ARCADIS Canada Inc.
121 Granton Drive
Suite 12
Richmond Hill
Ontario L4B 3N4
Tel 905 882 5984
Fax 905 882 8962
www.arcadis.com

ENVIRONMENT

VIA EMAIL: Ian.Parsons@aandc.gc.ca

Mr. Ian Parsons
Regional Coordinator
AANDC Nunavut Regional Office
P.O. Box 100, Iqaluit, NU
X0A 0H0

Subject:
Assessment of Potential Fugitive Tailings
Tailings Containment Area
Lupin Mine Site, Nunavut

Date:
October 30, 2015

Contact:
Barry Cooke

Phone:
905 882 5984

Email:
Barry.Cooke@arcadis.com

Our ref:
702380

Dear Mr. Parsons:

As per our proposal dated September 3, 2015, we are pleased to provide our letter report presenting the results of our assessment of the potential presence of fugitive tailings outside the tailings containment area (TCA) at the Lupin Mine Site in Nunavut. In recent site inspections of the TCA AANDC staff have identified what they have inferred to be tailings that had been blown from the south end of the TCA near Perimeter Dam 6 (see Figure 1) to south of the dam onto the tundra.

While conducting inspections of the internal and perimeter dams at the TCA on August 21 and 22, 2015, our Mr. Barry Cooke, P.Eng., collected surface and near surface samples of the tailings from Cell 3 north of Perimeter Dam 6, the potential fugitive material south of Perimeter Dam 6, plus a sample from an esker located a few kilometers south of the TCA, at the locations shown on Figure 1. Photographs of the sampling locations are provided in Appendix A.

The tailings in Cell 3 near Perimeter Dam 6 had been covered using material sourced from the esker, and based on visual observations by Mr. Cooke, the possible fugitive material south of Perimeter Dam 6 resembled the esker cover material over the tailings in Cell 3. Table 1 summarizes the results of the sampling, and includes the analytical schedule for the samples. Six samples were collected from three locations south of Perimeter Dam 6, a surface sample and a second samp le from what was inferred to be the original tundra, at a depth of 0.075 to 0.125 m. All samples were analysed for metals and pH, and samples of the tailings (Sa 1 and Dup 1) and the esker (Sa 8) were submitted for gradation analyses.

The laboratory certificates for the analyses are attached to this letter in Appendix B. As can be seen, the tailings samples (Sa 1 and Dup 1) comprised 7.6 % gravel, 11.0 % sand, 77.4 % silt and 4.0 % clay sizes. The esker sample comprised 15.6% gravel, 72.7 % sand and 11.7 % silt sizes.

Review of the results of the pH analyses indicates that all samples had a low, or acidic, pH. Values ranged from 2.85 to 4.38.

The results returned for metals analysis indicated that the two samples of tailings (Sa 1 and Dup 1) contained an average concentration of arsenic of 3850 mg/kg, an order of magnitude higher than that measured in the samples collected from the area south of Perimeter Dam 6 (Sa 2 to Sa 7), with arsenic levels ranging from 51 to 590 mg/kg, averaging 204 mg/kg. The esker sample (Sa 8) was found to contain an arsenic level of 4 mg/kg. Similar trends in concentrations were noted for barium, chromium, lead and zinc in the samples collected from south of Perimeter Dam 6, in that contaminant levels were significantly lower than those measured in the tailings samples.

Based on the analytical results, it appears that the material south of Perimeter Dam 6 is not pure tailings, nor is it pure esker material. Rather, the material south of Perimeter Dam 6 could be a mixture of tailings and esker cover material.

We trust the contents of this letter are sufficient for your present purposes. If you have any questions, please call.

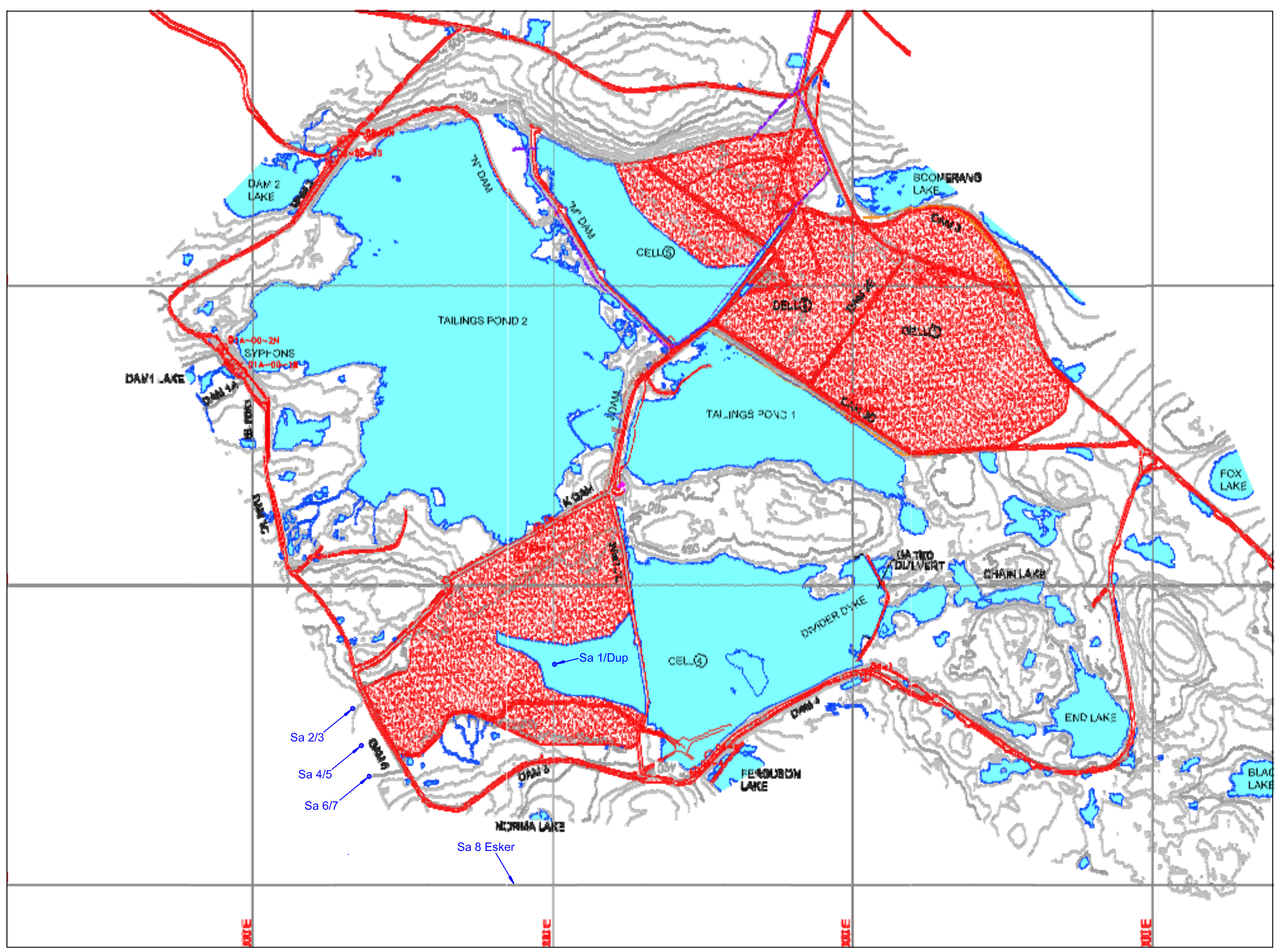
Sincerely,

ARCADIS CANADA INC.

Barry H Cooke, P.Eng.
Senior Consultant

Table 1: Fugitive Tailings Investigation
Lupin Mine, NT

Sample ID	Location		Sample Log Depth (m)	Description	Analyses
	Latitude N65° 43.22'	Longitude W111° 16.85'			
SA1 & Dupl.	N65° 43.22'	W11° 16.85'	0.0-0.1	Cell 3 Tailings – Grey silt, some sand.	Metals, pH, sieve, hydrometer.
SA2	N65° 43.14'	W11° 17.83'	0.0	Brown fine to medium sand.	Metals, pH.
SA3	N65° 43.14'	W11° 17.83'	0.075-0.125	Grey-brown sandy silt, some roots, trace organics.	Metals, pH.
SA4	N65° 43.13'	W11° 17.83'	0.0	Browne fine to medium sand.	Metals, pH.
SA5	N65° 43.13'	W11° 17.85'	0.075-0.125	Brown sandy silt.	Metals, pH.
SA6	N65° 43.12'	W11° 17.807	0.0	Brown fine to medium sand.	Metals, pH.
SA7	N65° 43.12'	W11° 17.807	0.075-0.125	Brown fine sand, trace organics.	Metals, pH.
SA8	N65° 18.62'	W11° 11.82	0.0-0.075	Esker-Browne fine to medium sand.	Metals, pH, sieve.

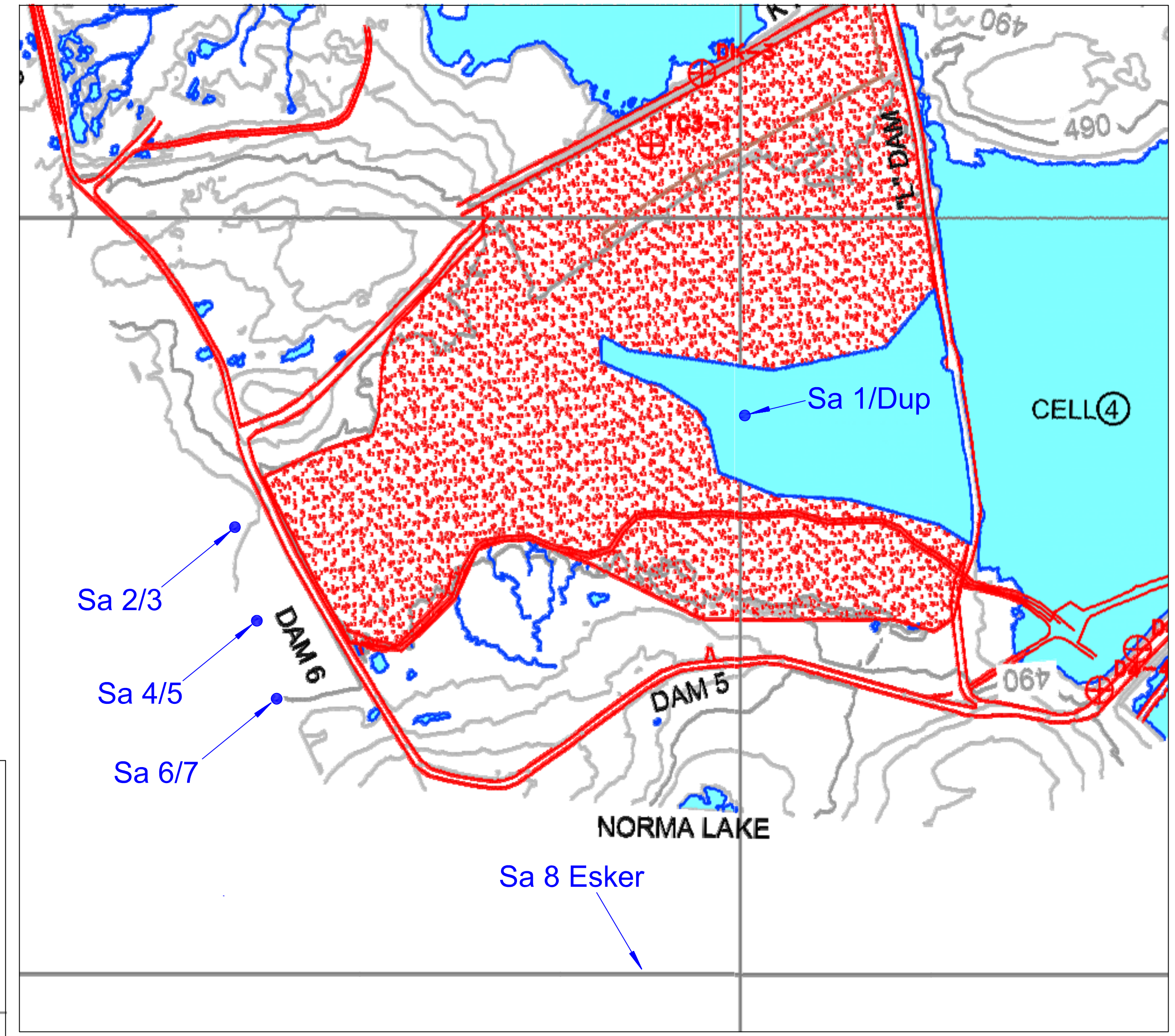


0 100 200 300 400 500

Scale in Metres

Coordinate System: Nad_1983_UTM_Zone_12N

NTS Map Sheets 076E11 and 076E14



0 100 200 300 400 500

Scale in Metres

LEGEND

- Water Body
- Granular Tailings Cover
- Lake Shore, Drainage
- Tailings Line Route (Not In Use)
- Contour 1 m
- Contour 5 m
- Roads
- Berm Area
- Thermistor
- Sa 8 Hand Sample Location

REFERENCE:
SRK CONSULTING, JOB No.: 1CL008.001, FIG. 2.3, OCT. 2014

ARCADIS

ABORIGINAL AFFAIRS AND NORTHERN DEVELOPMENT CANADA

FUGITIVE TAILINGS INVESTIGATION

LUPIN MINE, NUNAVUT

LOCATION PLAN

Drawn By: I.S.Z.	Approved By: B.H.C.	Project No: 702380
Date: OCT. 2015	Scale: AS SHOWN	FIGURE 1

ARCADIS Design & Consultancy for natural and built assets

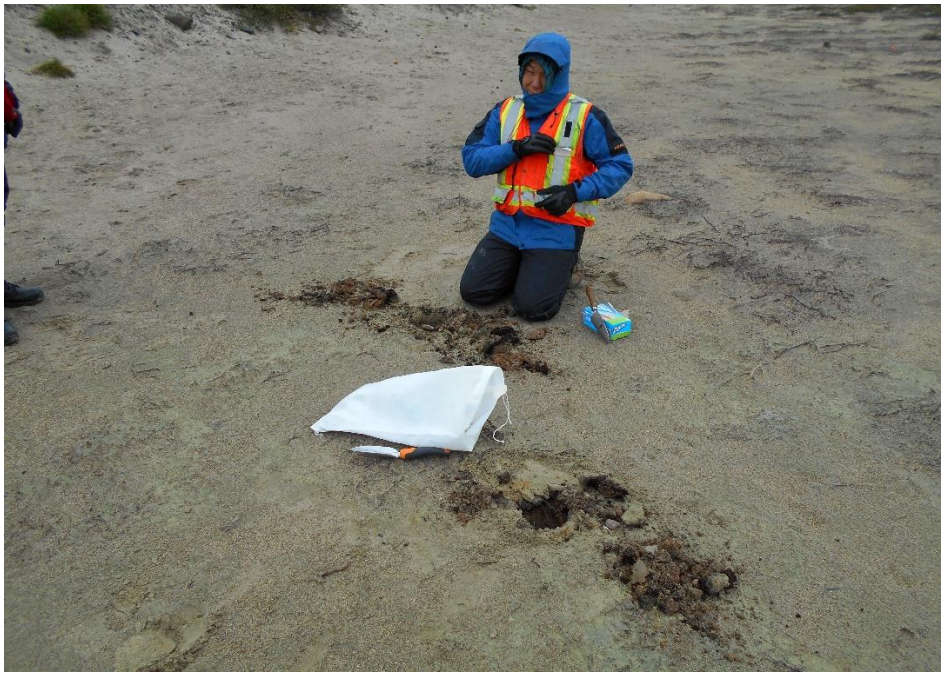
AANDC
October 30, 2015
702380

Attachment A

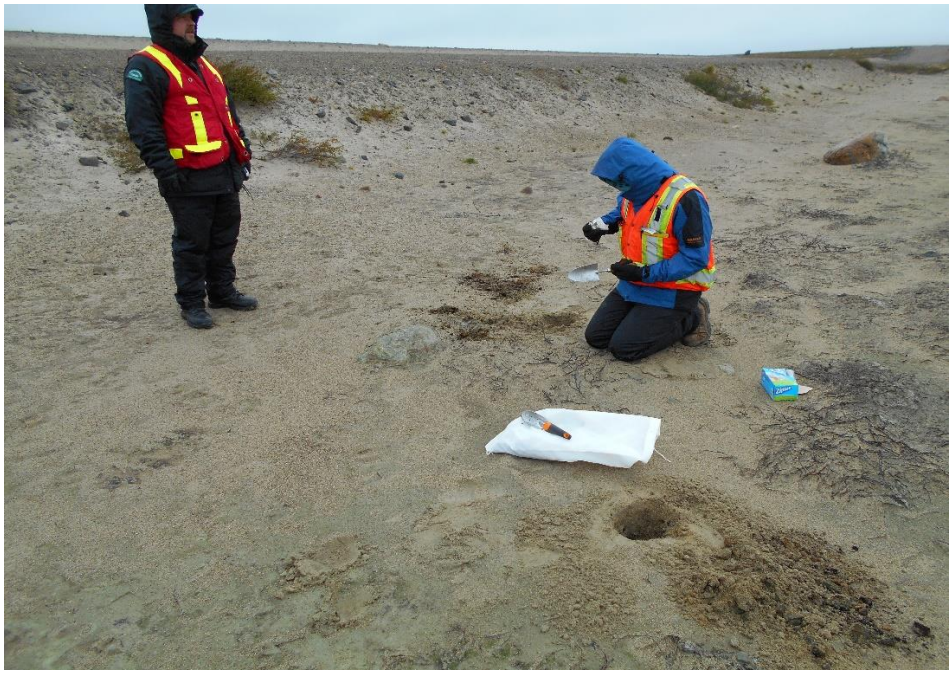
Site Photographs

Photograph 1:
Sa #1 and Dup 1 – Tailings Area, Cell 3.

Photograph 2:
Sa #2 and Sa # 3.



Photograph 3:
Sa #4 and Sa #5.



Photograph 4:
Sa #6 and Sa #7.

Photograph 5:
Sa #8 – Esker.

ARCADIS Design & Consultancy for natural and built assets

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702380

Attachment B

Laboratory Certificates

Your Project #: 702380
Site Location: LUPIN
Your C.O.C. #: NA

Attention:Barry Cooke

ARCADIS Canada Inc
121 Granton Dr
Unit 11
Richmond Hill, ON
L4B 3N4

Report Date: 2015/10/22
Report #: R3728991
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5K5641
Received: 2015/10/08, 15:15

Sample Matrix: Soil
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Strong Acid Leachable Metals by ICPMS	9	2015/10/15	2015/10/15	CAM SOP-00447	EPA 6020A m
pH CaCl2 EXTRACT	9	2015/10/16	2015/10/16	CAM SOP-00413	EPA 9045 D m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keshani Vijh, Project Manager
Email: KVijh@maxxam.ca
Phone# (905) 817-5700
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B5K5641
Report Date: 2015/10/22

ARCADIS Canada Inc
Client Project #: 702380
Site Location: LUPIN

RESULTS OF ANALYSES OF SOIL

Maxxam ID		BDC702	BDC703	BDC704	BDC705	
Sampling Date		2015/08/22	2015/08/22	2015/08/22	2015/08/22	
COC Number		NA	NA	NA	NA	
	UNITS	SA#1 0.0-0.10M	SA#2 0.0M (SURFACE)	SA#3 0.075-0.125M	SA#4 0.0M (SURFACE)	QC Batch
Inorganics						
Available (CaCl2) pH	pH	3.55	3.85	3.26	4.10	4230951
QC Batch = Quality Control Batch						

Maxxam ID		BDC706	BDC707	BDC708	BDC709	BDC710	
Sampling Date		2015/08/22	2015/08/22	2015/08/22	2015/08/22	2015/08/22	
COC Number		NA	NA	NA	NA	NA	
	UNITS	SA#5 0.075-0.125M	SA#6 0.0M (SURFACE)	SA#7 0.075-0.125M	SA#8 0.0-0.075M	DUP1	QC Batch
Inorganics							
Available (CaCl2) pH	pH	3.63	3.71	3.21	4.38	2.85	4230951
QC Batch = Quality Control Batch							

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Maxxam Job #: B5K5641
Report Date: 2015/10/22

ARCADIS Canada Inc
Client Project #: 702380
Site Location: LUPIN

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		BDC702		BDC703	BDC704		
Sampling Date		2015/08/22		2015/08/22	2015/08/22		
COC Number		NA		NA	NA		
	UNITS	SA#1 0.0-0.10M	RDL	SA#2 0.0M (SURFACE)	SA#3 0.075-0.125M	RDL	QC Batch
Metals							
Acid Extractable Antimony (Sb)	ug/g	0.37	0.20	<0.20	<0.20	0.20	4230413
Acid Extractable Arsenic (As)	ug/g	3800	5.0	51	590	1.0	4230413
Acid Extractable Barium (Ba)	ug/g	120	0.50	26	28	0.50	4230413
Acid Extractable Beryllium (Be)	ug/g	0.41	0.20	<0.20	<0.20	0.20	4230413
Acid Extractable Boron (B)	ug/g	<5.0	5.0	<5.0	<5.0	5.0	4230413
Acid Extractable Cadmium (Cd)	ug/g	0.11	0.10	<0.10	<0.10	0.10	4230413
Acid Extractable Chromium (Cr)	ug/g	45	1.0	17	13	1.0	4230413
Acid Extractable Cobalt (Co)	ug/g	6.1	0.10	2.3	2.2	0.10	4230413
Acid Extractable Copper (Cu)	ug/g	120	0.50	11	8.8	0.50	4230413
Acid Extractable Lead (Pb)	ug/g	180	1.0	2.2	12	1.0	4230413
Acid Extractable Molybdenum (Mo)	ug/g	1.8	0.50	<0.50	<0.50	0.50	4230413
Acid Extractable Nickel (Ni)	ug/g	20	0.50	8.0	7.6	0.50	4230413
Acid Extractable Selenium (Se)	ug/g	0.94	0.50	<0.50	<0.50	0.50	4230413
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	<0.20	<0.20	0.20	4230413
Acid Extractable Thallium (Tl)	ug/g	0.21	0.050	0.083	0.053	0.050	4230413
Acid Extractable Uranium (U)	ug/g	0.62	0.050	0.41	0.48	0.050	4230413
Acid Extractable Vanadium (V)	ug/g	32	5.0	14	10	5.0	4230413
Acid Extractable Zinc (Zn)	ug/g	60	5.0	12	9.5	5.0	4230413

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B5K5641
Report Date: 2015/10/22

ARCADIS Canada Inc
Client Project #: 702380
Site Location: LUPIN

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		BDC705	BDC706	BDC707	BDC708		
Sampling Date		2015/08/22	2015/08/22	2015/08/22	2015/08/22		
COC Number		NA	NA	NA	NA		
	UNITS	SA#4 0.0M (SURFACE)	SA#5 0.075-0.125M	SA#6 0.0M (SURFACE)	SA#7 0.075-0.125M	RDL	QC Batch
Metals							
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	<0.20	<0.20	0.20	4230413
Acid Extractable Arsenic (As)	ug/g	120	74	130	260	1.0	4230413
Acid Extractable Barium (Ba)	ug/g	29	16	28	16	0.50	4230413
Acid Extractable Beryllium (Be)	ug/g	<0.20	<0.20	<0.20	<0.20	0.20	4230413
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	<5.0	<5.0	5.0	4230413
Acid Extractable Cadmium (Cd)	ug/g	<0.10	<0.10	<0.10	<0.10	0.10	4230413
Acid Extractable Chromium (Cr)	ug/g	18	13	17	12	1.0	4230413
Acid Extractable Cobalt (Co)	ug/g	2.2	2.3	2.2	1.8	0.10	4230413
Acid Extractable Copper (Cu)	ug/g	7.8	7.0	7.7	6.8	0.50	4230413
Acid Extractable Lead (Pb)	ug/g	3.5	2.9	4.0	5.0	1.0	4230413
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	<0.50	<0.50	0.50	4230413
Acid Extractable Nickel (Ni)	ug/g	7.6	8.0	7.7	6.4	0.50	4230413
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	0.50	4230413
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	0.20	4230413
Acid Extractable Thallium (Tl)	ug/g	0.093	<0.050	0.078	<0.050	0.050	4230413
Acid Extractable Uranium (U)	ug/g	0.36	0.76	0.40	0.65	0.050	4230413
Acid Extractable Vanadium (V)	ug/g	16	11	14	12	5.0	4230413
Acid Extractable Zinc (Zn)	ug/g	15	8.9	11	8.3	5.0	4230413

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Report Date: 2015/10/22

ARCADIS Canada Inc
Client Project #: 702380
Site Location: LUPIN

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		BDC709		BDC710		
Sampling Date		2015/08/22		2015/08/22		
COC Number		NA		NA		
	UNITS	SA#8 0.0-0.075M	RDL	DUP1	RDL	QC Batch
Metals						
Acid Extractable Antimony (Sb)	ug/g	<0.20	0.20	0.32	0.20	4230413
Acid Extractable Arsenic (As)	ug/g	4.6	1.0	3900	5.0	4230413
Acid Extractable Barium (Ba)	ug/g	31	0.50	110	0.50	4230413
Acid Extractable Beryllium (Be)	ug/g	<0.20	0.20	0.40	0.20	4230413
Acid Extractable Boron (B)	ug/g	<5.0	5.0	<5.0	5.0	4230413
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.10	0.11	0.10	4230413
Acid Extractable Chromium (Cr)	ug/g	22	1.0	44	1.0	4230413
Acid Extractable Cobalt (Co)	ug/g	3.5	0.10	4.6	0.10	4230413
Acid Extractable Copper (Cu)	ug/g	11	0.50	130	0.50	4230413
Acid Extractable Lead (Pb)	ug/g	1.8	1.0	200	1.0	4230413
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	2.3	0.50	4230413
Acid Extractable Nickel (Ni)	ug/g	13	0.50	15	0.50	4230413
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	1.0	0.50	4230413
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	<0.20	0.20	4230413
Acid Extractable Thallium (Tl)	ug/g	0.073	0.050	0.20	0.050	4230413
Acid Extractable Uranium (U)	ug/g	0.62	0.050	0.66	0.050	4230413
Acid Extractable Vanadium (V)	ug/g	19	5.0	30	5.0	4230413
Acid Extractable Zinc (Zn)	ug/g	14	5.0	46	5.0	4230413

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B5K5641
Report Date: 2015/10/22

QUALITY ASSURANCE REPORT

ARCADIS Canada Inc
Client Project #: 702380
Site Location: LUPIN

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4230413	Acid Extractable Antimony (Sb)	2015/10/15	96	75 - 125	102	80 - 120	<0.20	ug/g	NC	30
4230413	Acid Extractable Arsenic (As)	2015/10/15	102	75 - 125	99	80 - 120	<1.0	ug/g	NC	30
4230413	Acid Extractable Barium (Ba)	2015/10/15	NC	75 - 125	95	80 - 120	<0.50	ug/g	0.59	30
4230413	Acid Extractable Beryllium (Be)	2015/10/15	102	75 - 125	97	80 - 120	<0.20	ug/g	NC	30
4230413	Acid Extractable Boron (B)	2015/10/15	102	75 - 125	95	80 - 120	<5.0	ug/g	NC	30
4230413	Acid Extractable Cadmium (Cd)	2015/10/15	102	75 - 125	99	80 - 120	<0.10	ug/g	NC	30
4230413	Acid Extractable Chromium (Cr)	2015/10/15	NC	75 - 125	98	80 - 120	<1.0	ug/g	6.1	30
4230413	Acid Extractable Cobalt (Co)	2015/10/15	96	75 - 125	99	80 - 120	<0.10	ug/g	1.5	30
4230413	Acid Extractable Copper (Cu)	2015/10/15	NC	75 - 125	98	80 - 120	<0.50	ug/g	2.4	30
4230413	Acid Extractable Lead (Pb)	2015/10/15	97	75 - 125	97	80 - 120	<1.0	ug/g	4.0	30
4230413	Acid Extractable Molybdenum (Mo)	2015/10/15	104	75 - 125	97	80 - 120	<0.50	ug/g	NC	30
4230413	Acid Extractable Nickel (Ni)	2015/10/15	96	75 - 125	98	80 - 120	<0.50	ug/g	3.4	30
4230413	Acid Extractable Selenium (Se)	2015/10/15	100	75 - 125	98	80 - 120	<0.50	ug/g	NC	30
4230413	Acid Extractable Silver (Ag)	2015/10/15	100	75 - 125	99	80 - 120	<0.20	ug/g	NC	30
4230413	Acid Extractable Thallium (Tl)	2015/10/15	95	75 - 125	96	80 - 120	<0.050	ug/g	NC	30
4230413	Acid Extractable Uranium (U)	2015/10/15	96	75 - 125	96	80 - 120	<0.050	ug/g	6.8	30
4230413	Acid Extractable Vanadium (V)	2015/10/15	NC	75 - 125	97	80 - 120	<5.0	ug/g	NC	30
4230413	Acid Extractable Zinc (Zn)	2015/10/15	NC	75 - 125	94	80 - 120	<5.0	ug/g	8.5	30
4230951	Available (CaCl2) pH	2015/10/16			99	97 - 103			1.1	N/A

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

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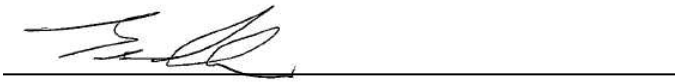
Maxxam Job #: B5K5641
Report Date: 2015/10/22

ARCADIS Canada Inc
Client Project #: 702380
Site Location: LUPIN

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Specialist

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ARCADIS

121 Granton Drive. Suite 12. Richmond Hill, ON
Tel: (905) 882-5984 Fax: (905) 882-8962
Website: www.arcadis.com

Chain of Custody Record

Page 1 of 1.

Shipper

Project No.: 702380 Site: LUPIN
Project Manager: BARRY COOKE
E-mail: Barry.Cooke@arcadis.com
Field Engineer/Techician: BHC
Date: Oct 8/2015 Route: Pick up
Lab: Maxxam Location: Campobello
Required Date: Turnaround: 5 Day(s)
Quotation No.: MSA
MDL's To Meet: CCME / O.Reg 153 Table 1

Location/ Hole No.	Sample No.	Depth (m)	Description	Label No.	Grab/ Comp.	Date Collected	O.Reg 153 metals	pH	Sieve	Hydrometer
	1	0.0-0.1	Soil			Aug 22	✓	✓	✓	✓
	2	0.0					✓	✓		
	3	0.075-0.125					✓	✓		
	4	0.0					✓	✓		
	5	0.075-0.125					✓	✓		
	6	0.0					✓	✓		
	7	0.075-0.125					✓	✓		
	8	0.0-0.075					✓	✓	✓	
Dup	1						✓	✓		

Analyses Requested

Groundwater Analyses

Required for Compliance with Ontario Drinking Water Guidelines.

___Yes/No___

Field Procedures

pH	Electrical Conductivity	Preservatives

08-Oct-15 15:15
Keshani Vijh
B5K5641
ABH ENV-011

Relinquished By:	Date:	Time:	Received By:
	Oct 8/2015	08:10	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Laboratory

Remarks:
ALL RESULTS ARE TO BE SENT TO THE PROJECT MANAGER.

20/21/20 NO ICE

RACHEL DEVLIN 2015/10/08 15:15

Project No. and Date

(Revision 2 - 21 April 2015)

JOB # B5V 5641 CLIENT NAME

Internal Sample Receipt Form

	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Bottles	Comments
1	SA#1 0.0-0.10m					
2	SA#2 0.0m (surface)					
3	SA#3 0.075-0.125m					
4	SA#4 0.0m (surface)					
5	SA#5 0.075-0.125m					
6	SA#6 0.0m (surface)					
7	SA#7 0.075-0.125m					
8	SA#8 0.0-0.075m					
9	DUP1					
10						
11						
12						
13						
14						
15						

Received by (Signature & Print):	Date	Time	Cooler ID	Temperature	Custody seal Present		Custody Seal Intact		Ice Present	
					YES	NO	YES	NO	YES	NO

Your Project #: MB5K5641
Site Location: 702380

Attention:KESHANI VIJH

MAXXAM ANALYTICS
CAMPOBELLO
6740 CAMPOBELLO ROAD
MISSISSAUGA, ON
CANADA L5N 2L8

Report Date: 2015/10/21
Report #: R2061882
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B591557
Received: 2015/10/16, 10:35

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Moisture	2	N/A	2015/10/20	AB SOP-00002	CCME PHC-CWS
Particle Size by Sieve (Dry) (1)	2	N/A	2015/10/20	AB SOP-00022	ASTM D422-63 2007 m
Grain Size Analysis Report	2	N/A	2015/10/21	AB SOP-00049	ASTM D422-63 2007 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Result indicates % of sample retained on the sieve.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alexander Dobbie, Project Manager
Email: ADobbie@maxxam.ca
Phone# (780)577-7116
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B591557
Report Date: 2015/10/21

MAXXAM ANALYTICS
Client Project #: MB5K5641
Site Location: 702380
Sampler Initials: BHC

PARTICLE SIZE PACKAGE WITH GRAPH (SIEVE)

Maxxam ID		NK0039	NK0040	
Sampling Date		2015/08/22	2015/08/22	
	UNITS	**BDC702-01R / SA#1 0.0-0.10M**	**BDC709-01R / SA#8 0.0-0.075M**	**QC Batch**
Industrial				
See Attachment	N/A	ATTACHED	ATTACHED	8080776
Physical Properties				
Attachment	%	ATTACHED	ATTACHED	8080415

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B591557
Report Date: 2015/10/21

MAXXAM ANALYTICS
Client Project #: MB5K5641
Site Location: 702380
Sampler Initials: BHC

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		NK0039	NK0040		
Sampling Date		2015/08/22	2015/08/22		
	UNITS	**BDC702-01R / SA#1 0.0-0.10M**	**BDC709-01R / SA#8 0.0-0.075M**	**RDL**	**QC Batch**
Physical Properties					
Moisture	%	24	5.8	0.30	8079959
RDL = Reportable Detection Limit					

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Maxxam Job #: B591557
Report Date: 2015/10/21

MAXXAM ANALYTICS
Client Project #: MB5K5641
Site Location: 702380
Sampler Initials: BHC

TEST SUMMARY

Maxxam ID: NK0039
Sample ID: BDC702-01R / SA#1 0.0-0.10M
Matrix: Soil

Collected: 2015/08/22
Shipped: 2015/10/15
Received: 2015/10/16

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	8079959	N/A	2015/10/20	Shamsuddin Khairuddin
Particle Size by Sieve (Dry)	SIEV	8080415	N/A	2015/10/20	Amandeep Chhibbar
Grain Size Analysis Report	HY	8080776	N/A	2015/10/21	Junyan Ban

Maxxam ID: NK0040
Sample ID: BDC709-01R / SA#8 0.0-0.075M
Matrix: Soil

Collected: 2015/08/22
Shipped: 2015/10/15
Received: 2015/10/16

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	8079959	N/A	2015/10/20	Shamsuddin Khairuddin
Particle Size by Sieve (Dry)	SIEV	8080415	N/A	2015/10/20	Amandeep Chhibbar
Grain Size Analysis Report	HY	8080776	N/A	2015/10/21	Junyan Ban

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B591557
Report Date: 2015/10/21

MAXXAM ANALYTICS
Client Project #: MB5K5641
Site Location: 702380
Sampler Initials: BHC

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.7°C

Results relate only to the items tested.

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Maxxam Job #: B591557
Report Date: 2015/10/21

QUALITY ASSURANCE REPORT

MAXXAM ANALYTICS
Client Project #: MB5K5641
Site Location: 702380
Sampler Initials: BHC

			Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
8079959	Moisture	2015/10/20	<0.30	%	4.9	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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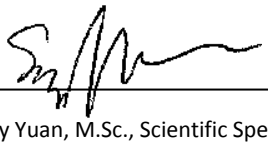
Maxxam Job #: B591557
Report Date: 2015/10/21

MAXXAM ANALYTICS
Client Project #: MB5K5641
Site Location: 702380
Sampler Initials: BHC

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Lisa Cummings, Organics Manager



Sandy Yuan, M.Sc., Scientific Specialist

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ARCADIS

121 Granton Drive, Suite 12, Richmond Hill, ON
Tel: (905) 882-5984 Fax: (905) 882-8962
Website: www.arcadis.com

Chain of Custody Record

Shipper

Project No.: 702380 Site: Lupin

Project Manager: Barry Cooks

E-mail: Barry.Cooke@arcadis.com

Field Engineer/Technician: BHC

Date: Oct 8/2015 Route: Pick up

Lab: Maxxam Location: Campbell

Required Date: _____ Turnaround: 5 Day(s)

Quotation No.: MSA

MDL's To Meet: (CME / O.Reg 153) Table 1

Analyses Requested

Location/ Hole No.	Sample No.	Depth (m)	Description	Label No.	Grab/ Comp.	Date Collected	O.Reg 153 metals	pH	Sieve	Hydrometer	Groundwater Analyses: Required for Compliance with Ontario Drinking Water Guidelines. __Yes/No__	Field Procedures: pH	Electrical Conductivity	Preservatives
	1	0.0-0.1	Soil			Aug 22	✓	✓	✓	✓				08-Oct-15 15:15
	2	0.0					✓	✓						Keshani Vijh
	3	0.075-0.125					✓	✓						B5K3641
	4	0.0					✓	✓						ABH ENV-011
	5	0.075-0.125					✓	✓						
	6	0.0					✓	✓						
	7	0.075-0.125					✓	✓						
	8	0.0-0.075					✓	✓	✓					
Dup							✓	✓						

Relinquished By:	Date:	Time:	Received By:
	Oct 8/2015	08:10	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Laboratory

Remarks:
ALL RESULTS ARE TO BE SENT TO THE PROJECT MANAGER.

20/21/20 NO ICE

RACHEL DEVLIN 2015/10/08 15:15

JOB# BSV-5641 CLIENT NAME

Maxxam Analytics
CAM FCD 010552
Page 1 of 1

	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Bottles	Comments
1	SA#1 0.0-0.10m					
2	SA#2 0.0m (surface)					
3	SA#3 0.075-0.125m					
4	SA#4 0.0m (surface)					
5	SA#5 0.075-0.125m					
6	SA#6 0.0m (surface)					
7	SA#7 0.075-0.125m					
8	SA#8 0.0-0.095m					
9	DUP1					
10						
11						
12						
13						
14						
15						

Received by (Signature & Print):	Date	Time	Cooler ID	Temperature	Custody seal Present		Custody Seal Intact		Ice Present	
					YES	NO	YES	NO	YES	NO

Grain Size Analysis Report

Client Sample ID: BDC702-01R / SA#1 0.0-0.10M
Maxxam Sample ID: NK0039-01
Maxxam Job #: B591557

Tot. Sample Wt (g)*: 8.93
> 2 mm Sample Wt (g)*: 0.68
* Dry mass based on Sieve Aliquot

Batch # (Sieve): 8080415
Batch # (Hydro): 8080776

Analysis Date (Sieve): 2015/10/20
Analysis Date (Hydro): 2015/10/20

	Description	Particle Size (mm)	Percent Passing
Sieve	Sieve 4	4.750	98.5
	Sieve 10	2.000	92.4
	Sieve 20	0.850	88.6
	Sieve 40	0.425	86.2
	Sieve 100	0.150	85.7
	Sieve 200	0.075	81.4
Hydrometer	R1min	0.0457	55.7
	R3min	0.0271	46.6
	R10min	0.0157	29.6
	R30min	0.0095	13.6
	R90min	0.0056	6.8
	R270min	0.0032	4.5
	R1080min	0.0016	3.4

Grain Size Proportion (%)**:

	Min (mm)	Max (mm)	Percentage
Sand	0.050	2.000	35.6
Silt	0.002	0.050	60.4
Clay	-	0.002	4.0

** Calculations based only on sub 2 mm fraction.
Compatible with USDA and Canadian Soil Triangles

Soil Classification***:

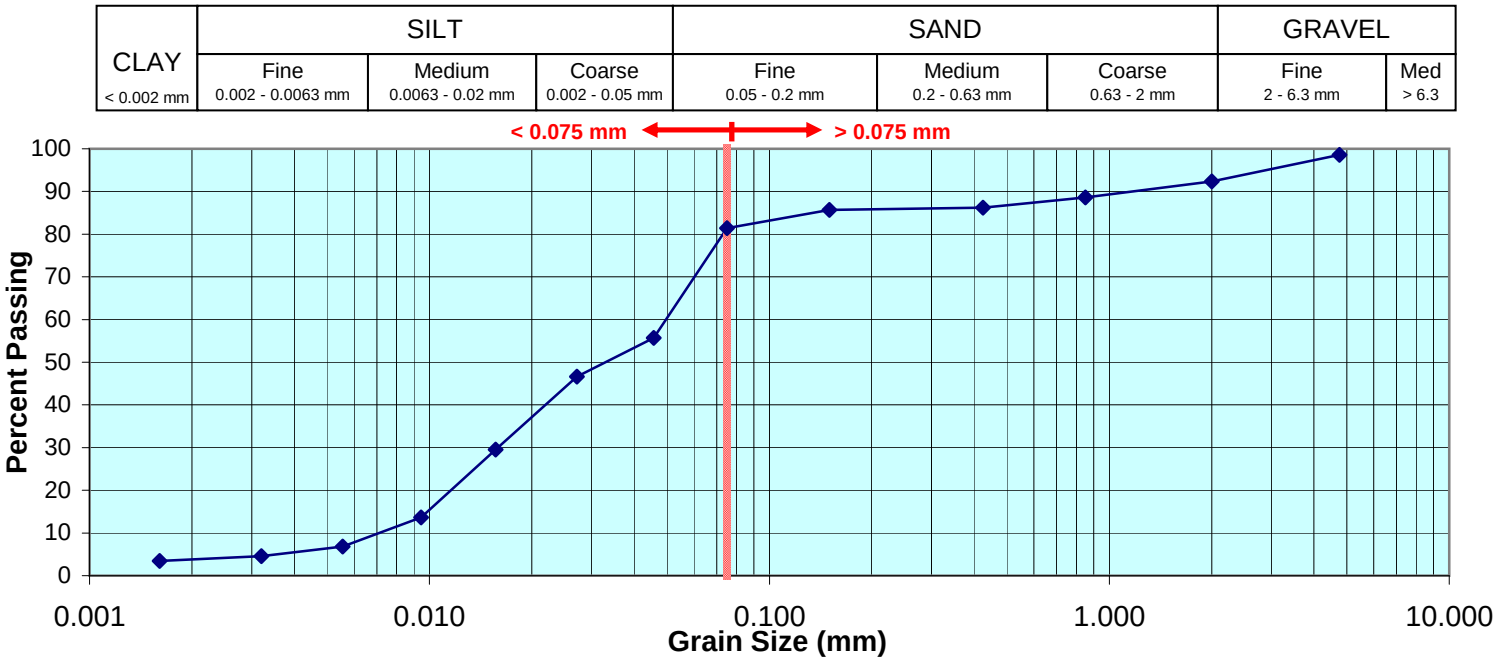
Based on the entire sample

Percentage (by mass) less than 0.075 mm = 81.4
Classification = Fine Textured Soil

Based on the < 2 mm fraction **

Percentage (by mass) less than 0.075 mm = 88.1
Classification = Fine Textured Soil

**** Grain size analysis performed to classify the soil material according to the criteria prescribed in Section 42.2 of Ontario Regulation 153/04 as amended by Ontario Regulation 511/09, and conducted in accordance with test procedures outlined in ASTM D422.



*** ON Regulation 153/04 requires coarse:fine determination on the < 2 mm fraction. Other jurisdictions may require the entire sample, thus both classifications are provided

Note: Clay/Silt/Sand/Gravel Graphic above Graph: Sand | Silt | Clay fractions in accordance with USDA and Canadian System of Soil Classification. Sub fractions in accordance with the British (BSI) system for information purposes.

Grain Size Analysis Report

Client Sample ID: BDC709-01R / SA#8 0.0-0.075M
Maxxam Sample ID: NK0040-01
Maxxam Job #: B591557

Tot. Sample Wt (g)*: 12.58
> 2 mm Sample Wt (g)*: 1.96
* Dry mass based on Sieve Aliquot

Batch # (Sieve): 8080415
Batch # (Hydro): 8080776

Analysis Date (Sieve): 2015/10/20
Analysis Date (Hydro): 2015/10/20

	Description	Particle Size (mm)	Percent Passing
Sieve	Sieve 4	4.750	95.3
	Sieve 10	2.000	84.4
	Sieve 20	0.850	67.3
	Sieve 40	0.425	47.4
	Sieve 100	0.150	17.1
	Sieve 200	0.075	11.7
Hydrometer	R1min	0.0528	1.9
	R3min	0.0307	0.9
	R10min	0.0169	0.9
	R30min	0.0098	0.9
	R90min	0.0056	0.0
	R270min	0.0032	0.0
	R1080min	0.0016	0.0

Grain Size Proportion (%)**:

	Min (mm)	Max (mm)	Percentage
Sand	0.050	2.000	97.9
Silt	0.002	0.050	2.1
Clay	-	0.002	0.0

** Calculations based only on sub 2 mm fraction.
Compatible with USDA and Canadian Soil Triangles

Soil Classification***:

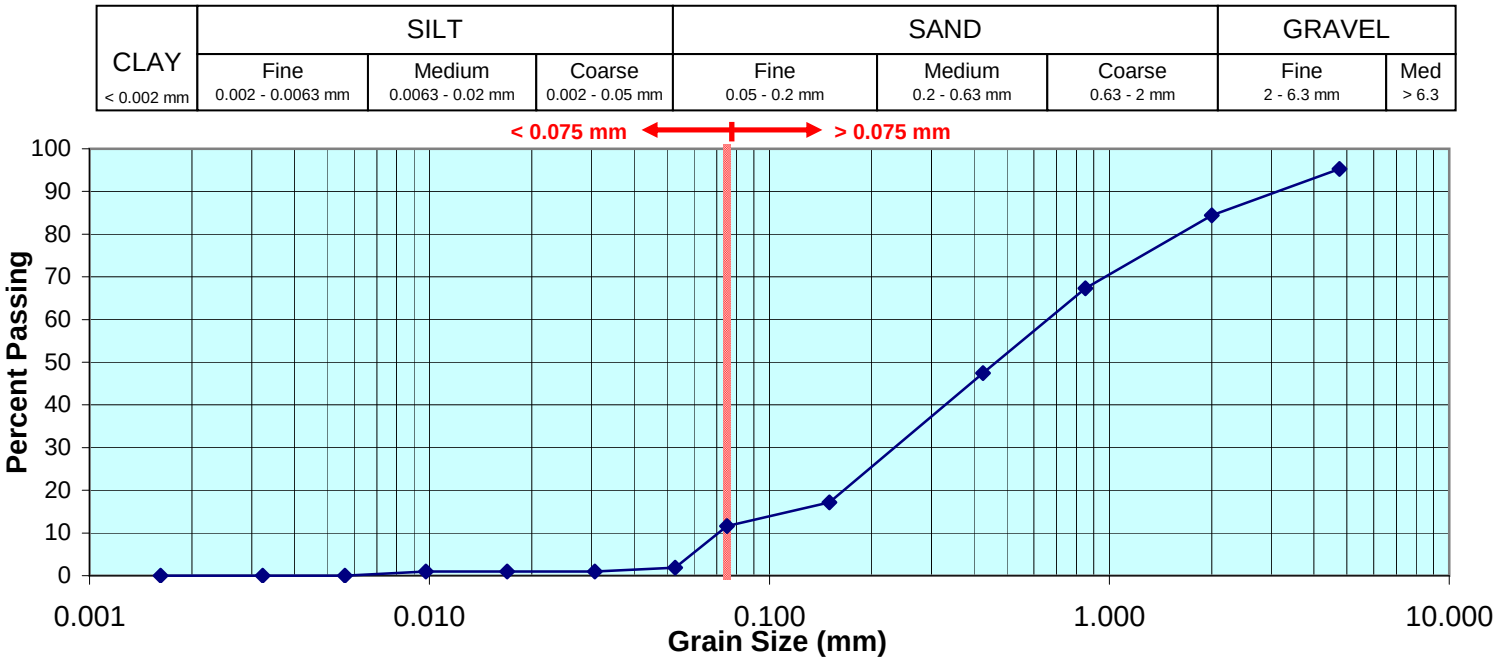
Based on the entire sample

Percentage (by mass) less than 0.075 mm = 11.7
Classification = Coarse Textured Soil

Based on the < 2 mm fraction **

Percentage (by mass) less than 0.075 mm = 13.8
Classification = Coarse Textured Soil

**** Grain size analysis performed to classify the soil material according to the criteria prescribed in Section 42.2 of Ontario Regulation 153/04 as amended by Ontario Regulation 511/09, and conducted in accordance with test procedures outlined in ASTM D422.



*** ON Regulation 153/04 requires coarse:fine determination on the < 2 mm fraction. Other jurisdictions may require the entire sample, thus both classifications are provided

Note: Clay/Silt/Sand/Gravel Graphic above Graph: Sand | Silt | Clay fractions in accordance with USDA and Canadian System of Soil Classification. Sub fractions in accordance with the British (BSI) system for information purposes.

Grain Size Analysis Report (QA-SRM)

Sieve Batch #: 8080415
Hydrometer Batch #: 8080776

Standard Reference Material

			Acceptance Limits	
	Fraction	% Recovery	Minimum	Maximum
Sieve	> 0.075 mm	105	84	116
	< 0.075 mm	97	91	109
Hydrometer	Sand	98	75	125
	Silt	103	75	125
	Clay	100	75	125