disposal options for the debris,
- Graphics as necessary to depict site conditions and the locations of key features,
- Photographs of the site with documentation,
- Assessment of the volume of contaminated soil,
- Engineering evaluation of the impact the removal effort will have on bank stability,
- Bank stabilization plan,
- Environmental protection plan,
- Results of site assessment sampling,
- Evaluation of the permits, approvals, and public input needed to accomplish the removal,
- A cost estimate to perform the removal, and
- A detailed list of the necessary equipment.

OASIS will prepare and submit a draft plan to ADEC for review. OASIS will incorporate ADEC comments into the draft plan and prepare a final plan. Three unbound hard copies of the draft report will be submitted along with three CDs containing the report in both Microsoft Word and PDF formats. Photographs will be provided in the report and as separate JPEG files on the CD.

10.0 PROPOSED SCHEDULE

The schedule proposed for this project is presented below.

	Anticipated Date
• Notice to Proceed (NTP)	April 9, 2004
• Submit Draft Workplan	April 21, 2004
• Project Scoping Meeting	May 4, 2004
• ADEC Approve Workplan	May 14, 2004
• Perform Site Assessment	Week of May 17
• Site Assessment Draft Report	May 28, 2004
• Site Assessment Final Report	June 4, 2004
• Debris Removal and Disposal Draft Plan	June 18, 2004
• Debris Removal and Disposal Final Plan [1]	June 30, 2004

[1] The current term contract ends on 6/30/04.

11.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2002. *Underground Storage Tanks Procedures Manual, Guidance for Treatment of Petroleum Contaminated Soil and Water, and Standard Sampling Procedures*. November 7, 2002.

ADEC, 2003a. *18 AAC 75, Oil and Hazardous Substances Pollution Control Regulations*. January 2003.

ADEC, 2003b. *18 AAC 78, Underground Storage Tanks*. January 2003.

ADEC, 2003c. *18 AAC 70, Water Quality Standards.* June 26, 2003.

OASIS Environmental, Inc., 1996. *Quality Assurance Program Plan for Site Assessments*.

FIGURES

SOURCE:
AERIAL PHOTOGRAPH MV_4-47.TIFF DATED MAY 10, 2000 PROVIDED BY AREOMAP U.S.

PATH: V:\Project Drawings\Matanuska Valley FILE: 14-053_Plan1.Dwg PLOTTED: 4/21/04

SITE MAP
MAY 10, 2000 PHOTOGRAPH

MATANUSKA RIVER DEBRIS SITE ASSESSMENT
Palmer, Alaska

FIGURE
1

oasis
ENVIRONMENTAL
807 G STREET, SUITE #250
ANCHORAGE, ALASKA 99501

DATE APRIL 2004
CHKD T.M.
DRAWN C.E.H.
PROJ. NO 14-053

PATH: V:\Project Drawings\Matanuska Valley FILE: 14-053_Plan1.Dwg PLOTTED: 4/21/04

SOURCE:
AERIAL PHOTOGRAPH MV_4-23.TIFF DATED SEPT. 10, 2003 PROVIDED BY AREOMAP U.S.

SITE MAP
SEPTEMBER 10, 2003 PHOTOGRAPH

MATANUSKA RIVER DEBRIS SITE ASSESSMENT
Palmer, Alaska

FIGURE
2

oasis
ENVIRONMENTAL
807 G STREET, SUITE #250
ANCHORAGE, ALASKA 99501

DATE APRIL 2004
CHKD T.M.
DRAWN C.E.H.
PROJ. NO 14-053

APPENDIX A

Site Health and Safety Plan

SITE HEALTH AND SAFETY PLAN **OASIS Environmental**

Site: Matanuska River Project #: 14-053

Location: Palmer, Alaska Date: May 18, 2004

Prepared by: Tim McDougall

Client Contact: Alaska Department of Environmental Conservation
Laura Eldred
(907) 269-1065

Project Introduction: Project includes site assessment of debris disposal area along Matanuska River near Palmer Alaska. Site activities will include surface soil screening, surface soil and sediment sample collection, surface water sample collection, and mapping and documentation of visible debris with differential GPS and photographs.

Anticipated Date/Duration of Field Activities: Week of May 17th or May 24th 2004.

Background Review

Access to the site is by foot along by the old railroad bed on a stretch of the Matanuska River just north of Eagle Avenue. Underground and overhead utilities may be present. The site consists of an active open dump on and in the Matanuska River. Visible contents of the dump include railroad cars, vehicles, household refuse and items, fuel cans, possible 55-gallon drums with unknown contents, scrap metal and other debris.

Waste Type Characteristics

Liquid ■	Solid ■	Sludge ☐	Gas ☐
Corrosive ☐	Ignitable ☐	Reactive ☐	Volatile ■
Toxic ☐	Radioactive ☐	Unknown ■	Other ☐

Facility Description

Size: Debris disposal area estimated to follow along the Matanuska River for approximately 300 feet and be approximately 100 feet wide.

Buildings and structures: None

Topography and access: Access on foot or possibly by vehicle via old railroad bed off of Eagle Avenue near a residential area, topography is relatively flat except along bluff at the rivers edge where it is relatively steep.

Storage and disposal method: The only investigation derived wastes expected for the project is personal protective equipment which will be placed in plastic garbage bags and disposed of at the local landfill.

Status: Active open dump located next to old railroad bed that is used for road access.

History (injury, illness, complaints, public or agency): None reported.

Special conditions and comments: OASIS employees will follow health and safety guidelines outlined in this plan, and guidelines outlined in the OASIS Health and Safety Corporate Plan. Subcontractors are required to read and follow the guidelines in this health and safety plan; however, the subcontractors must follow the guidelines described in their own company health and safety plans.

Hazard Evaluation

Chemicals of concern: The soil and surface water may contain petroleum hydrocarbons, chlorinated solvents, metals, and PCB contamination.

Weather Conditions: Work will commence and finish during the late spring, extreme weather is not anticipated.

Vehicle Traffic: Bicycles and possibly ATVs and vehicles but not likely.

Operations Plan

Site figure included in work plan (Figure 1 and Figure 2).

Sampling method: Sampling will be performed manually with disposable sample scopes and disposable sample containers.

Safety Equipment and Procedures

Level of protection: ☐ A ☐ B ☐ C ■ D

Additions and modifications: Disposable nitrile gloves and eye protection will be worn when handling soil and groundwater. Leather gloves will be worn when working around or moving metal debris. Field personnel are to use extreme care while walking or working on steep embankment slopes. Any drums encountered during field effort are only to be inspected visually and will not be opened for any reason.

Site access controls: None.

Special surveillance equipment and materials: A photo-ionization detector (PID) will be used to measure organic vapors in the breathing zone.

Decontamination procedures: Discard gloves in plastic garbage bags for disposal. Cleanse hands and face prior to breaks. Launder all soiled work clothing.

PDS equipment, materials, and special facilities: Emergency eye wash and first-aid kit will be easily accessible.

Site Entry Procedures

Access: Site entry will be coordinated with the property owners Alaska Railroad Corporation and their leaseholders (State of Alaska, Division of Natural Resources and Matanuska-Susitna Borough).

Site work team (name - responsibility):

1. Tim McDougall – Project Manager and Field Team Leader
2. Claire Albertson – Sampling Technician

Special conditions (e.g., work schedule or limitations):

None

Emergency Procedures

In the event of an OSHA-recordable injury or illness, accident, or damage or significant changes to process equipment, the OASIS project manager and H&S officer should be contacted immediately.

Acute exposure symptom:	First aid action:
1. Eyes - severe irritation	Flush with water.
2. Skin - irritation	Wash with soap and water.
3. Respiratory - dizziness, headache, nausea, or fatigue	Remove to fresh air.
4. Ingestion	Do not induce vomiting, can cause chemical pneumonitis.

Hospitals/emergency medical center (address/phone no.)

1. Valley Hospital (515 E. Dahlia, Palmer, phone #: (907) 746-8600).

Emergency transportation (fire, ambulance, police):

1. Ambulance/police/fire dial 911.

Emergency routes:

Valley Hospital - Left on N. Alaska St. from Eagle Dr., left on Old Glenn Hwy./E. Arctic Ave., right on S. Valley Way to Valley Hospital.

Safety/Health Equipment Check-out List

General Safety:

First Aid Kit	■	Eye wash station	■
Safety glasses/face shield	■	Drinking water	■
Sampling gloves	■	Nomex suits/vinyl gloves	☐
Personal Clothing Change	■	Hearing Protection	☐
Wash/decontamination materials	■	Other	☐

Specific Safety Equipment:

- ■ Respirator type: Organic Vapor cartridge if elevated PID levels
- ☐ Combustible gas/explosimeter
- ☐ Oxygen indicator
- ☐ Dosimeter badge
- ☐ Draeger/sensidyne pump and detector tubes
- ■ Duct tape, brushes, buckets, water, soap, paper towels
- ☐ Caution tape, traffic cones
- ■ Photoionization detector
- ■ Fire extinguisher

Special condition and comments: Prior to working at any site, OASIS personnel are given a complete physical examination and are evaluated for use of respiratory protection. If any OASIS personnel believe that they have suffered an overexposure, they contact their supervisor immediately. OASIS personnel on site have completed a general site worker course that complies with 8 AAC 10.0101 and have a minimum of three days actual supervised field experience. OASIS employees have also had training in the following: Hazard Communication, Respiratory Protection, and Personal Protective Equipment. Documentation of this training is available through the OASIS health and safety department.

Site: Matanuska River Debris Site Assessment Date: 5/18/04

Note: This H&S plan has been developed for the use of OASIS personnel only. OASIS makes this plan available for review by other personnel on a work site; however, this plan does not cover the employees of any other employer on the work site.

Project Manger: _____ Phone: _____

Signature: _____ Date: _____

Health and Safety Manger: _____ Phone: _____

Signature: _____ Date: _____

Sign-Off Sheet

Project: Matanuska River Debris Site Assessment Project Number: 14-053

Sign-Off: I have read and I understand the attached Health and Safety Plan, and agree to comply with the requirements described within.

Name:	Title:	Date:

APPENDIX B

Field Documentation Forms

Figure B-1

Surface Water/Soil/Sediment Sample Data Sheet

Sample ID _____ Date_____ Time _____

Site Matanuska Debris Assessment Sampler _____

Location Palmer Alaska_____ QA/QC Sample

Weather _____ Associated QA/QC Sample

Split _____

Duplicate _____

Marine	Lake/Pond (LK)	Sample Depth _____
Brackish	River (RV)	Total Depth _____
Freshwater	Stream/Creek (SP)	Velocity (ft./Sec.)_____
Seep/Spring (SE)	Other	Flow Direction _____
Emergent Vegetation		

Temperature °C _____	Color _____
pH _____	Odor _____
Conductance (mS) _____	Sheen _____
	Debris _____
Dissolved O_2 _____	Turbidity _____

Location Diagram/Notes

APPENDIX C

Quality Assurance Project Plan

OASIS ENVIRONMENTAL, INC.

MATANUSKA RIVER DEBRIS SITE ASSESSMENT

Quality Assurance Project Plan

May 2004

A. Project Management Elements

A1. Title Page and Approvals

Project Manager **Date**

Quality Assurance Officer **Date**

ADEC Project Manager **Date**

ADEC Water Quality Assurance Officer **Date**

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A2. Table of Contents

Tables

A3. Distribution List

This list includes the names and addresses of those who receive copies of this approved QAPP and subsequent revisions. It is not the list of those who receive data reports.

Tim McDougall, Project Manager
OASIS Environmental, Inc.
807 G St., Suite 250
Anchorage, Alaska
Phone: (907) 258-4880
Email: max@oasisenviro.com

Carl Benson, Project Quality Assurance Officer
OASIS Environmental, Inc.
250 Cushman St., Suite 4G
Fairbanks, Alaska
Phone: (907) 458-8270
Email: carl@oasisenviro.com

Laura Eldred, ADEC Project Manager
Nonpoint Source Pollution Program
Alaska Department of Environmental Conservation
555 Cordova St.
Anchorage, Alaska 99501
Phone: (907) 269-1065
Email: mailto:laura_eldred@dec.state.ak.us

Kent Patrick-Riley, Water Quality Assurance Officer
ADEC Division of Water
Alaska Department of Environmental Conservation
555 Cordova St.
Fairbanks, Alaska 99501
Phone: (907) 269-7554
Email: mailto:kent_patrick-riley@dec.state.ak.us

Mike Priebe, Project Manager
North Creek Analytical Services, Alaska
2000 W. International Airport Road, Suite A10
Anchorage, Alaska 99502
Phone: (907) 563-9200
Email: mailto:mpriebe@ncalabs.com

A4. Project/Task Organization

OASIS Environmental, Inc. (OASIS) has been contracted to assess the potential impacts of a debris disposal site on the Matanuska River. Tasks to be performed include a site assessment and field sampling of potential contaminants at the debris disposal site and from three surface water and sediment samples taken from the Matanuska River. Preparation of a Site Assessment Report and development of a Debris Removal and Disposal Plan will also be performed under this contract. Staff duties and responsibilities for completing these tasks are described below.

OASIS staff

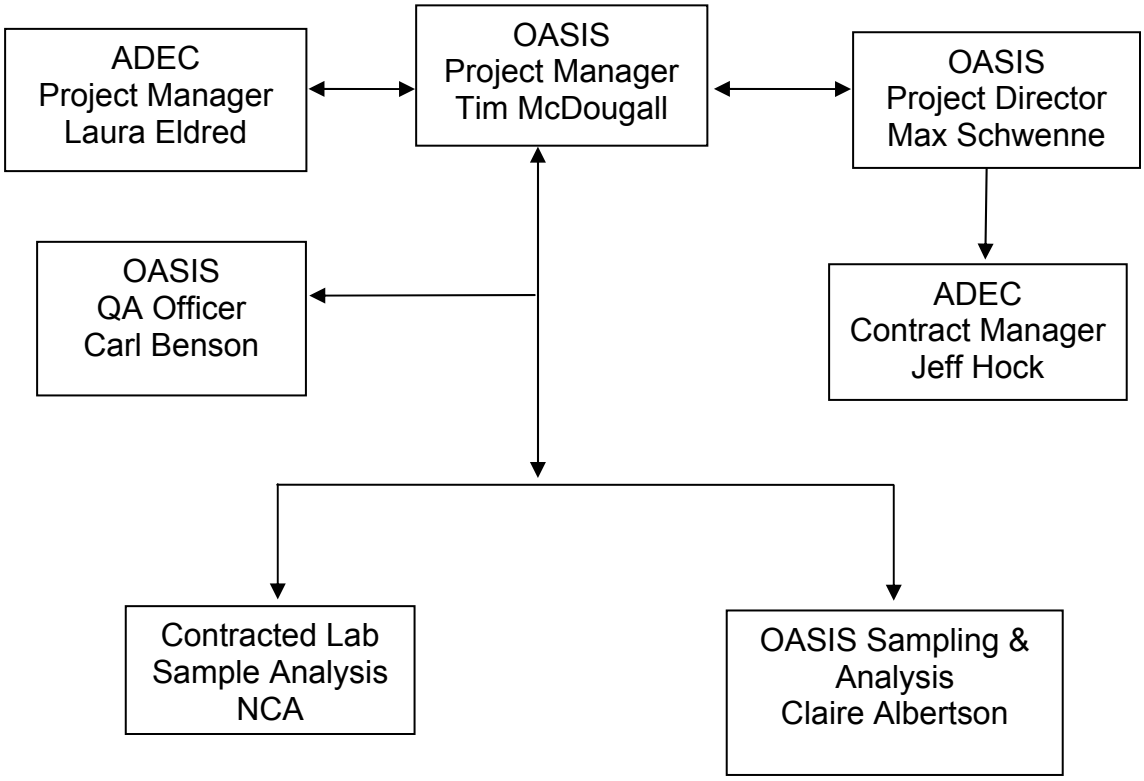
- Max Schwenne is the Project Director. He will provide overall senior review and direction for the project.
- Tim McDougall is the Project Manager for OASIS. He will help to coordinate tasks and deliverables for the project and serve as the primary point of contact for communications with ADEC project staff. He will contribute to the site assessment sampling and reporting of data.
- Carl Benson is the Quality Assurance Officer. He will be responsible for QA/QC of all data.
- Claire Albertson will provide support as an Environmental Scientist. She will assist in collecting samples and help in reporting responsibilities.
- Cody Black will provide technical support and assist in preparation of the Debris Removal and Disposal Plan.

The project laboratory will be North Creek Analytical - Alaska. Mike Priebe will be the contact for this project.

ADEC Staff

- ADEC Project Manager is Laura Eldred. Laura will be the primary contact for technical questions or other questions related to the project.
- ADEC Contract Manager is Jeff Hock.
- ADEC Quality Assurance Officer is Kent Patrick-Riley. He will assist in development of the QAPP, if necessary, and approve it for ADEC along with the ADEC Project Manager. He may also review data and/or audit monitoring activities.

Organization Chart



A5. Problem Definition/Background

The purpose of this project is to assess the potential impacts of a debris disposal site on the Matanuska River by performing a site assessment. The site assessment information will be used in the preparation of a debris removal and disposal plan.

There is an unpermitted active dump located on and in the Matanuska River just north of Eagle Avenue in Palmer, Alaska. The disposal area is accessed from the old railroad bed off of Eagle Avenue. Debris is deposited along a stretch of the Matanuska River approximately ¼ to ½ mile upstream of Eagle Avenue and is mainly concentrated in an area approximately ¼ mile from Eagle Avenue. Visible contents of the dump at the time ADEC inspected it included railroad cars, vehicles, household refuse, fuel cans, possible 55-gallon drums with unknown contents, scrap metal, and other miscellaneous debris. River channels run through and next to the dump at all times of the year. Visible sheens have also been observed in the river. This open dump is within the Drinking Water Protection Area for a minimum of three public water systems.

The first objective of the project is to assess, map, and determine the extent of debris as well as any potential pollutants in a debris disposal area along the Matanuska River. The focus of the site assessment is to estimate the volume of debris and collect

information to determine potential impacts to water quality on the Matanuska River adjacent to the site.

The second objective of the project is to develop a debris removal and disposal plan that addresses permits needed, cost estimates, site logistics, and site safety concerns (from contents of debris pile such as contaminants and from the actual debris removal process).

A6. Project/Task Description

The proposed work elements to meet the project objective are summarized below by task. Each task summary includes the products to be produced and delivered for that task and the task schedule.

Work Plan and Quality Assurance Project Plan

The Work Plan and this QAPP will be submitted for approval by ADEC prior to collection of samples.

Deliverable: Work Plan and QAPP

Schedule: completed by May 14, 2004

Site Assessment and Sampling

A site assessment will be performed to visibly document the debris disposal area and estimate the volume of debris present. Site assessment documentation will consist of the following items.

- The extent of visible debris will be mapped and documented with differential GPS and photographs. A metal detector scan and/or shallow hand excavations will be performed around the perimeter of visible debris to ascertain if there is any near surface debris outside the visibly impacted area.
- Significant debris piles will be photographed and described as to the type and quantity of debris. Estimates of the debris volume will be made using a cloth tape or other means.
- Visual observations and PID screening will be used to determine if site contamination has occurred. Visual inspections for leaking drums, surface staining, and surface water sheens will be performed throughout the debris disposal area. PID readings will be collected from all areas of suspected contamination.
- Research to determine land ownership(s).
- The site assessment will be performed in early May 2004 when snow cover has melted but before significant rise in the river level associated with spring breakup occurs.

Based on PID field screening results a total of six soil or water samples will be collected from inside the debris disposal area for laboratory analysis. Additionally three surface water and sediment samples will be collected from upstream, adjacent, and downstream of the site. The field parameters of dissolved oxygen (DO), pH, conductivity, temperature, turbidity will be collected at the surface water sampling locations. The soil and sediment samples will be analyzed using AK Method 101 for GRO, AK Method 102/103 for DRO/RRO, EPA Method 8260B for volatile organic compounds (VOC), EPA Method 6020/7000 for RCRA metals, and EPA Methods 8081A/8082 for pesticides and PCBs (Table 1 in Work Plan). The surface water samples will be analyzed using EPA Method 624 for VOC, EPA Method 610 for polynuclear aromatic hydrocarbons (PAH), EPA Method 608 for pesticides and PCBs, and EPA Method 6020/7000 for RCRA metals (Table 2 in Work Plan). Proposed sample locations are discussed below.

- Six soil and or water samples will be collected from debris disposal locations deemed most likely contaminated based on field screening.
- Three surface water and sediment sample pairs will be collected at the river's edge. These sample locations will be upstream, adjacent to, and downstream of the debris disposal area. The upstream and downstream locations will be approximately one hundred feet upstream and downstream, respectively.
- Two quality control (QC) duplicate samples will be collected, one for soil/sediment and one for water.
- OASIS will request a 5 day turnaround time for the laboratory results.
- If evidence of a spill is found the extent of impact will be estimated based on PID screening and surface staining. The volume of contaminated soil will be estimated from aerial extent of staining and shallow hand excavations (if possible).

Samples will be submitted to the contracted laboratory, North Creek Analytical (NCA) for analysis. NCA will provide the sampling containers, coolers, gel ice, trip blanks and temperature blanks for all sampling activities. Upon receipt of the samples, NCA will analyze them and report results both in hard-copy format and in an electronic format (Excel spreadsheet) under rapid (5-day) turn around times.

Results will be used by ADEC staff and other agencies to make management decisions that will protect the Matanuska River and its resources.

Deliverable: Analytical sampling results from NCA. Site Assessment Reports submitted draft and final that summarize the field activities and sampling results.

Schedule: The site assessment will be performed the week of May 17. The draft Site Assessment Report will be completed on May 28, 2004. The final Site Assessment Report will be completed on June 4, 2004.

Debris Removal and Disposal Plan

OASIS will prepare and submit a draft debris disposal and removal plan to ADEC for review. At a minimum the plan will contain the following elements:

- Estimate of the amount of debris present,
- A historical aerial photograph review,
- Disposal options for the debris,
- Graphics as necessary to depict site conditions and the locations of key features,
- Photographs of the site with documentation,
- Assessment of the volume of contaminated soil,
- Engineering evaluation of the impact the removal effort will have on bank stability,
- Bank stabilization plan,
- Environmental protection plan,
- Results of site assessment sampling,
- Evaluation of the permits, approvals, and public input needed to accomplish the removal,
- A cost estimate to perform the removal, and
- A detailed list of the necessary equipment.

OASIS will incorporate ADEC comments into the draft plan and prepare a final plan. Three unbound hard copies of the draft report will be submitted along with three CDs containing the report in both Microsoft Word and PDF formats. Photographs will be provided in the report and as separate JPEG files on the CD.

Deliverable: Draft and Final Debris Removal and Disposal Plan.

Schedule: The draft plan will be completed on June 18, 2004. The final Debris Removal and Disposal Plan will be completed on June 30, 2004.

A7. Data Quality Objectives and Criteria for Measurement of Data

Project Data Quality Objectives

The overall Quality Objective of this QAPP is to ensure that the State of Alaska regulatory criteria for contamination are being met at this debris disposal site.

Reporting limits for the analytical methods must be comparable to the levels of concern in order to meet data quality objectives. The levels of concern used for this project are the site cleanup rules for soil and groundwater in 18 AAC 75 and the water quality standards in 18 AAC 70. The required reporting limits and data quality objectives (DQOs) for soil and sediment samples are indicated in Table 1. The required reporting limits and DQOs for water samples are indicated in Table 2.

Reporting limits or practical quantitation limits, as they are also referred to, are defined by the EPA as the lowest concentration of an analyte that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating

conditions. The remaining DQO parameters listed in Table 1 and Table 2 are explained in the following section (Criteria for Measurement of Data).

Table 1 Data Quality Objectives for Soil/Sediment Samples

Parameters	Method	Reporting Limit	Precision (RPD %)	Accuracy (Percent Recovery)	Completeness (%)
VOCs	EPA 8260B	0.1 - 1.0 mg/kg	≤ 20	70 - 130	85
GRO	AK 101	20 mg/kg	≤ 20	60 - 120	85
DRO	AK 102	20 mg/kg	≤ 20	75 - 125	85
RRO	AK 103	100 mg/kg	≤ 20	60 - 120	85
Pesticides	EPA 8081A	0.01 mg/kg	≤ 20	60 - 140	85
PCBs	EPA 8082	0.01 mg/kg	≤ 20	60 - 140	85
RCRA Metals	EPA 6020	3 – 20 mg/kg	≤ 20	80 - 120	85

Table 2 Data Quality Objectives for Water Samples

Parameters	Method	Reporting Limit	Precision (RPD %)	Accuracy (Percent Recovery)	Completeness (%)
Benzene	EPA 624	2.0 μg/L	≤ 25	80 - 124	85
Toluene	EPA 624	2.0 μg/L	≤ 25	80 - 120	85
Ethylbenzene	EPA 624	2.0 μg/L	≤ 25	80 - 120	85
Total Xylenes	EPA 624	2.0 μg/L	≤ 25	80 - 120	85
Acenaphthene	EPA 610	2.0 μg/L	≤ 30	30 – 150	85
Acenaphthylene	EPA 610	4.0 μg/L	≤ 30	30 – 150	85
Anthracene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Benzo(a)anthracene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Benzo(a)pyrene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Benzo(b)fluoranthene	EPA 610	0.4 μg/L	≤ 30	30 – 150	85
Benzo(ghi)perylene	EPA 610	0.4 μg/L	≤ 30	30 – 150	85
Benzo(k)fluoranthene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Chrysene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Dibenzo(ah)anthracene	EPA 610	0.4 μg/L	≤ 30	30 – 150	85
Fluoranthene	EPA 610	0.4 μg/L	≤ 30	30 – 150	85
Fluorene	EPA 610	0.4 μg/L	≤ 30	30 – 150	85
Indeno(123-cd)pyrene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Napththalene	EPA 610	2.0 μg/L	≤ 30	30 – 150	85
Phenanthrene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Pyrene	EPA 610	0.2 μg/L	≤ 30	30 – 150	85
Aldrin	EPA 608	0.1 μg/L	≤ 22	43 - 115	85
Gamma-BHC (Lindane)	EPA 608	0.1 μg/L	≤ 22	61 - 120	85
4,4'-DDT	EPA 608	0.1 μg/L	≤ 22	58 - 128	85
Dieldrin	EPA 608	0.1 μg/L	≤ 22	60 - 128	85
Endrin	EPA 608	0.1 μg/L	≤ 22	68 - 136	85
Heptachlor	EPA 608	0.1 μg/L	≤ 22	49 - 116	85
Toxaphene	EPA 608	5.0 μg/L	≤ 22	50 - 150	85
Aroclor 1016	EPA 608	0.5 μg/L	≤ 22	57 - 122	85
Aroclor 1260	EPA 608	0.5 μg/L	≤ 22	62 - 120	85

Parameters	Method	Reporting Limit	Precision (RPD %)	Accuracy (Percent Recovery)	Completeness (%)
RCRA Metals	EPA 6020	0.006 – 0.1 mg/L	≤ 20	80 - 120	85
pH		+/- 0.01 pH units	NA	NA	NA
Conductivity		0.1 mS/cm	NA	NA	NA
Temperature		+/- 1°C	NA	NA	NA
Turbidity		+/- 1 NTU	NA	NA	NA
Dissolved Oxygen		+/- 0.01 mg/L	NA	NA	NA

Criteria for Measurement of Data

Criteria for Measurements of Data are the performance criteria: accuracy, precision, comparability, representativeness and completeness of the tests. These criteria must be met to ensure that the data are verifiable and that project quality objectives are met.

Objectives for accuracy, precision, comparability, representativeness and completeness are summarized in this section.

Accuracy

Accuracy is a measure of confidence that describes how close a measurement is to its "true" value. Methods to ensure accuracy of field measurements include instrument calibration and maintenance procedures discussed in Section B of this QAPP. Sample handling procedures are also discussed in Section B and review of these procedures for verification of data is included in Section D.

Laboratory accuracy is normally determined by the percent recovery of the target analyte in spiked samples and also by the recoveries of the surrogates in all samples and QC samples. Laboratory accuracy ranges are specified in Table 1 and Table 2 and depend on the parameter being measured. Accuracy as percent recovery is calculated as follows:

$$\%R = \frac{\text{Analyzed value}}{\text{true value}} \times 100$$

OASIS will ensure laboratory accuracy by meeting percent recovery values specified by EPA methods listed in Table 1 and 2.

Precision

Precision is the degree of agreement among repeated measurements of the same characteristic, or parameter, and gives information about the consistency of measurements. Precision is expressed in terms of the relative percent difference (RPD) between two measurements (A and B), and is computed as follows:

$$RPD = \frac{A - B \times 100}{(A+B)/2}$$

Field precision is measured by collecting blind (to the laboratory) field duplicate samples. Laboratory precision is measured by duplication or laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) and by measuring Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples.

One set of MS/MSD and duplicate samples will be analyzed per batch of samples. OASIS will use RPDs specific to the EPA method listed in Tables 1 and 2 in Section A7 for each sample parameter.

Representativeness

Representativeness is the extent to which measurements actually represent the true environmental condition. Representativeness of data collected is part of the sampling program developed by ADEC and OASIS as outlined in the scope of work and work plan. The soil sampling locations will be selected based on field screening and visual observation of contamination. Three surface water and sediment sampling locations were selected for the Matanuska River one upstream, one adjacent to, and one downstream of the debris disposal area.

OASIS will ensure the representativeness of the data by using consistent sampling methods and ensuring data quality during sample collection, handling, and transport (see Sections B2 and B3).

Comparability

Comparability is the degree to which data can be compared directly to similar studies. Standardized sampling and analytical methods and units of reporting with comparable sensitivity will be used to ensure comparability. Analytical sample analysis will be performed following State of Alaska and EPA-approved procedures by using the ADEC certified laboratory, North Creek Analytical.

Completeness

Completeness is the comparison between the amount of usable data collected versus the amount of data called for in the scope of work. OASIS will determine completeness by comparing valid sampling and analysis results (i.e., completed and not rejected during data review) with the requirements in the scope of work. The goal is to complete 85% or better of the required monitoring. The following equation is used to calculate completeness:

$$\frac{T - (I+NC)}{T} \times (100\%) = \text{Completeness}$$

Where T = Total number of expected measurements.
I= Number of invalid results.
NC = Number of results not produced (e.g. spilled sample, etc.).

A8. Training and Certifications

Sampling personnel are trained in sampling methods, sample handling, chain-of-custody procedures, sample transport, and field analytical measurements. Personnel analyzing and reporting data are qualified to conduct these tasks per their experience with sampling on various contaminated sites in the State of Alaska and the ADEC contaminated site regulations (18 AAC 75) and water quality standards (18 AAC 70). Resumes of all project personnel are on file with ADEC as part of the Water Quality Term Contract. The contracted laboratory, North Creek Analytical, is an ADEC-certified lab for all analytical methods required by the project. Other certifications held by the laboratory are on file at NCA and may be requested by ADEC.

A9. Documents and Records

All field logbooks will be kept in a bound, waterproof notebook containing consecutively numbered pages. All entries will be made in waterproof ink. No pages will be removed for any reason. Changes are made by crossing out errors, initialing, and adding correct information. All sample analysis records and documentation are kept at NCA and are available to ADEC for inspection at any time.

Sample collection information and diagrams are recorded on waterproof Surface Water/Soil/Sediment Sample Data Sheets as shown in Appendix B of the Work Plan.

OASIS will request a 5 day turnaround time for the laboratory results.

Laboratory data results are recorded on laboratory data sheets, bench sheets and/or in laboratory logbooks for each analysis. These records as well as control charts, equipment maintenance records, calibration and quality control checks, such as preparation and use of standard solutions, inventory of supplies and consumables, check in of equipment, equipment parts and chemicals are kept on file at the laboratory and are available to ADEC upon request.

Any procedural or equipment problems are recorded in the field notebooks. Any deviation from the Work Plan including this Quality Assurance Project Plan will also be recorded in the field notebooks. Data results returned to ADEC will include information on field and/or laboratory QA/QC problems and corrective actions.

Chain-of-Custody and/or Transmission forms will be kept with the sample during transport and will accompany data results back to ADEC.

Training records and data review records will be kept on file at OASIS and NCA and will be available on request by ADEC.

All records will be retained by NCA for a minimum of five years. All project records at OASIS are retained permanently.

B. Data Generation and Acquisition

B1. Sampling Process Design

This project will include field studies at a debris disposal location along the Matanuska River in order to evaluate potential impacts to the site from contaminant releases and potential impacts to the Matanuska River due to contaminant migration. A maximum of six soil or surface water samples will be collected from the debris disposal site. Additionally three surface water and sediment samples will be collected from upstream, adjacent, and downstream of the site to evaluate potential impacts to the Matanuska River.

Based on PID field screening results a total of six soil or water samples will be collected from inside the debris disposal area for laboratory analysis. The purpose of these sample locations will be to document contaminant releases that have occurred from the disposal of drums or other debris containing petroleum, oils, or lubricants (POL), solvents, or other hazardous chemicals.

Additionally three surface water and sediment samples will be collected from upstream, adjacent, and downstream of the site. Sampling will start at the downstream locations and progress upstream to avoid sampling from the same water column. Surface water samples will be collected prior to the sediment sample at each location so that disturbed sediments will not impact the surface water quality. All sample site locations will be identified using a GPS receiver and through landmarks logged in the field notebook.

The samples will be analyzed using AK Method 101 for GRO, AK Method 102/103 for DRO/RRO, EPA Method 8260B for volatile organic compounds (VOC), EPA Method 6010/7000 for RCRA metals, and EPA Methods 8081A/8082 for pesticides and PCBs. Tables 1 and 2 in from the Work Plan detail the sample locations and analytical requirements for each sample plus the number of duplicate, MS/MSD, and trip blank samples. All specified analytical methods with the exception of RCRA metals require the collection of discrete samples that will be sent to North Creek Analytical for analysis.

Surface water sample locations will include collecting field measured water quality parameters including pH, conductivity, temperature, and turbidity using a Horiba U-10 field meter or similar instrument. Dissolved oxygen will be measured using an YSI 55 field meter.

B2. Sampling Methods

Sample collection procedures and field equipment needs are discussed in Section 5 of the Work Plan.

To ensure sample integrity, specific sampling and documentation procedures will be followed. This process will include labeling containers prior to sampling, extensive sample and site information recording, appropriate sample handling and comprehensive chain-of-custody procedures. All samples will be immediately placed on gel ice after sampling and will remain chilled to ~4°C during transportation to the laboratory. Holding times for each sample analysis type will be met. Sample documentation procedures will

include field notebooks, chain-of-custody forms and sample labels. Specific information such as site identification, sample identification numbers, sampling observations and sample collection time and date will be recorded in field notebooks. Additionally, photo documentation will be collected during each sampling event. The field team leader is responsible for field procedures and documentation and will discuss problems with the project manager and quality assurance officer prior to taking corrective action.

Sample Containers and Preservation

Tables 3 and 4 provide the appropriate sample container, preservation, and holding time information for each of the analytical methods used on this project. Sample containers will be provided by and samples analyzed by North Creek Analytical Laboratory located in Anchorage, Alaska and Bothell, Washington, both are ADEC certified laboratories. The project manager will maintain communication with the laboratory to ensure samples are analyzed within holding times and the samples do not linger in holding areas during transport, e.g. samples cannot be left overnight or the cooler temperature may rise to high.

Table 3 Containers, Preservation, and Holding Times: Soil/Sediment Samples

PARAMETER	ANALYTICAL METHOD	CONTAINER	PRESERVATION	MAXIMUM HOLDING TIMES
GRO	AK 101	(1) 4oz glass Septumated Lid	Methanol, Cool 4°C	28 days to analysis
Volatile Organics	SW 8260B	Same bottle as GRO	Methanol, Cool 4°C	28 days to analysis
DRO/RRO	AK 102/103	8 oz. glass bottle	Cool 4°C	14 days to extract, 40 days to analysis
Pest-PCBs	EPA 8081A/8082	Same bottle as DRO/RRO	Cool 4°C	14 days to extract, 40 days to analysis
RCRA Metals	EPA 6020/7000	Same bottle as DRO/RRO	Cool 4°C	6 months

Table 4 Containers, Preservation, and Holding Times: Water Samples

PARAMETER	ANALYTICAL METHOD	CONTAINER	PRESERVATION	MAXIMUM HOLDING TIMES
Volatile Organics	EPA 624	(3) 40-mL VOA	HCL ph < 2, Cool 4°C	14 days to analysis
PAH	EPA 610	(2) 1-L amber	Cool 4°C	7 days to extract, 40 days to analysis
Pest-PCBs	EPA 608	(2) 1-L amber	Cool 4°C	7 days to extract, 40 days to analysis
RCRA Metals	EPA 6020/7000	(1) 500-mL poly	HNO_3 pH < 2, Cool 4°C	6 months

B3. Sample Handling and Custody

To ensure sample integrity, specific sampling and documentation procedures will be followed. These procedures will include labeling containers prior to sampling, extensive sample and site information recording, appropriate sample handling and comprehensive chain-of-custody procedures. Sample and site information will be recorded in the field notebooks. All samples will be immediately placed in coolers and packed with gel ice after sampling and will remain chilled to 4°C during transportation to North Creek Analytical in Anchorage, Alaska. All sample coolers will be accompanied with completed chain-of-custody forms and coolers will be sealed with signed and dated fiber tape for shipment.

Detailed descriptions regarding sample handling custody procedures are provided in Sections 5.4 and 5.5 of the Work Plan.

B4. Analytical Methods

Soil, sediment, and water quality analytical methods that will be used for this project are outlined in Tables 1 and 2 of the Work Plan. Reporting limits for these analytical methods are contained in Tables 1 and 2 of this document. All analysis methods used for this program are State of Alaska or EPA-approved. The contracted laboratory, North Creek Analytical, is ADEC-certified for analyses requested. A laboratory turnaround time of 5 days will be requested for all analysis on this project. North Creek Analytical has a Quality Management Plan (QMP) on file with ADEC detailing their quality assurance procedures. Any issues regarding analytical data quality will be resolved by the OASIS project manager or quality assurance officer through discussions with the laboratory project manager.

B5. Quality Control

Quality control activities in the field will include adherence to documented procedures and the comprehensive documentation of sample collection information included in the field notebooks. A rigidly enforced chain-of-custody program will ensure sample

integrity and identification. The chain-of-custody procedure documents the handling of each sample from the time the sample was collected to the arrival of the sample at the laboratory.

Analytical methods in use on the program have been approved and documented by the State of Alaska and EPA. These methods will be used as project-specific protocols to document and guide analytical procedures. Adherence to these documented procedures will ensure that analytical results are properly obtained and reported.

Quality control activities in the field will consist of the following items:

- Adherence to documented procedures in this QAPP,
- Cross-checking of field measurements and recording to ensure consistency and accuracy and
- Comprehensive documentation of field observations, sample collection and sample identification information.

Internal laboratory quality control checks will include the use of surrogate solutions and quality control samples such as method blanks, laboratory control samples, matrix spike/spike duplicates, calibration checks, standard reference materials (SRMs) or EPA QC check samples, and duplicates as specified in the EPA approved analytical procedures. Surrogate compounds will be spiked into the samples as appropriate to measure individual sample matrix effects that are associated with sample preparation and analysis.

In addition to laboratory QC samples, multiple field quality control samples will also be collected. One field duplicate sample will be collected for each sample matrix and sent to the lab blind to test for precision of analytical procedures. A methanol blank will accompany the soil sample containers sent into the field from the project laboratory. Water trip blanks are used when samples are collected for VOC and GRO analysis and are included in all shipments containing samples to be analyzed for these parameters to ensure that equipment handling and transport procedures do not introduce contamination. A list of the quality control samples and their collection frequency is included in the table below.

Table 5 Quality Control Samples

Quality Control Sample	Frequency
Laboratory Quality Control Samples	
Method Blanks	1/batch
Laboratory Control Sample/Laboratory Control Sample Duplicate	1/batch
Matrix Spike/Matrix Spike Duplicate	1/20 samples
Surrogate Compounds	Each Sample
Field Quality Control Samples	
Field Duplicate	1/sample matrix
Trip Blank	1/VOA cooler

Laboratory duplicates and the blind field duplicate will be compared to the RPD criteria for the methods provided in Tables 1 and 2. Spiked QC samples including surrogates, matrix spikes and laboratory control samples will be compared to the percent recovery values in Tables 1 and 2. Concentrations of contaminants of concern reported in method and trip blanks will be compared to reported values in the analytical samples. If analytical sample results are less than five times the concentration reported in the associated blank, then results will be flagged to indicate potential blank contamination.

Results from quality control samples allow the assessment of quality assurance parameters such as accuracy and precision of the data. Any data falling outside the acceptable criteria as defined in the methods will be appropriately investigated and qualified as described in Section D2.

B6. Instrument/Equipment Testing, Inspection and Maintenance

Water quality parameters including pH, conductivity, salinity, turbidity and temperature will be measured in the field using a Horiba U-10 field meter. Dissolved oxygen will be measured using a YSI 55 field meter. Routine maintenance on the Horiba and YSI will be conducted according to schedules described in the manual provided by the manufacturer and recorded in the maintenance log stored in its carrying case.

Field screening of soil samples will be performed in the field using a MSA Passport PID or equivalent. Annual maintenance and manufacturer calibration is provided by the manufacturer and recorded in the maintenance log stored in its carrying case.

Parts for these instruments will be ordered directly from the manufacturer and shipped by express air within two working days. The OASIS project manager will coordinate ordering replacement parts and repairing of instruments.

B7. Instrument/Equipment Calibration and Frequency

Care will be taken to ensure that the Horiba and YSI 55 used for field measurements is calibrated and adjusted prior to sampling using known buffer solutions that are included with the Horiba U-10 and following manufacture calibration procedures. Field personnel will calibrate the PID at the beginning of each day. Specific calibration procedures for each instrument are provided below.

All calibration measurements will be recorded on the appropriate field forms or in field logbooks and will be available for review by ADEC upon request.

YSI 55

The YSI 55 used to measure dissolved oxygen will be calibrated using the following procedures. Ensure that the sponge inside the instrument's calibration chamber is wet. Insert the probe into the calibration chamber. Turn the instrument on by pressing the ON/OFF button on the front of the instrument. Wait for the dissolved oxygen and temperature readings to stabilize (usually 15 to 30 minutes is required). Note: It is normal for error messages to appear momentarily at power up. Use two fingers to press and release the two arrow keys at the same time. The LCD will prompt you to enter the local altitude in hundreds of feet. Use the arrow keys to increase or decrease

the altitude. Example: Entering the number 12 here indicates 1200 feet. When the proper altitude appears on the LCD, press the ENTER key once to view the calibration value in the lower right of the LCD; and a second time to move to the salinity compensation procedure. The LCD will prompt you to enter the approximate salinity of the water you are about to analyze. You can enter any number from 0 to 40 parts per thousand (PPT) of salinity. Use the arrow keys to increase or decrease the salinity compensation. When the correct salinity appears on the LCD, press the ENTER key. The mode key can now be used to change the dissolved oxygen reading from the % air saturation mode to the mg/L mode. Verify that the calibration value does not exceed the dissolved oxygen saturation limit for the altitude and temperature used during calibration.

Horiba U-10

The Horiba U-10 will be calibrated using the following procedures. Fill the beaker with the standard pH 4.0 buffer solution. Immerse the probe in the beaker noting the DO sensor is outside of the solution because it is calibrated to atmospheric air. With the power on, press the mode key to put the instrument in maintenance mode. Use the mode key to move the lower cursor to auto if it is not already there. Press enter and the unit will auto-calibrate through four parameters: pH, conductivity, turbidity and dissolved oxygen.

Photo-ionization Detector (PID)

Field personnel will calibrate the PID at the beginning of each day. The instrument will be calibrated to yield "total organic vapors" in parts per million (ppm) to a benzene equivalent (e.g. isobutylene). PID calibration will be checked for drift at least once during each day of testing. If significant drift in the instrument is observed, the PID will be recalibrated immediately, and subsequently (after approximately 1 hour) checked for drift. Operation, maintenance, and calibration will be performed in accordance with the manufacturer's specifications. All calibration information will be recorded in a calibration notebook that will accompany the PID.

B8. Inspection/Acceptance of Supplies and Consumables

Qualified field staff will check all field equipment and supplies that are required for this project to ensure their technical specifications before use. Evaluation criteria that will be used are listed below:

- Ensuring that equipment and supplies have been cleaned if they are reusable or are sterile if they are packaged,
- Equipment is in serviceable condition,
- All buffer solutions used for field instrument calibration will be checked for expiration date, sufficient quantity, and discoloration,
- The appropriate sample containers with proper preservatives were supplied by the project laboratory, and

- The appropriate chain-of-custody procedures have been taken if equipment or supplies were shipped.

Any deviances discovered during inspection procedures will be remedied by the project manager and recorded in the field notebook. If necessary, replacements to shipped consumables will be made.

Coolers, gel ice, samples containers, and chain-of-custody forms will be provided by North Creek Analytical prior to field mobilization. Extra sample containers will be available in the event of container breakage or that re-sampling becomes necessary. All COC records will be kept at OASIS should ADEC request to see them.

B9. Non-Direct Measurements

Non-direct measurement data collected for this project include:

- Aerial photographs, and
- Topographic maps.

AeroMap U.S. provided the aerial photographs for this project. Topographic maps are from All Topo Maps software. Aerial photographs and topographic maps are both limited in the accuracy of their information based on the date they were updated. All efforts will be made to obtain the most updated information.

B10. Data Management

Data obtained during sampling activities will be entered into field notebooks. The following is a list of possible data information that will be kept at OASIS or NCA for ADEC review upon request:

- Field equipment and chemicals maintenance, cleaning and calibration records,
- Field notebooks,
- Sample Data Sheets (included as Attachment to Work Plan),
- Photographs of sampling stations and events,
- Chain-of-Custody forms,
- Laboratory equipment maintenance, cleaning and calibration records,
- Laboratory bench sheets, control charts, and SOPs,
- Records of QA/QC problems and corrective actions (field and/or laboratory),
- Laboratory data QC records,
- Records of data review sheets,
- Duplicate, performance evaluation records and other QA/QC control records (field and laboratory) and
- Data review, verification and validation records.

In addition hardcopy reports, analytical data collected for this project will be provided electronically to ADEC via a CD-ROM or email ZIP file. The data format will meet the

requirements for Statewide Database entry into STORET in the form of a comma delimited text file. The text file will be an ASCII (text) file, with fields separated by commas, (comma de-limited; often called "CSV" (comma separated value), with text enclosed in quotes. Spaces are **not** permitted between fields. Blank lines are **not** permitted in the file. All dates **must** be formatted as "**MM-DD-YYYY"**.

Data handling equipment will include computer software applications Microsoft Excel and Microsoft Access. Data will be entered into an Access database which can then be exported in a form compatible with requirements of the statewide database entry into STORET.

C. Assessment and Oversight

C1. Assessments and Response Actions

Should the sampling staff, laboratory personnel, or Quality Assurance Officer find errors in sampling or analysis, the Quality Assurance Officer will notify the Project Manager and the party responsible for the error or deficiency and recommend methods of correcting the deficiency. The responsible party will then take action to correct the problem and will report corrections to the Quality Assurance Officer and Project Manager.

The Quality Assurance Officer will review the QA/QC procedures used for the sampling and analytical program. Procedures for this review are included in Section D2 to meet the data quality criteria specified in A7. The Quality Assurance Officer will report these assessment records in the Draft and Final Site Assessment Reports.

C2. Reports to Management

Sampling results will be summarized in the Draft and Final Site Assessment Reports completed for this project. These reports will include the results of data quality assessments listed above.

All reports will be submitted to the ADEC Project Manager.

D. Data Validation and Usability

D1. Data Review, Validation & Verification Requirements

Validation and review of all analytical data will be performed by a qualified professional experienced in data validation procedures and reviewed by the OASIS quality assurance officer. All data will be validated and reviewed in accordance with ADEC and United States Environmental Protection Agency (USEPA) procedural guidance documents. The reference documents include the ADEC *Underground Storage Tank Procedures Manual*, November 7, 2002; the *USEPA Environmental Data Verification and Validation* (EPA QA/G-8), August 1999; the USEPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 540/R-99/008), October 1999; and the USEPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 540/R-01/008), July 2002.

OASIS will conduct data review and verification using the following methods on 10% of the primary project samples, including their associated quality control duplicates and laboratory quality control samples.

- A review of sample handling and analytical and field data for completeness, accuracy, holding time compliance, and quality control (QC) sample frequency compliance.
- Evaluation of laboratory blank samples.
- Evaluation of the accuracy and precision of field duplicate samples, laboratory control samples (LCS), and matrix spike/matrix spike duplicate (MS/MSD) samples.
- Assignment of data qualifiers, when necessary, to reflect limitations identified in the data assessment process.
- Estimation of completeness.

D2. Validation and Verification Methods

The following procedures will be used to determine if data meets the data quality objectives and criteria specified in Section A7. If data QA/QC procedures do not meet the specified criteria, the Quality Assurance Officer will review all field and laboratory records to determine the cause. If equipment failures are limiting the usability of the data, calibration and maintenance procedures will be reviewed and changed as needed. If sampling or analytical procedures are causing the failures, methods will be reviewed to resolve the errors. Any changes or modifications to quality control procedures will be approved by ADEC prior to use on this project.

Review of Sample Handling

Proper sample handling techniques are required to ensure sample integrity. During data review, the sample handling procedures identified below are evaluated to determine potential effects on data quality.

- Review of field sample collection and preservation procedures to determine whether they were completed in accordance with the requirements specified by the analytical methods.
- Review of chain-of-custody documentation to ensure control and custody of the samples was maintained.
- Review of sample holding times between sample collection, extraction, and analysis (see Table 3 in Section B3).
- Review of sample conditions upon receipt at the contract laboratory.
- Review of Quality Assurance/Quality Control (QA/QC) Samples. Specific procedures for review of QA/QC samples are included in the sections below.

Laboratory Blank Samples

Laboratory blank samples (method and instrument blanks) are laboratory-prepared, analyte-free samples used to detect the introduction of contamination or other artifacts into the laboratory sample handling and analytical process. These blanks play an especially important role in sampling programs involving trace-level analyses or analytes that are common solvents found in a laboratory. If a contaminant is discovered in the analytical sample at less than five times the concentration it is found in the laboratory blank, it will be considered a laboratory contaminant. Otherwise, it will be reported as an environmental contaminant.

Laboratory Control Samples

Laboratory control samples are used to assess analytical performance under a given set of standard conditions. Synthetic samples, containing some or all of the analytes of interest at known concentrations, are prepared independently from calibration standards. The samples consist of laboratory control samples (LCS) and laboratory control sample duplicates (LCSD). Laboratory control samples will be analyzed with each analytical batch. LCS may be used to estimate analytical accuracy and precision by comparing measured results to actual concentrations. LCS/LCSD percent recoveries and RPD values will be checked on laboratory reports to ensure they are within the limits set by the EPA methods listed in Tables 1 and 2.

Matrix Spike and Matrix Spike Duplicates

Matrix spike samples are actual field samples to which known amounts of select compounds (one, or more, of the analytes of interest) are added. Both spiked and unspiked aliquots are analyzed. The difference between the concentration of the spike compound(s) in the spiked and unspiked aliquots is compared to the amount of spike added before the extraction process. Since actual samples are used for the recovery determination, the matrix effects can be evaluated. Usually expressed as a percentage of the mass of the spiked amount, spike recovery is the measurement of accuracy anticipated for the sample matrix. Percent recoveries will be compared to EPA method-specific recoveries listed in Tables 1 and 2.

Matrix spike samples are also duplicated in the laboratory and then analyzed in an identical manner by the laboratory to assess sample reproducibility and the laboratory's internal precision. The analytical precision is expressed by the RPD between the measurement results of the two duplicate samples. Analytical precision and accuracy should meet the criteria provided in Tables 1 and 2.

Surrogates

Surrogate compounds will be added to all samples being analyzed to evaluate analytical accuracy for each individual sample. Surrogate compounds are chemically similar to the analytes of interest but are not expected to be present in the field samples. Recovery of these surrogate compounds gives an estimate of the effectiveness of the extraction and analysis for each individual sample. Surrogate recoveries (%R) should meet the criteria provided in Tables 1 and 2 for each analyte.

Field Duplicate Samples

Field duplicate samples will be collected simultaneously with a primary project sample. Duplicates are treated in the same manner as the primary sample during all phases of sample collection, handling, and analysis. Duplicate sample results are used to assess precision, including variability associated with both the laboratory analysis and the sample collection process (i.e., QC purposes). One duplicate field sample will be collected and submitted blind to the laboratory for each sampling matrix under this sampling program.

Analytical results will be reviewed for agreement with each other or their respective reporting limits and evaluated for comparability. Estimated results, those quantified below the reporting limit and qualified with a "J" flag are not considered significant for the purpose of data agreement. The comparison between project and field duplicate sample results should meet RPD criteria for each method listed in Tables 1 and 2.

Reporting Limits

The reporting limits are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory conditions. For many analytes, the reporting limit analyte concentration is selected by the laboratory as the lowest non-zero standard in the calibration curve. Sample reporting limits vary based on sample matrix and dilution of the samples during analysis. Reporting limits should be equal to or below the values provided in Tables 1 and 2 for each method.

Data Qualification

Qualifiers will be applied to QC samples when acceptance criteria are not met and corrective action was not performed or was unsuccessful. These same qualifiers will be applied to the associated sample data, as defined in the following table. The data qualifiers will be included in all tabulated analytical results used for reporting of the data. A summary of the data review and qualification process will also be prepared and included in the report.

Table 6 Data Qualifiers

Qualifier	Description
J	The analyte was positively identified, however the quantitation is an estimation.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit (MDL).
F	The analyte was positively identified but the associated numerical value is below the reporting limit (RL).
R	The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
B	The analyte was found in an associated blank, as well as in the sample.
M	A matrix effect was present.
H	Analysis was performed outside of the recommended holding time.

Completeness

Completeness is calculated after the QC data have been evaluated, and the qualifiers have been applied to the sample data. Invalid results, broken or spilled samples, and samples that were unable to be analyzed for other reasons are included in the assessment of completeness. The criteria and calculation to determine completeness are provided in Section A7. If analytical data does not meet completeness goals, OASIS will consult with the ADEC Project Manager to determine if additional sampling should be performed to accomplish data quality objectives.

D3. Reconciliation with User Requirements

The Project Manager will review all data deliverables upon receipt from the lab. Laboratory results will be checked for data qualifiers entered by the lab to ensure that sample collection and preservation procedures were adequate and that laboratory analysis procedures met quality assurance objectives. Any outstanding issues will be addressed immediately with the lab and/or sampling staff to ensure that project quality assurance objectives are met.

The Project Manager and Quality Assurance Officer will review and validate the data during the reporting preparation stages. If there are any problems with data quality or sampling and analysis procedures, these issues will be addressed immediately and methods will be modified to ensure that data quality objectives are being met. Modifications to monitoring will require notification to ADEC and subsequent edits to the approved QAPP. Where data quality objectives were not meet the data will be qualified as discussed in Section D2 to indicate any limitations on the use of the data.