

2014 Sewage Pond Dams Geotechnical Inspection

Prepared for

Lupin Mines Incorporated



Prepared by

 **srk** consulting

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2014

SRK Consulting (Canada) Inc.
1CL008.001
October 2014

2014 Sewage Pond Dams Geotechnical Inspection

October 2014

Prepared for

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Project No: 1CL008.001

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1 Introduction

The Lupin Mine site is currently under care and maintenance status and operating under Nunavut Water Licence 2AM-LUP0914 (NWB 2009) by Lupin Mines Incorporated, a wholly-owned indirect subsidiary of Elgin Mining Inc. Elgin acquired LMI from MMG Resources Inc. in July 2011. The mine is located on the west shore of Contwoyto Lake, approximately 285 km southeast of Kugluktuk, Nunavut and 400 km northeast of Yellowknife (Figure 1.1). As part of the Inspector's Direction issued on September 8, 2014, specified on page 2 of the document, Measures to be Taken, Article 2:

"A geotechnical inspection is to be conducted of the Upper and Lower Sewage Lagoon. The engineer's report is to be submitted to the Nunavut Water Board and to the Inspector by October 31, 2014, accompanied by a plan and timelines to implement the engineer's recommendations. Any repair required are to be carried out without delay."

The report summarizes SRK's observation of the sewage pond dams and our recommendations. Review of the previous design, as-built and annual inspection reports made prior to 2010 were outside SRK's scope for this inspection. Reviewed document included:

- Inspection in 2010 by TBT Engineering

Generally, the 2014 inspection indicated the dams are in stable condition with some requirement for maintenance repairs. Ongoing monitoring is also recommended of the tension cracks observed at the Lower Sewage Dam.



Lupin Mine Inc.

2014 Geotechnical Inspection

Location Plan

SRK JOB NO.: 1CL008.001

FILE NAME: Lupin-SiteFacil-utm-12_AEdits_RevA-20131018.dwg

Lupin Mine Incorporated

DATE:
October 2014

APPROVED:

FIGURE:

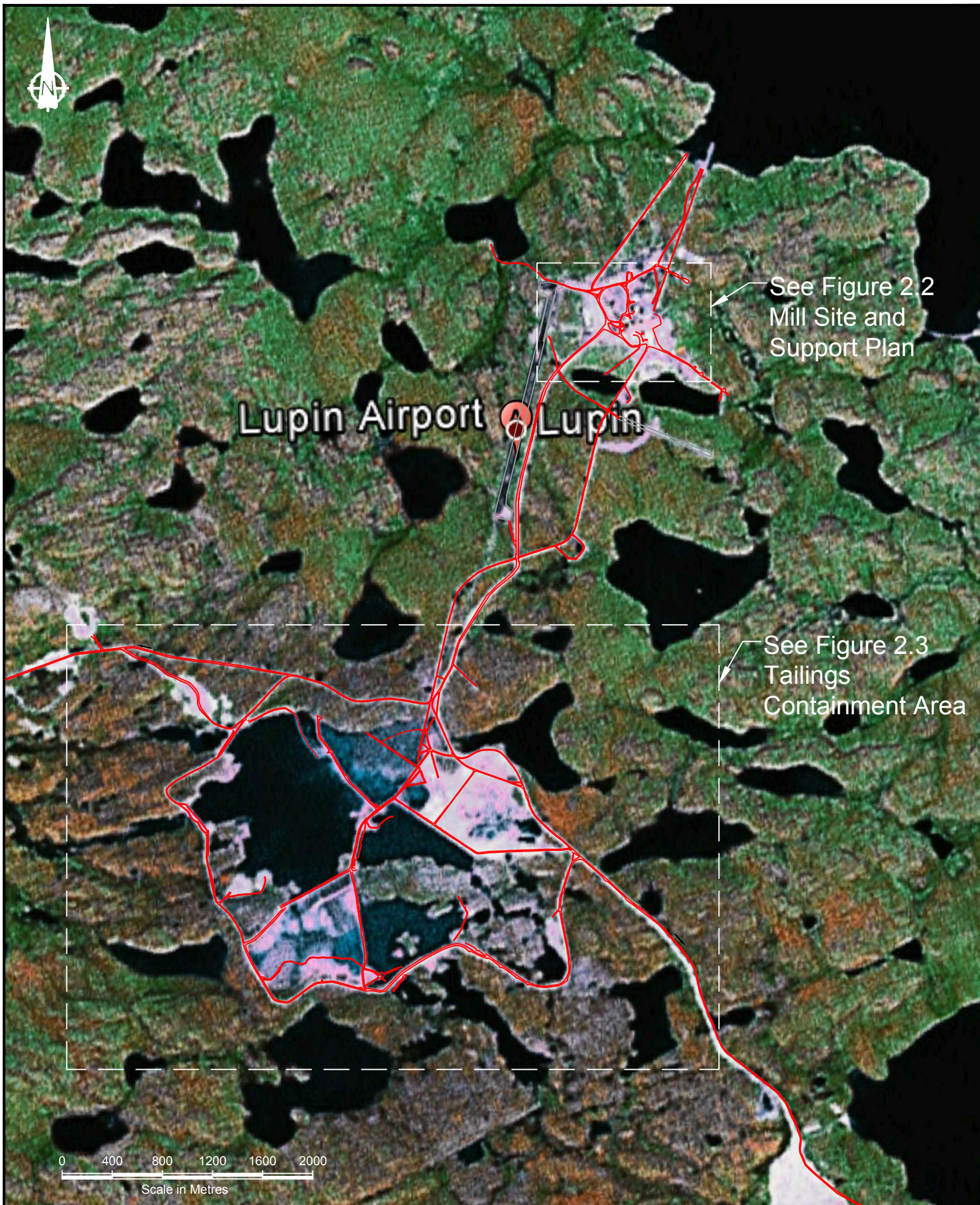
1.1

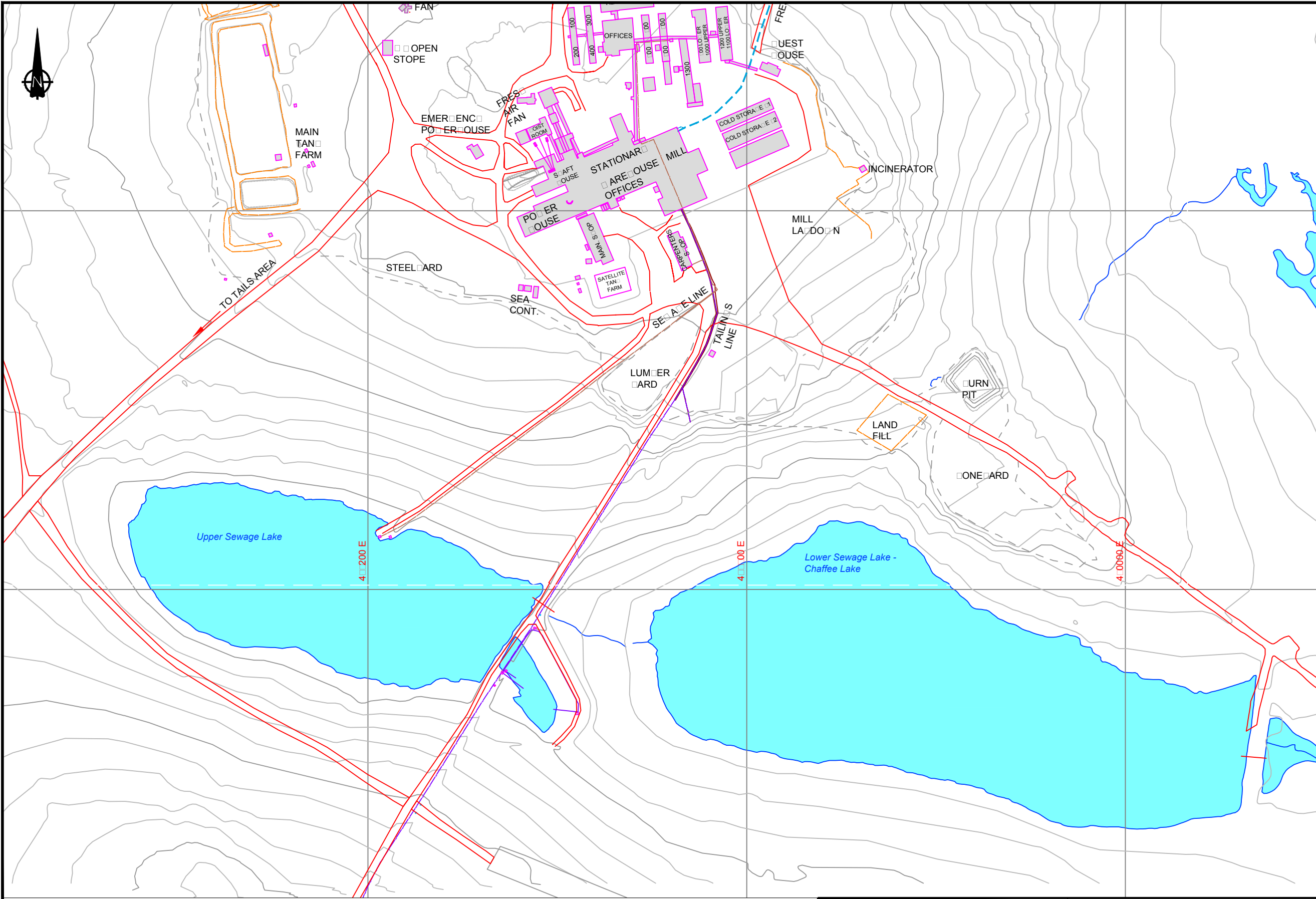
2 Site Conditions

2.1 Sewage Management Facility

The Lupin Mine consists of a mill facility, camps, airstrip and tailings containment area (Figure 2.1). The sewage management facility consist of two lagoon lakes located in south of the mill facility (Figure 2.2). The sewage lagoon lakes system is constructed in a natural valley which generally drains in a northwest to southeast direction. The system consists of two lakes, created by Upper and Lower Sewage Dams. The dams are generally aligned in the north to south direction and observed to be constructed from compacted esker sand and gravel at estimate 3 to 4 m high. The Upper Sewage Dam is around 60 m in length and on the crest it supports the now decommissioned tailings pipe line to tailings containment area (TCA) from the mill. About 1/3 of the length south of the dam to the southern buttress, a small containment (tailings dump pond #1) is built into the downstream face of the Upper Sewage Dam. The height of this small containment varies between 3 to 4 m. The Lower Sewage Dam is around 80 m in length.

The general sewage management requires raw sewage to be hauled and discharged into the western shore of the Upper Sewage Lake. Water from Upper Sewage Lake would siphon to Lower Sewage Lake periodically during mine operation or as needed during the care and maintenance period. The water in the Lower Sewage Lake will be tested and discharged into the environment through the siphon over the dam as needed.





LEGEND

Laie Pond

Tan Farm Term Outline

Building

Water Pipeline in DiamNot in Use

Tailings Line Route Not in Use

Sewage Pipeline in DiamNot in Use

Laie Shore Drainage

Contour 1 m

Contour m

Roads

Site Features Miscellaneous

Cleared Area

Term Area

Slope Toe

Slope Top

Culvert

Fence

NOTES

1. Topographic information and facilities outline provided by Lupin Mine Inc. on August 13, 2012.

04080120100200

Scale in Metres

Coordinate System: Nad_1983_UTM_Zone_12N

NTS Map Sheets 01E11 and 01E14

srk consulting

SRK JOB NO.: 1CL008.000

FILE NAME: Lupin-SiteFacil-utm-12_ATedits_RevA-20121030.dwg

Lupin Mine Inc.

Lupin Mine Incorporated

LUPIN MINE

Mill Site and Sewage Ponds Plan

DATE: October 2014

APPROVED:

FIGURE: 2.2

2.2 Dam Classifications

According to the Canadian Dam Association guidelines (Table 2-1), the sewage dams are classified as Low where no loss of life is expected and minimal short-term impact to the environment and cultural values. The classification of the dams does not require an Emergency Preparedness Plan (EPP) or a dam break inundation study. A Liquid Waste Management Plan for care and maintenance prepared by Lupin (LMI 2013) is included in Appendix B.

Table 2-1: Dam Classifications as per CDA (2007, Revised 2013)

Dam Class	Population at Risk ¹	Incremental losses		
		Loss of Life ²	Environmental and Cultural Values	Infrastructure and Economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of <i>important</i> fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very high	Permanent	100 or fewer	Significant loss or deterioration of <i>critical</i> fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances)
Extreme	Permanent	More than 100	Major loss of <i>critical</i> fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services (e.g., hospital, major industrial complex, major storage facilities for dangerous substances)

¹ Definitions for population at risk:

None—There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary—People are only temporarily in the dam-breach inundation zone (e.g., seasonal cottage use, passing through on transportation routes, participating in recreational activities).

Permanent—The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

² Implications for loss of life:

Unspecified – The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.

2.3 Climate

Climate conditions were recorded at the Lupin manned weather station until October 2006. An automated weather station known as Lupin (MAPS) (CWIJ) has recorded data intermittently at the site. Reviewing the data from the end of October 2006 to the present, the station has reported an arctic climate with a mean annual temperature of -9.8°C . Winter is considered to last from October to May and summer is considered to last from June to September. The summer daily temperature averages 6.8°C and winter daily temperature averages -18.5°C . There are persistent winds at an annual mean velocity of 18.0 km/h and gusts up to 95 km/h. Measured site precipitation is reported at an annual mean of around 388 mm. The data does not breakdown the precipitation into rain and snow (WU 2012).

2.4 Site Geology

The Lupin gold deposit is situated in an Archean metatubidite sequence of the Contwoyto Formation, part of the Yellowknife Supergroup of supracrustal metasedimentary and metavolcanic rocks of the Slave Geologic Province. The rocks have been subjected to both regional and contact metamorphism and to several phases of deformation and intrusion.

The Contwoyto Lake area lies within the Upland unit of the Kazan physiographic region of the Canadian Shield. The area was glaciated during the Pleistocene Epoch. Isostatic rebound after ice melt resulted in emergent landforms, and during this process all parts of the land were washed by runoff and lakes. The easily erodible glaciolacustrine sediment, till and glacio-fluvial sand and gravels were subsequently reworked by melts and runoff. This has resulted in the present day outcrops with thin soil veneers, abandoned beaches and esker formations (Kinross 2005).

3 Sewage Dam Inspection

3.1 General

Mr. Alvin Tong, P.Eng., a Senior Consultant with SRK, conducted the geotechnical inspection on September 15, 2014. After a general overview of the site in the air, the detailed site inspection was carried out using ground transportation for thorough visual inspections. Mr. George Friesen of LMI was not present during the inspection but was available for comment and discussion after the inspection. Discovery Mining Service (DMS) was on site to carry maintenance work around site, including siphoning of the Lower Sewage Lake to lower the water level. Their work activity log is provided in Appendix C.

Weather conditions during the inspection were cold and overcast with periods of flurry. A detailed photographic log of the inspection is included in Appendix A.

3.2 Upper Sewage Dam

The dam is generally in good condition with no geotechnical concerns where the minimum erosion damages are noted and no visual evidence such as cracks or otherwise that could affect

its stability. Previous damages and deficiencies noted from the 2010 inspection report (TBT 2010) were repaired and mitigated. The crest of the dam was repaired and widened with new backfill material. Tailings dump pond #1 has been sufficiently dewatered and has no stability concerns. Riprap was placed in the upstream face of the dam. The old siphon pipes have been removed. An old, highly corroded culvert was found within the dam, approximately 1.5 m below the crest. The culvert is mostly buried and estimated to be around 200 mm in diameter. Seepage was observed discharging from the culvert, roughly at 0.5 L/min. The condition of the culvert made it very difficult to accurately measure the flow. The freeboard is observed to be around 1.3 m.

3.3 Low Sewage Dam

The dam is generally in stable condition with no immediate concern for major failure and breaching. There are a number of tension cracks observed along the dam, between 5 to 8 m in lengths. It is very difficult to determine the exact cause of these tension cracks base on the visual inspection. However a possible cause could be foundation “creep” resulting from movement between the active layer and permafrost. A detailed investigation would be required to better understand the mechanism causing the tension cracks. The upstream face of the dam is observed to have some wave action erosion and potential ice scouring, where the overall width of the dam is slightly reduced. A seepage is observed at around 2 L/min in the northern abutment. A section of the dam, near the southern abutment is observed to be lower in elevation than other parts of the dam, by approximately 0.15 m in elevation. The freeboard is observed to be less than 0.1 m at this low southern area of the dam.

4 Recommendations

The current condition of the Upper Sewage Dam is good and geotechnically sound where the minimum erosion damages are noted and no visual evidence such as cracks and sinkholes that could affect its stability. Periodical inspection should be carried out on the buried culvert to monitor its condition and seepage rate as culvert is heavily corroded and partially filled with sand and gravel. It is assumed that this culvert controls the upper lake level. If the seepage stops or further reduces, then the lake level could increase as a result. If the culvert is found to be fully collapsed or blocked and the seepage has stopped, then it is recommended the siphon pipes be reinstalled to transfer water to the lower lake.

The Lower Sewage Dam is generally in stable condition with no immediate concern of major failure and breaching. Maintenance and monitoring are recommended to ensure the condition of the dam does not further degrade. LMI should consider backfilling the eroded upstream section of the dam with compacted granular material with the face armored with riprap. Additional granular fill should be placed and compacted in the southern low section of dam to create a uniform elevation crest. LMI should monitor the condition of the tension cracks to determine their rate of movement. If the monitoring results indicate the cracks are lengthening or widening, LMI should consider constructing a 2 m wide buttress with a 2H:1V slope to half the height of the dam with compacted granular material, downstream of failed section of dam.

During the inspection, DMS was in the process of siphoning the Lower Sewage Lake to lower the water level. The activity log provided on September 22nd, 2014 indicated that the water level has

been lowered by 0.36 m since the inspection, measured at the low area of the dam. A supporting note from George Friesen on October 9, 2014 confirmed that the current freeboard is 0.96 m as the pond is frozen for the winter. This lowering of the water level reduces the risk of overtopping. For future operation reference, we recommend that the operational freeboard of the lower pond be no less than 0.5 m at all times. Furthermore, we recommend that in order to achieve this minimum freeboard of 0.5 m at the time of future freshets that prior to the onset of winter, the pond level be lowered to provide a 0.8 m freeboard.

This report, 2014 Sewage Pond Dams Geotechnical Inspection, was prepared by

Alvin Tong, PEng.
Senior Consultant

and reviewed by

Peter Healey, PEng.
Principal Consultant

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Disclaimer—SRK Consulting (Canada) Inc. has prepared this document for Lupin Mines Incorporated. Any use or decisions by which a third party makes of this document are the responsibility of such third parties. In no circumstance does SRK accept any consequential liability arising from commercial decisions or actions resulting from the use of this report by a third party.

5 References

Canadian Dam Association, 2007. Dam Safety Guidelines. ISBN 978-0-7726-5802-9.

TBT Engineering, 2010. Letter RE: Limited Geotechnical Inspection Sewage Lake Dam Structures, Lupin Mine, Nunavut. September.

[WU] Weather Underground. 2012. San Francisco (CA): Weather Underground, Inc. Accessed October. Available from: <http://www.wunderground.com/cgi-bin/findweather/hdfForecast?query=lupin>. WunderSearch.

Appendix A – Photograph Log



Photo 1: Looking southwest at the Upper Sewage Dam with the Upper Sewage Lake on the right.



Photo 2: Looking south at the tailings dump pond #1.



Photo 3: Looking southwest at the Lower Sewage Dam from the north abutment.



Photo 4: Close up view of the tension cracks in Lower Sewage Dam near the north abutment.



Photo 5: Looking southwest at the erosion in upstream face of Lower Sewage Dam.



Photo 6: Close up view of the upstream face erosion in the Lower Sewage Dam.



Photo 7: Looking southwest at the tension crack in the upstream portion of the Lower Sewage Dam toward the south abutment.



Photo 8: Looking southwest at low area of the Lower Sewage Dam toward the south abutment.



Photo 9: Looking at the seepage in the downstream toe in the north abutment of the Lower Sewage Dam.

Appendix B – LMI Liquid Waste Management Plan

Lupin Mines Incorporated

A wholly owned indirect subsidiary of Elgin Mining Inc.

Lupin Mine Site

Nunavut, Canada

Liquid Waste Management Plan

(Care and Maintenance)

March 2013

Lupin Mines Incorporated
Elgin Mining Inc.
#201 - 750 West Pender Street
Vancouver, BC, V6C 2T7

Document Control

Revision No.	Date	Details	Author	Approver
1.0	20/03/12	Reformatted to Lupin Mines standard. Revised and updated to reflect new ownership and contact information. Updated figures to reflect current site conditions. Document re-write, primarily for clarity and organization. Addressed comments from AANDC (2010), EC (2009) Revised to include liquid waste management	S Hamm	P Downey
2.0	30/03/13	Combined <i>Discharge Procedure: Tailings Containment Area and Sewage Lakes Disposal Facility</i> with the <i>Liquid Waste and Stormwater Management Plan</i> to create the <i>Liquid Waste Management Plan</i> . Updated contact and general information. Additional details on preparation for discharge from the TCA added.	D Vokey	W. Osborne

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Appendix A:	Water Quality Monitoring Plan and Quality Assurance/ Quality Control Plan	
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1 Introduction

Lupin Mines Incorporated (LMI), a wholly owned indirect subsidiary of Elgin Mining Inc. (Elgin), has prepared this Liquid Waste Management Plan (the Plan).

An annual review of the Plan will take place and revisions will be submitted as necessary with the annual report. The current Type A Water Licence 2AM-LUP0914 (Water Licence) for the Lupin Gold Mine (Lupin or the Lupin Mine or the Site) is valid until March 31, 2014 and has been kept in good standing.

1.1 Project and Company Information

Elgin is a Canadian based company focused on the production at the Björkdal Gold Mine located in Sweden, and the exploration and development of the Lupin Gold Mine and Ulu Gold Project, both located in Nunavut, Canada.

Elgin purchased LMI, which owns the Lupin Mine, from MMG Resources Ltd. in July 2011. Lupin was in operation from 1982 to 2005 with temporary suspensions of activities between January 1998 and April 2000, and again between August 2003 and March 2004. The mine resumed production in March 2004 until February 2005. Since 2005, the Site has remained in Care and Maintenance.

General site maintenance and facilities upgrades are underway at the Lupin Mine in preparation for an underground exploration program. The activities underway were screened by the Nunavut Impact Review Board under file 99WR053 and approved by the Nunavut Water Board under Water Licence 2AM-LUP0914. Surface exploration is conducted under Water Licence 2BE-LEP1217. All camp infrastructure required for the surface exploration program currently exists at the Lupin Mine.

Company:	LMI
Project:	Lupin Mine, Nunavut
Company Address:	201 – 750 W Pender St, Vancouver, BC, V6C 2T7
Telephone:	604-682-3366
Email:	wosborne@elginmining.com
Attention:	Wayne Osborne, Project Manager
Effective date:	30 March 2013

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Wayne Osborne	Project Manager
David Vokey	Sr. Environmental Coordinator
Karyn Lewis	General Administration

Additional copies of this Plan are available from General Administration. The Plan is available at the LMI Environmental Department office and a notice is posted in key locations at the site indicating where they can be found. All employees and contractors will be made aware of its contents.

1.2 Site Location

The Lupin Mine is located in Kitikmeot Region, Nunavut, 400 km north of Yellowknife, Northwest Territories and 285 km southeast of Kugluktuk. The airport serving this Site is at 65° 46'00" N and 111° 14'41" W. The Site is on the western shore of Contwoyto Lake, approximately 60 km south of the Arctic Circle (Figure 1).

1.3 Environmental and Sustainable Development Policy

Elgin Mining Inc. and its subsidiaries (collectively, "Elgin Mining") are committed to maintaining a safe, clean, compliant and respectful work environment. Elgin Mining looks to our employees, contractors and managers to adopt and grow a culture of social responsibility and environmental excellence. Together we achieve this by:

- Promoting environmental stewardship in all tasks. Nothing is too important that it cannot be done in a clean and responsible manner. We strive towards maintaining a zero-incident work place.
- Recognizing that we have a shared responsibility as stewards of the environment in which we operate. We will not walk away from a non-compliant act.
- Identifying, managing and mitigating environmental, business and social risks in an open, honest and transparent manner.
- Planning our work so it is done in the cleanest possible manner and executing work according to plan.
- Continually improving environmental and operational performance by setting and reviewing achievable targets.
- Providing appropriate and necessary resources in the form of training, personnel and capital, including that required for closure planning and reclamation.
- Managing our materials and waste streams, maintaining a high degree of emergency response preparedness and minimizing our operational footprint to maintain environmental protection at all stages of project development.
- Procuring goods and services locally, where available, and favouring suppliers with environmentally and socially responsible business practices.
- Seeking to understand, learn from and mitigate the root causes of environmental incidents and near misses when they do occur.

- Employing systems and technology to achieve compliance, increase efficiency and promote industry best practices in development, operations and environmental stewardship.
- Working with stakeholders to identify and pursue opportunities for sustainable social and economic development and capacity building.
- Conducting early and ongoing stakeholder engagement relevant to the stage of project and mine development and operation.
- Recognizing diversity in the workplace and building meaningful relationships with all stakeholders in a timely, collaborative and transparent manner.

Through implementation of this policy, Elgin Mining seeks to earn the public's trust and be recognized as a respectful and conscientious employer, neighbor and environmental steward.

Approved by the Board of Directors on August 10th, 2012

1.4 Purpose and Scope

This Plan is an appendix to the Care and Maintenance Plan. The purpose of this Plan is to provide the necessary information pertaining to liquid waste management during routine care and maintenance at the Lupin Mine. Liquid waste management planning is necessary to ensure waste water is appropriately stored, treated and discharged to the environment in compliance with the Water Licence and the *Metal Mining and Effluent Regulation* (MMER).

The objectives of the Plan are to:

- Describe source and fate waste water on the Lupin site, and
- Outline measures in place to mitigate impacts to the environment resulting from waste water discharge.

2 Sources of Liquid Waste

2.1 Stormwater

Water accumulates in secondary containment of fuel storage facilities due to precipitation. In order to maintain secondary containment dry, accumulated water needs to be removed and managed.

Precipitation and the overland flow of surface water can encounter surficial materials such as disturbed native soils and the fine-grained fraction of waste rock materials, and can mobilize fine particulates, chemicals and contaminants contained therein. The majority of sediment contained in runoff at the Site is waste rock fines found in stockpiles, roads, and miscellaneous "administrative" areas such as parking lots and storage yards (laydowns).

2.2 Sewage

Sewage and grey water are conveyed to the Sewage Lakes system. Liquid waste results from camp accommodations and kitchen facilities (dishwater and sanitary waste).

2.3 Tailings

There is a substantial amount of water present within the tailings containment area (TCA) (Figure 2). The containment is divided into three main components: solids retention cells (Cells 1, 2, 3, and 5), polishing ponds (Cell 4, Pond 1 and Pond 2) and the End Lake area (not used). All of this water is periodically transferred downstream to maintain a 1 m freeboard at all times at the perimeter dams. The water in Cell 4 is transferred to Pond 1 via gated valve, from here the water is transferred from Pond 1 to Pond 2 by way of siphon. Cell 5 is directly upstream of Pond 1 and water is transferred directly to Pond 2 via siphon. Pond 2 is the largest pond; here, water is treated with lime and eventually discharged to the environment by way of siphon.

3 Stormwater Management

The Lupin Mine is constructed on a topographic dome (Figure 3). Drainage to the northwest is towards the main tank farm, which is isolated by a containment berm system. Drainage to southwest and south reports to the Sewage Lakes Disposal Facility, which is contained by dykes. The north and east perimeter of the site is composed of laydown pads, graded to direct over land flow to either the airstrip access road, the surface crusher access road or the burn pit access road.

Site facilities at Lupin relevant to stormwater management planning include roads, the mine site infrastructure and the air strip.

3.1 Facilities

Mine Site Area

The mine site area referred to in this Plan includes: mine and mill buildings; shops; accommodations; laydown areas; storage facilities; weather station; and bulk fuel storage facilities. Surface runoff from these areas flows either towards the main tank farm area, the sewage pond system or access roads to the airstrip, burn pit or crusher as described above.

Roads

Runoff accumulating on roads is collected in a series of ditches and culverts. Road bases were constructed with non-acid forming materials.

Airstrip

The gradient of the airstrip results in run-off flow from south to north. Spring freshet and stormwater flow parallel to the strip, controlled through a combination of natural gradient, culverts, and ditches. The water flows naturally to Boot Lake, to the northwest, and typically carries negligible sediment.

3.2 Best Management Practices

LMI utilizes a number of best management practices (BMPs) to control the discharge of stormwater runoff to points outside the mine's footprint, as discussed in the following sections.

Good Housekeeping

Lupin management promotes good housekeeping to minimize exposure of materials to the environment and potential accumulation in stormwater. Materials and equipment are stored throughout the site such that leaks and leaching are minimized and contained.

Visual Inspections

Visual inspections of cold storage buildings, laydown areas, fuel containment, and tailings containment are conducted. These visual inspections are increased during spring freshet and after significant rain events.

Preventative Maintenance

Regularly scheduled maintenance for mobile equipment occurs to make sure fluids in process do not escape.

Material Handling Practices

The following material handling practices are used by Lupin personnel to minimize exposure of pollutants to stormwater:

- Containers are stored appropriately in designated storage locations at all times other than when in immediate use;
- Lids, covers, and caps are in place at all times other than when in immediate use; and
- Operators use caution when refueling equipment on site or transferring materials.

Spill Prevention and Emergency Response

Lupin has in effect a *Spill Contingency Plan*, designed to deal with proper procedures for oil and chemical spill prevention and response. Employees are trained in procedures to minimize the environmental and health risks associated with these events.

Sediment and Erosion Control

Ephemeral and intermittent drainages exist throughout the Lupin Mine site, many of which flow only because of significant rains events or during spring freshet. Ephemeral or intermittent drainages may require measures to control sedimentation and surface erosion; such as cross ditching, or silt fencing.

3.3 Bulk Fuel Storage Facility Discharge Procedures

LMI has in effect a *Fuel Containment Management Strategy*, designed to deal with proper procedures for the fuel and fuel handling facilities on site. Employees are trained in the procedures to maintain and operate the facilities.

Water accumulating in secondary containment of fuel storage facilities is tested prior to discharge to the environment to ensure it is in compliance with part E(9) of the Water Licence as listed below in Table 1. Samples for testing are collected in accordance with the *Water Quality Monitoring Plan and Quality Assurance/ Quality Control Plan* (the Monitoring Plan) found in Appendix A. Water that is not in compliance is pumped to a storage tank where it is held until it can be treated and subsequently released to the environment at LUP-27 (Figure 4, UTM coordinates: 7293609N 489072E). Snow that is contaminated with hydrocarbons is collected and melted. The hydrocarbon portion is removed and the water is then tested and either discharged or stored for further treatment. The hydrocarbon portion and water that cannot be treated on site is shipment off site for treatment and disposal.

Provide notice to the Aboriginal Affairs and Northern Development Canada (AANDC) Inspector at least ten (10) days prior to initiating discharge from the Bulk Fuel Storage Facilities including an estimated volume proposed for discharge and the receiving location.

Table 1: Monitoring station LUP-27 effluent quality criteria.

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of any Grab sample (mg/L)
Total Ammonia	2.0	4.0
Total Lead	0.01	0.02
Benzene	0.37	
Toulene	0.002	
Ethylbenzene	0.090	
Total Suspended Solids	15	30
Oil and Grease	5.0 and no visual sheen	10
pH	6.0 to 9.0	

4 Sewage Waste Management

4.1 Sewage Lakes Disposal Facility

The sewage facilities consist of several lift stations within the camp and an 800 m long 6" diameter insulated steel pipeline to the first of two sewage lakes. Alternatively, when camp capacity requirements during care and maintenance do not warrants its use; sewage and grey water are collected in a sewage tank at the 1300 and 800 wing of the accommodation buildings. The tank is then hauled to the Upper

Sewage Lake wherein waste is deposited. A sewage line to convey camp sewage directly to the Uppers Sewage Lake may be utilized. Grey water originating from office cabin use is deposited in a leaching pit adjacent to the guesthouse.

A 'permeable' type dam with an emergency overflow and an installed siphon exists between the upper and lower sewage lakes. Under Part E(7) of the Water Licence, all sewage is to be discharged to the Sewage Lakes Disposal Facilities. Discharge from the Lower Sewage Lake is controlled by the use of a siphon. Water accumulating in the Lower Sewage Lake is tested prior to discharge to the environment to ensure it is in compliance with Part E(8) of the Water Licence as provided in Table 2 below. If compliant, water is discharged from LUP-14 (Figure 4, UTM coordinates: 7293013N 490187E) to the environment. Samples for testing are collected in accordance with the *Water Quality Monitoring Plan and Quality Assurance/ Quality Control Plan*.

4.2 Sewage Lakes Disposal Facility Discharge Procedures

4.2.1 Pre-Discharge

The following procedures must be followed in preparation for discharge of sewage effluent from the Sewage Lakes Disposal Facility during open water conditions from the siphons.

3 weeks prior to Discharge

1. Collected samples from the Lower Sewage Lake near the siphon intake and test for pH, TSS, Total Metals, BOD₅, and Faecal Coliforms to confirm compliance with the effluent quality limits outlined in Table 2 following the procedures outlined in the Monitoring Plan (Appendix A).
2. The samples must be collected the morning of the plane day to account for sample holding times.
3. Inform the lab when the samples are shipped.

10 days prior to Discharge

1. Notify the AANDC Inspector at least ten (10) days prior to initiating discharge from the sewage pond. Including in the notification the laboratory sample results, an estimated volume proposed for discharge and the receiving location.
2. Monitoring Station LUP-14 sample analysis results must not exceed the criteria outlined in Table 2 prior to commencing discharge.

5 days prior to discharge

1. Take pH measurements daily for 5 days before anticipated discharge with the portable pH meter in the Lower Sewage Lake, near the siphon intake.
2. pH must be in the range of 6.0 to 9.5 or discharge cannot commence.

4.2.2 Discharge

The following procedures must be followed during discharge from the Sewage Lakes Disposal Facility:

1. Measure pH on the pond-side of the Lower Sewage Lake dam by the siphon intakes. If pH is between 6.0 and 9.5, and effluent quality at LUP-14 does not exceed the criteria provided in Table 2, start the siphons.
2. Record the following information for the Discharge Siphon Log:
 - a. Date and time that the siphons were started
 - b. pH reading from the portable meter
 - c. Flow volume from each siphon
 - d. General condition of the discharge point
3. Enter all information in the Discharge Siphon Log spreadsheet.
4. Collect monthly samples from LUP-14 including quality control samples (field duplicates, trip blanks) as outlined in the sampling event schedule (Table 2.2) of the *Water Quality Plan and Quality Assurance/ Quality Control Plan*. Follow the sampling procedures outline in that Monitoring Plan (Appendix A).
5. Prepare samples for shipment to the lab on weekly flight following the procedures outlined in the Monitoring Plan. Each shipment must include at least one duplicate sample and one trip blank.
6. If field pH measurement is <6.0 or >9.5, IMMEDIATELY shut down the siphons, employ the Spill Contingency Plan, and notify the following:
 - a. AANDC inspector at 867-975-4548
 - b. 24 Hour Spill Report Line at (867)920-8130
7. Upon receipt of analytical results for LUP-14 from the lab, compare analytical results to the effluent quality criteria outlined in the following Table 2. If results exceed the effluent quality limits IMMEDIATELY shut down the siphons, employ the Spill Contingency Plan, and notify the following:
 - a. AANDC inspector at 867-975-4548
 - b. 24 Hour Spill Report Line at (867)920-8130

Table 2: Monitoring station LUP-14 effluent quality criteria.

Parameter	Maximum Concentration of any Grab sample (mg/L)
Total Arsenic	0.05
Total Copper	0.20
Total Lead	0.05
Total Nickel	0.30
Total Zinc	0.50
Total Suspended Solids	35
Faecal Coliforms	30
BOD ₅	1000 colony forming units/ 100mL
Oil and Grease	Visual Sheen
pH	6.0 to 9.5

5 Tailings Effluent Management

5.1 Tailings Containment Area

The Tailings Containment Area (TCA) is located approximately six (6) km south of the Lupin Mine, and covers an area of about 361 ha within the 750 ha land lease. Water in the TCA is treated and tested prior to discharge to the environment to ensure it is in compliance with Part E(5) of the Water Licence. If compliant, water is discharged at LUP-10 (Figure 4, UTM coordinates: 7289689N 485843E). In accordance with Part E(2) and Part E(3) of the Water Licence discharge can commence no sooner than July 15 of any calendar year and the volume discharged cannot exceed 70,000 m³ per day.

The procedures for sampling discharge from the TCA in accordance with the Monitoring Program in Schedule J of the Water Licence and the MMER is described in the *Water Quality Monitoring Plan and Quality Assurance/ Quality Control Plan* (the Monitoring Plan). Samples are also collected from reference areas and downstream exposure areas, LUP-20, 21, 22, 24 and 25 (Figure 4). The Environmental Effects Monitoring (EEM) program of the MMER requires biological monitoring studies be completed in addition to the water quality studies. Cycle 4 of the EEM program is planned for 2013 and the study design was filed with Environment Canada in February 2013.

The TCA is also managed in compliance with Part E(6) of the Water Licence, which stipulates the following:

6. The TCA shall be constructed, operated and maintained to engineering standards such that:
 - a. A freeboard limit of 1.0 m shall be maintain at all times or as recommended by a Geotechnical Engineer and as approved by the Nunavut Water Board (the Board) in writing;
 - b. Seepage from the TCA is minimized;
 - c. Any seepage that occurs is collected and returned immediately to the TCA;
 - d. Erosion of constructed facilities is addressed immediately;
 - e. The solids fraction of the mill Tailings shall be permanently contained within the TCA or underground as Backfill;
 - f. Weekly inspections of the dam(s), Tailings line(s), and catchment basin(s) shall be carried out and records of these inspections shall be kept for review upon the request of an Inspector, or as otherwise approved by the Board. More frequent inspections shall be performed at the request of an Inspector; and
 - g. An inspection of the TCA shall be carried out annually during ince free, open water conditions by a Geotechnical Engineer. The Engineer's report shall be submitted to the Board within sixty (60) days following the inspection and shall include a covering letter from the Licensee outlining an implementation plan to respond to the Engineer's recommendations.

5.2 Tailings Containment Area Discharge Procedures

5.2.1 Pre Discharge

The following procedures must be followed in preparation for discharge of tailings effluent from the Tailings Containment Area (TCA). Note that calendar months and dates are provided only as a guide. Specific dates will be based on environmental conditions.

One month prior to discharge (June)

1. Air Compressor Check
 - o Inspect the portable air compressor to make sure it is working correctly. The compressor is needed to start the vacuum in the siphons. Get a spare jar for the compressor.
 - o Transport the air compressor to Dam 1A.
2. Set-up Siphons
 - o Check for holes in pipe, coupling integrity, plugged inlets and outlets (Only one 20" siphon worked in 2012).
 - o Add four 8 inch siphons.
 - o Ensure that a vacuum can be created in the pipe to induce siphon flow.
 - o Correct any problems so that the siphon process can be started when needed.
 - o Test and calibrate flow meters to confirm meter is working properly. Flow meters can be calibrated annually by the manufacturer prior to discharge. Calibration to MMER specifications is necessary.¹
 - o By 30 June, install the flow meter probes in the siphons and check to ensure that the meters are working (one in 20" pipe, and one in one of the 8" pipes).
3. Organize Water Quality Monitoring Equipment
 - o Rent or purchase an immersion probe to measure pH, temperature, dissolved oxygen and conductivity with a 7.5 m cable to allow for profiling.
 - o Ensure the immersion probe functions correctly and that the data logger can be downloaded.
 - o Ensure the handheld pH, dissolved oxygen and conductivity meters and desktop pH meter function correctly. Order replacement meters or sensors if required.
 - o Check expiry date on calibration and storage solutions and order fresh solutions as required.

¹ Flow meters can be calibrated manually by the manufacturer prior to discharge. Calibration to MMER specifications is necessary. Spare flow meters may be obtained directly from the manufacturer(s) or supplier(s) as back-up. See Environment Canada's *Guidance Document for Flow Measurement of Metal Mining Effluents*, EPS 2/MM/4, April 2001.

4. Contact Analytical Lab
 - o Calculate the number and type of sample bottles that will be required for the sampling of monitoring program stations taking into consideration quality control samples such as field duplicates and trip blanks.
 - o Order bottles from the analytical laboratory. Request an empty cooler be sent to site each week until requested by LMI to stop.
 - o Ensure at least four large coolers to have on site before prior to discharge.
5. Contact Bioassay Lab
 - o At least one month prior to discharge (before approximately 15 June), contact bioassay lab and order two sets of containers required for the Static pass/fail bioassay for Rainbow Trout (20 L) and one set of containers required the MMER LC50 bioassay for Rainbow Trout (40L).
 - o Ensure there are sufficient 1 L bottles on site for the *Daphnia Magna* bioassays (1L for Static pass/fail and 2 L for MMER LC50).
6. Collect Pre-Discharge Samples
 - o Sample Pond 2 as soon as ice is off for pH and all parameters as listed in Table 2.2 of the *Water Quality Plan and Quality Assurance/ Quality Control Plan* (Appendix A) and submit to the lab.
 - o If the sample from Pond 2 meets the discharge criteria listed in Table 3 below and the pH range is between 6 and 9, collect the static pass/fail bioassay for Rainbow Trout and *Daphnia* following the procedures outlined in the Monitoring Plan. If the sample results to not meet discharge criteria wait to submit the bioassay until pH is above 6 following lime treatment.
 - o Bioassay sample point is internal station 102, located approximately 100 m upstream from the siphon intake. UTM coordinates: 7289875N, 486196E.
 - o The bioassay samples must be collected the morning of the plane day to account for sample holding times (there is a 3-day limit between taking the sample and start of analysis).
 - o Inform the lab when the samples are shipped.
 - o A “Pass” result must be received for the static pass/fail bioassay, Pond 2 sample analysis results must not exceed the limits listed in Table 3 and the pH of Pond 2 can be stabilized between 6.0 and 9.5 prior to commencing discharge.
7. Commence Lime Treatment
 - o If the pH of Pond 2 is below 6 water treatment is to commence with the addition of a dilute lime slurry.
 - o The pH, temperature and conductivity of Pond 2 is to be profiled at 1 m intervals in depth at various locations, including station 102 and a site near the siphon intake, to monitor the treatment rate.
8. Contact Environment Canada
 - o Provide notice to the Environment Canada Enforcement Officer at least thirty (30) days in advance of the collecting the MMER LC50 bioassay samples.

Ten (10) days prior to discharge (July)

If pH is between 6.0 and 9.5, the results from the bioassay pass, and effluent quality at in Pond 2 does not exceed the limits listed in Table 3 additional steps to commencing discharge are to be undertaken.

- o Provide notice to the AANDC Inspector at least ten (10) days prior to initiating discharge from the TCA including an estimated volume proposed for discharge and the receiving location, and copy the Environment Canada Enforcement Officer.
- o Commence daily pH measurements with the portable pH meter in Pond 2 near the siphon intake to verify pH stability.
- o As weather allows continue to profile Pond 2 at various locations to verify homogeneity.
- o Continue water treatment to maintain a consistent pH throughout Pond 2 (ideally between pH 6.5 and 9).

5.2.2 Discharge

The following procedures must be followed during discharge from the Tailings Containment Area (TCA):

1. The discharge from the TCA at Monitoring Station LUP-10 shall commence no sooner than 15 July of any calendar year unless otherwise approved by the Board in writing.
2. Measure pH in Pond 2 near the siphon intakes. If pH is between 6.0 and 9.5, the results from the Rainbow Trout and *Daphnia* bioassay tests pass, and effluent quality at LUP-10 does not exceed the criteria provided in Table 3 below, start the siphons.
3. The discharge rate from the TCA shall not exceed 70,000 cubic metres per day, unless otherwise approved by the Board in writing.
4. Record the following information for the Discharge Siphon Log:
 - a. Date and time that the siphons were started,
 - b. pH reading from the portable meter,
 - c. Flow volume from each siphon, and
 - d. General condition of the discharge point.
5. Enter all information in the Discharge Siphon Log spreadsheet.
6. Collect daily, weekly, and monthly samples at LUP-10, 20, 21, 22, 24 and 25 including quality control samples (field duplicates, trip blanks) as outlined in the sampling event schedule (Table 2.2) of the *Water Quality Plan and Quality Assurance/ Quality Control Plan*. Follow the sampling procedures outline in that Monitoring Plan (Appendix A).
7. Prepare samples for shipment to the lab on weekly flight following the procedures outlined in the Monitoring Plan. Each shipment must include at least one duplicate sample and one trip blank.
8. Continue water treatment to maintain a consistent pH throughout Pond 2 (ideally between pH 6.5 and 9).
9. If field pH measurement is <6.0 or >9.5 at LUP-10, IMMEDIATELY shut down the siphons, employ the Spill Contingency Plan, and notify the following:
 - a. Environment Canada MMER enforcement officer at 867-669-4794 or 867-446-0924,
 - b. AANDC inspector at 867-975-4548, and
 - c. 24 Hour Spill Report Line at (867)920-8130.

10. Upon receipt of analytical results for LUP-10 from the lab, compare analytical results to the effluent quality criteria outlined in the Table 3 below. If results exceed the effluent quality limits IMMEDIATELY shut down the siphons, employ the Spill Contingency Plan, and notify the following:

- c. Environment Canada MMER enforcement officer at 867-669-4794 or 867-446-0924,
- a. AANDC inspector at 867-975-4548, and
- d. 24 Hour Spill Report Line at (867)920-8130.

Table 3: Monitoring station LUP-10 effluent quality criteria.

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of any Grab sample (mg/L)	
Total Arsenic	0.50	1.00	
Total Copper	0.15	0.30	
Total Cyanide	0.80	1.60	
Total Lead	0.10	0.20	
Total Nickel	0.20	0.40	
Total Zinc	0.40	0.80	
Total Suspended Solids	15	30	
Oil and Grease	Visual Sheen		
pH	6.0 to 9.5		
Parameter	Max Mean Concentration	Max Concentration in a Composite Sample	Max Concentration in a Grab Sample
Radium	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L



Legend



Project Location

Coordinate System: NAD_1983_UTM_Zone_12N

Map Sources/Notes:
Various Canadian Government Websites - Feb 2012



1:15,000,000

Approved By: SH Prepared By: PW
Project No.: LUP Date Revised: 21 Mar 2012
File Name: Lup-12-10-01-LocationMap-A.mxd

Project:

Lupin Project

Location: Kitikmeot Region, Nunavut, Canada

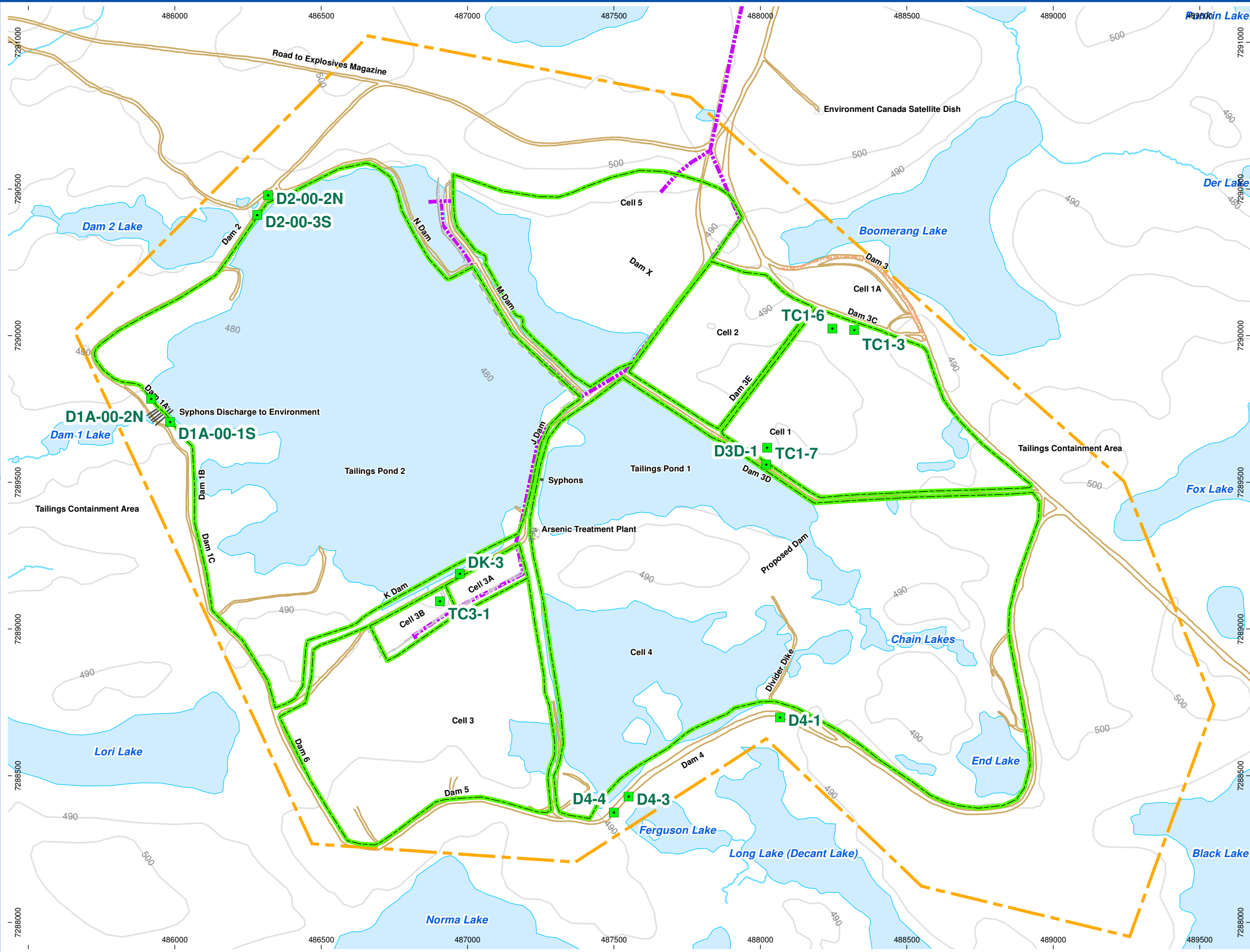
Lupin Mine Annual Report - Water Licence 2AM-LUP0914

Location Map - Lupin Mine

**Lupin Mines
Incorporated**

ELGIN
MINING INC.

Figure: **1**
Rev: 120321



Legend

Building

Lake

Stream

Road

Contour (10m)

Tails Line Route

Fuel Pipe

Boundary of Surface Lease 3594

Cell Areas

Location of Thermistor

W

N

E

S

Map Sources/Notes:
Topographic features and site layout from Satellite image dated Aug 21, 2012

Coordinate System: NAD_1983_UTM_Zone_12N

0

50

100

200

300

400

500

Meters

1:12,500

Approved By: JCB

Prepared By: PW

Project No.: LUP

Date Revised: 15 Apr 2013

File Name: Lup-13-08-02-TailingsArea-B.mxd

Project:

Lupin Gold Mine

Location:

Kitikmeot Region, Nunavut, Canada

Mine Tailings Containment Area

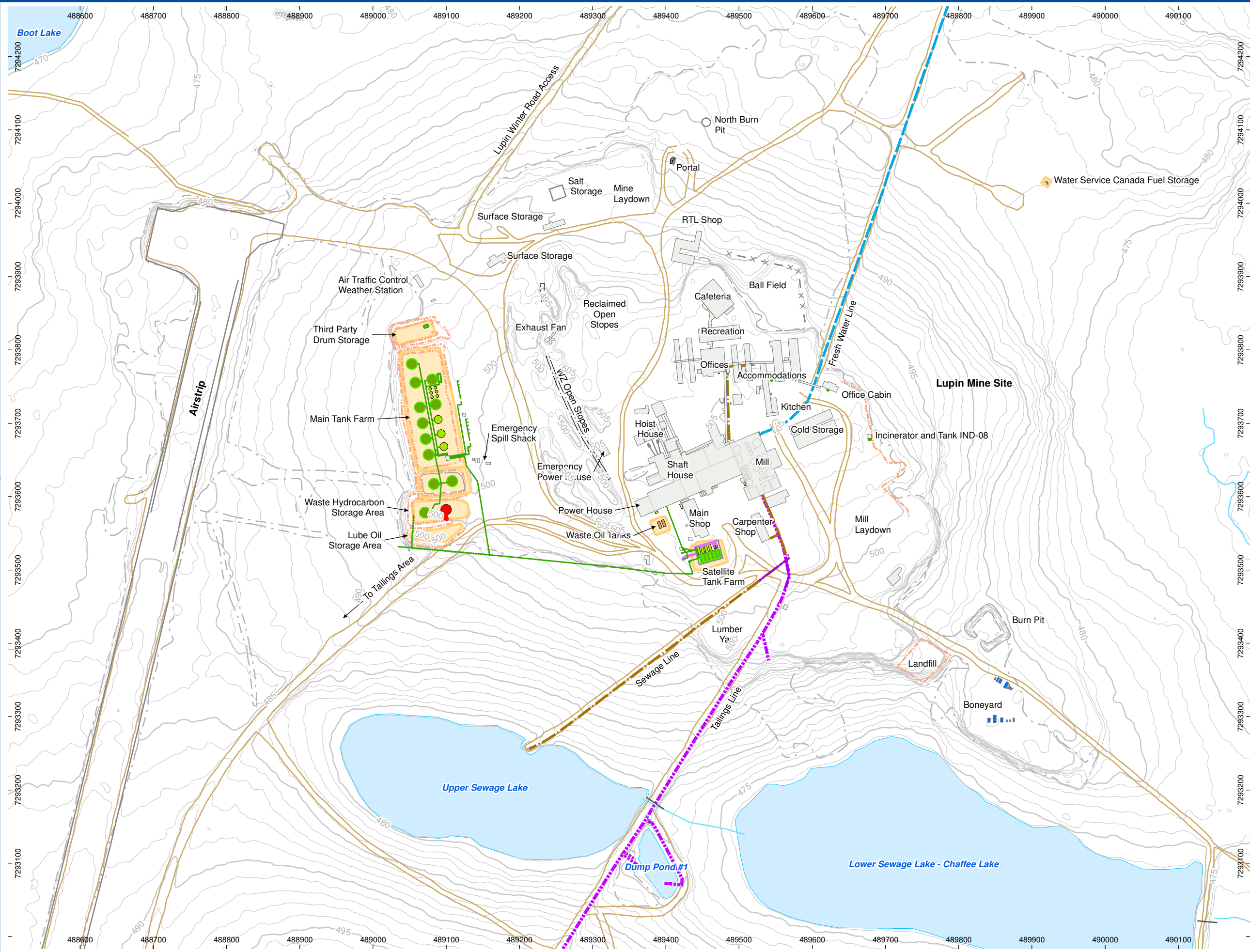
Lupin Mines Incorporated

ELGIN

MINING INC.

Figure: 2

Rev: 130415



Legend

Building

Tank Farm Berm Outline

Lake

Edge of Disturbed Area

Stream

Road

Topographic Contour (5m)

Topographic Contour (1m)

Sewage Pipeline (6 in Diam)

Tailings Line Route

Water Pipeline (8 in Diam)

Pipe - Fuel Type, Status

Diesel, Active

Diesel, Abandoned

Diesel, Uncertain

Gasoline, Active

Jet A, Active

Location of Tank - FuelTypeDiesel P-40Diesel P-50DieselWaterJet-AGasGlycolWaste OilEmptyUnknown

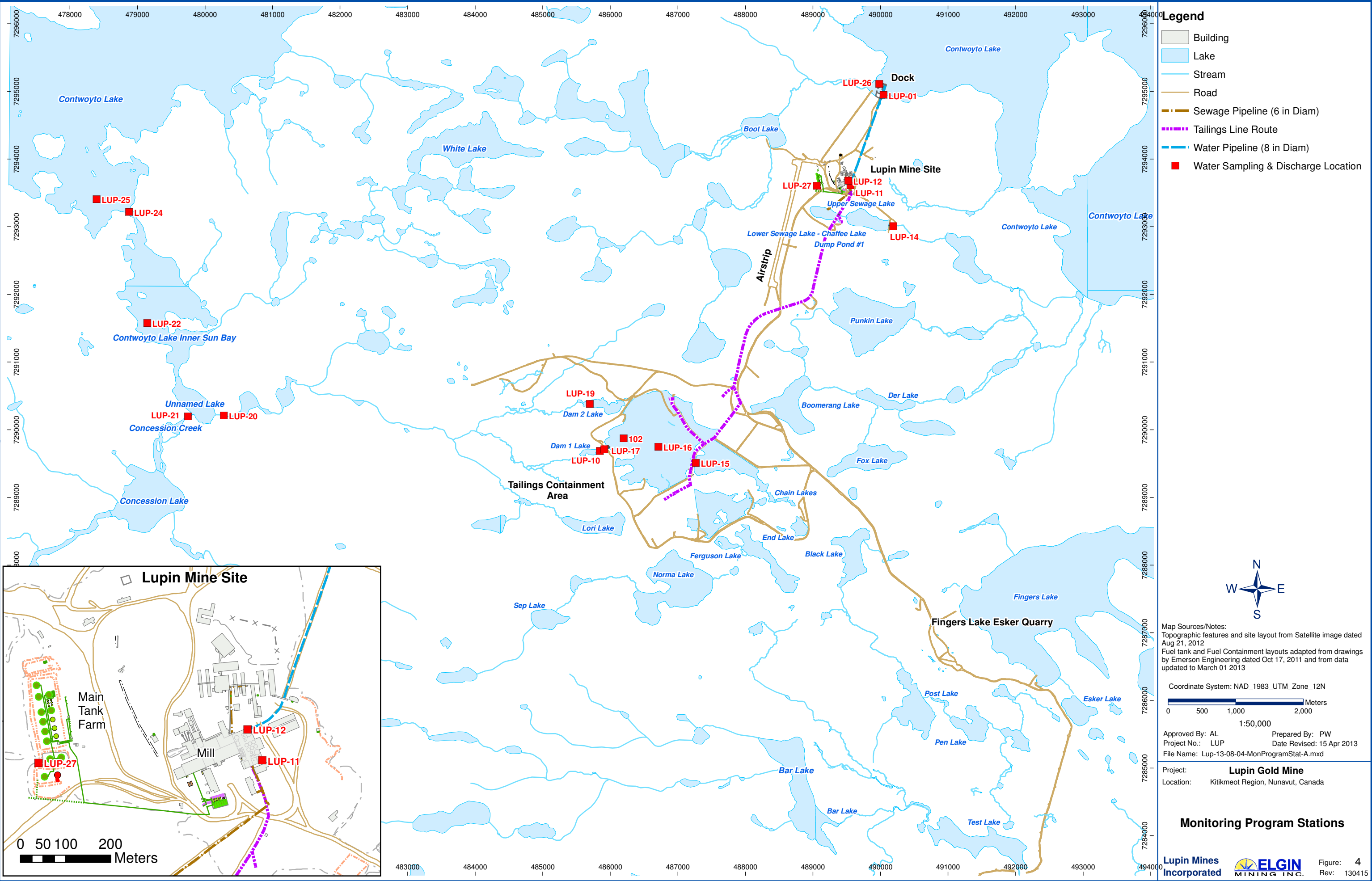
Map Sources/Notes:
Topographic features and site layout from Satellite image dated Aug 21, 2012
Fuel tank and Fuel Containment layouts adapted from drawings by Emerson Engineering dated Oct 17, 2011 and from data updated to March 01 2013

Coordinate System: NAD_1983_UTM_Zone_12N
0 25 50 100 150 200 Meters
1:5,000

Approved By: JCB Prepared By: PW
Project No.: LUP Date Revised: 01 Apr 2013
File Name: Lup-13-04-01-SiteFacilities-B.mxd

Project: **Lupin Gold Mine**
Location: Kitikmeot Region, Nunavut, Canada
Fuel Containment Management Strategy

General Site Map - Lupin Mine



Appendix A: Water Quality Monitoring Plan and Quality Assurance/ Quality Control Plan

Lupin Mines Incorporated

A wholly owned indirect subsidiary of Elgin Mining Inc.

Lupin Mine Site

Nunavut, Canada

Water Quality Monitoring Plan and Quality Assurance/ Quality Control Plan

(Care and Maintenance)

March 2013

Lupin Mines Incorporated
Elgin Mining Inc.
#201 - 750 West Pender Street
Vancouver, BC, V6C 2T7

Document Control

Revision No.	Date	Details	Author	Approver
1.0	30/03/13	Replaces Care and Maintenance Plan – <i>Sampling Procedure: Tailings Containment Area and Sewage Lakes Disposal Facility</i> , March 2012. Replaces the <i>Environmental Laboratory Quality Assurance / Control Plan</i> , Prepared: March 1993, Revised: December 1995. Update contact and general information. Revised to include bioassay sample requirements.	D. Vokey	W. Osborne

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Appendix A: Chain of Custody

Appendix B: Scope of Accreditations

1 Introduction

Lupin Mines Incorporated (LMI), an indirect wholly owned subsidiary of Elgin Mining Inc. (Elgin), has prepared this Water Quality Monitoring Plan and Quality Assurance / Quality Control Plan (the Plan).

An annual review of the Plan takes place and revisions are submitted as necessary with the annual report. The current Type A Water Licence 2AM-LUP0914 (Water Licence) for the Lupin Gold Mine (Lupin or the Lupin Mine or the Site) is valid until March 31, 2014 and has been kept in good standing.

1.1 Project and Company Information

Elgin is a Canadian based company focused on the production at the Björkdal Gold Mine located in Sweden, and the exploration and development of the Lupin Gold Mine and Ulu Gold Project, both located in Nunavut, Canada.

Elgin purchased LMI, which owns the Lupin Mine, from MMG Resources Ltd. in July 2011. Lupin was in operation from 1982 to 2005 with temporary suspensions of activities between January 1998 and April 2000, and again between August 2003 and March 2004. The mine resumed production in March 2004 until February 2005. Since 2005, the Site has remained in Care and Maintenance.

General site maintenance and facilities upgrades are underway at the Lupin Mine in preparation for an underground exploration program. The activities underway were screened by the Nunavut Impact Review Board under file 99WR053 and approved by the Nunavut Water Board under Water Licence 2AM-LUP0914. Surface exploration is conducted under Water Licence 2BE-LEP1217. All camp infrastructure required for the surface exploration program currently exists at the Lupin Mine.

Company:	LMI
Project:	Lupin Mine, Nunavut
Company Address:	201 – 750 W Pender St, Vancouver, BC, V6C 2T7
Telephone:	604-682-3366
Email:	wosborne@elginmining.com
Attention:	Wayne Osborne, Project Manager

Effective date: 30 March 2013

Distribution List:	
Patrick Downey	Chief Executive Officer
Jim Currie	Chief Operations Officer
Peter Tam	Chief Financial Officer
Wayne Osborne	Project Manager
Michele Jones	Manager, Corporate Affairs
David Vokey	Sr. Environmental Coordinator
Karyn Lewis	General Administration

Additional copies of this Plan are available from General Administration. The Plan is available at the LMI Environment Department office and a notice is posted in key locations at the site indicating where they can be found. All employees and contractors will be made aware of its contents.

1.2 Site Location

The Lupin Mine is located in Kitikmeot Region, Nunavut, 400 km north of Yellowknife, Northwest Territories and 285 km southeast of Kugluktuk. The airport serving this Site is at 65° 46'00" N and 111° 14'41" W. The Site is on the western shore of Contwoyto Lake, approximately 60 km south of the Arctic Circle (Figure 1).

1.3 Environmental and Sustainable Development Policy

Elgin Mining Inc. and its subsidiaries (collectively, "Elgin Mining") are committed to maintaining a safe, clean, compliant and respectful work environment. Elgin Mining looks to our employees, contractors and managers to adopt and grow a culture of social responsibility and environmental excellence. Together we achieve this by:

- Promoting environmental stewardship in all tasks. Nothing is too important that it cannot be done in a clean and responsible manner. We strive towards maintaining a zero-incident work place.
- Recognizing that we have a shared responsibility as stewards of the environment in which we operate. We will not walk away from a non-compliant act.
- Identifying, managing and mitigating environmental, business and social risks in an open, honest and transparent manner.
- Planning our work so it is done in the cleanest possible manner and executing work according to plan.
- Continually improving environmental and operational performance by setting and reviewing achievable targets.
- Providing appropriate and necessary resources in the form of training, personnel and capital, including that required for closure planning and reclamation.
- Managing our materials and waste streams, maintaining a high degree of emergency response preparedness and minimizing our operational footprint to maintain environmental protection at all stages of project development.
- Procuring goods and services locally, where available, and favouring suppliers with environmentally and socially responsible business practices.
- Seeking to understand, learn from and mitigate the root causes of environmental incidents and near misses when they do occur.
- Employing systems and technology to achieve compliance, increase efficiency and promote industry best practices in development, operations and environmental stewardship.
- Working with stakeholders to identify and pursue opportunities for sustainable social and economic development and capacity building.

- Conducting early and ongoing stakeholder engagement relevant to the stage of project and mine development and operation.
- Recognizing diversity in the workplace and building meaningful relationships with all stakeholders in a timely, collaborative and transparent manner.

Through implementation of this policy, Elgin Mining seeks to earn the public's trust and be recognized as a respectful and conscientious employer, neighbor and environmental steward.

Approved by the Board of Directors on August 10th, 2012

1.4 Purpose and Scope

This Plan is an appendix to the Care and Maintenance Plan. The purpose of this Plan is to identify water quality monitoring requirements for the Site and minimize the impacts of potential sampling and analytical errors by providing a set of standardized procedures for sampling, analysis and reporting. These procedures are to be implemented by any personnel involved in monitoring for the purpose of regulatory compliance or internal environmental management.

The Plan documents Quality Assurance (QA) and Quality Control (QC) procedures for the Lupin Mine Monitoring Program as required by Type A Water Licence 2AM-LUP0914 Part J, Items 5, 6 and 7. The Plan also documents QA/QC procedures for the Lupin Mine Monitoring Program as required by the *Metal Mine Effluent Regulations* (MMER) under the *Fisheries Act* Part 2 Division 1 Item 11 and Part 2 Division 2 Items 12(2), 14(1), 17(1), and 19(3).

QA/QC planning has been developed in accordance with the Indian and Northern Affairs Canada (INAC), *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class 'A' Licensees in meeting SNP Requirements and for Submission of a QA/QC Plan*, July 1996 which defines QA and QC as follows:

Quality Assurance: is the system of activities designed to better ensure that quality control is one effectively.

Quality Control: is the use of established procedures to achieve standards of measurement for the three principal components of quality: precision, accuracy and reliability.

Overall this Plan outlines field sample collection procedures including sampling requirements and methods; field sample identification, preservation and transport procedures; field sampling quality control measures; analytical laboratory information; and reporting requirements.

2 Field Sampling

2.1 Sample Collection

2.1.1 Sampling Station Locations, Requirements and Parameters

Sampling station locations, requirements, and parameter analyses are set out in the Type A Water Licence 2AM-LUP0914 Table 1 of Schedule J and in the MMER Part 2 Division 2 Items 12 thru 18 and Schedules 4 and 5.

Generally, samples are required from the following locations:

- Freshwater intake at Contwoyto Lake,
- Tailings Containment Area (TCA):
 - o TCA prior to discharge;
 - o TCA during discharge;
 - o Reference areas; and
 - o Downstream exposure areas,
- Sewage Lakes Disposal Facility, and
- Bulk Fuel Storage Facility.

The monitoring requirements outlined in the Water Licence and MMER effluent monitoring requirements are outlined in Table 1. Water sampling under the Environmental Effects Monitoring Program of the MMER will accompany any planned discharges from the TCA.

A sample event schedule is also provided in Table 2 which outlines the Water Licence and MMER effluent monitoring requirements as well as field monitoring and QC sample requirements (see Section 3 of this Plan for more details about QC monitoring). This table is intended to serve as a guide to on-site personnel with sampling responsibilities.

Regulatory authorities are to be notified of planned discharge events. Table 3 provides the notification schedule.

Table 1: Sample collection requirements

Station	Description	Samples											Frequency	
		Routine ⁽¹⁾	Total Metals ⁽²⁾	Nutrient ⁽³⁾	Hg	CN	²²⁶ Ra ⁽⁶⁾	BOD ₅ ⁽⁷⁾	Faecal Coliform	Bio-assay ⁽⁸⁾	BTEX ⁽⁹⁾	OG ⁽¹⁰⁾		
LUP-01	Freshwater intake from Contwoyto Lake	pH, Conductivity, TSS	X		X				X				Annually	
LUP-10	TCA Pond 2 discharge at Dam 1A	pH, TSS	X			X							Daily during periods of discharge	
		Daily	Daily	NH ₄			X						Weekly during periods of discharge	
		Daily, hardness, Alkalinity, NO ₂ , NO ₃	Daily	Weekly		X				X			Monthly (no less than one month intervals) beginning at start of decant	
LUP-10/ 102 ⁽¹¹⁾	Internal station in TCA Pond 2 approximately 100 m upstream from siphon intake.	X	X	X	X	X	X			Static pass/fail test			Twice per year, prior to initiation of decant and just prior to termination of decant	
LUP-11	Minewater discharge at automatic sampler in the mill													
LUP-12	Mill tailings taken at the mill													
LUP-14	Decant structure from the Sewage Lakes Disposal Facilities	pH, TSS, Alkalinity, Hardness, NO ₂ , NO ₃	X	NH ₄ , TKN, TP, OPO ₄				X	X				First day of discharge and then monthly thereafter during periods of flow	
LUP-15	Discharge from TCA Pond 1 (east pond) into TCA Pond 2 (west pond)													
LUP-16	TCA Pond 2 at center													
LUP-17	TCA Pond 2 upstream of station LUP-10													
LUP-19	East end of Seep Creek in Dam 2 Lake													
LUP-20	West end of Seep Creek before discharge into Unnamed Lake	pH, TSS, Alkalinity, hardness	X	NH ₄		X							Weekly during discharge from the TCA	

Station	Description	Samples											Frequency
		Routine ⁽¹⁾	Total Metals ⁽²⁾	Nutrient ⁽³⁾	Hg	CN	²²⁶ Ra ⁽⁶⁾	BOD ₅ ⁽⁷⁾	Faecal Coliform	Bio-assay ⁽⁸⁾	BTEX ⁽⁹⁾	OG ⁽¹⁰⁾	
LUP-21	North end of Concession Creek before discharge into Unnamed Lake ⁽¹²⁾	pH, TSS, Alkalinity, hardness	X	NH ₄		X							Weekly during discharge from the TCA
		Weekly, NO ₃	X	Weekly		X	X						Monthly at mid-depth and when bioassay sample is collected at LUP-10 just prior to termination of decant
LUP-22	Inner Sun Bay near centre midway between end of peninsula and west shore	pH, TSS, Alkalinity, hardness	X	NH ₄		X							Weekly at mid-depth, commencing one week prior to discharge from the TCA and concluding two weeks after cessation of discharge
LUP-24	Inner Sun Bay near narrows ⁽¹²⁾	pH, TSS, Alkalinity, hardness	X	NH ₄		X							Weekly at mid-depth, commencing one week prior to discharge from the TCA and concluding two weeks after cessation of discharge and when bioassay sample is collected at LUP-10 just prior to termination of decant
		Weekly, NO ₃	X	Weekly		X	X						Monthly at mid-depth
LUP-25	Outer Sun Bay	pH, TSS, Alkalinity, hardness	X	NH ₄		X							Weekly at mid-depth commencing one week prior to discharge from the TCA and concluding two weeks after cessation of discharge
LUP-26	Contwoyto Lake in bay east of water intake	INACTIVE											
LUP-27	Bulk Fuel Storage Facility	pH, TSS, Alkalinity, hardness, NO ₂ , NO ₃	X	NH ₄							X	X	Once prior to discharge and weekly during periods of discharge

Notes:

- (1) Routine sampling may include analyses for pH, temperature, Total Suspended Solids, alkalinity, hardness, Nitrite (NO₂), Nitrate (NO₃);
(2) Total metals refers to a whole suite of metals unless otherwise specified;
(3) Nutrient means Ammonium (NH₄), Total Kjeldahl Nitrogen (TKN), Total Phosphorus (TP), and Orthophosphate (OPO₄);
(7) BOD₅ means five (5) day Biological Oxygen Demand;

- (8) Bioassay means static pass/fail bioassay for both rainbow trout and *Daphnia* species under the Water Licence and acute lethality testing and *Daphnia magna* monitoring tests under the MMER;
(9) BTEX means Benzene, Toluene, Ethylbenzene and Xylene
(10) OG means Oil and Grease;
(11) Water licence erroneously refers to this station as LUP-10; and
(12) Field temperature and dissolved oxygen are also required.

Table 2: Sampling event schedule.

Sampling Events	Station	Samples and Parameters	Quality Control ⁽¹⁾
TAILINGS CONTAINMENT FACILITY			
One month prior to discharge	Station 102	Field pH, temperature, conductivity	1 field duplicate
		pH, TSS, alkalinity, hardness, NO ₂ , NO ₃	
		Total Metals	
		CN (total cyanide)	
		NH ₄	
		Total Hg	
		²²⁶ Ra	
Daily during water treatment prior to discharge	Station 102	Field pH, temperature and conductivity	
Upon receipt of results meeting discharge criteria and not less than one week prior to discharge	Station 102	Static pass/ fail Bioassay	
One week prior to discharge	Station 102	Field pH, temperature, and conductivity (Daily)	1 field duplicate
		Field observation of visual sheen	
	LUP-22, 24, 25 (at mid-depth)	pH, TSS, alkalinity, hardness	
		Total Metals	
		NH ₄	
		CN	
Daily during discharge	LUP-10	Field pH, temperature, and conductivity	1 field duplicate per week
		Field observation of visual sheen	
		flow rate m ³	
		pH and TSS	
		CN	
		Total Metals (As, Cu, Zn)	
First day of discharge ⁽²⁾ (in addition to daily sampling)	LUP-10	Alkalinity, Hardness, NO ₂ , NO ₃	1 field duplicate
		NH ₄	
		Total Metals	
		Total Hg	
		MMER Bioassay LC50	
		²²⁶ Ra	
		Field dissolved oxygen	
	LUP-20, 21 (surface), LUP-22, 24, 25 (at mid-depth)	pH, TSS, alkalinity, hardness	
		Total Metals	
		NH ₄	
		CN	
	LUP-21 (surface), LUP-24 (at mid-depth)	NO ₃	
		Total Hg	
		²²⁶ Ra	
		Field pH, temperature, conductivity, dissolved oxygen	

Sampling Events	Station	Samples and Parameters	Quality Control ⁽¹⁾
Weekly during discharge (in addition to daily sampling)	LUP-10	Alkalinity, hardness, NO ₂ , NO ₃	1 field duplicate
		NH ₄	
		Total Metals (Pb, Ni, Cd)	
	LUP-20, 21 (surface), LUP-22, 24, 25 (at mid- depth)	pH, TSS, alkalinity, hardness	
		Total Metals	
		NH ₄	
		CN	
	Monthly during discharge (in addition to daily and weekly sampling)	LUP-10	
MMER Bioassay LC50			
Total Hg			
²²⁶ Ra			
Field dissolved oxygen			
LUP-21 (surface), LUP-24 (at mid- depth)		NO ₃	
		Total Hg	
		²²⁶ Ra	
		Field pH, temperature, conductivity, dissolved oxygen	
Last day of discharge (in addition to daily sampling)		LUP-10	Static Pass/ Fail Bioassay
Weekly for two weeks following termination of discharge	LUP-22, 24, 25 (at mid- depth)	pH, TSS, alkalinity, hardness	1 field duplicate
		Total Metals	
		NH ₄	
		CN	
SEWAGE LAKES DISPOSAL FACILITY			
Three weeks prior to discharge	LUP-14	Field pH, temperature, conductivity	1 field duplicate
		Field observation for visual sheen	
		pH, TSS, alkalinity, hardness, NO ₂ , NO ₃	
		Total Metals (As, Cd, Cu, Ni, Pb, Zn)	
		Nutrient for NH ₄ , TKN, TP, OPO ₄	
		BOD ₅	
		Faecal Coliforms	
Daily during discharge	LUP-14	Field flow rate in m ³	
		Field pH, temperature, conductivity	
		Field observation for visual sheen	
First day of discharge ⁽²⁾ and Monthly thereafter (in addition to daily sampling)	LUP-14	pH, TSS, alkalinity, hardness, NO ₂ , NO ₃	1 field duplicate
		Total Metals	
		BOD ₅	
		Faecal Coliforms	
		Nutrient for NH ₄ , TKN, TP, OPO ₄	

Sampling Events	Station	Samples and Parameters	Quality Control ⁽¹⁾
FRESHWATER INTAKE FACILITY			
Daily during intake	LUP-01	Field flow rate in m ³	1 field duplicate
Annually		Field pH, temperature, conductivity,	
		pH, TSS	
		Total Metals (As, Cd, Cu, Ni, Pb, Zn)	
		Total Hg	
		Faecal Coliforms	
BULK FUEL STORAGE FACILITY			
One week prior to discharge (RUSH 48 hour turnaround for sample results are to be requested of the laboratory)	LUP-27	Field pH, temperature, conductivity	1 field duplicate
		Field observation for visual sheen	
		pH, TSS	
		Total Lead	
		Total Oil and Grease	
		BTEX	
		Nutrient for NH ₄	
Daily during discharge		Field flow rate in m ³	
		Field pH, temperature, conductivity	
		Field observation for visual sheen	
Weekly during discharge (in addition to daily testing)		Field pH, TSS	1 field duplicate
		Total Lead	
		Oil and Grease	
		BTEX	
	Nutrient for NH ₄		

Notes:

- (1) Duplicate samples must be collected for approximately every ten (10) field samples collected across the range of parameters. At least one duplicate must be submitted per sample shipment.
- (2) Samples are collected on the morning of the next plane departure after discharge commences.

Table 3: Discharge notification schedule.

Discharge Event	Schedule	Action Required
TAILINGS CONTAINMENT AREA	30 days prior to MMER Bioassay	Provide notice to Environment Canada of planned sample date.
	10 days prior to discharge	Provide notice to the AANDC inspector, include analytical results and estimated volume of discharge.
LOWER SEWAGE LAKE	10 days prior to discharge	Provide notice to the AANDC inspector, include analytical results and estimated volume of discharge.
BULK FUEL STORAGE FACILITY	10 days prior to discharge	Provide notice to the AANDC inspector and estimated volume of discharge ⁽¹⁾ . Analytical results will be provided upon receipt and no discharge to occur prior to AANDC acknowledgment of receipt.

Note:

- (1) Discharge from the bulk fuel storage facilities needs to commence as soon as possible when water starts accumulating in the spring.

Active monitoring (sampling) station locations as shown in Figure 2.1 are clearly identified in the field with permanent stakes and appropriate signage.

Samples must always be collected from the same locations, unless the sampling locations are relocated at the request of the designated AANDC Inspector or sampling location modifications are approved in writing by the Nunavut Water Board.

The following Table 4 summarizes the current UTM coordinates of the active sampling locations:

Table 4: Water quality monitoring program station locations.

Monitoring Station No.	Description	UTM Northing	UTM Easting
LUP-01	Freshwater intake from Contwoyto Lake	7294933	490030
LUP-10	TCA Pond 2 discharge at Dam 1A	7289689	485843
LUP-14	Decant structure from the Sewage Lakes Disposal Facilities	7293013	490187
LUP-20	West end of Seep Creek before discharge into Unnamed Lake	7290197	480149
LUP-21	North end of Concession Creek before discharge into Unnamed Lake	7290217	479841
LUP-22	Inner Sun Bay near centre midway between end of peninsula and west shore	7291749	479175
LUP-24	Inner Sun Bay near narrows	7293121	479017
LUP-25	Outer Sun Bay	7293765	478352
LUP-27	Bulk Fuel Storage Facility	7293609	489072
Station 102	Approximately 100 m upstream from the siphon intake in TCA Pond 2	7289875	486196

2.1.2 Field Measurements and Field Log Book

Where required by the monitoring program, pH, temperature and, conductivity and dissolved oxygen of water is measured and recorded in the field directly from the water body being sampled wherever possible. Where it is not possible to take field measurements directly from the water body, the measurements can be taken from the sample bottle.

The pH and conductivity meters must be calibrated in advance of each day's sampling activities according to the manufactures instructions, using fresh standard calibration solutions. Any discrepancies must be recorded in the Field Log Book along with the sampling data; however recorded field measurements must not be altered due to calibration issues. Refer to the pH and conductivity meter manuals for instructions regarding how to calibrate and take measurements with the particular devices.

Details of all sampling activities are recorded in the Field Log Book including:

- Date and time of each sample collected,
- Sampling location visited,
- Weather conditions and air temperature,
- Flow rates where applicable,
- Integrity of sample location and water observations,

- Samples collected at each location including identification number (see Section 2.2), whether the sample will be submitted for analysis, and type of analysis as well and sample preservation measures,
- Sample depth where applicable, and
- Field measurements (i.e. pH, conductivity, temperature, dissolved oxygen) as well as any calibration discrepancies with the field meters.

Immediately following field activities, an electronic copy of the Field Log data must be made. Field log entries in the Field Log Book must not be altered; pages must not be removed; space or pages left blank must be labeled as such and crossed with a diagonal line; and errors must be crossed out, not erased.

2.1.3 Sample Containers

Sample container sizes and materials of construction depend upon the parameter(s) of the sample to be analyzed. A summary of sample container requirements for various parameters is provided in Table 2.5 (Section 2.3 of this Plan).

All water quality sample containers will be prepared and supplied by the contracted laboratory. Only clean, unused containers should be used to limit contamination and preservation errors. Samples analyzed for faecal coliform tests must be contained in bottles provided by the laboratory to ensure that the bottle is sterilized prior to use. Toxicity samples are to be collected in food grade containers, such as water jugs or buckets. The food grade containers must be thoroughly cleaned and rinsed and then triple rinsed with the sample water prior to being filled.

2.1.4 Sampling Methods

Water quality sampling methods are as follows:

- Record details of the sampling activity and field measurements in the Field Log Book (see Section 2.1.2 for details).
- In the field, disposable nitrile sampling gloves must be worn during handling of all the bottles and equipment.
- Triple rinse sample bottles with the source water prior to sample collection, except for those bottles with preservative already added by the laboratory (i.e. BTEX), as well as those bottles for Oil and Grease or Faecal Coliform analysis.
- Collect samples off-shore as much as possible without disturbing bottom sediments.
- When collecting samples from flowing bodies of waters (i.e. stream, creeks):
 - The sample must be collected as close as possible to the middle of the flowing water body. To prevent the stirring up of sediment, use a container attached to a pole extension. Otherwise, if wading into the stream is unavoidable, wait for the sediment to settle or flow away before collecting the sample.
 - When rinsing, plunge the sample bottle into the flowing water toward the current allowing it to fill at a depth of approximately half the stream depth. If the stream depth is too shallow to collect a clean sample without disturbing sediment or too shallow to fill the bottle completely, use a smaller bottle and transfer the water to the larger sample bottle.

- Empty rinse water downstream of the sample locations so as not to disturb sediments.
- When collecting samples from surface water bodies (ponds, lakes) follow the same procedures as above for flowing bodies of water, ensuring that subsequent samples are collected at the same location, and by plunging the sample bottle into the water to a depth of about six (6) inches below the water surface.
- Sample bottles must be filled with room left for preservative addition and mixing. Add preservatives after filling as directed by the laboratory (unless the bottle was provided pre-loaded with preservatives by the laboratory).
- Record field measurements (pH, temperature, conductivity, dissolved oxygen) and any deviations from the sample collection method in the Field Log Book.

2.2 Sample Identification

All water samples must be provided with a unique sample identification number based on the following example:

Example: LUP-22-130801-50

LUP-22	Refers to the monitoring station.
130801	Refers to the date that the sample was collected (yy/mm/dd). In this example the date the sample was collected was August 1, 2013.
50	Refers to the depth in centimeters from surface which the sample was collected. If the depth of the sample is not applicable do not include the suffix.

Sample labels including at a minimum: sample identification number, location, date, and parameters for analyses should be prepared as much as possible before entering the field for the sampling event with a waterproof, non-smear pen. Then, sample labels, bottles and preservatives should be packed, preferably in a cooler to maintain constant temperature, for transport to the field.

Sample bottle labels must be clearly and consistently labeled prior to being sent to the external laboratory with the following information:

- Company name,
- Site name,
- Sample Station Number,
- Sample Number,
- Sample Date and Time, and
- Analysis required.

Quality Control (QC) samples (i.e. field blanks, trip blanks, duplicates) are provided with unique sample identification numbers and note of the sample as a QC sample is recorded in the Field Log Book.

2.3 Sample Preservation

Water quality samples must be preserved, either by laboratory issued chemical preservative or temperature control, immediately following sample collection to ensure that the quality of the water sample remains similar to the source water. The following Table 2.5 summarizes the required containers, preservatives, holding times, and minimum sample volumes for each parameter as outlined in ALS Environmental's Western Canada Sampling/ Handling Guide, May 2012.

Table 5: Required sample containers, preservation, holding times, and sample volumes for analysis of specific parameters.

Parameter	Container Type	Preservative	Holding Time	Min. Sample Volume
pH ^(1,6)	0.5 – 1 L plastic	4° C	0.25 hours	50 mL
TSS ⁽¹⁾	0.5 – 1 L plastic	4° C	7 days	200 mL
Conductivity ^(1,6)	0.5 – 1 L plastic	4° C	28 days	50 mL
Total Metals and Hardness ^(2,5)	250 mL plastic	3 mL 1:3 Nitric Acid	6 months	200 mL
Mercury	250 mL plastic	3 mL 1:3 Nitric Acid	28 days	50 mL
Radium ²²⁶	1 L plastic	9 mL 1:3 Nitric Acid	6 months	1 L
Cyanide (Total, WAD or Free)	250 – 500 mL plastic	1 – 2 mL 6N Sodium Hydroxide	14 days	100 mL
Cyanide (Total or WAD (low level))	1 L plastic	3 mL 6N Sodium Hydroxide	14 days	750 mL
Alkalinity ⁽¹⁾	0.5 – 1 L plastic	4° C	14 days	150 mL
Total Ammonia Nitrogen	250 mL plastic/glass	1 mL 1:1 Sulphuric Acid	28 days	100 mL
Nitrate, Nitrite, Ammonia (unpreserved) ⁽¹⁾	0.5 – 1 L plastic	4° C	2 days	50 mL
Kjeldahl or Organic Nitrogen	250 mL plastic or glass	1 mL 1:1 Sulphuric Acid	28 days	200 mL
Total Nitrogen	250 mL plastic or glass	1 mL 1:1 Hydrochloric Acid	28 days	200 mL
Total Phosphorus	250 mL plastic	1 mL 1:1 Sulphuric Acid	28 days	100 mL
Ortho Phosphate ⁽¹⁾	0.5 – 1 L plastic	4° C	2 days	50 mL
BOD ₅ ⁽¹⁾	0.5 – 1 L plastic	4° C	2 days	500 mL
Faecal Coliforms	250 mL sterilized plastic	Sodium Thiosulphate	30 hours	250 mL
Oil and Grease	2 x 0.5-1 L amber glass	2 mL 1:1 HCL or 1:1 H ₂ SO ₄	28 days	1 L
BTEX ^(3,4)	2-3 x 40 mL glass vials	Sodium Bisulphate or Thiosulphate	14 days	40 mL
Daphnia Magna (pass/fail, LC50) ⁽⁷⁾	1-2 L glass or plastic	4° C	5 days	1 – 2 L
Rainbow Trout (pass/ fail, LC50) ⁽⁸⁾	1-2 20 L bladder	4° C	5 days	20 – 40 L

Notes:

- (1) Parameters may be analyzed from a single unpreserved bottle.
- (2) For dissolved parameters, samples must be field filtered before preservation.
- (3) 40 mL glass vials must be filled with no headspace. May contain preservative. Do not pre-rinse with sample. If sample is chlorinated use thiosulphate preservative.
- (4) All volatile organics in water (chlorinated aromatics, BTEX, volatile organics, THMs and halogenated aliphatics) can be analysed from the same set of vials. Consult ALS whether 2 or 3 vials are required.
- (5) If field filtering is not possible, or poses unacceptable risks for sample contamination, then send the samples unfiltered to and unpreserved to the laboratory as soon as possible.
- (6) Testing in the field is recommended.
- (7) For Daphnia Magna (LC50), require 2 L minimum volume. For Daphnia Magna (Pass/Fail), require 1 L minimum volume.
- (8) For Rainbow Trout (LC50), 2 x 20 L bladder and 40 L minimum volume required. For Rainbow Trout (Pass/Fail), 1 x 20 L bladder and 20 L minimum volume required.

2.4 Sample Transportation

Sample integrity will be preserved from the time of sample collection to completion of delivery to the laboratory by limiting exposure of samples to heat, light, and agitation.

Sample bottles will be packed standing upright and immobile in a new or laboratory issued portable cooler. Samples suspected of elevated contaminant levels, such as a sewage sample, will be shipped separately from clean samples. All samples will be stored and transported at 10°C to 1°C in the coolers with ice packs and the cooler will be securely closed prior to shipping. Samples will be shipped as soon as possible following sample collection with appropriate transportation instructions such as “refrigerate” and “do not freeze”.

2.5 Chain of Custody Forms

A Chain of Custody Form containing the following information is completed by the sampler for every cooler shipment of samples:

- Company name and contact information,
- Analytical laboratory name, address , and contact person,
- Invoicing instructions,
- Report format requested,
- Project information,
- Sampler’s name,
- Sample identification number, time and date of sampling, sample type, and analyses requested,
- Any special instructions, and
- Name of person releasing the shipment as well as date and time of release. Each person relinquishing and receiving the samples, including the courier, must sign the Chain of Custody form.

Each cooler shipped must have a Chain of Custody form indicating those samples contained in the particular cooler. Chain of Custody forms should be enclosed in a Ziploc bag to protect them from possible water damage during shipment.

One copy of the Chain of Custody form is included with the shipment and one copy must remain at the mine site for recording keeping. An example of the Chain of Custody Form is provided in Appendix A.

3 Field Quality Control

3.1 Trip or Travel Blanks

Travel blanks are supplied and shipped by the laboratory to test for possible contamination that might arise during the handling, transport, or storage of the samples. The identity of these samples must be recorded in the Field Log Book.

One travel blank must be submitted per sample shipment.

3.2 Duplicates or Replicates

Duplicate or replicate sampling is the collection of more than one sample for a given analysis at a given location to test the validity of sampling procedures and laboratory methodology. Duplicates are collected, handled, and analysed using the same procedures applied to routine samples. Duplicates are submitted to the laboratory with a unique (fictitious) identifier to prevent association of the paired samples. The identity of these samples must be recorded in the Field Log Book.

Duplicate samples must be collected for approximately every ten (10) field samples collected across the range of parameters. At least one duplicate must be submitted per sample shipment.

4 Laboratory Analyses

ALS Environmental laboratories (ALS) located in Edmonton, AB performs the required environmental analyses for the Lupin Mine, with the exception of MMER toxicity testing which is subcontracted by ALS to Nautilus Environmental in Burnaby, BC.

ALS is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) and conforms to the requirements of ISO/IEC Standard 17025. Attached in Appendix B is a copy of the ALS Edmonton laboratory scope of accreditation. The scope of accreditation of all ALS laboratories is available from their website at <http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Quality-Assurance>.

Nautilus Environmental is accredited by the CALA to conduct acute lethality and Daphnia magna monitoring tests and conforms to the requirements of ISO/IEC Standard 17025. Attached in Appendix B is a copy of the Nautilus Environmental Burnaby laboratory scope of accreditation.

The scope of accreditation of Nautilus Environmental laboratories is available from their website at <http://www.nautilusenvironmental.com/accreditation.aspx>.

Taiga's drinking water package covers the drinking water standards of the Department of Health and Social Services requirements for the sampling and testing of drinking water. Attached in Appendix B is a copy of the Taiga Environmental Laboratory accreditation for fecal coliform analysis.

All analyses are conducted in accordance with methods prescribed in the current edition of Standard Methods for the Examination of Water and Wastewater including regular QA/QC during the analysis of

field samples including a program of method blanks, laboratory control samples, instrument calibration samples, matrix spikes, and duplicates.

5 Reporting

All analytical results will be forwarded in electronic format from ALS to LMI for data collection and management. Upon receipt, LMI will review the results to identify any anomalies. Anomalous results will be either re-analyzed by the laboratory or new samples will be collected to confirm the analytical results.

Any analytical results that indicate exceedance of regulatory criteria will be reported to the appropriate agencies including the NWB and the AANDC inspector.

Part J Item 9 of the Lupin Mine Water Licence requires LMI to include in its Annual Report (due March 31st), all data, monitoring results and information required by Part J of the Water Licence. Under the MMER effluent monitoring reporting of all tests and monitoring conducted during each quarter is to be reported not later than 45 days after the end of a quarter. A report summarizing the previous calendar year is also required under the MMER to Environment Canada (due March 31st).

To facilitate the required annual reporting, LMI prepares written monthly reports supported by laboratory analyses results table summaries and quality assurance review. Each monthly report includes the following:

- A description of the sample activities undertaken,
- Description of the existing conditions at each sampling station,
- Tabular summary of analytical lab result including the results of the quality control samples (travel blank, field blank, duplicate samples), and
- Interpretation of the analytical lab results including comparison of the results with water licence criteria and assessment of the reliability of the results.

Within the annual report, the acceptability of samples will be evaluated qualitatively by examination of the trip blanks and field duplicate sample data. Reproducibility of samples will be expressed as relative percent difference (RPD):

$$RPD = 100 * ((X_1 - X_2) / (X_1 + X_2) / 2)$$

Where X_1 is the original sample concentration, X_2 is the duplicate sample concentration, and $X_1 - X_2$ denotes the absolute value of the difference between these two concentrations.



Legend

 Project Location

Coordinate System: NAD_1983_UTM_Zone_12N

Map Sources/Notes:
Various Canadian Government Websites - Feb 2012


0 60 120 240 360 480 600 Km

1:15,000,000

Approved By: SH Prepared By: PW
Project No.: LUP Date Revised: 21 Mar 2012
File Name: Lup-12-10-01-LocationMap-A.mxd

Project:

Lupin Project

Location: Kitikmeot Region, Nunavut, Canada

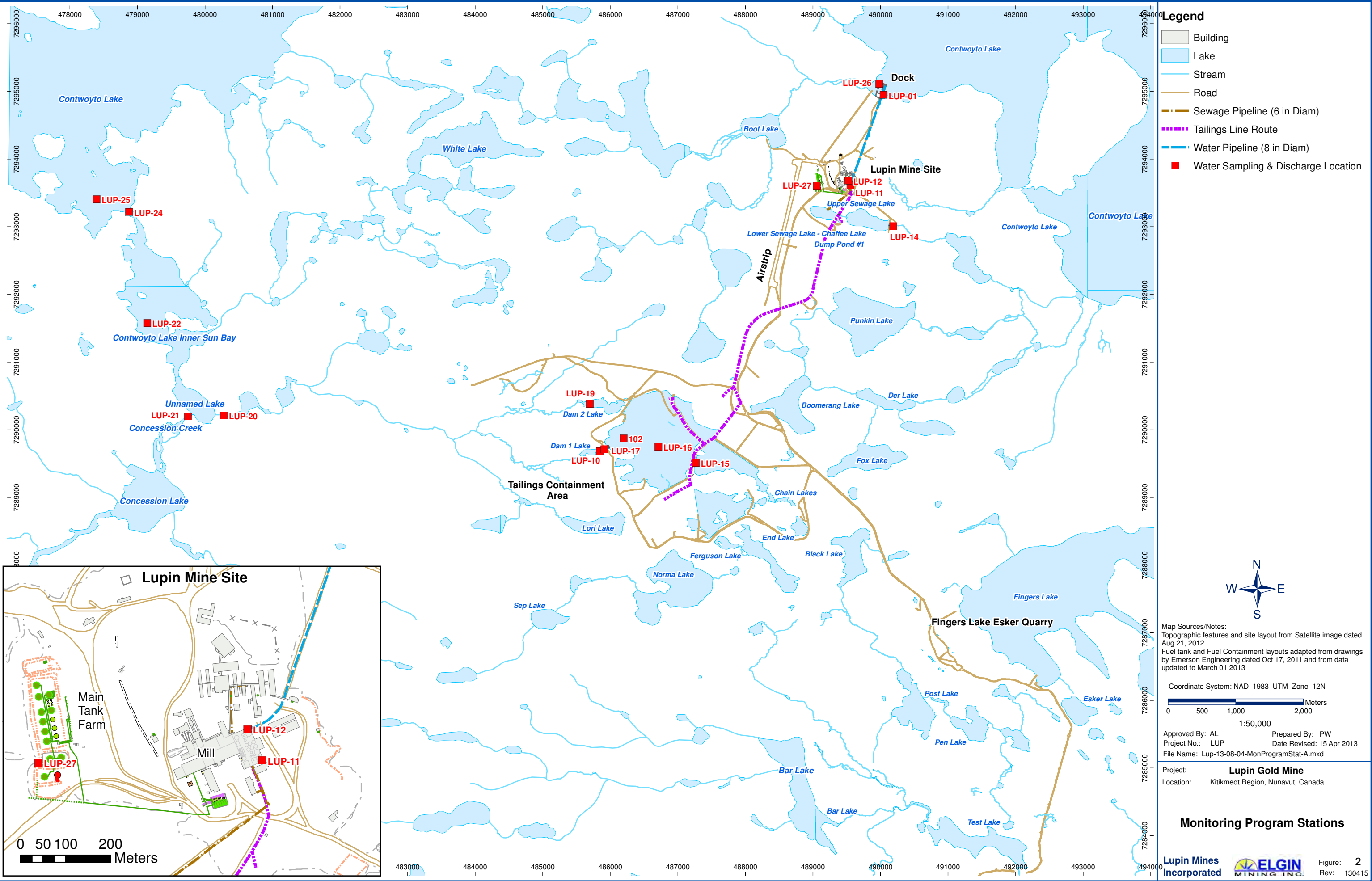
Lupin Mine Annual Report - Water Licence 2AM-LUP0914

Location Map - Lupin Mine

**Lupin Mines
Incorporated**

 **ELGIN
MINING INC.**

Figure: **1**
Rev: 120321



Appendices

Appendix A: Chain of Custody

Appendix B: Scope of Accreditations



ALS Quality Control Protocols

08 May, 2012

Quality control samples are introduced into batches of samples at critical points of sample handling, preparation and analysis to demonstrate the processes are performing as expected. In general, quality control samples are considered either Instrument QC or Method QC.

Instrument QC:

Instrument QC samples demonstrate control for the instrumental portion of a method. Instrument QC requirements must be successfully met before the analysis of Method QC or samples may proceed.

- o Verification of initial calibration - criteria varies with each test.
- o 2nd source Calibration Verification Standard (CVS) – at minimum, with each initial calibration.
- o Continuing Calibration Verification (CCV) – frequency varies by test.
- o Instrument Blanks – usage and frequency varies by test.

Method QC:

Method QC samples encompass the entire method and are initiated at the earliest point of the method where appropriate. Refer to the QC Definitions below. One set of Method QC is included for each batch of up to 20 client samples. Each set includes:

- o 1 Method Blank.
- o 1 Sample Duplicate. *
- o 1 Lab Control Sample.
- o 1 Reference Material or Matrix Spike. **
- o Surrogate Compounds.

* Duplicate analyses are not performed where sub-sampling is not possible – e.g. most tests for organics in water.

** Spikes and Reference Materials are unavailable for Microbiology tests.

Method QC must be successfully analyzed before sample results are approved. Method QC results are normally reported to ALS clients with data reports.

Data Quality Objectives (DQOs):

DQOs are established for each QC sample, based on a combination of reference method objectives, customer requirements and historical test method performance. Where applicable, prescriptive elements of reference methods take precedence over internal DQOs. Current DQOs are available upon request.

Detailed descriptions of how DQOs are evaluated for different types of Quality Control samples are described on the following pages.



Types of Quality Control – Definitions and Evaluation Protocols

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

Except in special cases (as outlined in ALS DQO summary documents) the ALS DQO for Method Blanks is for all results to lie below the Limit of Reporting (LOR).

Laboratory Sample Duplicate (DUP) - A second portion of sample taken from the same container as the sub-sample used for the primary analysis, that is analyzed independently through all steps of the laboratory's sampling and analytical procedures. Duplicate samples are used to assess variance of the total method including sampling and analysis.

Duplicate precision is normally measured as Relative Percent Difference (RPD), where $RPD = |(Result2 - Result1) / \text{Mean}| * 100$. Duplicate samples should normally agree to within the ALS Precision DQO for the test and parameter (expressed as RPD), or within $\pm 2 \times$ the LOR (for low level results). Refer to the ALS DQOs for Precision for specific limits for any given test.

ALS does not establish DQOs for Field Sample Duplicates. However, it is generally understood and accepted that the variability of Field Sample Duplicates is significantly more than what is observed with Laboratory Sample Duplicates.¹

Laboratory Control Sample (LCS) - A known matrix spiked with compound(s) representative of the target analytes. An LCS is used to verify the accuracy of the laboratory's performance of the test.

LCS accuracy is calculated as the measured amount divided by the target concentration, and is normally expressed as percent recovery. LCS recoveries should normally lie within the ALS Accuracy DQOs for the test and parameter. For a low level LCS, the result should lie within $\pm 1 \times$ the LOR of the target concentration. Refer to the ALS Accuracy DQOs for specific limits for any given test.

Reference Material (RM) - A material or substance, one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. An RM is similar to an LCS, but encompasses a representative sample matrix. Similar to an LCS, an RM is used to verify the accuracy of the laboratory's performance of the test, but including the challenges of a complex sample matrix.

RM accuracy is calculated, expressed, and evaluated similarly to LCS accuracy. Refer to ALS Accuracy DQOs for specific limits for any given test.

Matrix Spike (MS) - A sample prepared by adding a known amount of a target analyte to a specified amount of a sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used, for example, to determine the effect of the sample matrix on a method's recovery efficiency.

Matrix Spike results are calculated and expressed as percent recovery, by dividing the measured result (minus any analyte contribution from the unspiked sample) by the target analyte concentration. Matrix Spike results should normally lie within the ALS Accuracy DQOs for Matrix

¹ Depending on the type of Field Sample Duplicates being evaluated (e.g. Co-located versus Split Sample Duplicates), ALS recommends DQOs for Field Sample Duplicates that are between 1.5 – 2.0 times higher than our Laboratory Sample Duplicate DQOs. Co-located Sample Duplicates generally require higher DQOs than Split Sample Duplicates.



Spikes. Matrix Spike results cannot be calculated or reported in cases where the background concentration of the test parameter in the sample is too high relative to the spike level.

Surrogate Compounds (SURR) – Surrogate Compounds are added to every sample where applicable (organics tests only). They are substances with properties that mimic the analyte of interest, and which are unlikely to be found in environmental samples. They are added at known concentration to samples to establish that the analytical method has been properly performed.

Surrogate results are calculated and expressed as percent recovery, by dividing the measured result against the expected target concentration. Refer to ALS Accuracy DQOs for specific limits for any given test.

Automated Relational Checks

In addition to all our standard Quality Control checks, ALS also employs dozens of “Relational Checks”, which are programmed into our Laboratory Information Systems (LIMS) to automatically highlight any situations where the expected relationships between different test parameters are violated, which can often point to errors. Such errors may originate with field sampling, or from laboratory processes, but should always be identified and pro-actively investigated.

Total versus Dissolved Metals (“D > T” Check) – One of the most important and common relational checks we do is a check for situations where Dissolved Metal concentrations significantly exceed Total Metal concentrations. By definition, this situation should not occur. However, there are a few reasons why this can occur:

- i) Circumstances where Dissolved Metals slightly exceed Total Metals are expected in a small percentage of samples, simply due to normal random variability. In fact, when all metals in a test sample exist in the dissolved form, we expect that Dissolved Metals measurements will numerically exceed Total Metals measurements exactly half the time (by a small margin), simply due to random chance.
- ii) Samples to be analyzed for Dissolved Metals must be filtered, which is normally done in the field. Filtration processes are a common source of low level metals contaminants. Contamination of a sample during filtration is the most common source of significant D > T issues.
- iii) Field samples for Dissolved and Total Metals are normally collected independently, so variability of the sampling process is another common cause of D > T issues.

If none of the above causes can explain a situation where Dissolved Metals exceed Total Metals, then another type of error may be indicated, either with the collection of the sample in the field, or with sample containers or preservatives, or with the laboratory testing process.

ALS automatically highlights and investigates all circumstances where a Dissolved Metal result exceeds the Total Metal result by 20% RPD or more, but only if the absolute difference between the two results is greater than the sum of the Limits of Reporting (Detection Limits) of the two results.

The mechanism of this relational check is derived from the ALS Duplicate DQOs for Metals in Water.

All D > T relational checks that violate the rule above are flagged internally, and are investigated by ALS before sample results will be released to our clients. In most cases, results will be re-analyzed to confirm or correct the anomalous relationship. If results are confirmed by re-analysis, the following data qualifier is applied:

DTC: Dissolved concentration exceeds total. Results were confirmed by re-analysis.



Other Important Relational Checks Conducted by ALS

ALS employs dozens of other relational checks to highlight anomalous relationships between test parameters. Some of more common checks include the following:

- *Total Ammonia should not exceed Total Kjeldahl Nitrogen*
- *Weak Acid Dissociable Cyanide should not exceed Total Cyanide*
- *E. coli should not exceed Fecal Coliforms*
- *Nitrate + Nitrite should not exceed Total Nitrogen*
- *Hexavalent Chromium should not exceed Total Chromium*
- *True Colour should not exceed Apparent Colour*
- *Mineral Oil and Grease should not exceed Total Oil and Grease*
- *Reactive Phosphorus should not exceed Total Phosphorus*



CALA

Canadian Association for
Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 1352

Laboratory Name: ALS Environmental (Edmonton)

Parent Institution: ALS Canada Ltd.

Address: 9936 - 67th Ave. NW Edmonton AB T6E 0P5

Contact: Ms. Anne Beaubien

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Email: alsed.quality@alsglobal.com

Standard: Conforms with requirements of ISO/IEC 17025

Clients Served: All Interested Parties

Revised On: November 27, 2012

Valid To: May 28, 2015

Scope of Accreditation

Air (Inorganic)

Dustfall - Air (120)

ED-TM-1030; modified from AB ENVIRONMENT 32020

GRAVIMETRIC

Dustfall, Fixed

Dustfall, Total

Air (Inorganic)

Fluoride - Air (188)

ISOP 145, ISOP 117; modified from SM 4500-F C

SELECTIVE ION ELECTRODE

Fluoride

Air (Inorganic)

Mercury - Air Filter (190)

ISOP32/ISOP160; modified from NIOSH 6009/EPA 245.1

COLD VAPOUR AA - DIGESTION

Mercury

Air (Inorganic)

Metals - Air Filter (016)

ISOP 32/ISOP 96; modified from EPA 200.8, NIOSH 7303

ICP/MS - DIGESTION

Aluminum

Barium

Beryllium

Cadmium

Calcium

Chromium

Cobalt

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Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silver
Sodium
Strontium
Thallium
Tin
Vanadium
Zinc

Air (Organic)

Dioxins and Furans (PCDD/PCDF) - Air (138)

EX-TM-1605/EX-TM-1606; modified from EPA 1613 AND ENVIRONMENT CANADA, EPS 1/RM/19
GC-HRMS-EXTRACTION

1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-Heptachlorodibenzofuran
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
1,2,3,4,7,8-Hexachlorodibenzofuran
1,2,3,4,7,8,9-Heptachlorodibenzofuran
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-Hexachlorodibenzofuran
1,2,3,7,8-Pentachlorodibenzofuran
1,2,3,7,8-Pentachlorodibenzo-p-dioxin
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-Hexachlorodibenzofuran
2,3,4,6,7,8-Hexachlorodibenzofuran
2,3,4,7,8-Pentachlorodibenzofuran
2,3,7,8-Tetrachlorodibenzo-p-dioxin
2,3,7,8-Tetrachlorodibenzofuran
Heptachlorodibenzo-p-dioxins (Total)
Heptachlorodibenzofurans (Total)
Hexachlorodibenzo-p-dioxins (Total)
Hexachlorodibenzofurans (Total)
Octachlorodibenzo-p-dioxin
Octachlorodibenzofuran
Pentachlorodibenzo-p-dioxins (Total)
Pentachlorodibenzofurans (Total)
Tetrachlorodibenzo-p-dioxins (Total)
Tetrachlorodibenzofurans (Total)

Biological Tissue (Inorganic)

Metals - Tissue (186)

NA-TP-2003/ISOP 100; modified from EPA 200.3/EPA 200.7
ICP - DIGESTION

Aluminum
Beryllium
Cadmium
Calcium
Chromium

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Cobalt
Copper
Iron
Magnesium
Manganese
Phosphorus
Potassium
Sodium
Strontium
Titanium
Zinc

Oil (Organic)

Polychlorinated Biphenyls (PCB) - Oil (002)
MSOP 8; modified from EPA 8082, ASTM D4059
GC/ECD - EXTRACTION
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Aroclor 1262
Aroclor 1268
Total PCB

Paint

Lead - Paint (153)
ISOP 100, ISOP 165; modified from EPA 200.2, EPA 200.7
ICP - DIGESTION
Lead

Serum

Perfluorinated Organics (PFC) - Serum (147)
EX-TM-1603; modified from ENVIRO. SCI. TECH, 38, 3698-3704
LC-MS/MS - EXTRACTION
Perfluorobutane sulfonate
Perfluorobutanoic acid
Perfluorodecane sulfonate
Perfluorodecanoic acid
Perfluorododecanoic acid
Perfluoroheptanoic acid
Perfluorohexane sulfonate
Perfluorohexanoic acid
Perfluorononanoic acid
Perfluorooctane sulfonamide
Perfluorooctane sulfonate
Perfluorooctanoic acid
Perfluoroundecanoic acid

Solids (Inorganic)

Ammonia - Soil (177)
ISOP 49/70; modified from CSSS 15.2.1/SM 4500-NH3
COLORIMETRIC (SATURATED PASTE)
Ammonia

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Solids (Inorganic)

Anions - Soil (176)

ISOP 49, NA-TM-1001; modified from CSSS 15.2.1/SM 4110 B
ION CHROMATOGRAPHY (SATURATED PASTE)

Nitrate

Nitrite

Sulfate

Solids (Inorganic)

Barium - Soil (172)

ISOP 158, ISOP 100; modified from SSSA PART 3, 1996, PG 202
ICP - FUSION

Barium

Solids (Inorganic)

Barium (Extractable) - Soil (182)

ISOP 164, ISOP 100; modified from BARITE WASTE GUIDELINES
ICP - EXTRACTION

Barium

Solids (Inorganic)

Chloride - Saturated Paste, Soil (168)

ISOP 49/ED-TM-1032; modified from CSSS 15.2.1/SM 4500 - CL E
COLORIMETRIC

Chloride

Solids (Inorganic)

Conductivity - Soil (156)

ISOP 49/ISOP19; modified from CARTER CSSS 15.2.1, 15.3
SATURATED PASTE, METER

Conductivity

Solids (Inorganic)

Conductivity - Soil (157)

ISOP 19; modified from CARTER CSSS 15.3
1:2 EXTRACTION, METER

Conductivity

Solids (Inorganic)

Density - Soil (170)

ISOP 114; modified from ASTM D5057
GRAVIMETRIC

Density

Solids (Inorganic)

Grain Size - Soil (028)

ISOP 68; modified from ASTM D422-63
SIEVING

Grain Size

Solids (Inorganic)

Hexavalent Chromium - Soil (148)

ISOP 108; modified from EPA 3060 A
IC-ALKALINE DIGESTION

Chromium

Solids (Inorganic)

Hot Water Soluble Boron - Soil (145)

ISOP144/ISOP100; modified from KEREN 1996 METHODS OF SOIL ANALYSIS
ICP - EXTRACTION

Boron

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Solids (Inorganic)

Mercury - Soil (164)

ISOP165, ISOP 160; modified from EPA 200.2, EPA 245.1

COLD VAPOUR AA - DIGESTION

Mercury

Solids (Inorganic)

Metals - Soil (023)

ISOP165/ISOP 96; modified from EPA 200.2/6020

ICP/MS - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Calcium

Chromium

Cobalt

Copper

Iron

Lead

Lithium

Magnesium

Manganese

Molybdenum

Nickel

Phosphorus

Potassium

Selenium

Silver

Sodium

Strontium

Thallium

Tin

Titanium

Uranium

Vanadium

Zinc

Solids (Inorganic)

Oil and Grease - Soil (029)

MSOP176; modified from SM 5520

GRAVIMETRIC - EXTRACTION

Oil and Grease

Solids (Inorganic)

Particle Size - Soil (110)

ISOP 162; modified from CARTER CSSS 47.3

PARTICLE SIZE

% Clay

% Sand

% Silt

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Solids (Inorganic)

Percent Moisture - Soil (179)

MSOP104; modified from ASTM D2216-80

GRAVIMETRIC

% Moisture

Solids (Inorganic)

Percent Saturation - Soil (169)

ISOP 49; modified from CSSS 15.2.1

GRAVIMETRIC

% Saturation

Solids (Inorganic)

pH - Soil (099)

ISOP 49/ISOP 18; modified from CARTER CSSS 15.2.1, 16.2

SATURATED PASTE, METER

pH

Solids (Inorganic)

pH - Soil (100)

ISOP 18; modified from CARTER CSSS 16.2

1:2 EXTRACTION, METER

pH

Solids (Inorganic)

pH (1:2 CaCl₂) - Soil (163)

ISOP 69; modified from CSSS 16.3

1:2 CaCl₂ EXTRACTION - METER

pH (1:2 CaCl₂)

Solids (Inorganic)

Salinity - Soil (160)

ISOP 49/ISOP 100; modified from CARTER CSSS 15.2.1, EPA 200.7

ICP (SATURATED PASTE)

Calcium

Magnesium

Potassium

Sodium

Sulfur SO₄

Solids (Inorganic)

Sulfate - Solids (173)

ISOP 155; modified from CSA A23.2

IC - DIGESTION

Sulfate

Solids (Organic)

Aldehydes - Soil (180)

ED-TM-1110; EPA 8270

GC/MS

Acetaldehyde

Formaldehyde

Solids (Organic)

Dioxins, Furans (PCDD/PCDF) - Soil, Sediment (085)

EX-TM-1605/EX-TM-1606; modified from EPA 1613, EPS 1/RM/19

HRGC/HRMS - EXTRACTION

1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin

1,2,3,4,6,7,8-Heptachlorodibenzofuran

1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin

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1,2,3,4,7,8-Hexachlorodibenzofuran
 1,2,3,4,7,8,9-Heptachlorodibenzofuran
 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
 1,2,3,6,7,8-Hexachlorodibenzofuran
 1,2,3,7,8-Pentachlorodibenzofuran
 1,2,3,7,8-Pentachlorodibenzo-p-dioxin
 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
 1,2,3,7,8,9-Hexachlorodibenzofuran
 2,3,4,6,7,8-Hexachlorodibenzofuran
 2,3,4,7,8-Pentachlorodibenzofuran
 2,3,7,8-Tetrachlorodibenzo-p-dioxin
 2,3,7,8-Tetrachlorodibenzofuran
 Heptachlorodibenzo-p-dioxins (Total)
 Heptachlorodibenzofurans (Total)
 Hexachlorodibenzo-p-dioxins (Total)
 Hexachlorodibenzofurans (Total)
 Octachlorodibenzo-p-dioxin
 Octachlorodibenzofuran
 Pentachlorodibenzo-p-dioxins (Total)
 Pentachlorodibenzofurans (Total)
 Tetrachlorodibenzo-p-dioxins (Total)
 Tetrachlorodibenzofurans (Total)

Solids (Organic)

Extractable Petroleum Hydrocarbons (EPH) - Soil (109)
 MSOP 119; modified from BC MELP EPH IN SOLIDS BY GC/FID
 GC/FID - EXTRACTION
 EPH 10-19
 EPH 19-32

Solids (Organic)

Petroleum Hydrocarbons (PHC) - Soil (154)
 MSOP 173; CCME
 GC/MS - HEADSPACE
 Benzene
 Ethylbenzene
 m/p-xylene
 o-xylene
 Toluene

Solids (Organic)

Petroleum Hydrocarbons (PHC) - Soil (155)
 MSOP 173; CCME
 GC/FID - HEADSPACE
 F1: C6-C10
 VH: C6-C10

Solids (Organic)

Petroleum Hydrocarbons (PHC) - Soil (158)
 NA-TM-1100, NA-TP-2100; CCME
 GC/FID - EXTRACTION TUMBLER
 F2: C10-C16
 F3: C16-C34
 F4: C34-C50

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Solids (Organic)

Petroleum Hydrocarbons (PHC) - Soil (171)

NA-TM-1100, NA-TP-2100; CCME
GRAVIMETRIC - TUMBLER

F4: Gravimetric

Solids (Organic)

Phenols - Soil (077)

MSOP70; modified from EPA 8270/3540

GC/MS - EXTRACTION

2-Chlorophenol

2-Methylphenol (o-Cresol)

2-Nitrophenol

2,3-Dichlorophenol

2,3,4-Trichlorophenol

2,3,4,5-Tetrachlorophenol

2,3,4,6 Tetrachlorophenol

2,3,5-Trichlorophenol

2,3,5,6-Tetrachlorophenol

2,3,6-Trichlorophenol

2,4 & 2,5-Dichlorophenol

2,4-Dimethylphenol

2,4-Dinitrophenol

2,4,5-Trichlorophenol

2,4,6-Trichlorophenol

2,6-Dichlorophenol

3-Chlorophenol

3-Methylphenol (m-Cresol)

3,4-Dichlorophenol

3,4,5-Trichlorophenol

3,5-Dichlorophenol

4-Chloro-3-methylphenol

4-Chlorophenol

4-Methylphenol (p-Cresol)

4-Nitrophenol

4,6-Dinitro-2-methylphenol

Pentachlorophenol

Phenol

Solids (Organic)

Polychlorinated Biphenyls (PCB) - Soil (097)

MSOP 7; modified from EPA 3550/8082

GC/ECD - EXTRACTION

Aroclor 1016

Aroclor 1221

Aroclor 1232

Aroclor 1242

Aroclor 1248

Aroclor 1254

Aroclor 1260

Aroclor 1262

Aroclor 1268

Total PCB

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Solids (Organic)

Polychlorinated Biphenyls (PCB) - Soil, Sediment (088)

EX-TM-1605/EX-TM-1607; modified from EPA 1668A

HRGC/HRMS - EXTRACTION

PCB 1
PCB 100
PCB 101
PCB 102
PCB 103
PCB 104
PCB 105
PCB 106
PCB 108/86/125
PCB 11
PCB 110
PCB 111/117
PCB 112
PCB 113
PCB 114
PCB 115
PCB 116
PCB 118
PCB 12
PCB 120
PCB 122
PCB 123/107/109
PCB 124
PCB 126
PCB 127
PCB 128/162
PCB 13
PCB 130
PCB 131/142/133
PCB 132
PCB 134
PCB 135
PCB 136
PCB 137
PCB 138
PCB 139/143
PCB 14
PCB 140
PCB 141
PCB 144
PCB 145
PCB 146
PCB 147/149
PCB 148
PCB 15
PCB 150
PCB 151
PCB 152
PCB 153/168

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PCB 154
PCB 155
PCB 156
PCB 157
PCB 158/129
PCB 159
PCB 16
PCB 160/163
PCB 161
PCB 164
PCB 165
PCB 166
PCB 167
PCB 169
PCB 17
PCB 170
PCB 171
PCB 172
PCB 173
PCB 174
PCB 175/182
PCB 176
PCB 177
PCB 178
PCB 179
PCB 18
PCB 180
PCB 181
PCB 183
PCB 184
PCB 185
PCB 186
PCB 187
PCB 188
PCB 189
PCB 19
PCB 190
PCB 191
PCB 192
PCB 193
PCB 194
PCB 195
PCB 197
PCB 198
PCB 199
PCB 2
PCB 200
PCB 201/204
PCB 202
PCB 203/196
PCB 205
PCB 206
PCB 208

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PCB 209
PCB 21/20/23
PCB 22
PCB 23
PCB 24
PCB 25
PCB 26
PCB 27
PCB 28
PCB 29
PCB 3
PCB 30
PCB 31
PCB 32
PCB 34
PCB 35
PCB 36
PCB 37
PCB 38
PCB 39
PCB 4/10
PCB 40/68
PCB 41
PCB 43/52
PCB 44
PCB 45
PCB 46
PCB 47
PCB 48/49
PCB 5
PCB 50
PCB 51
PCB 53
PCB 54
PCB 55
PCB 56
PCB 57
PCB 58/67
PCB 59/42
PCB 6
PCB 60
PCB 61
PCB 63/76
PCB 64
PCB 66
PCB 69
PCB 7
PCB 70
PCB 71
PCB 72
PCB 74
PCB 75/65/62
PCB 77

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PCB 78
PCB 79
PCB 8
PCB 80
PCB 81
PCB 82
PCB 83/119
PCB 84/89
PCB 85
PCB 87
PCB 88/121
PCB 9
PCB 90/101
PCB 91
PCB 92
PCB 93
PCB 94
PCB 95
PCB 96
PCB 97
PCB 98
PCB 99

Solids (Organic)

Polycyclic Aromatic Hydrocarbons (PAH) - Soil (064)

MSOP 143; modified from EPA 8270/3540

GC/MS - EXTRACTION

1,3-Dimethylnaphthalene
1,3-Methylnaphthalene
2-Methylantracene
2-Methylnaphthalene
3-Methylcholanthrene
Acenaphthene
Acenaphthylene
Anthracene
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b,i) fluoranthene
Benzo (q,h,i) perylene
Benzo (k) fluoranthene
Carbazole
Chrysene
Dibenzo (a,h) anthracene
Dibenzofuran
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Phenanthrene
Pyrene
Quinoline

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Solids (Organic)

Volatile Organic Compounds (VOC) - Soil (167)

MSOP 50; modified from EPA 5021/8260

GC/MS - HEADSPACE/EXTRACTION

1,1-Dichloroethane
1,1-dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-dichlorobenzene
2-Chlorotoluene
2-Hexanone
2,2-Dichloropropane
4-Chlorotoluene
Acetone (2-Propanone)
Acrylonitrile
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Carbon Disulphide
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
cis-1,4-Dichloro-2-Butene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethyl Alcohol
Ethyl Methacrylate
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Isopropylbenzene

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m/p-xylene
Methyl Ethyl Ketone
Methyl Iodide
Methyl isobutyl Ketone
n-butylbenzene
n-propylbenzene
o-xylene
p-Isopropyltoluene
sec-butylbenzene
Styrene
tert-butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trans-1,4-Dichloro-2-Butene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

Tissue (Inorganic)

Mercury - Biological (054)

NA-TP-2003, ISOP151, ISOP 160; modified from EPA 200.3, 245.1, 245.7

COLD VAPOR AA - DIGESTION

Mercury

Tissue (Inorganic)

Metals - Biological (060)

NA-TP-2003, ISOP 96; modified from EPA 200.3, 6020

ICP/MS - DIGEST

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Selenium
Silver
Strontium
Thallium
Uranium
Vanadium
Zinc

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Tissue (Organic)

Dioxins/Furans (PCDD/PCDF) - Biological (086)

EX-TM-1605/EX-TM-1606; modified from EPA 1613, EPS 1/RM/19

HRGC/HRMS - EXTRACTION

1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin

1,2,3,4,6,7,8-Heptachlorodibenzofuran

1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin

1,2,3,4,7,8-Hexachlorodibenzofuran

1,2,3,4,7,8,9-Heptachlorodibenzofuran

1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin

1,2,3,6,7,8-Hexachlorodibenzofuran

1,2,3,7,8-Pentachlorodibenzofuran

1,2,3,7,8-Pentachlorodibenzo-p-dioxin

1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin

1,2,3,7,8,9-Hexachlorodibenzofuran

2,3,4,6,7,8-Hexachlorodibenzofuran

2,3,4,7,8-Pentachlorodibenzofuran

2,3,7,8-Tetrachlorodibenzo-p-dioxin

2,3,7,8-Tetrachlorodibenzofuran

Heptachlorodibenzo-p-dioxins (Total)

Heptachlorodibenzofurans (Total)

Hexachlorodibenzo-p-dioxins (Total)

Hexachlorodibenzofurans (Total)

Octachlorodibenzo-p-dioxin

Octachlorodibenzofuran

Pentachlorodibenzo-p-dioxins (Total)

Pentachlorodibenzofurans (Total)

Tetrachlorodibenzo-p-dioxins (Total)

Tetrachlorodibenzofurans (Total)

Tissue (Organic)

Polychlorinated Biphenyls (PCB) - Biological (089)

EX-TM-1605/EX-TM-1607; modified from EPA 1668A

HRGC/HRMS - EXTRACTION

PCB 1

PCB 100

PCB 102

PCB 103

PCB 104

PCB 105

PCB 106

PCB 108/86/125

PCB 11

PCB 110

PCB 111/117

PCB 112

PCB 113

PCB 114

PCB 115

PCB 116

PCB 118

PCB 12

PCB 120

PCB 122

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PCB 123/107/109
PCB 124
PCB 126
PCB 127
PCB 128/162
PCB 13
PCB 130
PCB 131/142/133
PCB 132
PCB 134
PCB 135
PCB 136
PCB 137
PCB 138
PCB 139/143
PCB 14
PCB 140
PCB 141
PCB 144
PCB 145
PCB 146
PCB 147/149
PCB 148
PCB 15
PCB 150
PCB 151
PCB 152
PCB 153/168
PCB 154
PCB 155
PCB 156
PCB 157
PCB 159
PCB 16
PCB 160/163
PCB 161
PCB 164
PCB 165
PCB 166
PCB 167
PCB 169
PCB 17
PCB 170
PCB 171
PCB 172
PCB 173
PCB 174
PCB 175/182
PCB 176
PCB 177
PCB 178
PCB 179
PCB 18

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PCB 180
PCB 181
PCB 183
PCB 184
PCB 185
PCB 186
PCB 187
PCB 188
PCB 189
PCB 19
PCB 190
PCB 191
PCB 192
PCB 193
PCB 194
PCB 195
PCB 197
PCB 198
PCB 199
PCB 2
PCB 200
PCB 201/204
PCB 202
PCB 205
PCB 206
PCB 208
PCB 209
PCB 21/20/23
PCB 22
PCB 23
PCB 24
PCB 25
PCB 26
PCB 27
PCB 28
PCB 29
PCB 3
PCB 30
PCB 31
PCB 32
PCB 34
PCB 35
PCB 36
PCB 37
PCB 38
PCB 39
PCB 4/10
PCB 40/68
PCB 41
PCB 43/52
PCB 44
PCB 45
PCB 46

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PCB 47
PCB 48/49
PCB 5
PCB 50
PCB 51
PCB 52
PCB 53
PCB 54
PCB 55
PCB 56
PCB 57
PCB 58/67
PCB 59/42
PCB 6
PCB 60
PCB 61
PCB 63/76
PCB 64
PCB 66
PCB 69
PCB 7
PCB 70
PCB 71
PCB 72
PCB 73
PCB 74
PCB 75/65/62
PCB 77
PCB 78
PCB 79
PCB 8
PCB 80
PCB 81
PCB 82
PCB 83/119
PCB 84/89
PCB 85
PCB 87
PCB 88/121
PCB 9
PCB 90/101
PCB 91
PCB 92
PCB 93
PCB 94
PCB 95
PCB 96
PCB 97
PCB 98
PCB 99

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Waste

BTEX - TCLP Leachate - Waste (135)

ISOP74/MSOP173, NA-TM-1103; modified from EPA 1311, EPA 8260 B

GC/MS - TCLP

Benzene

Ethylbenzene

m/p - xylene

o-xylene

Toluene

Waste

Flashpoint - Waste (055)

ED-TM-1012; modified from ASTM 93-D

PENSKE-MARTEN CLOSED CUP

Flashpoint

Waste

Metals - TCLP Leachate - Waste (141)

ISOP 74, ISOP 96; modified from EPA 1311, EPA 6020

ICP/MS - TCLP

Antimony

Arsenic

Barium

Beryllium

Boron

Cadmium

Chromium

Cobalt

Copper

Iron

Lead

Nickel

Selenium

Silver

Thallium

Uranium

Vanadium

Zinc

Zirconium

Waste (Inorganic)

Mercury - TCLP - Waste (162)

ISOP 74/ISOP 151/160; modified from EPA 1311, 245.1, 245.7

COLD VAPOUR AA - DIGESTION - TCLP

Mercury

Waste (Inorganic)

Specific Gravity - Waste (174)

ISOP 114; modified from SM 2710 F

GRAVIMETRIC

Specific Gravity

Water (Inorganic)

Alkalinity - Water (004)

ED-TM-1026; modified from SM 2320 B

TITRIMETRIC

Alkalinity (pH 4.5)

Alkalinity (pH 8.3)

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Water (Inorganic)

Ammonia - Water (178)

ED-TM-1016; modified from SM 4500 NH3

COLORIMETRIC

Ammonia

Water (Inorganic)

Anions - Water (005)

NATM 1001; modified from SM 4110 B

ION CHROMATOGRAPHY

Bromide

Chloride

Fluoride

Nitrate

Nitrite

Sulfate

Water (Inorganic)

Biochemical Oxygen Demand (BOD) - Water (013)

ED-TM-1007/ISOP135; modified from SM 5210B

D.O. METER

BOD (5 day)

BOD_u (ultimate)

CBOD (5 day)

Water (Inorganic)

Carbon - Water (118)

ED-TM-1002; modified from SM 5310 B

IR - COMBUSTION

Inorganic Carbon

Organic Carbon

Total Carbon (TC)

Water (Inorganic)

Chemical Oxygen Demand (COD) - Water (051)

ED-TM-1009; modified from SM 5220 D

COLORIMETRIC - DIGESTION

COD

Water (Inorganic)

Chlorine - Water (123)

ISOP134; modified from SM 4500 CL-A,F,G

COLORIMETRIC

Free Chlorine

Total Chlorine

Water (Inorganic)

Colour - Water (152)

ED-TM-1038; modified from SM 2120 A, C

SPECTROPHOTOMETRIC

True Colour

Water (Inorganic)

Conductivity - Water (006)

ED-TM-1026; modified from SM 2510 B

CONDUCTIVITY METER

Conductivity (25°C)

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Water (Inorganic)

Disinfection By-Products - Water (056)
ED-TM-1006; modified from EPA 300.B
ION CHROMATOGRAPHY
Bromate
Chlorate
Chlorite

Water (Inorganic)

Dissolved Metals - Water (007)
ISOP 96; modified from EPA 6020
ICP/MS
Aluminum
Antimony
Arsenic
Barium
Beryllium
Bismuth
Boron
Cadmium
Chromium
Cobalt
Copper
Lead
Lithium
Molybdenum
Nickel
Selenium
Silver
Strontium
Thallium
Tin
Titanium
Uranium
Vanadium
Zinc

Water (Inorganic)

Dissolved Metals - Water (083)
ISOP 100, NA-TP-2002; modified from SM 3120B
ICP
Calcium
Iron
Magnesium
Manganese
Potassium
Silicon
Sodium
Sulfur

Water (Inorganic)

Hexavalent Chromium- Water (035)
ISOP 108; modified from SM 3500-CR,C
ION CHROMATOGRAPHY
Chromium (Hexavalent)

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Water (Inorganic)

Mercury - Water (149)

ISOP 151, ISOP 160; modified from EPA 245.7, EPA 245.1

COLD VAPOUR AA, COLD OXIDATION

Mercury

Water (Inorganic)

Metals (Ultra Trace) - Water (061)

ISOP 96, NA-TP-2002; modified from EPA 6020

ICP/MS

Calcium

Dissolved Aluminum

Dissolved Barium

Dissolved Beryllium

Dissolved Boron

Dissolved Cadmium

Dissolved Chromium

Dissolved Cobalt

Dissolved Copper

Dissolved Lead

Dissolved Manganese

Dissolved Molybdenum

Dissolved Nickel

Dissolved Silver

Dissolved Thallium

Dissolved Tin

Dissolved Vanadium

Dissolved Zinc

Magnesium

Potassium

Sodium

Strontium

Total Antimony

Total Arsenic

Total Selenium

Uranium

Water (Inorganic)

Microtox - Water (161)

ISOP 157; modified from WCMUC (1991)

BIOLUMINESCENCE

Microtox IC50 (15 min)

Water (Inorganic)

Nitrate/Nitrite - Water (057)

ISOP 80; modified from SM 4500-NO₂,B / SM 4500-NO₃,H

COLORIMETRIC

Nitrate plus Nitrite

Nitrite

Water (Inorganic)

Oil and Grease - Water (038)

MSOP177; modified from SM 5520 A,B,F

GRAVIMETRIC

Total Oil and Grease

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Water (Inorganic)

Oil and Grease - Water (159)
MSOP178; modified from SM 5520 C, F
INFRA-RED
Hydrocarbon Oil and Grease
Total Oil and Grease

Water (Inorganic)

pH - Water (015)
ED-TM-1026; modified from SM 4500-A,B
pH METER
pH

Water (Inorganic)

Phenols - Water (146)
ISOP149; modified from ALBERTA ENVIRONMENT 154
COLORIMETRIC
Total Phenolics

Water (Inorganic)

Phosphate - Water (084)
ED-TM-1031; modified from SM 4500-P
COLORIMETRIC
Phosphate

Water (Inorganic)

Phosphates (Low) - Water (183)
ISOP 80; modified from SM 4500-P
COLORIMETRIC - TECHNICON
Phosphate

Water (Inorganic)

Phosphorus - Water (011)
ED-TM-1031; modified from SM 4500-P,B,E
COLORIMETRIC - DIGESTION
Total Dissolved Phosphorus
Total Phosphorus

Water (Inorganic)

Phosphorus - Water (119)
ED-TM-1031; modified from SM 4500-A B, E
COLORIMETRIC
Inorganic Phosphorus

Water (Inorganic)

Phosphorus - Water (184)
ISOP 85; modified from SM 4500, P, B, E
COLORIMETRIC - TECHNICON
Total Dissolved Phosphorus
Total Phosphorus

Water (Inorganic)

Solids - Water (012)
ED-TM-1005; modified from SM 2540 A,B,C,D,E
GRAVIMETRIC
Fixed Suspended Solids
Total Dissolved Solids
Total Suspended Solids
Volatile Suspended Solids

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Water (Inorganic)

Sulfide - Water (033)

ED-TM-1001; modified from SM 4500-S2 A, D,E

COLORIMETRIC

Sulfide

Water (Inorganic)

Total Kjeldahl Nitrogen (TKN) - Water (010)

ED-TM-1017; modified from AB ENVIR. 235

COLORIMETRIC - DIGESTION

Dissolved Kjeldahl Nitrogen

Total Kjeldahl Nitrogen

Water (Inorganic)

Total Metals - Water (081)

NA-TP-2001/ISOP 100; modified from APHA 3030 E/3120 B

ICP - DIGESTION

Calcium

Iron

Magnesium

Manganese

Potassium

Silicon

Sodium

Sulfur

Water (Inorganic)

Total Metals - Water (082)

NA-TP-2001, ISOP 96; modified from EPA 6020, APHA 3030 E

ICP/MS - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

Bismuth

Boron

Cadmium

Chromium

Cobalt

Copper

Lead

Lithium

Molybdenum

Nickel

Selenium

Silver

Strontium

Thallium

Tin

Titanium

Uranium

Vanadium

Zinc

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Water (Inorganic)

Total Nitrogen - Water (195)
ED-TM-1002; modified from EN12260
IR - COMBUSTION
Total Nitrogen

Water (Inorganic)

Turbidity - Water (078)
ED-TM-1011; modified from SM 2130 A,B
TURBIDIMETRIC
Turbidity

Water (Organic)

Alkylated & Nitro PAHs - Water (181)
ED-TM-1135; modified from EPA 3570/8270
GC/MS
Acridine
C2 Alkyl subst'd Carbazoles
C2 Alkyl subst'd Quinolines
C3 Alkyl subst'd Quinolines
Carbazole
Methyl Acridine
Methyl Carbazoles
Methyl Quinolines
Phenanthridine
Quinoline

Water (Organic)

Base Neutral Extractables - Water (117)
MSOP 161; modified from EPA 3510/8270
GC/MS - EXTRACTION
1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene
2-Chloronaphthalene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Pentachlorobenzene

Water (Organic)

Chlorophenols - Water (019)
MSOP 42; modified from EPA 1653 AND ALBERTA ENVIRONMENT 130.0
GC/MS - EXTRACTION
2-Chlorophenol
2-Chlorosyringaldehyde
2,4,5-Trichlorophenol
2,6-Dichlorophenol
2,6-Dichlorosyringaldehyde
3,4-Dichlorocatechol
3,4-Dichloroquaiacol
3,4,5-Trichlorocatechol
3,4,5-Trichloroquaiacol
3,4,5-Trichloroveratrole
3,4,6-Trichlorocatechol

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3,4,6-Trichloroquaiacol
 3,5-Dichlorocatechol
 3,6-Dichlorocatechol
 4-Chlorocatechol
 4-Chloroquaiacol
 4-Chlorophenol
 4,5-Dichlorocatechol
 4,5-Dichloroquaiacol
 4,5-Dichloroveratrole
 4,5,6-Trichloroquaiacol
 4,5,6-Trichlorosyringol
 4,6-Dichloroquaiacol
 5-Chlorovanillin
 5,6-Dichlorovanillin
 6-Chlorovanillin
 Tetrachlorocatechol
 Tetrachloroquaiacol
 Tetrachloroveratrole
 Trichlorotrimethoxybenzene

Water (Organic)

Dioxins and Furans (PCDD/PCDF) - Water (049)
 EX-TM-1604/EX-TM-1606; modified from EPA 1613, EPS 1/RM/19
 GC/HRMS - EXTRACTION

1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin
 1,2,3,4,6,7,8-Heptachlorodibenzofuran
 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
 1,2,3,4,7,8-Hexachlorodibenzofuran
 1,2,3,4,7,8,9-Heptachlorodibenzofuran
 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
 1,2,3,6,7,8-Hexachlorodibenzofuran
 1,2,3,7,8-Pentachlorodibenzo-p-dioxin
 1,2,3,7,8-Pentachlorodibenzofuran
 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
 1,2,3,7,8,9-Hexachlorodibenzofuran
 2,3,4,6,7,8-Hexachlorodibenzofuran
 2,3,4,7,8-Pentachlorodibenzofuran
 2,3,7,8-Tetrachlorodibenzo-p-dioxin
 2,3,7,8-Tetrachlorodibenzofuran
 Heptachlorodibenzo-p-dioxins (Total)
 Heptachlorodibenzofurans (Total)
 Hexachlorodibenzo-p-dioxins (Total)
 Hexachlorodibenzofurans (Total)
 Octachlorodibenzo-p-dioxin
 Octachlorodibenzofuran
 Pentachlorodibenzo-p-dioxins (Total)
 Pentachlorodibenzofurans (Total)
 Tetrachlorodibenzo-p-dioxins (Total)
 Tetrachlorodibenzofurans (Total)

Water (Organic)

Extractable Petroleum Hydrocarbons (EPH) - Water (108)
 MSOP 125; modified from BC MELP EPH IN WATER BY GC/FID
 GC/FID - EXTRACTION
 EPH 10-19

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Water (Organic)

Formaldehyde - Water (116)

MSOP47; modified from ENVIRONMENTAL SCIENCE AND TECHNOLOGY, 1989, 23:838-847

GC/MS - EXTRACTION

Formaldehyde

Water (Organic)

Low Level PAHs and Alkylated PAHs - Water (185)

EX-TM-1600; modified from EPA 3510/8270

GC/MS

1-Methylnaphthalene

2-Methylnaphthalene

Acenaphthene

Acenaphthylene

Acridine

Anthracene

Benzo (a) anthracene

Benzo (a) pyrene

Benzo(b&i)fluoranthene

Benzo(e)pyrene

Benzo (g,h,i) perylene

Benzo (k) fluoranthene

Biphenyl

C1 Acenaphthenes

C1 Benz(a)Anthracenes/Chrysenes

C1 Benzofluoranthenes/Benzopyrenes

C1 Biphenyls

C1 Dibenzothiophenes

C1 Fluoranthenes/Pyrenes

C1 Fluorenes

C1 Phenanthrenes/Anthracenes

C2 Benzofluoranthenes/Benzopyrenes

C2 Biphenyls

C2 Bnz(a)Anthracenes/Chrysenes

C2 Dibenzothiophenes

C2 Fluoranthenes/Pyrenes

C2 Fluorenes

C2 Naphthalenes

C2 Phenanthrenes/Anthracenes

C3 Benzanthracenes/Chrysenes

C3 Dibenzothiophenes

C3 Naphthalenes

C3 Phenanthrenes/Anthracenes

C4 Benzanthracenes/Chrysenes

C4 Dibenzothiophenes

C4 Naphthalenes

C4 Phenanthrenes/Anthracenes

Chrysene

Dibenzo (a,h) anthracene

Dibenzothiophene

Fluoranthene

Fluorene

Indeno (1,2,3 - cd) pyrene

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Naphthalene
Perylene
Phenanthrene
Pyrene
Quinoline
Retene

Water (Organic)

Petroleum Hydrocarbons (PHC) - Water (075)
NA-TM-1104; modified from EPA 3510/8015
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Water (Organic)

Petroleum Hydrocarbons (PHC) - Water (165)
NA-TM-1103; modified from EPA 5021/8260
GC/FID - HEADSPACE
F1: C6-C10
VH: C6-C10

Water (Organic)

Phenols - Water (076)
MSOP71; modified from EPA 8270/3510
GC/MS - EXTRACTION
2-Chlorophenol
2-Methylphenol (o-Cresol)
2-Nitrophenol
2,3-Dichlorophenol
2,3,4-Trichlorophenol
2,3,4,5-Tetrachlorophenol
2,3,4,6-tetrachlorophenol
2,3,5-Trichlorophenol
2,3,5,6-Tetrachlorophenol
2,3,6-Trichlorophenol
2,4 & 2,5-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4,5-Trichlorophenol
2,4,6-trichlorophenol
2,6-Dichlorophenol
3-Chlorophenol
3-Methylphenol (m-Cresol)
3,4-Dichlorophenol
3,4,5-Trichlorophenol
3,5-Dichlorophenol
4-Chloro-3-methylphenol
4-Chlorophenol
4-Methylphenol (p-Cresol)
4-Nitrophenol
4,6-Dinitro-2-methylphenol
Pentachlorophenol
Phenol

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Water (Organic)

Polychlorinated Biphenyls (PCB) - Water (087)

EX-TM-1604/EX-TM-1607; modified from EPA 1668 A

HRGC/HRMS - EXTRACTION

PCB 1
PCB 100
PCB 102
PCB 103
PCB 104
PCB 105
PCB 106
PCB 108/86/125
PCB 11
PCB 110
PCB 111/117
PCB 112
PCB 113
PCB 114
PCB 115
PCB 116
PCB 118
PCB 12
PCB 120
PCB 122
PCB 123/107/109
PCB 124
PCB 126
PCB 127
PCB 128/162
PCB 13
PCB 130
PCB 131/142/133
PCB 132
PCB 134
PCB 135
PCB 136
PCB 137
PCB 138
PCB 139/143
PCB 14
PCB 140
PCB 141
PCB 144
PCB 145
PCB 146
PCB 147/149
PCB 148
PCB 15
PCB 150
PCB 151
PCB 152
PCB 153/168
PCB 154

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PCB 155
PCB 156
PCB 157
PCB 158/129
PCB 159
PCB 16
PCB 160/163
PCB 161
PCB 164
PCB 165
PCB 166
PCB 167
PCB 168
PCB 169
PCB 17
PCB 170
PCB 171
PCB 172
PCB 173
PCB 174
PCB 175/182
PCB 176
PCB 177
PCB 178
PCB 179
PCB 18
PCB 180
PCB 181
PCB 183
PCB 184
PCB 185
PCB 186
PCB 187
PCB 188
PCB 189
PCB 19
PCB 190
PCB 191
PCB 192
PCB 193
PCB 194
PCB 195
PCB 197
PCB 198
PCB 199
PCB 2
PCB 200
PCB 201/204
PCB 202
PCB 203/196
PCB 205
PCB 206
PCB 207

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PCB 208
PCB 209
PCB 21/20/23
PCB 22
PCB 23
PCB 24
PCB 25
PCB 26
PCB 27
PCB 28
PCB 29
PCB 3
PCB 30
PCB 31
PCB 32
PCB 34
PCB 35
PCB 36
PCB 37
PCB 38
PCB 39
PCB 4/10
PCB 40/68
PCB 41
PCB 43/52
PCB 44
PCB 45
PCB 46
PCB 47
PCB 48/49
PCB 5
PCB 50
PCB 51
PCB 53
PCB 54
PCB 55
PCB 56
PCB 57
PCB 58/67
PCB 59/42
PCB 6
PCB 60
PCB 61
PCB 63/76
PCB 64
PCB 66
PCB 69
PCB 7
PCB 70
PCB 71
PCB 72
PCB 73
PCB 74

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PCB 75/65/62
PCB 77
PCB 78
PCB 79
PCB 8
PCB 80
PCB 81
PCB 82
PCB 83/119
PCB 84/89
PCB 85
PCB 87
PCB 88/121
PCB 9
PCB 90/101
PCB 91
PCB 92
PCB 93
PCB 94
PCB 95
PCB 96
PCB 97
PCB 98
PCB 99

Water (Organic)

Polychlorinated Biphenyls (PCB) - Water (096)

MSOP4; modified from EPA 3510/8082

GC/ECD - EXTRACTION

Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Aroclor 1262
Aroclor 1268
Total PCB

Water (Organic)

Polycyclic Aromatic Hydrocarbons (PAH) - Water (003)

MSOP 5; modified from EPA 8270/3510

GC/MS - EXTRACTION

1-Methylnaphthalene
1,3-Dimethylnaphthalene
2-Methylantracene
2-Methylnaphthalene
3-Methylcholanthrene
Acenaphthene
Acenaphthylene
Anthracene
Benzo (a) anthracene
Benzo (a) pyrene
Benzo(b&i)fluoranthene

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Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Carbazole
Chrysene
Dibenzo (a,h) anthracene
Dibenzofuran
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Phenanthrene
Pyrene
Quinoline

Water (Organic)

Resin and Fatty Acids - Water (020)

MSOP 26; modified from ALBERTA ENVIRONMENT 129.0

GC/MS - EXTRACTION

12-Chlorodehydroabietic Acid
12,14-Dichlorodehydroabietic Acid
14-Chlorodehydroabietic Acid
9,10-Dichlorostearic Acid
Abietic Acid
Arachidic Acid
Dehydroabietic Acid
Isopimaric Acid
Levopimaric Acid
Linoleic Acid
Linolenic Acid
Myristic Acid
Neoabietic Acid
Oleic Acid
Palmitic Acid
Palustric Acid
Pimaric Acid
Sandaracopimaric Acid
Stearic Acid

Water (Organic)

Resin and Fatty Acids - Water (132)

ED-TM-1106; modified from ALBERTA ENVIRONMENT 129.0

GC/MS - EXTRACTION (RFA-Low ED)

12-Chlorodehydroabietic acid
12,14-Dichlorodehydroabietic acid
14-Chlorodehydroabietic acid
9,10-Dichlorostearic acid
Abietic acid
Arachidic acid
Dehydroabietic Acid
Isopimaric acid
Levopimaric acid
Linoleic Acid
Linolenic Acid
Myristic acid
Neoabietic acid

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Oleic Acid
Palmitic Acid
Palustric acid
Pimaric acid
Sandaracopimaric acid
Stearic Acid

Water (Organic)

Volatile Organic Compounds (VOC) - Water (166)

MSOP 50; modified from EPA 5021/8260

GC/MS - HEADSPACE

1,1-Dichloroethane
1,1-dichloroethylene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,2,3-Trichloropropane
1,3-Dichlorobenzene
1,4-dichlorobenzene
2-Hexanone
Acetone (2-Propanone)
Acrylonitrile
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Disulphide
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
cis-1,4-Dichloro-2-Butene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethyl Alcohol
Ethyl Methacrylate
Ethylbenzene
Ethylene Dibromide
m/p-xylene
Methyl Ethyl Ketone
Methyl Iodide
Methyl isobutyl Ketone
o-xylene
Styrene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene

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trans-1,3-Dichloropropene
Trans-1,4-Dichloro-2-Butene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

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CALA

Canadian Association for
Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 3525

Laboratory Name: Nautilus Environmental Inc.

Parent Institution:

Address: 8664 Commerce Court Burnaby BC V5A 4N7

Contact: Ms. Julianna Kalocai

Phone: (604) 420-8773

Fax: (604) 357-1361

Email: julianna@nautilusenvironmental.com

Standard: Conforms with requirements of ISO/IEC 17025

Clients Served: All Interested Parties

Revised On: September 13, 2011

Valid To: March 13, 2014

Scope of Accreditation

Water (Toxicology)

Ceriodaphnia dubia - Water (003)

209; EPS 1/RM/21

SURVIVAL AND REPRODUCTION

Ceriodaphnia dubia (7d)

Water (Toxicology)

Daphnia magna - Water (002)

205; EPS 1/RM/11, EPS 1/RM/14

ACUTE LETHALITY (SURVIVAL)

Daphnia LC50 (48 h)

Water (Toxicology)

Fathead Minnow - Water (007)

220; EPS 1/RM/22

SURVIVAL AND GROWTH

Fathead Minnow (7d)

Water (Toxicology)

Lemna minor - Water (005)

215; EPS 1/RM/37

GROWTH INHIBITION

Lemna minor (7d)

Water (Toxicology)

Pseudokirchneriella subcapitata - Water (006)

213; EPS 1/RM/25

GROWTH INHIBITION

Pseudokirchneriella subcapitata (72h)

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Water (Toxicology)

Rainbow Trout - Water (001)

201; EPS 1/RM/9, EPS 1/RM/13

ACUTE LETHALITY (SURVIVAL)

Trout LC50 (96 h)

Water (Toxicology)

Salmonid - Water (004)

203; EPS 1/RM/28

EARLY LIFE STAGE

Salmonid embryo (7d)

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CALA

Canadian Association for
Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2800

Laboratory Name: HydroQual Laboratories Ltd.

Parent Institution: Golder Associates Ltd.

Address: #4, 6125 12th St. S.E. Calgary AB T2H 2K1

Contact: Mrs. Tamara McClure

Phone: (403) 253-7121

Fax: (403) 252-9363

Email: tmcclure@golder.com; tanya_harvey@golder.com

Standard: Conforms with requirements of ISO/IEC 17025

Clients Served: All Interested Parties

Revised On: September 28, 2012

Valid To: March 24, 2014

Scope of Accreditation

Air (Mycology)

Mould - Air (043)

AIR-ME-002; POWERS, E.M. 1995. APPL. & ENV. MICRO 61(10): 3756-3758

CULTURABLE AIR MICROBES

fungus genus

fungus species

Air (Mycology)

Mould - Air (047)

AIR-ME-001; ZEFON ANALYTICAL ACCESSORIES/ ASTM D7391-09

DIRECT MICROSCOPE IDENTIFICATION (AIR-O-CELL)

fungus genus

Solids (Toxicology)

Chironomids - Sediment (013)

WTR-ME-026; EPS 1/RM/32

SURVIVAL AND GROWTH

Chironomus

Solids (Toxicology)

Earthworm - Soil (022)

SOIL-ME-017; EPS 1/RM/43

SURVIVAL

Eisenia andrei

Eisenia fetida

Solids (Toxicology)

Earthworm - Soil (049)

SOIL-ME-009; EPS 1/RM/43

SURVIVAL AND REPRODUCTION

Eisenia andrei

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Solids (Toxicology)

Hyalella azteca - Sediment (014)
WTR-ME-021; EPS 1/RM/33
SURVIVAL AND GROWTH
Hyalella azteca

Solids (Toxicology)

Plant Growth - Soil (050)
SOIL-ME-023; EPS 1/RM/45
EMERGENCE
Lettuce
Northern wheatgrass

Water (Microbiology)

Cryptosporidium and Giardia - Water (025)
WTQR-ME-014; EPA 815-R-05-002.METHOD 1623
FILTRATION/IMS/FA
Cryptosporidium
Giardia

Water (Microbiology)

Escherichia coli (E. coli) - Water (027)
WTRQ-ME-009; modified from SM 9223 B
MOST PROBABLE NUMBER
Escherichia coli (E. coli)

Water (Microbiology)

Microcystins - Water (037)
WTRQ-ME-005; AN AND CARMICHAEL (1994) TOXICON, 32, 1495-1507.
PROTEIN PHOSPHATASE INHIBITION
Microcystins

Water (Microbiology)

Total Coliforms - Water (052)
WTRQ-ME-009; modified from SM 9223 B
MOST PROBABLE NUMBER
Total Coliforms

Water (Toxicology)

Ceriodaphnia dubia - Water (006)
WTR-ME-018; EPS 1/RM/21
SURVIVAL AND REPRODUCTION
Ceriodaphnia dubia

Water (Toxicology)

Daphnia magna - Water (002)
WTR-ME-015; EPS 1/RM/11, EPS 1/RM/14
ACUTE LETHALITY (SURVIVAL)
Daphnia LC50 (48 h)

Water (Toxicology)

Fathead Minnow - Water (007)
WTR-ME-046; EPS 1/RM/22
GROWTH AND SURVIVAL
Fathead minnow

Water (Toxicology)

Lemna minor - Water (017)
WTR-ME-030; EPS 1/RM/37
GROWTH INHIBITION
Lemna minor

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Water (Toxicology)

Microtox - Liquid Phase - Water (003)

SOIL-ME-001; EPS 1/RM/24

BIOLUMINESCENCE

Microtox IC50 (15 min)

Water (Toxicology)

Pseudokirchneriella subcapitata - Water (008)

WTR-ME-034; EPS 1/RM/25

GROWTH INHIBITION

Pseudokirchneriella subcapitata

Water (Toxicology)

Rainbow Trout - Water (001)

WTR-ME-041; EPS 1/RM/9, EPS 1/RM/13

ACUTE LETHALITY (SURVIVAL)

Trout LC50 (96 h)

Water (Toxicology)

Salmonid - Water (026)

WTR-ME-044; EPS 1/RM/28

EARLY LIFE STAGE

Salmonid eggs

Salmonid embryo

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State of Utah

Department of Health

Environmental Laboratory Certification Program

Certification is hereby granted to

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

225 Commerce Drive
Fort Collins, CO 80524

*Has conformed with the
2009 TNI Standard*

*Scope of accreditation is limited to the
State of Utah Accredited Fields of Accreditation
Which accompanies this Certificate*

EPA Number: CO00078
Expiration Date: 11/30/2013
Certificate Number: CO000782013-7



Robyn M. Atkinson, Ph.D, HCLD
Director, Unified State Laboratories: Public Health



Continued accredited status depends on successful ongoing participation in the program.





State of Utah
 Gary R Herbert
 Governor
 Gregory S Bell
 Lieutenant Governor

Utah Department of Health

W. David Patton Ph.D

Executive Director

Disease Control and Prevention

Robyn M. Atkinson, Ph.D, HCLD

Director, Unified State Laboratories: Public Health

Bureau of Laboratory Improvement

David B Mendenhall, MPA, MT (ASCP)

Bureau Director



EPA Number: CO00078

Attachment to Certificate Number: CO000782013-7

Page 1 of 27

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date Expires AB

Program/Matrix: CWA (Non Potable Water)

Method EPA 120.1

Conductivity

7/1/2012 11/30/2013 UT

Method EPA 150.1

pH

7/1/2012 11/30/2013 UT

Method EPA 160.1

Residue-filterable (TDS)

7/1/2012 11/30/2013 UT

Method EPA 160.2

Residue-nonfilterable (TSS)

7/1/2012 11/30/2013 UT

Method EPA 160.3

Residue-total

7/1/2012 11/30/2013 UT

Method EPA 1664A (HEM)

Oil & Grease

7/1/2012 11/30/2013 UT

Method EPA 200.7

Aluminum

7/1/2012 11/30/2013 UT

Antimony

7/1/2012 11/30/2013 UT

Arsenic

7/1/2012 11/30/2013 UT

Barium

7/1/2012 11/30/2013 UT

Beryllium

7/1/2012 11/30/2013 UT

Boron

7/1/2012 11/30/2013 UT

Cadmium

7/1/2012 11/30/2013 UT

Calcium

7/1/2012 11/30/2013 UT

Chromium

7/1/2012 11/30/2013 UT

Cobalt

7/1/2012 11/30/2013 UT

Copper

7/1/2012 11/30/2013 UT

Iron

7/1/2012 11/30/2013 UT

Lead

7/1/2012 11/30/2013 UT

Lithium

7/1/2012 11/30/2013 UT

Magnesium

7/1/2012 11/30/2013 UT

Manganese

7/1/2012 11/30/2013 UT

Molybdenum

7/1/2012 11/30/2013 UT

Nickel

7/1/2012 11/30/2013 UT

Potassium

7/1/2012 11/30/2013 UT

Selenium

7/1/2012 11/30/2013 UT

Silica as SiO2

7/1/2012 11/30/2013 UT

Silver

7/1/2012 11/30/2013 UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: CWA (Non Potable Water)

Sodium	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Tin	7/1/2012	11/30/2013	UT
Titanium	7/1/2012	11/30/2013	UT
Total hardness as CaCO3	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT
Zinc	7/1/2012	11/30/2013	UT

Method EPA 200.8

Aluminum	7/1/2012	11/30/2013	UT
Antimony	7/1/2012	11/30/2013	UT
Arsenic	7/1/2012	11/30/2013	UT
Barium	7/1/2012	11/30/2013	UT
Beryllium	7/1/2012	11/30/2013	UT
Cadmium	7/1/2012	11/30/2013	UT
Calcium	7/1/2012	11/30/2013	UT
Chromium	7/1/2012	11/30/2013	UT
Cobalt	7/1/2012	11/30/2013	UT
Copper	7/1/2012	11/30/2013	UT
Iron	7/1/2012	11/30/2013	UT
Lead	7/1/2012	11/30/2013	UT
Magnesium	7/1/2012	11/30/2013	UT
Manganese	7/1/2012	11/30/2013	UT
Molybdenum	7/1/2012	11/30/2013	UT
Nickel	7/1/2012	11/30/2013	UT
Potassium	7/1/2012	11/30/2013	UT
Selenium	7/1/2012	11/30/2013	UT
Silver	7/1/2012	11/30/2013	UT
Sodium	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Thorium	7/1/2012	11/30/2013	UT
Tin	7/1/2012	11/30/2013	UT
Uranium	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT
Zinc	7/1/2012	11/30/2013	UT

Method EPA 245.1

Mercury	7/1/2012	11/30/2013	UT
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Method EPA 300.0

Bromide	7/1/2012	11/30/2013	UT
Chloride	7/1/2012	11/30/2013	UT
Fluoride	7/1/2012	11/30/2013	UT
Nitrate as N	7/1/2012	11/30/2013	UT
Nitrite as N	7/1/2012	11/30/2013	UT
Orthophosphate as P	7/1/2012	11/30/2013	UT
Sulfate	7/1/2012	11/30/2013	UT

Method EPA 310.1

Alkalinity as CaCO3	7/1/2012	11/30/2013	UT
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ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: CWA (Non Potable Water)

Method EPA 335.2			
Cyanide	7/1/2012	11/30/2013	UT
Method EPA 340.2			
Fluoride	7/1/2012	11/30/2013	UT
Method EPA 350.1			
Ammonia as N	7/1/2012	11/30/2013	UT
Method EPA 353.2			
Nitrate-nitrite	7/1/2012	11/30/2013	UT
Method EPA 354.1			
Nitrite as N	7/1/2012	11/30/2013	UT
Method EPA 365.2			
Orthophosphate as P	7/1/2012	11/30/2013	UT
Phosphorus, total	7/1/2012	11/30/2013	UT
Method EPA 376.1			
Sulfide	7/1/2012	11/30/2013	UT
Method EPA 415.1			
Total organic carbon	7/1/2012	11/30/2013	UT
Method EPA 608			
4,4'-DDD	7/1/2012	11/30/2013	UT
4,4'-DDE	7/1/2012	11/30/2013	UT
4,4'-DDT	7/1/2012	11/30/2013	UT
Aldrin	7/1/2012	11/30/2013	UT
alpha-BHC (alpha-Hexachlorocyclohexane)	7/1/2012	11/30/2013	UT
Aroclor-1016 (PCB-1016)	7/1/2012	11/30/2013	UT
Aroclor-1221 (PCB-1221)	7/1/2012	11/30/2013	UT
Aroclor-1232 (PCB-1232)	7/1/2012	11/30/2013	UT
Aroclor-1242 (PCB-1242)	7/1/2012	11/30/2013	UT
Aroclor-1248 (PCB-1248)	7/1/2012	11/30/2013	UT
Aroclor-1254 (PCB-1254)	7/1/2012	11/30/2013	UT
Aroclor-1260 (PCB-1260)	7/1/2012	11/30/2013	UT
beta-BHC (beta-Hexachlorocyclohexane)	7/1/2012	11/30/2013	UT
Chlordane (tech.)	7/1/2012	11/30/2013	UT
delta-BHC	7/1/2012	11/30/2013	UT
Dieldrin	7/1/2012	11/30/2013	UT
Endosulfan I	7/1/2012	11/30/2013	UT
Endosulfan II	7/1/2012	11/30/2013	UT
Endosulfan sulfate	7/1/2012	11/30/2013	UT
Endrin	7/1/2012	11/30/2013	UT
Endrin aldehyde	7/1/2012	11/30/2013	UT
Endrin ketone	7/1/2012	11/30/2013	UT
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7/1/2012	11/30/2013	UT
Heptachlor	7/1/2012	11/30/2013	UT
Heptachlor epoxide	7/1/2012	11/30/2013	UT
Methoxychlor	7/1/2012	11/30/2013	UT
Toxaphene (Chlorinated camphene)	7/1/2012	11/30/2013	UT

Method EPA 615

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date Expires AB

Program/Matrix: CWA (Non Potable Water)

2,4,5-T	7/1/2012	11/30/2013	UT
2,4-D	7/1/2012	11/30/2013	UT
2,4-DB	7/1/2012	11/30/2013	UT
Dalapon	7/1/2012	11/30/2013	UT
Dicamba	7/1/2012	11/30/2013	UT
Dichloroprop (Dichloroprop)	7/1/2012	11/30/2013	UT
MCPA	7/1/2012	11/30/2013	UT
MCPP	7/1/2012	11/30/2013	UT
Silvex (2,4,5-TP)	7/1/2012	11/30/2013	UT
Method EPA 900			
Gross-alpha	7/1/2012	11/30/2013	UT
Gross-beta	7/1/2012	11/30/2013	UT
Method EPA 901.1			
Gamma Emitters	7/1/2012	11/30/2013	UT
Method EPA 903			
Radium-226	7/1/2012	11/30/2013	UT
Total radium	7/1/2012	11/30/2013	UT
Method EPA 903.1			
Radium-226	7/1/2012	11/30/2013	UT
Method EPA 904			
Radium-228	7/1/2012	11/30/2013	UT
Method EPA 906.0			
Tritium	7/1/2012	11/30/2013	UT
Method HASL 300 U-02-RC			
Uranium	7/1/2012	11/30/2013	UT
Method SM 2320 B			
Alkalinity as CaCO ₃	7/1/2012	11/30/2013	UT
Method SM 2340 B			
Total hardness as CaCO ₃	7/1/2012	11/30/2013	UT
Method SM 2510 B			
Conductivity	7/1/2012	11/30/2013	UT
Method SM 2540 B			
Residue-total	7/1/2012	11/30/2013	UT
Method SM 2540 C			
Residue-filterable (TDS)	7/1/2012	11/30/2013	UT
Method SM 2540 D			
Residue-nonfilterable (TSS)	7/1/2012	11/30/2013	UT
Method SM 3500-Cr D			
Chromium VI	7/1/2012	11/30/2013	UT
Method SM 4500-CN⁻ C			
Cyanide	7/1/2012	11/30/2013	UT
Method SM 4500-CN⁻ E			
Cyanide	7/1/2012	11/30/2013	UT
Method SM 4500-CN⁻ G			
Cyanide	7/1/2012	11/30/2013	UT

Program/Matrix: CWA (Non Potable Water)**Method SM 4500-F⁻ C**

Fluoride

7/1/2012 11/30/2013 UT

Method SM 4500-H⁺ B

pH

7/1/2012 11/30/2013 UT

Method SM 4500-NH₃ H

Ammonia as N

7/1/2012 11/30/2013 UT

Method SM 4500-NO₂⁻ B

Nitrite as N

7/1/2012 11/30/2013 UT

Method SM 4500-P E

Orthophosphate as P

7/1/2012 11/30/2013 UT

Phosphorus, total

7/1/2012 11/30/2013 UT

Method SM 4500-S₂⁻ F

Sulfide

7/1/2012 11/30/2013 UT

Method SM 5310 C

Total organic carbon

7/1/2012 11/30/2013 UT

Method SM 7500-3H B

Tritium

7/1/2012 11/30/2013 UT

Method SM 7500-Rn B

Radon-222

7/1/2012 11/30/2013 UT

Program/Matrix: RCRA (Non Potable Water)**Method ASTM D3972-90**

Thorium-228	7/1/2012	11/30/2013	UT
Thorium-230	7/1/2012	11/30/2013	UT
Thorium-232	7/1/2012	11/30/2013	UT

Method EPA 053917 p. 33 EMSL LV

Thorium-228	7/1/2012	11/30/2013	UT
Thorium-230	7/1/2012	11/30/2013	UT
Thorium-232	7/1/2012	11/30/2013	UT

Method EPA 1010A

Ignitability	7/1/2012	11/30/2013	UT
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Method EPA 1110A

Corrosivity toward steel	7/1/2012	11/30/2013	UT
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Method EPA 1311

Toxicity Characteristic Leaching Procedure Metals	7/1/2012	11/30/2013	UT
Toxicity Characteristic Leaching Procedure Semi-Volatiles	7/1/2012	11/30/2013	UT
Toxicity Characteristic Leaching Procedure Volatiles	7/1/2012	11/30/2013	UT

Method EPA 1312

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 1664A

Total recoverable petroleum hydrocarbons (TRPH)	7/1/2012	11/30/2013	UT
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Method EPA 1664A (HEM)

Oil & Grease	7/1/2012	11/30/2013	UT
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Method EPA 3005A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3010A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3510C

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3520C

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3620B

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3630C

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3640A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3660A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 5030C

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 6010B

Aluminum	7/1/2012	11/30/2013	UT
Antimony	7/1/2012	11/30/2013	UT
Arsenic	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: RCRA (Non Potable Water)

Barium	7/1/2012	11/30/2013	UT
Beryllium	7/1/2012	11/30/2013	UT
Boron	7/1/2012	11/30/2013	UT
Cadmium	7/1/2012	11/30/2013	UT
Calcium	7/1/2012	11/30/2013	UT
Chromium	7/1/2012	11/30/2013	UT
Cobalt	7/1/2012	11/30/2013	UT
Copper	7/1/2012	11/30/2013	UT
Iron	7/1/2012	11/30/2013	UT
Lead	7/1/2012	11/30/2013	UT
Lithium	7/1/2012	11/30/2013	UT
Magnesium	7/1/2012	11/30/2013	UT
Manganese	7/1/2012	11/30/2013	UT
Molybdenum	7/1/2012	11/30/2013	UT
Nickel	7/1/2012	11/30/2013	UT
Phosphorus, total	7/1/2012	11/30/2013	UT
Potassium	7/1/2012	11/30/2013	UT
Selenium	7/1/2012	11/30/2013	UT
Silica as SiO2	7/1/2012	11/30/2013	UT
Silicon	7/1/2012	11/30/2013	UT
Silver	7/1/2012	11/30/2013	UT
Sodium	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Tin	7/1/2012	11/30/2013	UT
Titanium	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT
Zinc	7/1/2012	11/30/2013	UT

Method EPA 6020A

Aluminum	7/1/2012	11/30/2013	UT
Antimony	7/1/2012	11/30/2013	UT
Arsenic	7/1/2012	11/30/2013	UT
Cadmium	7/1/2012	11/30/2013	UT
Calcium	7/1/2012	11/30/2013	UT
Copper	7/1/2012	11/30/2013	UT
Iron	7/1/2012	11/30/2013	UT
Lead	7/1/2012	11/30/2013	UT
Magnesium	7/1/2012	11/30/2013	UT
Molybdenum	7/1/2012	11/30/2013	UT
Nickel	7/1/2012	11/30/2013	UT
Potassium	7/1/2012	11/30/2013	UT
Selenium	7/1/2012	11/30/2013	UT
Silver	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Thorium	7/1/2012	11/30/2013	UT
Uranium	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date Expires AB

Program/Matrix: RCRA (Non Potable Water)**Method EPA 7196A**

Chromium VI 7/1/2012 11/30/2013 UT

Method EPA 7470A

Mercury 7/1/2012 11/30/2013 UT

Method EPA 8015D

Diesel range organics (DRO) 7/1/2012 11/30/2013 UT

Ethylene glycol 7/1/2012 11/30/2013 UT

Gasoline range organics (GRO) 7/1/2012 11/30/2013 UT

Method EPA 8081A

4,4'-DDD 7/1/2012 11/30/2013 UT

4,4'-DDE 7/1/2012 11/30/2013 UT

4,4'-DDT 7/1/2012 11/30/2013 UT

Aldrin 7/1/2012 11/30/2013 UT

alpha-BHC (alpha-Hexachlorocyclohexane) 7/1/2012 11/30/2013 UT

alpha-Chlordane 7/1/2012 11/30/2013 UT

beta-BHC (beta-Hexachlorocyclohexane) 7/1/2012 11/30/2013 UT

Chlordane (tech.) 7/1/2012 11/30/2013 UT

delta-BHC 7/1/2012 11/30/2013 UT

Dieldrin 7/1/2012 11/30/2013 UT

Endosulfan I 7/1/2012 11/30/2013 UT

Endosulfan II 7/1/2012 11/30/2013 UT

Endosulfan sulfate 7/1/2012 11/30/2013 UT

Endrin 7/1/2012 11/30/2013 UT

Endrin aldehyde 7/1/2012 11/30/2013 UT

Endrin ketone 7/1/2012 11/30/2013 UT

gamma-BHC (Lindane, gamma-Hexachlorocyclohexane) 7/1/2012 11/30/2013 UT

gamma-Chlordane 7/1/2012 11/30/2013 UT

Heptachlor 7/1/2012 11/30/2013 UT

Heptachlor epoxide 7/1/2012 11/30/2013 UT

Methoxychlor 7/1/2012 11/30/2013 UT

Toxaphene (Chlorinated camphene) 7/1/2012 11/30/2013 UT

Method EPA 8082

Aroclor-1016 (PCB-1016) 7/1/2012 11/30/2013 UT

Aroclor-1221 (PCB-1221) 7/1/2012 11/30/2013 UT

Aroclor-1232 (PCB-1232) 7/1/2012 11/30/2013 UT

Aroclor-1242 (PCB-1242) 7/1/2012 11/30/2013 UT

Aroclor-1248 (PCB-1248) 7/1/2012 11/30/2013 UT

Aroclor-1254 (PCB-1254) 7/1/2012 11/30/2013 UT

Aroclor-1260 (PCB-1260) 7/1/2012 11/30/2013 UT

Aroclor-1268 (PCB-1268) 7/1/2012 11/30/2013 UT

PCBs 7/1/2012 11/30/2013 UT

Method EPA 8141A

Azinphos-methyl (Guthion) 7/1/2012 11/30/2013 UT

Bolstar (Sulprofos) 7/1/2012 11/30/2013 UT

Chlorpyrifos 7/1/2012 11/30/2013 UT

Coumaphos 7/1/2012 11/30/2013 UT

Demeton-o 7/1/2012 11/30/2013 UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date Expires AB

Program/Matrix: RCRA (Non Potable Water)

Demeton-s	7/1/2012	11/30/2013	UT
Diazinon	7/1/2012	11/30/2013	UT
Dichlorovos (DDVP, Dichlorvos)	7/1/2012	11/30/2013	UT
Disulfoton	7/1/2012	11/30/2013	UT
Ethoprop	7/1/2012	11/30/2013	UT
Fensulfothion	7/1/2012	11/30/2013	UT
Fenthion	7/1/2012	11/30/2013	UT
Malathion	7/1/2012	11/30/2013	UT
Merphos	7/1/2012	11/30/2013	UT
Methyl parathion (Parathion, methyl)	7/1/2012	11/30/2013	UT
Mevinphos	7/1/2012	11/30/2013	UT
Naled	7/1/2012	11/30/2013	UT
Phorate	7/1/2012	11/30/2013	UT
Ronnel	7/1/2012	11/30/2013	UT
Tetrachlorvinphos (Stirophos, Gardona) Z-isomer	7/1/2012	11/30/2013	UT
Tokuthion (Prothiophos)	7/1/2012	11/30/2013	UT
Trichloronate	7/1/2012	11/30/2013	UT

Method EPA 8151A

2,4,5-T	7/1/2012	11/30/2013	UT
2,4-D	7/1/2012	11/30/2013	UT
2,4-DB	7/1/2012	11/30/2013	UT
Dalapon	7/1/2012	11/30/2013	UT
Dicamba	7/1/2012	11/30/2013	UT
Dichloroprop (Dichlorprop)	7/1/2012	11/30/2013	UT
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	7/1/2012	11/30/2013	UT
MCPA	7/1/2012	11/30/2013	UT
MCPP	7/1/2012	11/30/2013	UT
Silvex (2,4,5-TP)	7/1/2012	11/30/2013	UT

Method EPA 8260C

1,1,1,2-Tetrachloroethane	7/1/2012	11/30/2013	UT
1,1,1-Trichloroethane	7/1/2012	11/30/2013	UT
1,1,2,2-Tetrachloroethane	7/1/2012	11/30/2013	UT
1,1,2-Trichloroethane	7/1/2012	11/30/2013	UT
1,1-Dichloroethane	7/1/2012	11/30/2013	UT
1,1-Dichloroethylene	7/1/2012	11/30/2013	UT
1,2,3-Trichlorobenzene	7/1/2012	11/30/2013	UT
1,2,3-Trichloropropane	7/1/2012	11/30/2013	UT
1,2,3-Trimethylbenzene	7/1/2012	11/30/2013	UT
1,2,4-Trichlorobenzene	7/1/2012	11/30/2013	UT
1,2-Dibromo-3-chloropropane (DBCP)	7/1/2012	11/30/2013	UT
1,2-Dibromoethane (EDB, Ethylene dibromide)	7/1/2012	11/30/2013	UT
1,2-Dichlorobenzene (o-Dichlorobenzene)	7/1/2012	11/30/2013	UT
1,2-Dichloroethane (Ethylene dichloride)	7/1/2012	11/30/2013	UT
1,2-Dichloropropane	7/1/2012	11/30/2013	UT
1,3,5-Trimethylbenzene	7/1/2012	11/30/2013	UT
1,3-Dichlorobenzene	7/1/2012	11/30/2013	UT
1,3-Dichloropropane	7/1/2012	11/30/2013	UT
1,4-Dichlorobenzene	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date Expires AB

Program/Matrix: RCRA (Non Potable Water)

1,4-Dioxane (1,4- Diethyleneoxide)	7/1/2012	11/30/2013	UT
1-Chlorobutane	1/23/2013	11/30/2013	UT
1-Chlorohexane	7/1/2012	11/30/2013	UT
2,2-Dichloropropane	7/1/2012	11/30/2013	UT
2-Butanone (Methyl ethyl ketone, MEK)	7/1/2012	11/30/2013	UT
2-Chloroethyl vinyl ether	7/1/2012	11/30/2013	UT
2-Chlorotoluene	7/1/2012	11/30/2013	UT
2-Hexanone	7/1/2012	11/30/2013	UT
4-Chlorotoluene	7/1/2012	11/30/2013	UT
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	7/1/2012	11/30/2013	UT
4-Methyl-2-pentanone (MIBK)	7/1/2012	11/30/2013	UT
Acetone	7/1/2012	11/30/2013	UT
Acetonitrile	7/1/2012	11/30/2013	UT
Acrolein (Propenal)	7/1/2012	11/30/2013	UT
Acrylonitrile	7/1/2012	11/30/2013	UT
Allyl chloride (3-Chloropropene)	7/1/2012	11/30/2013	UT
Benzene	7/1/2012	11/30/2013	UT
Bromobenzene	7/1/2012	11/30/2013	UT
Bromochloromethane	7/1/2012	11/30/2013	UT
Bromodichloromethane	7/1/2012	11/30/2013	UT
Bromoform	7/1/2012	11/30/2013	UT
Carbon disulfide	7/1/2012	11/30/2013	UT
Carbon tetrachloride	7/1/2012	11/30/2013	UT
Chloroacetonitrile	1/23/2013	11/30/2013	UT
Chlorobenzene	7/1/2012	11/30/2013	UT
Chlorodibromomethane	7/1/2012	11/30/2013	UT
Chloroethane (Ethyl chloride)	7/1/2012	11/30/2013	UT
Chloroform	7/1/2012	11/30/2013	UT
Chloroprene (2-Chloro-1,3-butadiene)	7/1/2012	11/30/2013	UT
cis-1,2-Dichloroethylene	7/1/2012	11/30/2013	UT
cis-1,3-Dichloropropene	7/1/2012	11/30/2013	UT
Dibromomethane (Methylene bromide)	7/1/2012	11/30/2013	UT
Dichlorodifluoromethane (Freon-12)	7/1/2012	11/30/2013	UT
Diethyl ether	7/1/2012	11/30/2013	UT
Ethanol	7/1/2012	11/30/2013	UT
Ethyl methacrylate	7/1/2012	11/30/2013	UT
Ethylbenzene	7/1/2012	11/30/2013	UT
Hexachlorobutadiene	7/1/2012	11/30/2013	UT
Hexachloroethane	7/1/2012	11/30/2013	UT
Iodomethane (Methyl iodide)	7/1/2012	11/30/2013	UT
Isobutyl alcohol (2-Methyl-1-propanol)	7/1/2012	11/30/2013	UT
Isopropylbenzene	7/1/2012	11/30/2013	UT
Methacrylonitrile	7/1/2012	11/30/2013	UT
Methyl acrylate	1/23/2013	11/30/2013	UT
Methyl bromide (Bromomethane)	7/1/2012	11/30/2013	UT
Methyl chloride (Chloromethane)	7/1/2012	11/30/2013	UT
Methyl methacrylate	7/1/2012	11/30/2013	UT
Methyl tert-butyl ether (MTBE)	7/1/2012	11/30/2013	UT
Methylene chloride (Dichloromethane)	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: RCRA (Non Potable Water)

m-Xylene	7/1/2012	11/30/2013	UT
Naphthalene	7/1/2012	11/30/2013	UT
n-Butyl alcohol (1-Butanol, n-Butanol)	7/1/2012	11/30/2013	UT
n-Butylbenzene	7/1/2012	11/30/2013	UT
n-Propylbenzene	7/1/2012	11/30/2013	UT
o-Xylene	7/1/2012	11/30/2013	UT
Pentafluorobenzene	1/23/2013	11/30/2013	UT
Propionitrile (Ethyl cyanide)	7/1/2012	11/30/2013	UT
p-Xylene	7/1/2012	11/30/2013	UT
sec-Butylbenzene	7/1/2012	11/30/2013	UT
Styrene	7/1/2012	11/30/2013	UT
Tetrachloroethylene (Perchloroethylene)	7/1/2012	11/30/2013	UT
Toluene	7/1/2012	11/30/2013	UT
trans-1,2-Dichloroethylene	7/1/2012	11/30/2013	UT
trans-1,3-Dichloropropylene	7/1/2012	11/30/2013	UT
trans-1,4-Dichloro-2-butene	7/1/2012	11/30/2013	UT
Trichloroethene (Trichloroethylene)	7/1/2012	11/30/2013	UT
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	7/1/2012	11/30/2013	UT
Vinyl acetate	7/1/2012	11/30/2013	UT
Vinyl chloride	7/1/2012	11/30/2013	UT
Xylene (total)	7/1/2012	11/30/2013	UT

Method EPA 8270D

1,2,4,5-Tetrachlorobenzene	7/1/2012	11/30/2013	UT
1,2,4-Trichlorobenzene	7/1/2012	11/30/2013	UT
1,2-Dichlorobenzene (o-Dichlorobenzene)	7/1/2012	11/30/2013	UT
1,2-Dinitrobenzene	7/1/2012	11/30/2013	UT
1,3,5-Trinitrobenzene (1,3,5-TNB)	7/1/2012	11/30/2013	UT
1,3-Dichlorobenzene	7/1/2012	11/30/2013	UT
1,3-Dinitrobenzene (1,3-DNB)	7/1/2012	11/30/2013	UT
1,4-Dichlorobenzene	7/1/2012	11/30/2013	UT
1,4-Dinitrobenzene	7/1/2012	11/30/2013	UT
1-Methylnaphthalene	7/1/2012	11/30/2013	UT
1-Naphthylamine	7/1/2012	11/30/2013	UT
2,3,4,6-Tetrachlorophenol	7/1/2012	11/30/2013	UT
2,4,5-Trichlorophenol	7/1/2012	11/30/2013	UT
2,4,6-Trichlorophenol	7/1/2012	11/30/2013	UT
2,4-Dichlorophenol	7/1/2012	11/30/2013	UT
2,4-Dimethylphenol	7/1/2012	11/30/2013	UT
2,4-Dinitrophenol	7/1/2012	11/30/2013	UT
2,4-Dinitrotoluene (2,4-DNT)	7/1/2012	11/30/2013	UT
2,6-Dichlorophenol	7/1/2012	11/30/2013	UT
2,6-Dinitrotoluene (2,6-DNT)	7/1/2012	11/30/2013	UT
2-Acetylaminofluorene	7/1/2012	11/30/2013	UT
2-Chloronaphthalene	7/1/2012	11/30/2013	UT
2-Chlorophenol	7/1/2012	11/30/2013	UT
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	7/1/2012	11/30/2013	UT
2-Methylnaphthalene	7/1/2012	11/30/2013	UT
2-Methylphenol (o-Cresol)	7/1/2012	11/30/2013	UT

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Program/Matrix: RCRA (Non Potable Water)

2-Naphthylamine	7/1/2012	11/30/2013	UT
2-Nitroaniline	7/1/2012	11/30/2013	UT
2-Nitrophenol	7/1/2012	11/30/2013	UT
3,3'-Dichlorobenzidine	7/1/2012	11/30/2013	UT
3-Methylcholanthrene	7/1/2012	11/30/2013	UT
3-Methylphenol (m-Cresol)	7/1/2012	11/30/2013	UT
3-Nitroaniline	7/1/2012	11/30/2013	UT
4-Bromophenyl phenyl ether	7/1/2012	11/30/2013	UT
4-Chloro-3-methylphenol	7/1/2012	11/30/2013	UT
4-Chloroaniline	7/1/2012	11/30/2013	UT
4-Chlorophenyl phenylether	7/1/2012	11/30/2013	UT
4-Methylphenol (p-Cresol)	7/1/2012	11/30/2013	UT
4-Nitroaniline	7/1/2012	11/30/2013	UT
4-Nitrophenol	7/1/2012	11/30/2013	UT
5-Nitro-o-toluidine	7/1/2012	11/30/2013	UT
7,12-Dimethylbenz(a) anthracene	7/1/2012	11/30/2013	UT
Acenaphthene	7/1/2012	11/30/2013	UT
Acenaphthylene	7/1/2012	11/30/2013	UT
Acetophenone	7/1/2012	11/30/2013	UT
Aniline	7/1/2012	11/30/2013	UT
Anthracene	7/1/2012	11/30/2013	UT
Azobenzene (1,2-Diphenylhydrazine)	7/1/2012	11/30/2013	UT
Benzidine	7/1/2012	11/30/2013	UT
Benzo(a)anthracene	7/1/2012	11/30/2013	UT
Benzo(a)pyrene	7/1/2012	11/30/2013	UT
Benzo(b)fluoranthene	7/1/2012	11/30/2013	UT
Benzo(g,h,i)perylene	7/1/2012	11/30/2013	UT
Benzo(k)fluoranthene	7/1/2012	11/30/2013	UT
Benzoic acid	7/1/2012	11/30/2013	UT
Benzyl alcohol	7/1/2012	11/30/2013	UT
bis(2-Chloroethoxy)methane	7/1/2012	11/30/2013	UT
bis(2-Chloroethyl) ether	7/1/2012	11/30/2013	UT
bis(2-Chloroisopropyl) ether	7/1/2012	11/30/2013	UT
bis(2-Ethylhexyl) phthalate (DEHP)	7/1/2012	11/30/2013	UT
Butyl benzyl phthalate	7/1/2012	11/30/2013	UT
Carbazole	7/1/2012	11/30/2013	UT
Chrysene	7/1/2012	11/30/2013	UT
Dibenz(a,h) anthracene	7/1/2012	11/30/2013	UT
Dibenzofuran	7/1/2012	11/30/2013	UT
Diethyl phthalate	7/1/2012	11/30/2013	UT
Dimethyl phthalate	7/1/2012	11/30/2013	UT
Di-n-butyl phthalate	7/1/2012	11/30/2013	UT
Di-n-octyl phthalate	7/1/2012	11/30/2013	UT
Ethyl methanesulfonate	7/1/2012	11/30/2013	UT
Fluoranthene	7/1/2012	11/30/2013	UT
Fluorene	7/1/2012	11/30/2013	UT
Hexachlorobenzene	7/1/2012	11/30/2013	UT
Hexachlorobutadiene	7/1/2012	11/30/2013	UT
Hexachlorocyclopentadiene	7/1/2012	11/30/2013	UT

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Program/Matrix: RCRA (Non Potable Water)

Hexachloroethane	7/1/2012	11/30/2013	UT
Hexachloropropene	7/1/2012	11/30/2013	UT
Indeno(1,2,3-cd) pyrene	7/1/2012	11/30/2013	UT
Isophorone	7/1/2012	11/30/2013	UT
Isosafrole	7/1/2012	11/30/2013	UT
Methyl methanesulfonate	7/1/2012	11/30/2013	UT
Naphthalene	7/1/2012	11/30/2013	UT
Nitrobenzene	7/1/2012	11/30/2013	UT
n-Nitrosodiethylamine	7/1/2012	11/30/2013	UT
n-Nitrosodimethylamine	7/1/2012	11/30/2013	UT
n-Nitroso-di-n-butylamine	7/1/2012	11/30/2013	UT
n-Nitrosodi-n-propylamine	7/1/2012	11/30/2013	UT
n-Nitrosodiphenylamine	7/1/2012	11/30/2013	UT
n-Nitrosomethylethylamine	7/1/2012	11/30/2013	UT
n-Nitrosomorpholine	7/1/2012	11/30/2013	UT
n-Nitrosopiperidine	7/1/2012	11/30/2013	UT
n-Nitrosopyrrolidine	7/1/2012	11/30/2013	UT
Pentachlorobenzene	7/1/2012	11/30/2013	UT
Pentachloronitrobenzene	7/1/2012	11/30/2013	UT
Pentachlorophenol	7/1/2012	11/30/2013	UT
Phenacetin	7/1/2012	11/30/2013	UT
Phenanthrene	7/1/2012	11/30/2013	UT
Phenol	7/1/2012	11/30/2013	UT
Pyrene	7/1/2012	11/30/2013	UT
Pyridine	7/1/2012	11/30/2013	UT
Safrole	7/1/2012	11/30/2013	UT
Method EPA 901.1			
Cesium-134	7/1/2012	11/30/2013	UT
Cesium-137	7/1/2012	11/30/2013	UT
Cobalt-60	7/1/2012	11/30/2013	UT
Method EPA 9010C			
Cyanide	7/1/2012	11/30/2013	UT
Method EPA 9013A			
Preparation/Extraction	7/1/2012	11/30/2013	UT
Method EPA 9014			
Cyanide	7/1/2012	11/30/2013	UT
Method EPA 9034			
Total sulfides	7/1/2012	11/30/2013	UT
Method EPA 9040C			
pH	7/1/2012	11/30/2013	UT
Method EPA 9050A			
Conductivity	7/1/2012	11/30/2013	UT
Method EPA 9056A			
Bromide	7/1/2012	11/30/2013	UT
Chloride	7/1/2012	11/30/2013	UT
Fluoride	7/1/2012	11/30/2013	UT
Nitrate as N	7/1/2012	11/30/2013	UT

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Program/Matrix: RCRA (Non Potable Water)

Nitrite as N	7/1/2012	11/30/2013	UT
Orthophosphate as P	7/1/2012	11/30/2013	UT
Sulfate	7/1/2012	11/30/2013	UT
Method EPA 906.0			
Tritium	7/1/2012	11/30/2013	UT
Method EPA 9060A			
Total organic carbon	7/1/2012	11/30/2013	UT
Method EPA 9214			
Fluoride	7/1/2012	11/30/2013	UT
Method EPA 9310			
Gross alpha-beta	7/1/2012	11/30/2013	UT
Method EPA 9315			
Total alpha radium	7/1/2012	11/30/2013	UT
Method EPA 9320			
Radium-228	7/1/2012	11/30/2013	UT
Method EPA RSK-175 (GC/FID)			
Ethane	7/1/2012	11/30/2013	UT
Ethene	7/1/2012	11/30/2013	UT
Methane	7/1/2012	11/30/2013	UT
n-Propane	7/1/2012	11/30/2013	UT
Method HASL 300 Ga-01-R sec 4.5.2.3			
Cesium-134	7/1/2012	11/30/2013	UT
Cesium-137	7/1/2012	11/30/2013	UT
Cobalt-60	7/1/2012	11/30/2013	UT
Method HASL 300 Sr-01-RC (GPC)			
Strontium-89, 90	7/1/2012	11/30/2013	UT
Method HASL 300 U-02-RC			
Americium-241	7/1/2012	11/30/2013	UT
Plutonium	7/1/2012	11/30/2013	UT
Thorium-228	7/1/2012	11/30/2013	UT
Thorium-230	7/1/2012	11/30/2013	UT
Thorium-232	7/1/2012	11/30/2013	UT
Method SM 7500-Ra C (SC)			
Radium-226	7/1/2012	11/30/2013	UT

Program/Matrix: RCRA (Solid & Hazardous Material)**Method ASTM D3972-90**

Thorium-228	7/1/2012	11/30/2013	UT
Thorium-230	7/1/2012	11/30/2013	UT
Thorium-232	7/1/2012	11/30/2013	UT

Method EPA 053917 p. 33 EMSL LV

Thorium-228	7/1/2012	11/30/2013	UT
Thorium-230	7/1/2012	11/30/2013	UT
Thorium-232	7/1/2012	11/30/2013	UT

Method EPA 1010A

Ignitability	7/1/2012	11/30/2013	UT
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Method EPA 1110A

Corrosivity toward steel	7/1/2012	11/30/2013	UT
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Method EPA 1311

Toxicity Characteristic Leaching Procedure Metals	7/1/2012	11/30/2013	UT
Toxicity Characteristic Leaching Procedure Semi-Volatiles	7/1/2012	11/30/2013	UT
Toxicity Characteristic Leaching Procedure Volatiles	7/1/2012	11/30/2013	UT

Method EPA 1312

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3050B

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3060A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3540C

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3580A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3620B

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3630C

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3640A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 3660A

Preparation/Extraction	7/1/2012	11/30/2013	UT
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Method EPA 5035A

Preparation/Extraction	1/23/2013	11/30/2013	UT
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Method EPA 6010B

Aluminum	7/1/2012	11/30/2013	UT
Antimony	7/1/2012	11/30/2013	UT
Arsenic	7/1/2012	11/30/2013	UT
Barium	7/1/2012	11/30/2013	UT
Beryllium	7/1/2012	11/30/2013	UT
Boron	7/1/2012	11/30/2013	UT
Cadmium	7/1/2012	11/30/2013	UT
Calcium	7/1/2012	11/30/2013	UT

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Program/Matrix: RCRA (Solid & Hazardous Material)

Chromium	7/1/2012	11/30/2013	UT
Cobalt	7/1/2012	11/30/2013	UT
Copper	7/1/2012	11/30/2013	UT
Iron	7/1/2012	11/30/2013	UT
Lead	7/1/2012	11/30/2013	UT
Lithium	7/1/2012	11/30/2013	UT
Magnesium	7/1/2012	11/30/2013	UT
Manganese	7/1/2012	11/30/2013	UT
Molybdenum	7/1/2012	11/30/2013	UT
Nickel	7/1/2012	11/30/2013	UT
Phosphorus, total	7/1/2012	11/30/2013	UT
Potassium	7/1/2012	11/30/2013	UT
Selenium	7/1/2012	11/30/2013	UT
Silica as SiO2	7/1/2012	11/30/2013	UT
Silicon	7/1/2012	11/30/2013	UT
Silver	7/1/2012	11/30/2013	UT
Sodium	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Tin	7/1/2012	11/30/2013	UT
Titanium	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT
Zinc	7/1/2012	11/30/2013	UT

Method EPA 6020A

Aluminum	7/1/2012	11/30/2013	UT
Antimony	7/1/2012	11/30/2013	UT
Arsenic	7/1/2012	11/30/2013	UT
Cadmium	7/1/2012	11/30/2013	UT
Calcium	7/1/2012	11/30/2013	UT
Copper	7/1/2012	11/30/2013	UT
Iron	7/1/2012	11/30/2013	UT
Lead	7/1/2012	11/30/2013	UT
Magnesium	7/1/2012	11/30/2013	UT
Molybdenum	7/1/2012	11/30/2013	UT
Nickel	7/1/2012	11/30/2013	UT
Potassium	7/1/2012	11/30/2013	UT
Selenium	7/1/2012	11/30/2013	UT
Silver	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Thorium	7/1/2012	11/30/2013	UT
Uranium	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT

Method EPA 7196A

Chromium VI	7/1/2012	11/30/2013	UT
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Method EPA 7471A

Mercury	7/1/2012	11/30/2013	UT
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Method EPA 8015D

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Program/Matrix: RCRA (Solid & Hazardous Material)

Diesel range organics (DRO)	7/1/2012	11/30/2013	UT
Ethylene glycol	7/1/2012	11/30/2013	UT
Gasoline range organics (GRO)	7/1/2012	11/30/2013	UT

Method EPA 8081A

4,4'-DDD	7/1/2012	11/30/2013	UT
4,4'-DDE	7/1/2012	11/30/2013	UT
4,4'-DDT	7/1/2012	11/30/2013	UT
Aldrin	7/1/2012	11/30/2013	UT
alpha-BHC (alpha-Hexachlorocyclohexane)	7/1/2012	11/30/2013	UT
alpha-Chlordane	7/1/2012	11/30/2013	UT
beta-BHC (beta-Hexachlorocyclohexane)	7/1/2012	11/30/2013	UT
Chlordane (tech.)	7/1/2012	11/30/2013	UT
delta-BHC	7/1/2012	11/30/2013	UT
Dieldrin	7/1/2012	11/30/2013	UT
Endosulfan I	7/1/2012	11/30/2013	UT
Endosulfan II	7/1/2012	11/30/2013	UT
Endosulfan sulfate	7/1/2012	11/30/2013	UT
Endrin	7/1/2012	11/30/2013	UT
Endrin aldehyde	7/1/2012	11/30/2013	UT
Endrin ketone	7/1/2012	11/30/2013	UT
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7/1/2012	11/30/2013	UT
gamma-Chlordane	7/1/2012	11/30/2013	UT
Heptachlor	7/1/2012	11/30/2013	UT
Heptachlor epoxide	7/1/2012	11/30/2013	UT
Methoxychlor	7/1/2012	11/30/2013	UT
Toxaphene (Chlorinated camphene)	7/1/2012	11/30/2013	UT

Method EPA 8082

Aroclor-1016 (PCB-1016)	7/1/2012	11/30/2013	UT
Aroclor-1221 (PCB-1221)	7/1/2012	11/30/2013	UT
Aroclor-1232 (PCB-1232)	7/1/2012	11/30/2013	UT
Aroclor-1242 (PCB-1242)	7/1/2012	11/30/2013	UT
Aroclor-1248 (PCB-1248)	7/1/2012	11/30/2013	UT
Aroclor-1254 (PCB-1254)	7/1/2012	11/30/2013	UT
Aroclor-1260 (PCB-1260)	7/1/2012	11/30/2013	UT
Aroclor-1268 (PCB-1268)	7/1/2012	11/30/2013	UT
PCBs	7/1/2012	11/30/2013	UT

Method EPA 8141A

Azinphos-methyl (Guthion)	7/1/2012	11/30/2013	UT
Bolstar (Sulprofos)	7/1/2012	11/30/2013	UT
Chlorpyrifos	7/1/2012	11/30/2013	UT
Coumaphos	7/1/2012	11/30/2013	UT
Demeton-o	7/1/2012	11/30/2013	UT
Demeton-s	7/1/2012	11/30/2013	UT
Diazinon	7/1/2012	11/30/2013	UT
Dichlorvos (DDVP, Dichlorvos)	7/1/2012	11/30/2013	UT
Disulfoton	7/1/2012	11/30/2013	UT
Ethoprop	7/1/2012	11/30/2013	UT
Fensulfothion	7/1/2012	11/30/2013	UT

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Program/Matrix: RCRA (Solid & Hazardous Material)

Fenthion	7/1/2012	11/30/2013	UT
Malathion	7/1/2012	11/30/2013	UT
Merphos	7/1/2012	11/30/2013	UT
Methyl parathion (Parathion, methyl)	7/1/2012	11/30/2013	UT
Mevinphos	7/1/2012	11/30/2013	UT
Naled	7/1/2012	11/30/2013	UT
Phorate	7/1/2012	11/30/2013	UT
Ronnel	7/1/2012	11/30/2013	UT
Tetrachlorvinphos (Stirophos, Gardona) Z-isomer	7/1/2012	11/30/2013	UT
Tokuthion (Prothiophos)	7/1/2012	11/30/2013	UT
Trichloronate	7/1/2012	11/30/2013	UT

Method EPA 8151A

2,4,5-T	7/1/2012	11/30/2013	UT
2,4-D	7/1/2012	11/30/2013	UT
2,4-DB	7/1/2012	11/30/2013	UT
Dalapon	7/1/2012	11/30/2013	UT
Dicamba	7/1/2012	11/30/2013	UT
Dichloroprop (Dichloroprop)	7/1/2012	11/30/2013	UT
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	7/1/2012	11/30/2013	UT
MCPA	7/1/2012	11/30/2013	UT
MCPP	7/1/2012	11/30/2013	UT
Silvex (2,4,5-TP)	7/1/2012	11/30/2013	UT

Method EPA 8260C

1,1,1,2-Tetrachloroethane	7/1/2012	11/30/2013	UT
1,1,1-Trichloroethane	7/1/2012	11/30/2013	UT
1,1,2,2-Tetrachloroethane	7/1/2012	11/30/2013	UT
1,1,2-Trichloroethane	7/1/2012	11/30/2013	UT
1,1-Dichloroethane	7/1/2012	11/30/2013	UT
1,1-Dichloroethylene	7/1/2012	11/30/2013	UT
1,2,3-Trichlorobenzene	7/1/2012	11/30/2013	UT
1,2,3-Trichloropropane	7/1/2012	11/30/2013	UT
1,2,3-Trimethylbenzene	7/1/2012	11/30/2013	UT
1,2,4-Trichlorobenzene	7/1/2012	11/30/2013	UT
1,2-Dibromo-3-chloropropane (DBCP)	7/1/2012	11/30/2013	UT
1,2-Dibromoethane (EDB, Ethylene dibromide)	7/1/2012	11/30/2013	UT
1,2-Dichlorobenzene (o-Dichlorobenzene)	7/1/2012	11/30/2013	UT
1,2-Dichloroethane (Ethylene dichloride)	7/1/2012	11/30/2013	UT
1,2-Dichloropropane	7/1/2012	11/30/2013	UT
1,3,5-Trimethylbenzene	7/1/2012	11/30/2013	UT
1,3-Dichlorobenzene	7/1/2012	11/30/2013	UT
1,3-Dichloropropene	7/1/2012	11/30/2013	UT
1,4-Dichlorobenzene	7/1/2012	11/30/2013	UT
1,4-Dioxane (1,4- Diethyleneoxide)	7/1/2012	11/30/2013	UT
1-Chlorobutane	1/23/2013	11/30/2013	UT
1-Chlorohexane	7/1/2012	11/30/2013	UT
2,2-Dichloropropane	7/1/2012	11/30/2013	UT
2-Butanone (Methyl ethyl ketone, MEK)	7/1/2012	11/30/2013	UT
2-Chloroethyl vinyl ether	7/1/2012	11/30/2013	UT

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Start Date	Expires	AB
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Program/Matrix: RCRA (Solid & Hazardous Material)

2-Chlorotoluene	7/1/2012	11/30/2013	UT
2-Hexanone	7/1/2012	11/30/2013	UT
4-Chlorotoluene	7/1/2012	11/30/2013	UT
4-Isopropyltoluene (p-Cymene,p-Isopropyltoluene)	7/1/2012	11/30/2013	UT
4-Methyl-2-pentanone (MIBK)	7/1/2012	11/30/2013	UT
Acetone	7/1/2012	11/30/2013	UT
Acetonitrile	7/1/2012	11/30/2013	UT
Acrolein (Propenal)	7/1/2012	11/30/2013	UT
Acrylonitrile	7/1/2012	11/30/2013	UT
Allyl chloride (3-Chloropropene)	7/1/2012	11/30/2013	UT
Benzene	7/1/2012	11/30/2013	UT
Bromobenzene	7/1/2012	11/30/2013	UT
Bromochloromethane	7/1/2012	11/30/2013	UT
Bromodichloromethane	7/1/2012	11/30/2013	UT
Bromoform	7/1/2012	11/30/2013	UT
Carbon disulfide	7/1/2012	11/30/2013	UT
Carbon tetrachloride	7/1/2012	11/30/2013	UT
Chloroacetonitrile	1/23/2013	11/30/2013	UT
Chlorobenzene	7/1/2012	11/30/2013	UT
Chlorodibromomethane	7/1/2012	11/30/2013	UT
Chloroethane (Ethyl chloride)	7/1/2012	11/30/2013	UT
Chloroform	7/1/2012	11/30/2013	UT
Chloroprene (2-Chloro-1,3-butadiene)	7/1/2012	11/30/2013	UT
cis-1,2-Dichloroethylene	7/1/2012	11/30/2013	UT
cis-1,3-Dichloropropene	7/1/2012	11/30/2013	UT
Dibromomethane (Methylene bromide)	7/1/2012	11/30/2013	UT
Dichlorodifluoromethane (Freon-12)	7/1/2012	11/30/2013	UT
Diethyl ether	7/1/2012	11/30/2013	UT
Ethanol	7/1/2012	11/30/2013	UT
Ethyl methacrylate	7/1/2012	11/30/2013	UT
Ethylbenzene	7/1/2012	11/30/2013	UT
Hexachlorobutadiene	7/1/2012	11/30/2013	UT
Hexachloroethane	7/1/2012	11/30/2013	UT
Iodomethane (Methyl iodide)	7/1/2012	11/30/2013	UT
Isobutyl alcohol (2-Methyl-1-propanol)	7/1/2012	11/30/2013	UT
Isopropylbenzene	7/1/2012	11/30/2013	UT
Methacrylonitrile	7/1/2012	11/30/2013	UT
Methyl acrylate	1/23/2013	11/30/2013	UT
Methyl bromide (Bromomethane)	7/1/2012	11/30/2013	UT
Methyl chloride (Chloromethane)	7/1/2012	11/30/2013	UT
Methyl methacrylate	7/1/2012	11/30/2013	UT
Methyl tert-butyl ether (MTBE)	7/1/2012	11/30/2013	UT
Methylene chloride (Dichloromethane)	7/1/2012	11/30/2013	UT
m-Xylene	7/1/2012	11/30/2013	UT
Naphthalene	7/1/2012	11/30/2013	UT
n-Butyl alcohol (1-Butanol, n-Butanol)	7/1/2012	11/30/2013	UT
n-Butylbenzene	7/1/2012	11/30/2013	UT
n-Propylbenzene	7/1/2012	11/30/2013	UT
o-Xylene	7/1/2012	11/30/2013	UT

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Program/Matrix: RCRA (Solid & Hazardous Material)

Pentafluorobenzene	1/23/2013	11/30/2013	UT
Propionitrile (Ethyl cyanide)	7/1/2012	11/30/2013	UT
p-Xylene	7/1/2012	11/30/2013	UT
sec-Butylbenzene	7/1/2012	11/30/2013	UT
Styrene	7/1/2012	11/30/2013	UT
Tetrachloroethylene (Perchloroethylene)	7/1/2012	11/30/2013	UT
Toluene	7/1/2012	11/30/2013	UT
trans-1,2-Dichloroethylene	7/1/2012	11/30/2013	UT
trans-1,3-Dichloropropylene	7/1/2012	11/30/2013	UT
trans-1,4-Dichloro-2-butene	7/1/2012	11/30/2013	UT
Trichloroethene (Trichloroethylene)	7/1/2012	11/30/2013	UT
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	7/1/2012	11/30/2013	UT
Vinyl acetate	7/1/2012	11/30/2013	UT
Vinyl chloride	7/1/2012	11/30/2013	UT
Xylene (total)	7/1/2012	11/30/2013	UT

Method EPA 8270D

1,2,4,5-Tetrachlorobenzene	7/1/2012	11/30/2013	UT
1,2,4-Trichlorobenzene	7/1/2012	11/30/2013	UT
1,2-Dichlorobenzene (o-Dichlorobenzene)	7/1/2012	11/30/2013	UT
1,2-Dinitrobenzene	7/1/2012	11/30/2013	UT
1,3,5-Trinitrobenzene (1,3,5-TNB)	7/1/2012	11/30/2013	UT
1,3-Dichlorobenzene	7/1/2012	11/30/2013	UT
1,3-Dinitrobenzene (1,3-DNB)	7/1/2012	11/30/2013	UT
1,4-Dichlorobenzene	7/1/2012	11/30/2013	UT
1,4-Dinitrobenzene	7/1/2012	11/30/2013	UT
1-Methylnaphthalene	7/1/2012	11/30/2013	UT
1-Naphthylamine	7/1/2012	11/30/2013	UT
2,3,4,6-Tetrachlorophenol	7/1/2012	11/30/2013	UT
2,4,5-Trichlorophenol	7/1/2012	11/30/2013	UT
2,4,6-Trichlorophenol	7/1/2012	11/30/2013	UT
2,4-Dichlorophenol	7/1/2012	11/30/2013	UT
2,4-Dimethylphenol	7/1/2012	11/30/2013	UT
2,4-Dinitrophenol	7/1/2012	11/30/2013	UT
2,4-Dinitrotoluene (2,4-DNT)	7/1/2012	11/30/2013	UT
2,6-Dichlorophenol	7/1/2012	11/30/2013	UT
2,6-Dinitrotoluene (2,6-DNT)	7/1/2012	11/30/2013	UT
2-Acetylaminofluorene	7/1/2012	11/30/2013	UT
2-Chloronaphthalene	7/1/2012	11/30/2013	UT
2-Chlorophenol	7/1/2012	11/30/2013	UT
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	7/1/2012	11/30/2013	UT
2-Methylnaphthalene	7/1/2012	11/30/2013	UT
2-Methylphenol (o-Cresol)	7/1/2012	11/30/2013	UT
2-Naphthylamine	7/1/2012	11/30/2013	UT
2-Nitroaniline	7/1/2012	11/30/2013	UT
2-Nitrophenol	7/1/2012	11/30/2013	UT
3,3'-Dichlorobenzidine	7/1/2012	11/30/2013	UT
3-Methylcholanthrene	7/1/2012	11/30/2013	UT
3-Methylphenol (m-Cresol)	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: RCRA (Solid & Hazardous Material)

3-Nitroaniline	7/1/2012	11/30/2013	UT
4-Bromophenyl phenyl ether	7/1/2012	11/30/2013	UT
4-Chloro-3-methylphenol	7/1/2012	11/30/2013	UT
4-Chloroaniline	7/1/2012	11/30/2013	UT
4-Chlorophenyl phenylether	7/1/2012	11/30/2013	UT
4-Methylphenol (p-Cresol)	7/1/2012	11/30/2013	UT
4-Nitroaniline	7/1/2012	11/30/2013	UT
4-Nitrophenol	7/1/2012	11/30/2013	UT
5-Nitro-o-toluidine	7/1/2012	11/30/2013	UT
7,12-Dimethylbenz(a) anthracene	7/1/2012	11/30/2013	UT
Acenaphthene	7/1/2012	11/30/2013	UT
Acenaphthylene	7/1/2012	11/30/2013	UT
Acetophenone	7/1/2012	11/30/2013	UT
Aniline	7/1/2012	11/30/2013	UT
Anthracene	7/1/2012	11/30/2013	UT
Azobenzene (1,2-Diphenylhydrazine)	7/1/2012	11/30/2013	UT
Benzidine	7/1/2012	11/30/2013	UT
Benzo(a)anthracene	7/1/2012	11/30/2013	UT
Benzo(a)pyrene	7/1/2012	11/30/2013	UT
Benzo(b)fluoranthene	7/1/2012	11/30/2013	UT
Benzo(g,h,i)perylene	7/1/2012	11/30/2013	UT
Benzo(k)fluoranthene	7/1/2012	11/30/2013	UT
Benzoic acid	7/1/2012	11/30/2013	UT
Benzyl alcohol	7/1/2012	11/30/2013	UT
bis(2-Chloroethoxy)methane	7/1/2012	11/30/2013	UT
bis(2-Chloroethyl) ether	7/1/2012	11/30/2013	UT
bis(2-Chloroisopropyl) ether	7/1/2012	11/30/2013	UT
bis(2-Ethylhexyl) phthalate (DEHP)	7/1/2012	11/30/2013	UT
Butyl benzyl phthalate	7/1/2012	11/30/2013	UT
Carbazole	7/1/2012	11/30/2013	UT
Chrysene	7/1/2012	11/30/2013	UT
Dibenz(a,h) anthracene	7/1/2012	11/30/2013	UT
Dibenzofuran	7/1/2012	11/30/2013	UT
Diethyl phthalate	7/1/2012	11/30/2013	UT
Dimethyl phthalate	7/1/2012	11/30/2013	UT
Di-n-butyl phthalate	7/1/2012	11/30/2013	UT
Di-n-octyl phthalate	7/1/2012	11/30/2013	UT
Ethyl methanesulfonate	7/1/2012	11/30/2013	UT
Fluoranthene	7/1/2012	11/30/2013	UT
Fluorene	7/1/2012	11/30/2013	UT
Hexachlorobenzene	7/1/2012	11/30/2013	UT
Hexachlorobutadiene	7/1/2012	11/30/2013	UT
Hexachlorocyclopentadiene	7/1/2012	11/30/2013	UT
Hexachloroethane	7/1/2012	11/30/2013	UT
Hexachloropropene	7/1/2012	11/30/2013	UT
Indeno(1,2,3-cd) pyrene	7/1/2012	11/30/2013	UT
Isophorone	7/1/2012	11/30/2013	UT
Isosafrole	7/1/2012	11/30/2013	UT
Methyl methanesulfonate	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date Expires AB

Program/Matrix: RCRA (Solid & Hazardous Material)

Naphthalene	7/1/2012	11/30/2013	UT
Nitrobenzene	7/1/2012	11/30/2013	UT
n-Nitrosodiethylamine	7/1/2012	11/30/2013	UT
n-Nitrosodimethylamine	7/1/2012	11/30/2013	UT
n-Nitroso-di-n-butylamine	7/1/2012	11/30/2013	UT
n-Nitrosodi-n-propylamine	7/1/2012	11/30/2013	UT
n-Nitrosodiphenylamine	7/1/2012	11/30/2013	UT
n-Nitrosomethylethylamine	7/1/2012	11/30/2013	UT
n-Nitrosomorpholine	7/1/2012	11/30/2013	UT
n-Nitrosopiperidine	7/1/2012	11/30/2013	UT
n-Nitrosopyrrolidine	7/1/2012	11/30/2013	UT
Pentachlorobenzene	7/1/2012	11/30/2013	UT
Pentachloronitrobenzene	7/1/2012	11/30/2013	UT
Pentachlorophenol	7/1/2012	11/30/2013	UT
Phenacetin	7/1/2012	11/30/2013	UT
Phenanthrene	7/1/2012	11/30/2013	UT
Phenol	7/1/2012	11/30/2013	UT
Pyrene	7/1/2012	11/30/2013	UT
Pyridine	7/1/2012	11/30/2013	UT
Safrole	7/1/2012	11/30/2013	UT

Method EPA 901.1

Cesium-134	7/1/2012	11/30/2013	UT
Cesium-137	7/1/2012	11/30/2013	UT
Cobalt-60	7/1/2012	11/30/2013	UT

Method EPA 9010C

Cyanide	7/1/2012	11/30/2013	UT
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Method EPA 9014

Cyanide	7/1/2012	11/30/2013	UT
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Method EPA 903.1

Radium-226	1/23/2013	11/30/2013	UT
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Method EPA 9034

Total sulfides	7/1/2012	11/30/2013	UT
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Method EPA 9045C

pH	7/1/2012	11/30/2013	UT
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Method EPA 9056A

Bromide	7/1/2012	11/30/2013	UT
Chloride	7/1/2012	11/30/2013	UT
Fluoride	7/1/2012	11/30/2013	UT
Nitrate as N	7/1/2012	11/30/2013	UT
Nitrite as N	7/1/2012	11/30/2013	UT
Orthophosphate as P	7/1/2012	11/30/2013	UT
Sulfate	7/1/2012	11/30/2013	UT

Method EPA 9071B

Oil & Grease	7/1/2012	11/30/2013	UT
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Method EPA 9095B

Free liquid	7/1/2012	11/30/2013	UT
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ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: RCRA (Solid & Hazardous Material)**Method EPA 9310**

Gross alpha-beta	7/1/2012	11/30/2013	UT
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Method EPA 9315

Total alpha radium	7/1/2012	11/30/2013	UT
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Method EPA 9320

Radium-228	7/1/2012	11/30/2013	UT
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Method EPA H2S Test Method

Reactive sulfide	7/1/2012	11/30/2013	UT
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Method EPA HCN Test Method

Reactive Cyanide	7/1/2012	11/30/2013	UT
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Method HASL 300 Ga-01-R sec 4.5.2.3

Cesium-134	7/1/2012	11/30/2013	UT
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Cesium-137	7/1/2012	11/30/2013	UT
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Cobalt-60	7/1/2012	11/30/2013	UT
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Method HASL 300 Sr-01-RC (GPC)

Strontium-89, 90	7/1/2012	11/30/2013	UT
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Method HASL 300 U-02-RC

Americium-241	7/1/2012	11/30/2013	UT
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Plutonium	7/1/2012	11/30/2013	UT
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Thorium-228	7/1/2012	11/30/2013	UT
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Thorium-230	7/1/2012	11/30/2013	UT
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Thorium-232	7/1/2012	11/30/2013	UT
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Method SM 7500-Ra C (SC)

Radium-226	7/1/2012	11/30/2013	UT
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ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: SDWA (Potable Water)**Method ASTM D3972-90**

Uranium	7/1/2012	11/30/2013	UT
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Method ASTM D5811-00

Strontium-90	7/1/2012	11/30/2013	UT
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Method EPA 120.1

Conductivity	7/1/2012	11/30/2013	UT
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Method EPA 150.1

pH	7/1/2012	11/30/2013	UT
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Method EPA 160.1

Residue-filterable (TDS)	7/1/2012	11/30/2013	UT
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Method EPA 200.7

Aluminum	7/1/2012	11/30/2013	UT
Antimony	7/1/2012	11/30/2013	UT
Arsenic	7/1/2012	11/30/2013	UT
Barium	7/1/2012	11/30/2013	UT
Beryllium	7/1/2012	11/30/2013	UT
Boron	7/1/2012	11/30/2013	UT
Cadmium	7/1/2012	11/30/2013	UT
Calcium	7/1/2012	11/30/2013	UT
Chromium	7/1/2012	11/30/2013	UT
Cobalt	7/1/2012	11/30/2013	UT
Copper	7/1/2012	11/30/2013	UT
Iron	7/1/2012	11/30/2013	UT
Lead	7/1/2012	11/30/2013	UT
Lithium	7/1/2012	11/30/2013	UT
Magnesium	7/1/2012	11/30/2013	UT
Manganese	7/1/2012	11/30/2013	UT
Molybdenum	7/1/2012	11/30/2013	UT
Nickel	7/1/2012	11/30/2013	UT
Potassium	7/1/2012	11/30/2013	UT
Selenium	7/1/2012	11/30/2013	UT
Silica as SiO ₂	7/1/2012	11/30/2013	UT
Silver	7/1/2012	11/30/2013	UT
Sodium	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Tin	7/1/2012	11/30/2013	UT
Titanium	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT
Zinc	7/1/2012	11/30/2013	UT

Method EPA 200.8

Aluminum	7/1/2012	11/30/2013	UT
Antimony	7/1/2012	11/30/2013	UT
Arsenic	7/1/2012	11/30/2013	UT
Barium	7/1/2012	11/30/2013	UT
Beryllium	7/1/2012	11/30/2013	UT
Cadmium	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: SDWA (Potable Water)

Calcium	7/1/2012	11/30/2013	UT
Chromium	7/1/2012	11/30/2013	UT
Copper	7/1/2012	11/30/2013	UT
Iron	7/1/2012	11/30/2013	UT
Lead	7/1/2012	11/30/2013	UT
Magnesium	7/1/2012	11/30/2013	UT
Manganese	7/1/2012	11/30/2013	UT
Molybdenum	7/1/2012	11/30/2013	UT
Nickel	7/1/2012	11/30/2013	UT
Potassium	7/1/2012	11/30/2013	UT
Selenium	7/1/2012	11/30/2013	UT
Silver	7/1/2012	11/30/2013	UT
Sodium	7/1/2012	11/30/2013	UT
Strontium	7/1/2012	11/30/2013	UT
Thallium	7/1/2012	11/30/2013	UT
Thorium	7/1/2012	11/30/2013	UT
Tin	7/1/2012	11/30/2013	UT
Uranium	7/1/2012	11/30/2013	UT
Vanadium	7/1/2012	11/30/2013	UT
Zinc	7/1/2012	11/30/2013	UT

Method EPA 245.1

Mercury	7/1/2012	11/30/2013	UT
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Method EPA 300.0

Bromide	7/1/2012	11/30/2013	UT
Chloride	7/1/2012	11/30/2013	UT
Fluoride	7/1/2012	11/30/2013	UT
Nitrate as N	7/1/2012	11/30/2013	UT
Nitrite as N	7/1/2012	11/30/2013	UT
Orthophosphate as P	7/1/2012	11/30/2013	UT
Sulfate	7/1/2012	11/30/2013	UT

Method EPA 310.1

Alkalinity as CaCO3	7/1/2012	11/30/2013	UT
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Method EPA 314

Perchlorate	7/1/2012	11/30/2013	UT
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Method EPA 335.2

Cyanide	7/1/2012	11/30/2013	UT
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Method EPA 524.2

1,1,1-Trichloroethane	7/1/2012	11/30/2013	UT
1,1,2-Trichloroethane	7/1/2012	11/30/2013	UT
1,1-Dichloroethylene	7/1/2012	11/30/2013	UT
1,2,4-Trichlorobenzene	7/1/2012	11/30/2013	UT
1,2-Dichlorobenzene (o-Dichlorobenzene)	7/1/2012	11/30/2013	UT
1,2-Dichloroethane (Ethylene dichloride)	7/1/2012	11/30/2013	UT
1,2-Dichloropropane	7/1/2012	11/30/2013	UT
1,4-Dichlorobenzene	7/1/2012	11/30/2013	UT
Benzene	7/1/2012	11/30/2013	UT
Carbon tetrachloride	7/1/2012	11/30/2013	UT

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date

Expires

AB

Program/Matrix: SDWA (Potable Water)

Chlorobenzene	7/1/2012	11/30/2013	UT
cis-1,2-Dichloroethylene	7/1/2012	11/30/2013	UT
Ethylbenzene	7/1/2012	11/30/2013	UT
Methylene chloride (Dichloromethane)	7/1/2012	11/30/2013	UT
m-Xylene	7/1/2012	11/30/2013	UT
o-Xylene	7/1/2012	11/30/2013	UT
p-Xylene	7/1/2012	11/30/2013	UT
Styrene	7/1/2012	11/30/2013	UT
Tetrachloroethylene (Perchloroethylene)	7/1/2012	11/30/2013	UT
Toluene	7/1/2012	11/30/2013	UT
trans-1,2-Dichloroethylene	7/1/2012	11/30/2013	UT
Trichloroethene (Trichloroethylene)	7/1/2012	11/30/2013	UT
Vinyl chloride	7/1/2012	11/30/2013	UT
Xylene (total)	7/1/2012	11/30/2013	UT

Method EPA 900.0

Gross-alpha	7/1/2012	11/30/2013	UT
Gross-beta	7/1/2012	11/30/2013	UT

Method EPA 901.1

Cesium-134	7/1/2012	11/30/2013	UT
Cesium-137	7/1/2012	11/30/2013	UT
Cobalt-60	7/1/2012	11/30/2013	UT
Gamma Emitters	7/1/2012	11/30/2013	UT

Method EPA 903

Radium-226	7/1/2012	11/30/2013	UT
Total radium	7/1/2012	11/30/2013	UT

Method EPA 903.1

Radium-226	7/1/2012	11/30/2013	UT
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Method EPA 904

Radium-228	7/1/2012	11/30/2013	UT
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Method EPA 906

Tritium	7/1/2012	11/30/2013	UT
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Method HASL 300 Ga-01-R sec 4.5.2.3

Cesium-134	7/1/2012	11/30/2013	UT
Cesium-137	7/1/2012	11/30/2013	UT
Cobalt-60	7/1/2012	11/30/2013	UT
Gamma Emitters	7/1/2012	11/30/2013	UT

Method HASL 300 Sr-01-RC (GPC)

Strontium-89, 90	7/1/2012	11/30/2013	UT
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Method HASL 300 Sr-02-RC (GPC)

Strontium-89, 90	7/1/2012	11/30/2013	UT
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Method HASL 300 U-02-RC

Americium-241	7/1/2012	11/30/2013	UT
Isotopic uranium	7/1/2012	11/30/2013	UT
Plutonium	7/1/2012	11/30/2013	UT
Uranium	7/1/2012	11/30/2013	UT

Method SM 2320 B

ALS Laboratory Group, Environmental Division (Fort Collins, CO)

Start Date	Expires	AB
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Program/Matrix: SDWA (Potable Water)

Alkalinity as CaCO ₃	7/1/2012	11/30/2013	UT
Method SM 2340 B			
Total hardness as CaCO ₃	7/1/2012	11/30/2013	UT
Method SM 2510 B			
Conductivity	7/1/2012	11/30/2013	UT
Method SM 2540 B			
Residue-total	7/1/2012	11/30/2013	UT
Method SM 2540 C			
Residue-filterable (TDS)	7/1/2012	11/30/2013	UT
Method SM 2540 D			
Residue-nonfilterable (TSS)	7/1/2012	11/30/2013	UT
Method SM 4500-H+ B			
pH	7/1/2012	11/30/2013	UT
Method SM 5310 C			
Total organic carbon	7/1/2012	11/30/2013	UT
Method SM 7500-3H B			
Tritium	7/1/2012	11/30/2013	UT
Method SM 7500-Ra C (SC)			
Radium-226	7/1/2012	11/30/2013	UT
Method SM 7500-Rn B			
Radon-222	7/1/2012	11/30/2013	UT

The Utah Environmental Laboratory Certification Program (ELCP) encourages clients and data users to verify the most current certification letter for the authorized method.

The analytes by method which a laboratory is authorized to perform at any given time will be those indicated in the most recent certificate letter. The most recent certification letter supersedes all previous certification or authorization letters. It is the certified laboratory's responsibility to review this letter for discrepancies. The certified laboratory must document any discrepancies in this letter and send notice to this bureau within 15 days of receipt. This certificate letter will be recalled in the event your laboratory's certification is revoked.

Appendix C – DMS Maintenance Activity Log



To: Karyn Lewis

Sept 22th, 2013

From: Mathieu Beaudoin

Discovery Mining Services LTD.

Subject: Care and maintenance program, fall 2014

Hi Karyn,

You will find down below a summary of our 4 days trip into Lupin site. Our focal point was to bring the Lower Sewage water level down to a reasonable level, check to make sure that the light system are in working condition. We end up sending a crew of 2.

Agenda as per George Friesen :

- Syphon water from the Lower Sewage Pond over the dam, about 150,000 m3, (please measure the before and after elevation of the water as well as the inside pipe diameter, length of pipe, and elevation drop between water level and discharge end of pipe)
- Check out the lights in the mill and develop a procedure to operate them
- Escort Tim Morton when he comes to site on Tuesday to do the Environment Canada inspection, take pictures
- Inspect all fuel containment areas, checking for any leaks
- If the road to the tailings ponds is passable please have a look at the dams and report anything unusual



Items requested by Tim Morton:

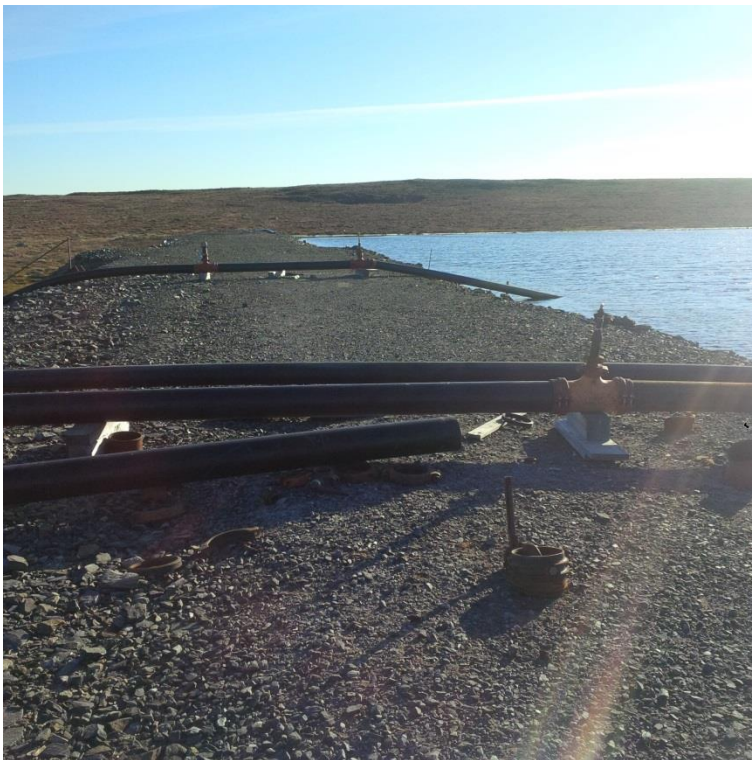
- Label 8 fuel tank with proper identification provide by him.(Action Completed)
- Elevate piping from M14 so they don't touch the ground (Action Non-completed)
 - o The pipe was frozen in ice and was under tension due to tank movement.
 - o The tank is empty and there is a blank install between the main tank farm and M14
- Expose Piping that was bury between the STF and the pump house (Action Completed)
- Elevate from the ground pipe located between JetA tank M15 to the pump house (Action Non-complete)
 - o The pipe was frozen in ice and rock, action could be completed during summer season



Monday, Sept 15th

We flew into Lupin on a Twin Otter. While Sam Sutherland, our mechanic was powering up camp. Alvin and I went for an inspection of the lower sewer pond dam. Once the inspection was done, Alvin Tong flew back to Yellowknife.

We install 2X8" Syphon drain, as we were instructed by George Friesen, We had both Drain install by 21H00, Monday night.





Tuesday, Sept 16th

On Tuesday, Tim Morton and his partner from Environment Canada show up at Lupin site to do an inspection. We try to be as helpful as we can without interfering in their inspection. Before the end of the day Tim, ask me if we could fix the following deficiency:

- Stencil 6 sand along vertical tank with proper permit identification that was given to us by Tim
 - EC-00018370
 - EC-00018371
 - EC-00018372
 - EC-00018374
 - EC-00018377
 - EC-00018376

- Stencil 1 standalone Horizontal tank located in the North-east corner of the Main Tank Farm with proper identification permit
 - EC-00018377

- - Stencil M-15 JET-A tank located South of the Main fuel berm with proper identification permit
 - EC-00032375

- we did a circuit around the Tailing pond, other than the level seems high; we didn't notice anything out of the ordinary.





Wednesday, Sept 17th

On Wednesday, we expose the piping going From the STF to the pump house as requested by Tim.

Also we fix the leaky drain pipe from the STF by replacing a crack gasket.

In the afternoon, we tested the light system in the mill, we had everything lite up for 1 hour or so.





Thursday, Sept 18th

On Thursday, we service the camp generator and refuel camp. We got pick up by Air Tindi at 15H00 with the Caravan.

Both syphon drains were working when we left.

We took measurements before and after.

- | | | |
|---------------------------------|--|-----------------|
| - Sept 15 th , 21H00 | water level from the lowest point of the dam | - 1" Freeboard |
| - Sept 18 th , 12H00 | water level from the lowest point of the dam | - 14" Freeboard |

If everything goes accordingly, the syphon should stop at around -20 " of freeboard from the lowest elevation of the dam. We will be able to take a final measurement during our next site visit





Over all, I consider this site visit to be a success, we got a lot accomplish. It seems like the water level is down to a safe level in the lower sewage pond, at least until the Freshets. We look around for any apparent fuel leak, none were spotted other than the leaky drain from the STF. Also it was a great opportunity to test the Detroit 250 KW to provide lights in the mills. As long as the temperature don't drop too much, It should be fairly straight forward to get Elgin's guess some lights in the mill. The fact that we were able to coordinate with the inspection was a plus, it enable us to fix some extra deficiency noted by Tim Morton.

If you have any questions, feel free to ask.

Thanks,

Mathieu Beaudoin

Discovery Mining Services

Memo

To:	George Friesen	Client:	Lupin Mine Incorporated
From:	Alvin Tong	Project No:	1CL008.001
Cc:	Peter Healey; Arlene Laudrum	Date:	October 29, 2014
Subject:	Addendum to 2014 Lupin TCA Geotechnical Inspection Report		

Introduction

This memorandum is issued as an addendum to the Sewage Pond Inspection Report dated October 2014 and forms part of the request outlined by AANDC in Section 3, Article 4 of the Water License Inspection Form issued on July 15, 2014. As part of the form, AANDC request a separate visual inspection was carried out at the main fuel tank farm and satellite tank farm at the Mill Site (Figure 2.2 of the report) during the visit on August 19th, 2014. The geotechnical inspection was carried out by Alvin Tong, PEng., accompanied by LMI representative George Friesen. It should be noted that there is no statutory requirement to complete a geotechnical inspection on these containment berms for the fuel tank farms. This memorandum specifically addresses the findings of the tank farm inspection as requested in the AANDC Inspection Form and provides recommendations.

Observations

The tank farm containment systems were observed to be in geotechnically stable condition. Liner exposures and minor damages are noted in both tank farms. The liner exposure is mainly located near the crest of the berm where sand overliner either eroded away or sloughed off. Minor damage typically associated with an exposed liner was found to include punctures of various sizes ranged from less than 2 cm to 30 cm in longest dimensions. It should be noted that site personnel complete repairs to such punctures when identified after inspections. Minor erosion gullies were observed in some areas in the downstream slope of the berms. Active seepage from the tank farms was not observed at the time of visit. Minor water ponding was observed in the main tank farm, assumed to be from runoff ranging from 5 to 15 cm. Engineering judgment suggests the water ponding in the tank farms indicates that the liner is unlikely to be compromised by damages in the bottom of the tank farms. Photographs of the tank farms are included in Attachment A.

Recommendations

Prior to adding new fuel in the tank farms, it is recommended that any noted damage to the liner to be repaired to ensure containment and the sand overliner be replaced over the exposed liner to provide for long-term protection. In addition to repairs on visually identified liner damages,

general earthwork maintenance repairs should be carried out on the erosion gullies in downstream slopes of the containment berms.

References

SRK Consulting Ltd. 2014. 2014 Sewage Pond Dam Geotechnical Inspection. 1CL008.001.
Prepared for Lupin Mines Incorporated.

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Attachment A: Photo Log



Picture 1: South view from the front of the main tank farm with shallow ponding water inside.



Picture 2: North view from the front of the main tank farm with shallow ponding water in the front of the containment.



Picture 3: North view from the back of the tank farm with shallow ponding water. Note the exposed and damaged liner.



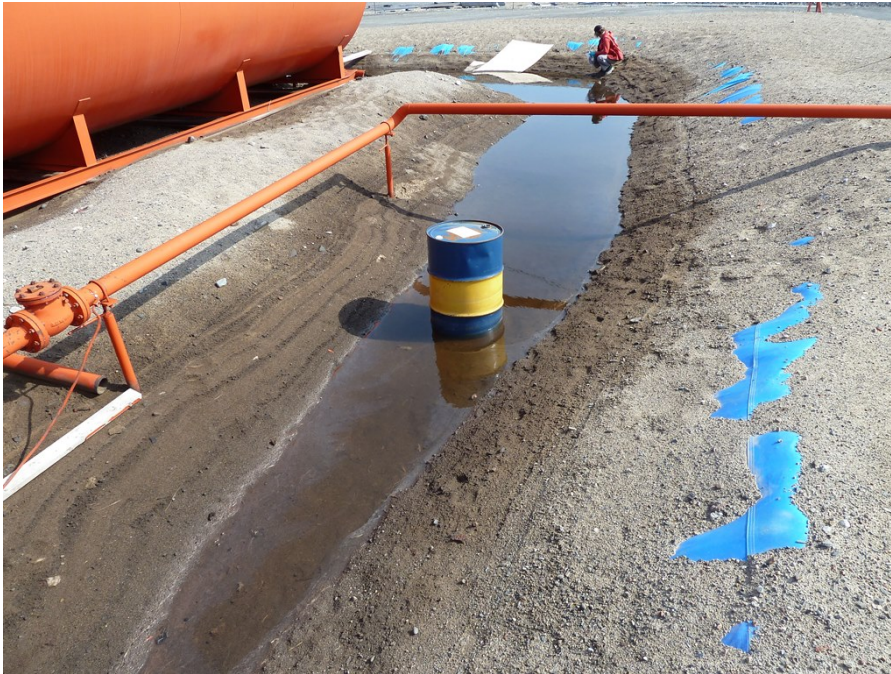
Picture 4: Closure up view of the damaged liner.



Picture 5: South view from inside of the main tank farm.



Picture 6: View of the damaged liner in the northwestern corner of the main tank farm.



Picture 7: South view of the southwestern corner of the satellite tank farm with exposed liner.



Picture 8: South view of the eastern embankment of the satellite tank farm with exposed and damaged liner.