Quality Assurance Review Report

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Prepared for:

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This report is one of a series of reports prepared for Suncor Inc. Oil Sands Group for the Environmental Impact Assessment for the development and operation of the Steepbank Mine, north of Fort McMurray, Alberta. These reports provided information and analysis in support of Suncor's application to the Alberta Energy Utilities Board and Alberta Environmental Protection to develop and operate the Steepbank Mine, and associated reclamation of the current mine (Lease 86/17) with Consolidated Tailings technology.

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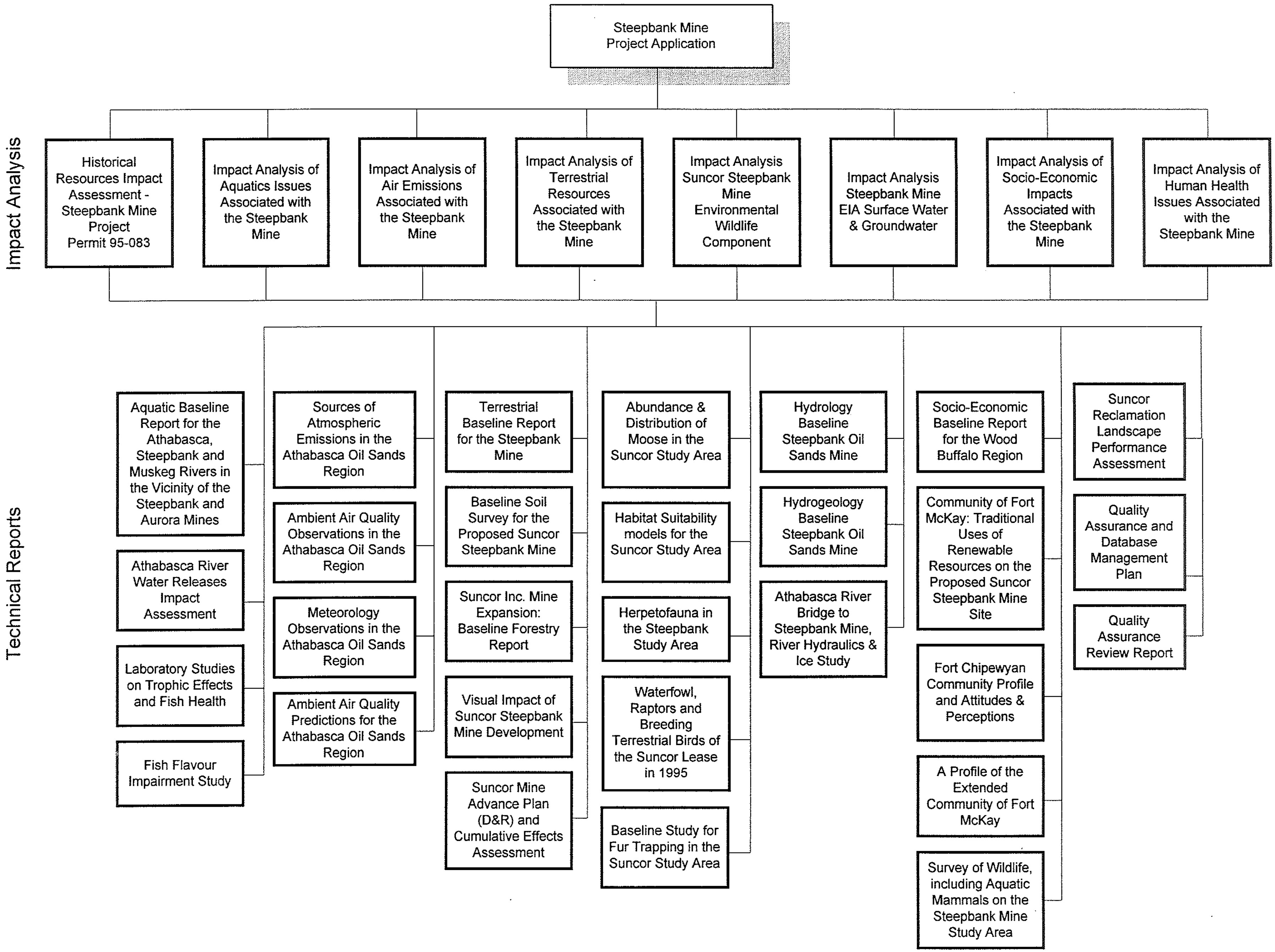

Reports Prepared for the Steepbank Mine Environmental Assessment

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1.0 INTRODUCTION

This report consists of two parts:

1. A quality assurance review of chemical analyses of surface water, groundwater, soil, sediment, porewater, and benthic tissue samples; and
2. A field and documentation audit.

1.1 QUALITY ASSURANCE REVIEW INTRODUCTION

This section of the report documents the results of a quality assurance review of data from chemical analyses of surface water, groundwater, soil, sediment, porewater, and benthic tissue samples. Data validation procedures were based on quality control criteria and data quality objectives established in the Steepbank Mine EIA: Quality Assurance Needs and Database Management Plan (QAPP) (Golder, 1995). Overall usability of the data was assessed according to U.S. Environmental Protection Agency (U.S. EPA) data usability guidelines for remedial response activities (U.S. EPA, 1987).

Analytical data for the samples are of good quality and satisfy the data use category Level III (U.S. EPA, 1987), which is suitable for conducting risk assessments and assessing environmental impacts.

Data qualifiers were assigned, as necessary, during the quality assurance reviews in accordance with the above documents. The following laboratory deliverables were reviewed during the data validation process:

- Results of all available laboratory quality control check results, including surrogate compounds, laboratory control samples, matrix spikes, and duplicate analyses;
- Instrument and sample detection limits for all target analytes and compounds;
- Sample holding times; and
- Field blanks and field replicates associated with the sampling event.

All data met the data quality objectives for this project, except for the exceedances discussed below.

2.0 SUMMARY OF QUALIFIED DATA

During the quality assurance review, several surface water and porewater results were qualified as undetected (*U*) because of field blank contamination. The affected sample results are shown in Table 1. For surface water, 17 dissolved potassium results, 7 total aluminum results, 20 total boron results, 1 total iron result, 14 total titanium results, 20 total zinc results, 5 silicon results, 2 total recoverable hydrocarbon results, 2 naphthalene results, and 1 methyl naphthalene result were qualified as undetected (*U*). For porewater, 1 dissolved potassium result, 1 dissolved calcium result, 11 dissolved zinc results, 1 total zinc result, 10 cyanide results, 2 total recoverable hydrocarbon results, 1 acetone result, 2 naphthalene results, 1 methyl naphthalene result, 2 methyl dibenzothiophene results, and 5 total phenol results were qualified as undetected (*U*). For groundwater, 6 chromium results, 9 copper results, and 11 zinc results were qualified as undetected (*U*).

3.0 DATA QUALITY ASSESSMENT

The results of the quality control procedures employed in the analyses of the field samples are discussed below, including completeness, holding times, analytical methods, accuracy, and precision. Data quality was assessed according to requirements specified in the Quality Assurance Needs and Database Management Plan (QAPP) (Golder, 1995).

3.1 COMPLETENESS

The results reported by the laboratory were 100 percent complete. No data were rejected during the quality assurance review.

3.2 HOLDING TIMES

Analytical holding time constraints were met for all samples.

3.3 ANALYTICAL METHODS

All analyses were performed using the methods specified in the QAPP (Golder, 1995).

3.4 ACCURACY

The accuracies of the analytical results have been evaluated in terms of analytical bias (based on surrogate compound, matrix spike, and laboratory control sample recoveries) and precision (based on matrix duplicates).

3.4.1 SURROGATE COMPOUND RECOVERIES

The recoveries reported by the laboratory for the surrogate compounds added to all field samples met the criteria for acceptable performance, with the exception of total phenolic compounds for surface water, porewater, and groundwater. Two of the three surrogate recoveries for total phenolic compounds frequently fell below the acceptance criteria stated in the QAPP. However, phenolic compounds were not detected in the affected samples; therefore, no data were qualified based on this exceedance.

3.4.2 MATRIX SPIKE RECOVERIES

Reported matrix spike recoveries for all analyses met the control criteria specified in the QAPP, with the exception of volatile organic compounds in surface water and porewater. Two of the seven matrix spike compounds for volatile organic analyses exceeded the control limits of 85 to 115 percent recovery specified in the QAPP (1,1-dichloroethene with 66 percent recovery and trichloroethene with 73 percent recovery). No data were qualified for these exceedances since all other volatile organic matrix spike compound recoveries were within the specified control limits and since the matrix spike recovery exceedances for 1,1 -dichloroethene and trichloroethene were within the limits set forth in the U.S. Environmental Protection Agency's Contract Laboratory Program (U.S. EPA) (61 to 145 percent for 1,1-dichloroethene and 71 to 120 percent for trichloroethene).

3.4.3 LABORATORY CONTROL SAMPLE RECOVERIES

All laboratory control sample results met the criteria for acceptable performance.

3.5 PRECISION

The reported results for all matrix duplicate analyses met the criteria for acceptable performance.

3.6 FIELD QUALITY ASSURANCE

Although validation guidelines were not established for field quality control samples, the results are useful in identifying possible problems as a result of sample collection and/or sample processing in the field.

3.6.1 FIELD BLANKS

Field blanks are useful in assessing whether or not the samples could have been contaminated during sample collection. Field blanks were collected for the surface water, porewater, and groundwater components of this investigation.

Several analytes and compounds were detected in the field blanks at concentrations exceeding twice the limit of detection. All sample results which fell below 5 times the concentration found in the field blank were qualified as undetected (*U*) during the quality assurance review. The affected sample results are listed in Table 1. For surface water, 17 dissolved potassium results, 7 total aluminum results, 20 total boron results, 1 total iron result, 14 total titanium results, 20 total zinc results, 5 silicon results, 2 total recoverable hydrocarbon results, 2 naphthalene results, and 1 methyl naphthalene result were qualified as undetected (*U*) during the quality assurance review. For porewater, 1 dissolved potassium result, 1 dissolved calcium result, 11 dissolved zinc results, 1 total zinc result, 10 cyanide results, 2 total recoverable hydrocarbon results, 1 acetone result, 2 naphthalene results, 1 methyl naphthalene result, 2 methyl dibenzothiophene results, and 5 total phenol results were qualified as undetected (*U*) during the quality assurance review. For groundwater, 6 chromium results, 9 copper results, and 11 zinc results were qualified as undetected (*U*) during the quality assurance review. Chloroform was detected in one of the groundwater blanks at a concentration of 14 μg/L; however, chloroform was not detected in any of the associated sample results.

3.6.2 FIELD REPLICATES

Field replicates provide information that is useful in assessing sample heterogeneity and variability of contaminant concentrations in the field. Field triplicates were collected for the surface water investigation and field duplicates were collected for the groundwater investigation. The relative standard deviations of the field triplicate results for surface water ranged from zero to 48 percent. The relative percent difference of the field duplicates results for groundwater ranged from zero to 67 percent. These results indicate that the surface water and groundwater samples were relatively homogeneous.

Table 1 **Sample results qualified as undetected (*U*) during the data validation review because of field blank results**

Sample Number	Sample Results Affected (qualified *U*)
Surface Water	
AW001-S001	Total recoverable hydrocarbons and dissolved potassium
AW001-S003	Dissolved potassium, total aluminum, total boron, total titanium, and total zinc
AW004-C001	Dissolved potassium, total boron, and total zinc
AW004-C003	Dissolved potassium, total aluminum, total boron, total titanium, and total zinc
AW005-S001	Dissolved potassium, total boron, and total zinc
AW005-S003	Dissolved potassium, total aluminum, total boron, total titanium, and total zinc
AW006-S001	Dissolved potassium, total boron, and total zinc
AW006-S003	Dissolved potassium, total aluminum, total boron, total titanium, and total zinc
AW007-S001	Total silicon, total boron, and total zinc
AW007-S003	Total boron, total titanium, and total zinc
AW008-S001	Dissolved potassium, total silicon, total boron, and total zinc
AW008-S003	Total boron, total titanium, and total zinc
AW009-C001	Naphthalene, methyl naphthalene, dissolved potassium, total boron, and total zinc
AW010-S001	Dissolved potassium, total silicon, total boron, and total zinc
AW010-S002	Dissolved potassium, total silicon, total boron, and total zinc
AW010-S003	Total recoverable hydrocarbons, dissolved potassium, total silicon, total boron, total zinc
AW010-S007	Dissolved potassium, total aluminum, total boron, total titanium, and total zinc
AW010-S008	Naphthalene, dissolved potassium, total aluminum, total boron, total titanium, and total zinc
AW010-S009	Dissolved potassium, total aluminum, total boron, total titanium, and total zinc
AW014-S003	Dissolved potassium, total boron, and total zinc
AW018-C001	Total boron, total iron, and total zinc

Sample Number	Sample Results Affected (qualified *U*)
Porewater	
AW001-P001	Total recoverable hydrocarbons, naphthalene, and total phenols
AW001-P002	Total cyanide and dissolved zinc
AW003-P001	Naphthalene, methyl naphthalene, and total phenols
AW003-P002	Methyl dibenzothiophene and dissolved zinc
AW012-P001	Acetone, dissolved potassium, total cyanide, total phenols, and dissolved zinc
AW012-P002	Total recoverable hydrocarbons, total phenols, and total zinc
AW012-P003	Total cyanide, total phenols, and dissolved zinc
AW012-P004	Total cyanide and dissolved zinc
AW012-P005	Total cyanide and dissolved zinc
AW012-P006	Total cyanide and dissolved zinc
AW015-P002	Total cyanide and dissolved zinc
AW016-P002	Total cyanide and dissolved zinc
AW017-P002	Total cyanide and dissolved zinc
AW019-P002	Methyl dibenzothiophene, dissolved calcium, total cyanide, and dissolved zinc
Groundwater - Summer	
L97-P95-2-L	Total copper
L97-P95-8-BA	Total chromium and total copper
L97-P95-OB-2	Total copper
L97-P95-OB-4	Total chromium
L97-P95-3-BA	Total chromium and total copper
L97-P95-OB-3	Total chromium and total copper
FL7-BRDG-4	Total chromium and total copper
L97-P95-OB-5	Total copper
FL3-P95-13-BA	Total chromium and total copper
FL3-P95-6-BA	Total copper

Sample Number	Sample Results Affected (qualified *U*)
Groundwater - Fall	
FL3-P95-13-BA	Total zinc
FL3-P95-6-BA	Total zinc
FL7-BRDG-4	Total zinc
L97-P94-2-L	Total zinc
L97-P95-1-BA	Total zinc
L97-P95-3-BA	Total zinc
L97-P95-8-BA	Total zinc
L97-P95-OB-1	Total zinc
L97-P95-OB-2	Total zinc
L97-P95-OB-3	Total zinc
L97-P95-OB-4	Total zinc
L97-P95-OB-5	Total zinc

4.0 AUDIT INTRODUCTION

An audit was conducted in two parts for the Suncor Steepbank Mine Environmental Impact Assessment. A field audit was conducted for the fish inventory/biomarker sampling conducted on September 28, 1995, and a documentation audit was conducted for the water and sediment sampling and the fish inventory and vegetation surveys. The audit consisted of reviewing project-specific standard operating procedures and sample collection and documentation practices.

The following sections summarize the results of the field and documentation audits. There is more detailed information relating to the audit contained in the field notes, which are on file at EVS. The field section covers the sampling stations, type of sampling, observations, and recommendations. The documentation section covers observations and recommendations for the various sampling activities and surveys associated with this project.

5.0 FIELD AUDIT

The field audit was conducted on September 28, 1995. Sampling activities were observed for the fish inventory/biomarker surveys of Stations AF006, AF005, AF015, and AF019.

In general, the standard operating procedures for the EIA were followed in the field. All sampling personnel were familiar with their tasks and knowledgeable regarding the type of sampling being performed. Overall, the quality of the data collected was retained throughout the sampling event. Measurements were cross checked by other individuals on the sampling team to ensure that transcription errors did not occur.

6.0 DOCUMENTATION AUDIT

The documentation associated with the EIA activities were reviewed October 10 through October 12, 1995. The documentation audit consisted of spot checking and cross referencing field collection forms, chain-of-custody forms, and field logbooks.

6.1 OBSERVATIONS AND RECOMMENDATIONS

Overall, the sampling collection efforts for this project were thoroughly and consistently documented. Minor deficiencies are discussed below.

Observation

In general, the field logbooks documented the samples collected, the analyses required, and where the samples were being sent. However, sometimes the types of analyses or where the samples were being sent were omitted.

Recommendation

For each site entry in the logbook it would be helpful to have a standard table which includes spaces for the above information.

Observation

Individuals involved in the sampling efforts did not sign the first page of the field logbooks.

Recommendation

The first page of the field logbook should include the signature and corresponding initials of each individual recording information in the logbook. This can then be used as a key to identify the individuals who initialled corrections and made any entries throughout the logbook.

Observation

Some of the corrections in the logbooks were overwritten or obliterated and initialled. In some cases corrections were made with white-out.

Recommendation

To ensure that there is no confusion in interpreting the corrections, all errors should be crossed out with a single line, dated, and initialled with the correction clearly indicated nearby. White-out should never be used.

Observation

The time of sample receipt was not always recorded on the chain-of-custody forms.

Recommendation

It is important to document the time that samples were released and received. Otherwise the chain-of-custody for the samples can not be traced as accurately and consequently the custody (and potentially the integrity) of the samples becomes questionable.

Observation

The form of shipment and corresponding air bill number was not always identified on the chain-of-custody forms.

Recommendation

To maintain custody of the samples, the form of shipment should be entered in the appropriate place on the chain-of-custody forms. The air bill number for the shipper is also important to include on the chain-of-custody forms. Knowing the shipper and the air bill number enables tracking of the sample through the shipping process if needed. If the samples are being hand-couriered by one of the sampling crew, then their name must be entered as the shipper and their signature should appear in the "Relinquished by:" box on the chain-of-custody form.

7.0 REFERENCES

Golder Associates. 1995. Suncor Steepbank Mine EIA: Quality Assurance Needs and Database Management Plan. Submitted to Suncor Inc., Fort. McMurray, AB, by Golder Associates, Calgary, AB.

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