Notice of Alteration Form

Manitoba

File No. :	Environment Act Licence No. : 1339RR
Legal name of the Licencee: Canadian Kraft Paper Industries Ltd.	
Name of the development: Biosoilds Landspreading- Trail on Agricultural Land	
Category and Type of development per Classes of Development Regulation: Waste Treatment and Disposal <SELECT>	
Licencee Contact Person: Leigh Johnston, Mill Services Manager Mailing address of the Licencee: PO Box 1590 City: The Pas Province: MB Postal Code: R9A 1L4 Phone Number: (204) 623-8585 Fax: (204) 623-5995 Email: Leigh.Johnston@ckpi.com	
Name of proponent contact person for purposes of the environmental assessment (e.g. consultant):	
Phone: Fax:	Mailing address:
Email address:	
Short Description of Alteration *(max 90 characters)*:	
Alteration fee attached: Yes: ☑ No: ☐ If No, please explain:	
Date: 2023-10-06 2024/02/08 Revision	Signature: [redacted] Printed name: Leigh Johnston

A complete Notice of Alteration (**NoA**) consists of the following components:

- ☑ **Cover letter**
- ☐ **Notice of Alteration Form**
- ☑ **1 hard copy and 1 electronic copy of the NoA detailed report** (see "Information Bulletin - Alteration to Developments with Environment Act Licences")
- ☐ **$500 Application fee, if applicable** (Cheque, payable to the Minister of Finance)

Submit the complete NoA to:
Director, Environmental Approvals Branch
Manitoba Environment and Climate
14 Fultz Blvd
Winnipeg, Manitoba R3Y 0L6
EABDirector@gov.mb.ca

For more information:
Phone: (204) 945-8321 Fax: (204) 945-5229
https://www.gov.mb.ca/sd/permits_licenses_approvals/eal/licence/index.html

Note: Per Section 14(3) of the Environment Act, Major Notices of Alteration must be filed through submission of an Environment Act Proposal Form (see "Information Bulletin – Environment Act Proposal Report Guidelines")

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PO Box 1590 • The Pas, Manitoba • R9A 1L4 Telephone (204) 623-7411

February 8, 2024

TM-10048
Code #09-LF-009

Agnes Wittmann
Director
Environmental Approvals Branch
Manitoba Environment and Climate
14 Fultz Blvd.
Winnipeg, Manitoba
R3Y 0L6

Re: Canadian Kraft Paper Biosolids Landspreading – Continuation and Expansion of Trials on Agricultural Land - Amended

Dear Ms. Wittman,

Canadian Kraft Paper Industries (CKP) is a high performance, unbleached sack kraft papermill located in The Pas, Manitoba. From 2017-2022, CKP with the approval of Manitoba Environment and Climate Change (MECC), has undertaken a Biosolids Landspreading Pilot Study Project on CKP property. The Pilot Study involved removing biosolids from the effluent treatment system onsite and applying it to industrial lands at the CKP mill site. With the Pilot Study approval ending in 2022, CKP has begun exploring other options with respect to landspreading biosolids. This includes a biosolids landspreading trial on agricultural land that took place in the summer of 2023 at Round the Bend Farms (RTBF) in the Carrot River Valley, west of The Pas.

The research carried out on RTBF has been led by Emmanuel Badewa, a postdoctoral research scientist from the University of Toronto, working for CKP. To expand the scope of the research on using biosolids as a soil amendment on agriculture lands, CKP is proposing to include an additional trial location for the 2024 growing season. The trail will be located on farmland owned by Rob White, in the Carrot River Valley. As such CKP is requesting an NOA be issued for this new trial location. CKP will also be seeking approval to continue the trial at RTBF for the 2024 season with the exact same methodology that was used in 2023.

The trial on Rob White's farmland (RWF) would build on the learnings from the previous year's trial by reducing the number of biosolid/fertilizer combinations and increasing the total volume applied. The rationale for the increased volume is to take the best performing combinations of material from the RTBF trial and applied to larger plots. In addition, the composition of the soil at RWF differs, as it contains a higher clay content than the previous trial location which will aid in understanding how biosolids impact crop growth on varying types of soils in the Carrot Valley.

There has been much interest from the local farming community on the use of biosolids as a soil amendment on farmland. This was evident during an open house held at the trial site this summer, which was attended by 8 local farmers. Some of the farmers are interested in carrying out large scale biosolids

landspreading on their lands. With the interest from the farming community and learnings coming from the trials, the end goal is to carry out annual biosolids landspreading in the Carrot River Valley via a similar mechanism that is used for municipal biosolids spreading. Conducting this trial is another step in which the mill is exploring alternative biosolids management practices apart from the existing landfilling and landspreading on CKP's property.

As an aside, CKP continues to pursue an Environment Act License (EAL) in order to continue the biosolids landspreading operations on the CKP mill site. Currently, the EAL proposal has been closed for public comments. CKP is awaiting a request for additional information, and it is expected that the licensing process will be completed by spring 2024.

TRIAL OVERVIEW

The focus of the trial is to explore the benefit of biosolids on soil health and crop productivity to determine if biosolids can be effectively used as a fertilizer/soil amendment. If successful, this could help reduce the demand for nitrogen fertilizer and improve soil microbial activity/diversity of the local farmland. Upon completion of successful trials, CKP plans to work toward registering the biosolids produced onsite as a fertilizer with the Canadian Food Inspection Agency and/or create a similar mechanism used to spread municipal biosolids on farmland. This will not only benefit the nearby agricultural community but will also divert biosolids from the onsite landfill extending its life. The reduction in landfill waste also aligns with MECC's directive to promote a circular economy.

Similar to the ongoing agricultural trial located on RTBF, CKP intends to conduct another trial on a different soil type and on a larger scale with selected treatments at RWF. This trial will involve the use of four different amendments, ranging from a control group to various ratios of biosolids mixed with nitrogen fertilizer (Table 1).

The biosolids being used for the trial will be sourced from previously landspread locations on CKP property. The primary biosolids source for the trial will be from the South Settling Basin (SSB), dredged in 2022. The secondary biosolids source will be from the Aerated Settling Basin (ASB), dredged in 2021. For the trial, approx. 494 tonnes of primary biosolids and approx. 195 tonnes of secondary biosolids are required. Once, approval of this NOA has been received the biosolids will be transported from CKP's property to the trial site on RWF using a semitruck and dump trailer. Due to the distance of transportation and volume of biosoilds required for the trail, the material offloaded will need to be stockpiled for a maximum duration of two weeks. During this time impact to the environment will be mitigated by the use of an earthen berm which will prevent runoff due to incremental weather. The biosolids will then be loaded into a manure spreader using an excavator for land application. The manure spreader has a capacity of 7.7m^3 and a heaped capacity of approx. 15.4m^3.

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Table 1: Summary information for agricultural land trial of CKP biosolids.

Site/Size	Location (Lat/Long)	Crops	Amendments	Description
Rob White Farm (~16ha)	53°45'14.1"N 101°24'55.7"W	Canola/ Wheat	1) Control	No amendment
			2) Fertilizer (urea)	Urea nitrogen fertilizer
			3) Primary Biosolids 50% + urea 50%	Biosolids from the NSB that was land applied on Site 2A zone 1 and 3, co-applied with urea
			4) Mixed Biosolids 100%	Primary-secondary biosolids mix (1:1)

Note: Based on the land area (16ha), biosolids applied will be less than 700 bone dry tonnes (BDT).

The trial site is a 400 m x 400 m (16 ha) area at RWF, in the Carrot Valley farming area west of The Pas, Manitoba (53°45'14.1"N, 101°24'55.7"W) (Appendix A, A1). The soil in the area was formed from deposited glacial drifts and alluvium parent material, grouped as peaty calcareous gleysol in the Pasquia series (Ehrlich et al., 1960 - Report of Detailed Soil Survey of Pasquia map area in Northern Manitoba). The soil is medium textured loam soil at 0-15 cm (<1% Sand, 68% Silt, 24.5% Clay) and clay loam soil at 0-60 cm (<1% Sand, 74.5% Silt, 31% Clay). Historically, the trial site was used to grow wheat and canola with conventional mineral fertilizer application. The trial site will be moldboard plowed (20-25 cm depth) and harrowed (10 cm depth) in the spring prior to seeding.

For the experimental design, treatments will be established in a randomized, complete block design, replicated four times, for a total of 32 plots with each plot having 1680 m^2 (45 m × 80 m) (Appendix A, A2). The trial location will be divided into two adjacent sections for canola and wheat cultivation, each crop section will be divided into 16 plots separate plots. All plots will be separated from each other by a 5-m buffer zone.

The application rate considered was calculated for each crop type (Table 2) based on the baseline/preliminary soil and biosolids information (Table 3 and 4). Rates of biosolids were calculated using 0.25 nitrogen efficiency coefficient. This helps to target optimum available nitrogen and phosphorus levels for canola and wheat crops while considering the metal loading limits for agricultural land. This rate calculation was done according to the Tri-Provincial Manure Application and User Guidelines. The biosolids and urea will be spread using a manure spreader and incorporated within 1 hour with a vertical tiller (10 cm depth) to minimize ammonia volatilization losses.

Table 2: Description of the Nitrogen (N) application treatments to be applied at RWF by crop.

Crops	Treatment	Biosolids Application rate (t/ha)	Total N applied (kg N ha^{-1})			Total Carbon (C) applied (kg C ha^{-1})
			Urea-N	Biosolids-N	Total N	
Canola (Hybrid)	Control (No Nitrogen)	0	0	0	0	0
	Fertilizer (urea)	0	135	0	135	0
	Primary Biosolids + urea 50%	47.3	67.5	268.8	336	10650
	Mixed Biosolids 100%	61.7	0	530.5	530.5	17597
Wheat (CWRS)	Control (No Nitrogen)	0	0	0	0	0
	Fertilizer (urea)	0	78.5	0	78.5	0
	Primary Biosolids + urea 50%	27.5	39.3	156.3	196	6193
	Mixed Biosolids 100%	35.9	0	308.5	308.5	10232

To mitigate any potential environmental effects, the RWF trial will implement the following:

- The site is surrounded by grass that will serve as a buffer. Also, the site has a class A slope - little or no slope; 0-3% gradient.
- In addition, the site is flat (Appendix C, C1-C3).
- The trial plot will be established far from any ground water wells (>50m), designated residential area (>1000m), property line with a residence (>10m), waterway (>30m), major swamp or wetland (>8m), and not subjected to annual land inundation.

These steps will ensure the trial will have little to no effect on the surrounding environment.

BACKROUND SOIL TESTING

On August 12, 2023, background soil sampling was carried on the RWF trial site at three different locations, each at depths 0-15 cm and 0-60 cm. The three samples from each depth were then combined and mixed to create one composite sample from each depth. Samples were collected by use of a shovel; depths were verified with a tape measure. The pattern of sub-sampling locations was designed to be as random as possible, while also allowing for the collection of samples representative of the entire site/ zone. The GPS coordinates for each sub-sample pit were collected and recorded using Avenza Maps (Table 3).

Table 3. Coordinates of sampling points on trial site at RWF

Lat/Long	Latitude	Longitude
#1	53°45’18.7"N	101°24’57.4"W
#2	53°45’15.7"N	101°24’57.0"W
#3	53°45’11.6"N	101°24’59.6"W

Each composite sample was analyzed for conductivity, metals, percent moisture, particle size/composition, pH, mercury, available phosphate-phosphorus, and numerous forms of nitrogen (Table 4). Analyzing the soils testing results, the available phosphorus and nitrate level in the soil at the proposed site are below the regulated limits (Table 4). Thus, at the proposed site on RWF (Appendix A, A1), CKP is requesting to spread a biosolid approximate amount of 700 bone dry tonnes/year for a period of two years to complete the trial (Appendix A, A2). See Table 5 for the chemical characteristics of the biosolids that will be utilized from the landspread locations on CKP property.

Table 4: The preliminary soil characteristics of composite samples, depths 0-15 cm and 0-60 cm at RWF trial site.

Chemical Properties	Composite 0-15cm	Composite 0-60cm	CCME Soil Guideline (Agricultural)*
Sample Date	August 12, 2023	August 12, 2023	-
Soil Texture	loam	clay loam	-
pH	7.81	7.90	6 to 8
Total Nitrogen (%)	0.146	0.088	-
Ammonium (mg/kg)	12.3	9.6	-
Nitrate (mg/kg)	6.9	4.6	-
Available Phosphate-P	14.6	4.9	-
Phosphorus (mg/kg)	759	588	-
Potassium (mg/kg)	2190	1860	-
Arsenic (mg/kg)	10	8.23	17[a]
Cadmium (mg/kg)	0.443	0.315	1.4
Chromium (mg/kg)	26.3	23.2	64
Copper (mg/kg)	23.9	21.8	63
Lead (mg/kg)	13.3	12.1	60
Mercury (mg/kg)	0.0449	0.0473	0.5
Nickel (mg/kg)	29.4	25.6	32
Zinc (mg/kg)	83.0	71.8	200

Units with < indicates below or at detection limit.

* Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health

[a] CCME soil contact guideline using environmental health guidelines/check values.

Table 5: Chemical properties of the biosolids proposed for agricultural land application.

Chemical Properties	Primary Biosolids (SSB 2022)[1]	Secondary Biosolids (ASB 2021)	CCME Biosolids Guidelines[2]
Total Solids	29.45	64.7	-
Electrical conductivity (dS/m)	1.11	1.26	-
pH	7.54	7.05	-
Total Carbon (%)	22.5	33.3	-
Inorganic Carbon (%)	3.1	3.69	-
organic carbon (%)	19.4	29.6	-
Total Nitrogen (%)	0.522	1.22	-
Ammonium (mg/kg)	8.65	3.5	-
Nitrate (mg/kg)	<3.5	90.9	-
Available Phosphate-P (mg/kg)	83.85	101	-
Phosphorus (mg/kg)	811.5	3360	-
Potassium (mg/kg)	196	99	-
Magnesium (mg/kg)	188	128	-
Arsenic (mg/kg)	0.9	1.96	13
Cadmium (mg/kg)	0.426	6.01	20[a]
Cobalt (mg/kg)	2.53	3.96	34
Chromium (mg/kg)	51.3	43.9	210
Copper (mg/kg)	11.85	84.8	400
Lead (mg/kg)	4.745	12	150
Mercury (mg/kg)	0.0086	0.0635	0.8
Molybdenum (mg/kg)	3.465	4.79	20[a]
Nickel (mg/kg)	31.85	41.9	62
Selenium (mg/kg)	0.35	0.7	2
Zinc (mg/kg)	60.8	879	1850[a]

Units with < indicates below or at detection limit.

[1] using an average of CKP site 2A zone 1 and 3.

[2] Canadian Council of Ministers of the Environment (CCME) guidelines for compost quality- Category A maximum concentration within biosolids product.

[a] Concentrations are the existing standards under the Canadian Food Inspection Agency's Standards for Metals in Fertilizers and Supplements, September 1997 (Trade Memorandum T-4-93).

To ensure the dryland agricultural capability of the trial site receiving the biosolids meets the nutrient management regulation, a review of the soil survey report for the area was undertaken (Appendix B, B1-B3). The soil survey report reviewed indicated the Pasquia and Le Pas soil series of Northern Manitoba is underlying by Peaty Calcareous Gleysol-Silty clay/loam. According to the Canada Land Inventory Soil Capability Classification, for agriculture and the current management practice at the site, RWF's land is

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classified as a Class 3. This categorization results in the adoption of conservation practices such as field-edge filter strips, calculation of the fertilizer and amendment rate using the soil test results. Also, the information suggested the adopted of the N1 nutrient management zone, as defined in Nutrient Management Regulation, Man Reg 62/2008.

Post crop harvest, an intensive in-depth analysis of soil and plants on the site will take place at analytical facilities located at the University of Edmonton and Lakehead University. Sampling will be carried out on each treatment replicate to determine soil health indicators that encompasses physical, chemical, and biological soil properties. The soil indicators will include, bulk density, water stable aggregate stability, soil pH, cation exchange capacity, soil organic carbon, hot water extractable carbon, and microbial community analysis (Appendix A, A3). The trial will also be assessing agronomic rates for the biosolids as soil amendments. Furthermore, the trial will also assess the risk of metal accumulation on soil amended with the biosolids.

The trial is tentatively scheduled to begin in the last first week of May 2024 to align with the start of the farming season. Thus, CKP is requesting a response regarding the approval of the NOA to carry out an agricultural landspreading trial at RWF by March 15, 2024, to ensure there is no delay in the planned spring biosolids application. If you have any further questions, please feel free to contact me at (204) 623-8450 or via email at lisa.jones@ckpi.com

Sincerely,

[redacted]

Lisa Jones
Environmental Team Lead

Attach.
cc: Siobhan Burland Ross, Environmental Approvals Branch, Winnipeg
Robert Boswick, Environmental Approvals Branch, Winnipeg
Cristal Huculak, Environmental Compliance and Enforcement, The Pas
Emmanuel Badewa, CKP Research Scientist
Leigh Johnston, CKP Manager of Mill Services
Tamsin Patience, CKP Director of Mill Services
Landspreading File

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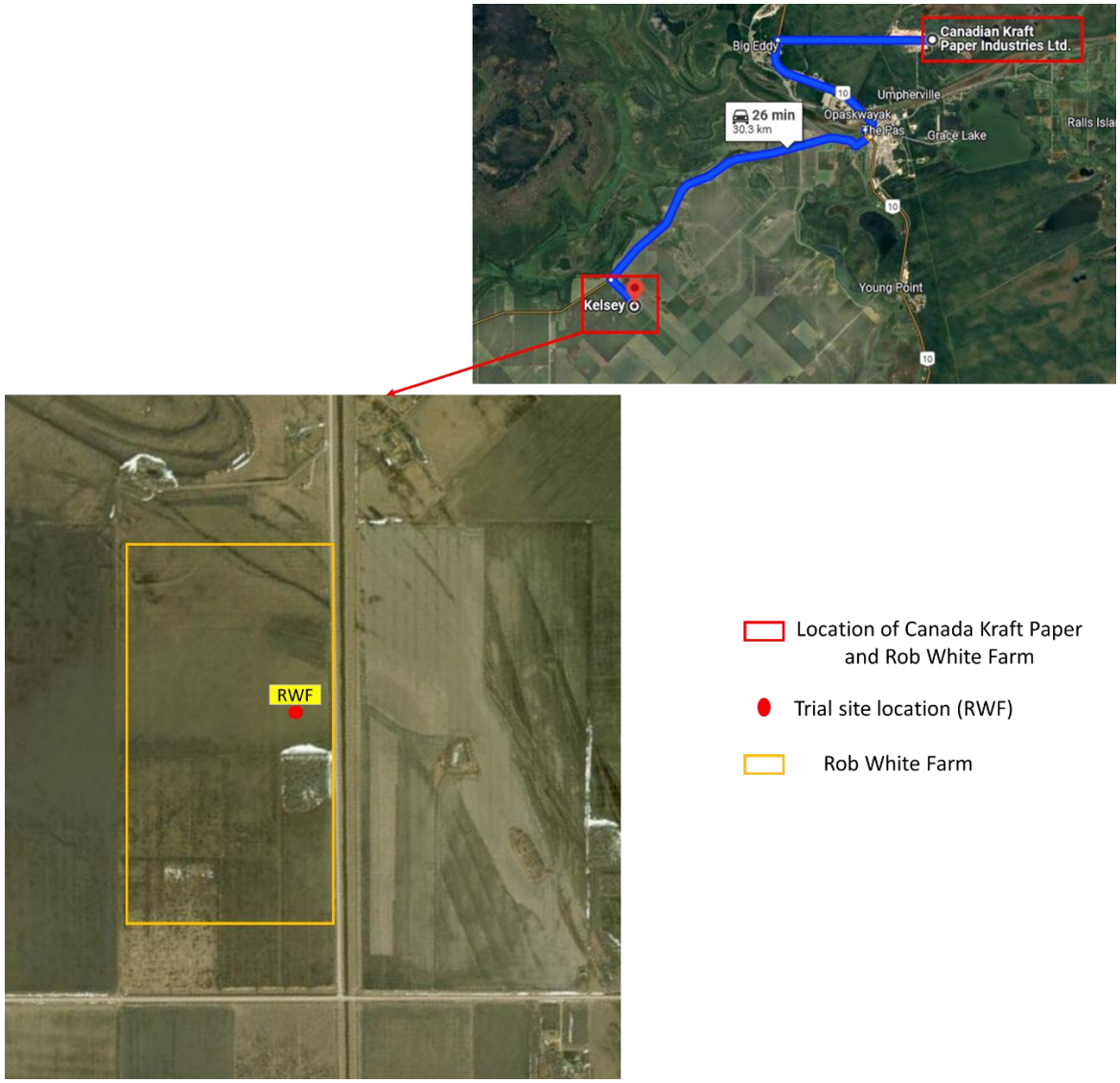
APPENDICES

A: Figures



A1: Location of the trial site on RWF and the driving distance from the CKP mill site.

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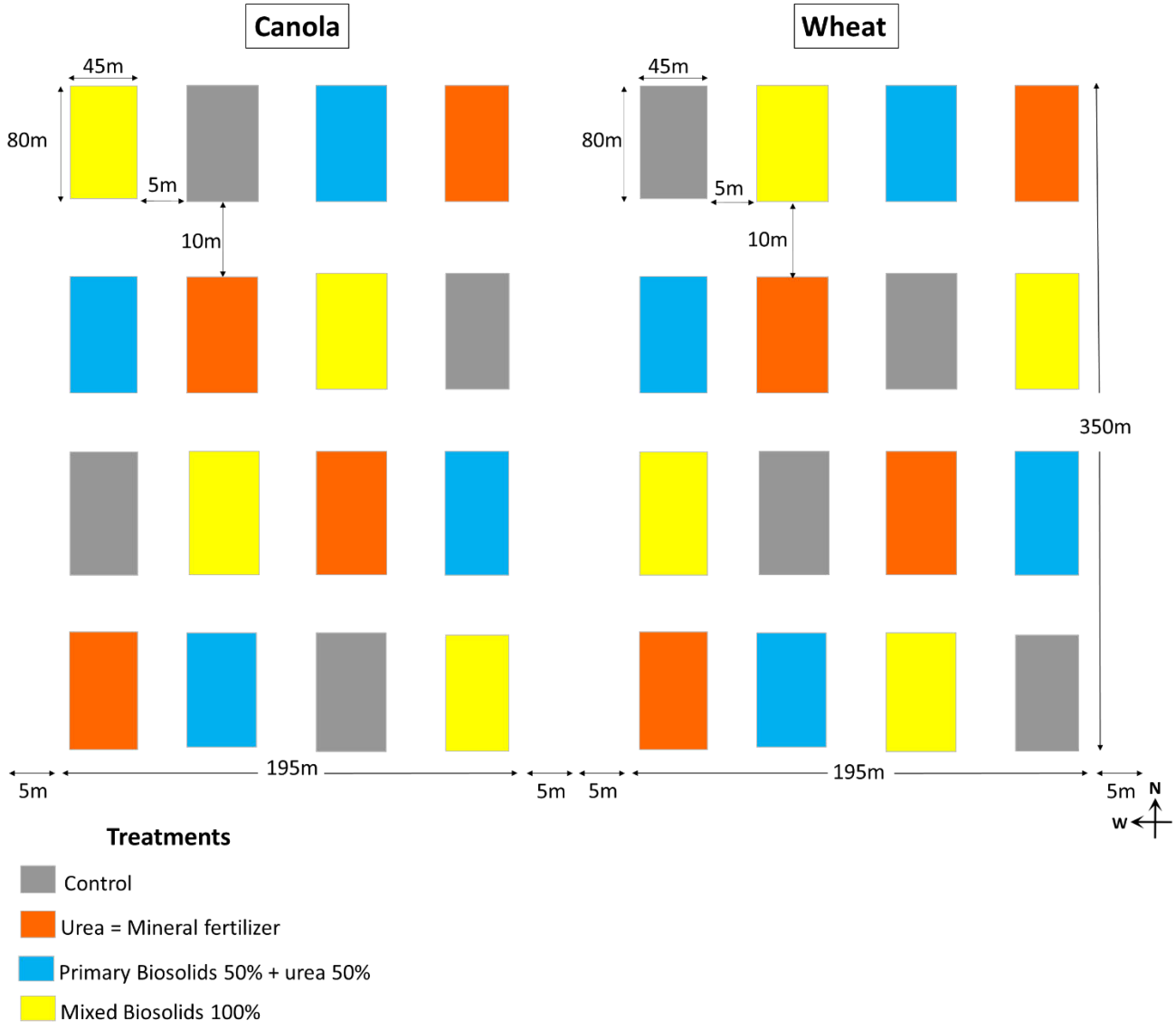

A2: Proposed experimental design showing the treatments and the adjacent sections for the proposed crops, Canola and Wheat.

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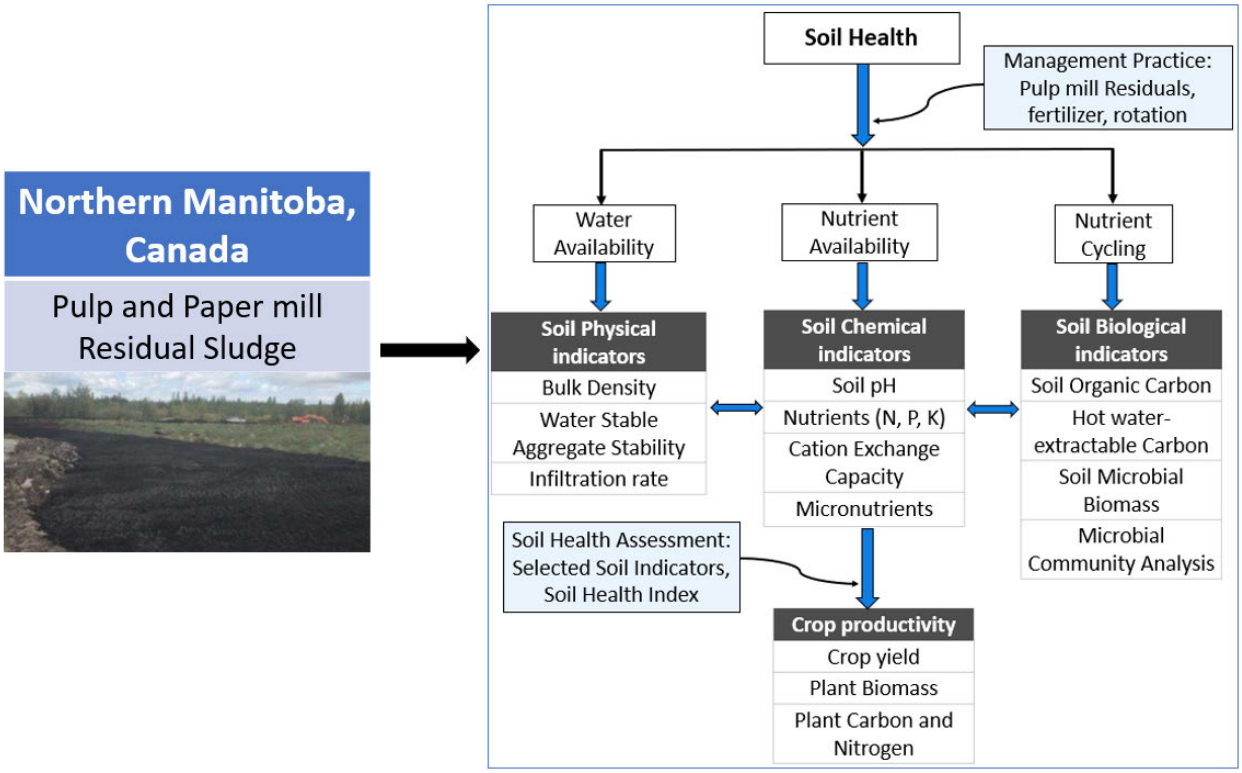

A3: Soil health indicators to be used in this assessment suggested by the Soil Health Institute.

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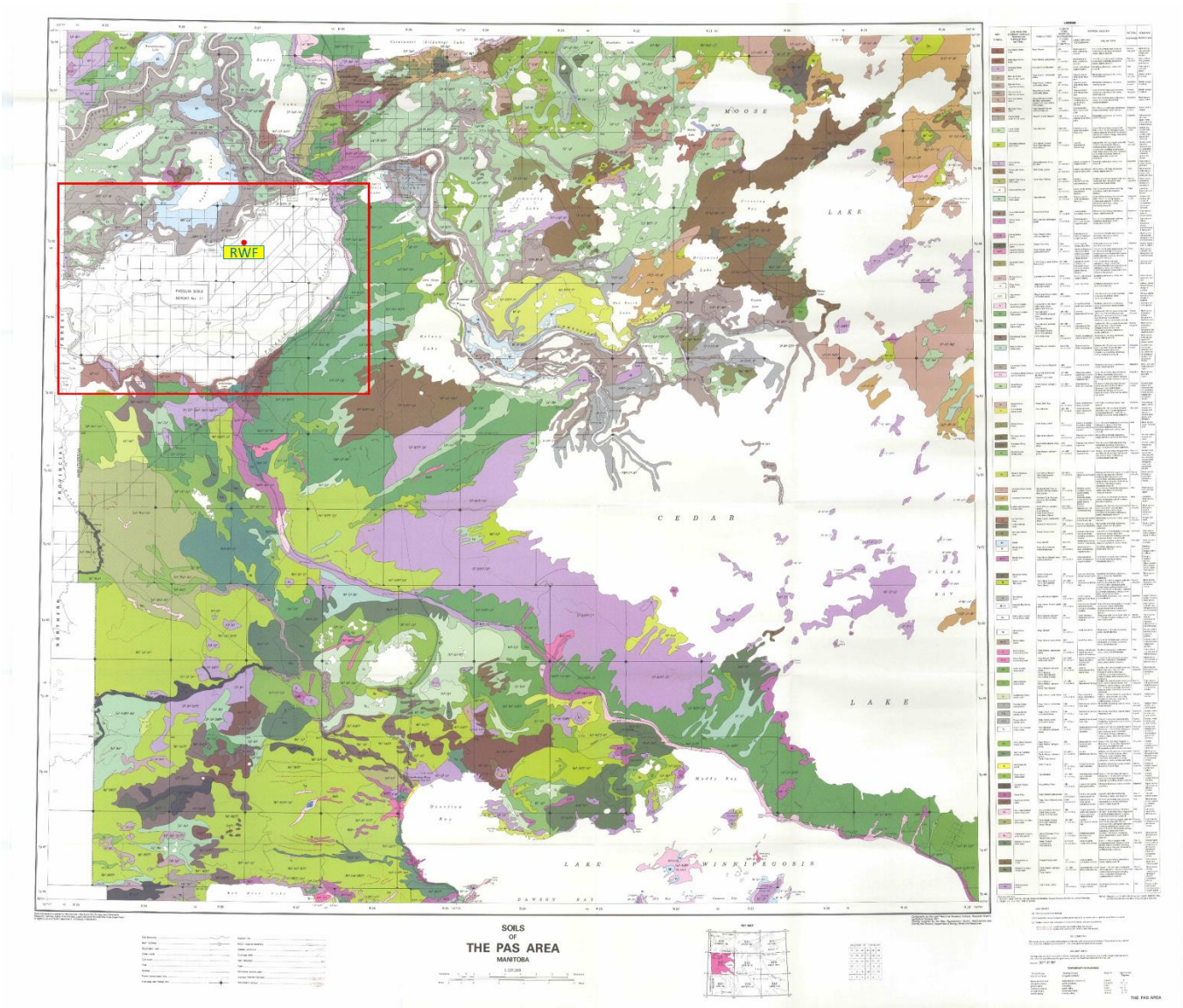
B: Survey maps and trial site information



B1: The location of RWF trial site on The Pas pedological soil map.

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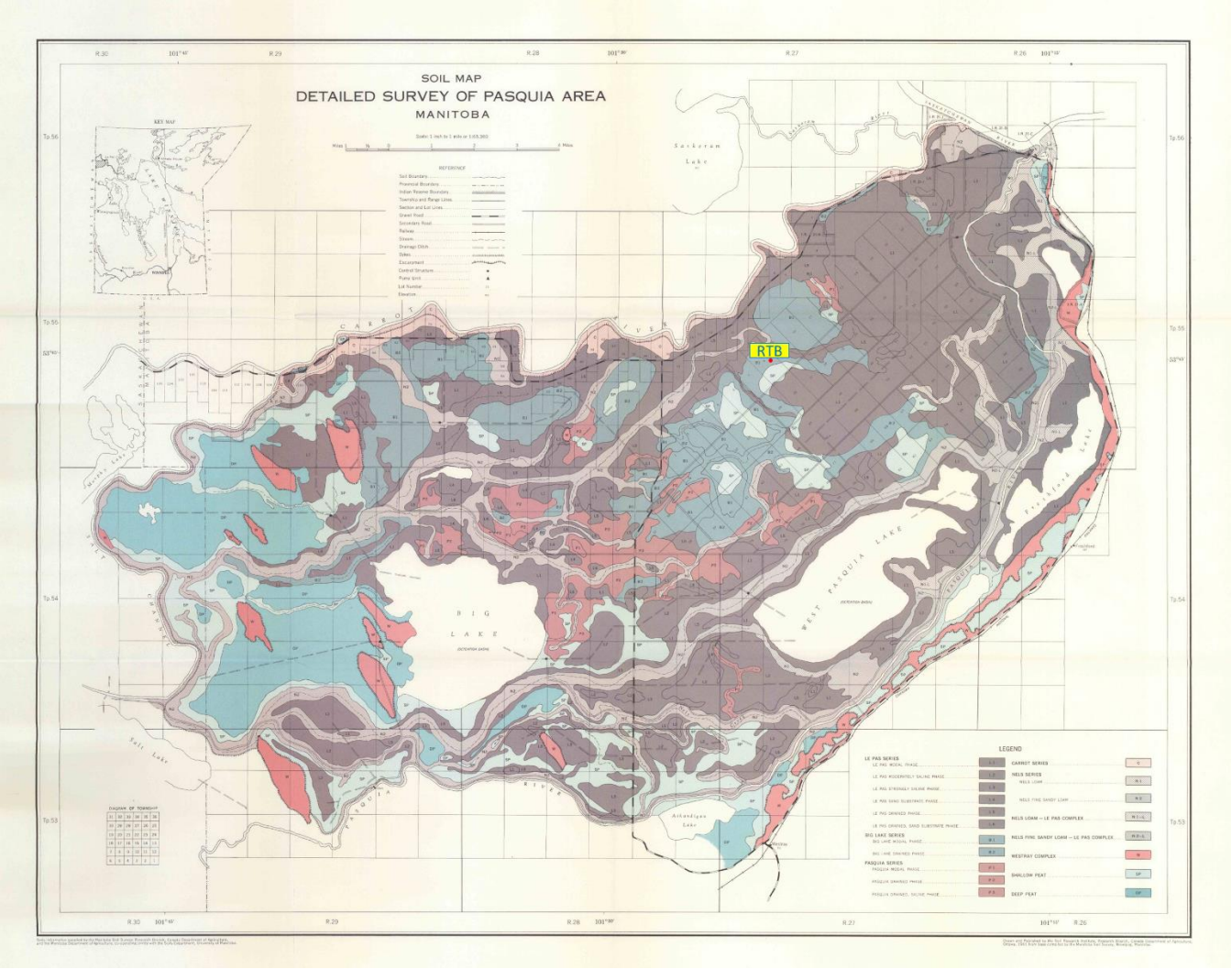

B2: The location of RWF trial site on detailed soil survey map of old Pasquia area.

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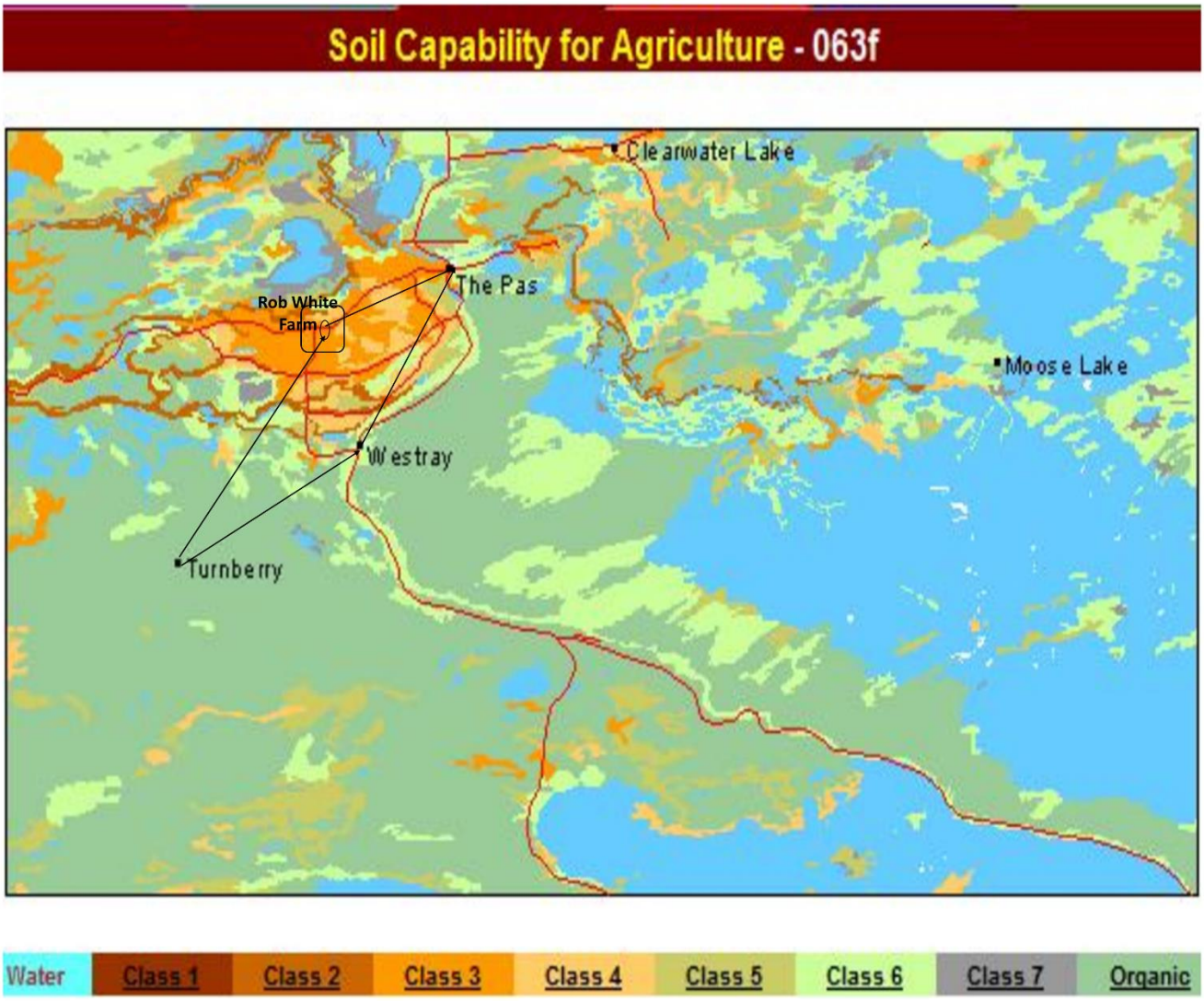

B3: The approximate location of the RWF trial site on soil capability for Agriculture in Northern Manitoba.

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C: Photos of Trial Site

C1: Photo of RWF trial site, August 12, 2023, during soil sample collection.

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C2: Photo of RWF sample site soil profile, August, 2023, depth of 15 cm.

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C3: Photo of RWF sample site soil profile, August 12, 2023, depth of 60 cm.

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D: Biosolids Certificate of Analysis

D1: Primary Biosolids from South Settling Basin

Canadian Kraft Paper Industries Limited
ATTN: ERNIE BALLANTYNE
PO Box 1590
The Pas MB R9A 1L4

Date Received: 13-OCT-22
Report Date: 18-NOV-22 10:02 (MT)
Version: FINAL REV. 2

Client Phone: 204-623-8636

Certificate of Analysis

Lab Work Order #: L2736640
Project P.O. #: SV-31293
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments:
18-NOV-2022 Revised report - Full metals reporting.

[redacted]
Hua Wo
Chemistry Laboratory Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-3 SITE 2A ZONE 1, 0-15 CM							
Sampled By: CLIENT on 11-OCT-22 @ 14:30							
Matrix: COMPOSITE SOIL							
Total Carbon, TOC and TIC in soil							
Inorganic Carbon as CaCO3 Equivalent							
Inorganic Carbon (as CaCO3 Equivalent)	22.7		0.40	%		21-OCT-22	
Total Carbon by combustion method							
Total Carbon by Combustion	18.5		0.05	%	20-OCT-22	20-OCT-22	R5878623
Total Inorganic Carbon in Soil							
Inorganic Carbon	2.73		0.050	%		21-OCT-22	R5879037
Total Organic Carbon Calculation							
Total Organic Carbon	15.8		0.050	%		22-OCT-22	
Miscellaneous Parameters							
Moisture	65.5		0.10	%		19-OCT-22	R5877597
Available Phosphate-P	30.4		1.0	mg/kg	20-OCT-22	20-OCT-22	R5878090
Specific Gravity	1210		10	kg/m3	22-OCT-22	22-OCT-22	R5879470
Conductivity (1:2)	1.21		0.050	dS m-1	19-OCT-22	19-OCT-22	R5877502
Mercury (Hg)	0.0084		0.0050	mg/kg	19-OCT-22	19-OCT-22	R5877496
Nitrate (as N)	<1.0		1.0	mg/L		16-OCT-22	R5879136
pH (1:2 CaCl2)	7.50		0.10	pH	19-OCT-22	19-OCT-22	R5877478
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	55.7	PSAL	1.0	%	28-OCT-22	29-OCT-22	R5883681
% Silt (0.05mm - 2um)	37.7	PSAL	1.0	%	28-OCT-22	29-OCT-22	R5883681
% Clay (<2um)	6.6	PSAL	1.0	%	28-OCT-22	29-OCT-22	R5883681
Texture	Sandy loam	PSAL			28-OCT-22	29-OCT-22	R5883681
Available Micronutrients (Cu,Fe,Zn,Mn)							
Copper (Cu)	1.98		0.60	mg/kg	27-OCT-22	27-OCT-22	R5882816
Iron (Fe)	197		6.0	mg/kg	27-OCT-22	27-OCT-22	R5882816
Manganese (Mn)	21.7		0.15	mg/kg	27-OCT-22	27-OCT-22	R5882816
Zinc (Zn)	6.95		0.60	mg/kg	27-OCT-22	27-OCT-22	R5882816
Total Available N & NO3-N, NO2-N & NH4							
Available Ammonium-N							
Available Ammonium-N	6.2		2.0	mg/kg	19-OCT-22	19-OCT-22	R5878240
Available Ammonium-N - Calculation							
Total Available Nitrogen	6.2		4.5	mg/kg		20-OCT-22	
Nitrate, Nitrite & Nitrate+Nitrite-N(KCL							
Nitrite-N	<2.0		2.0	mg/kg	19-OCT-22	19-OCT-22	R5878168
Nitrate+Nitrite-N	<4.0		4.0	mg/kg	19-OCT-22	19-OCT-22	R5878168
Nitrate-N	<4.0		4.0	mg/kg	19-OCT-22	19-OCT-22	R5878168
Total Organic Nitrogen - Soil							
Nitrogen, Total Organic - calculation							
Total Organic Nitrogen	0.284		0.020	%		22-OCT-22	
Total Kjeldahl Nitrogen							
Total Kjeldahl Nitrogen	0.285		0.040	%	19-OCT-22	21-OCT-22	R5879057
Available N, P and K							
Available Nitrate-N							
Available Nitrate-N	<2.0	DLM	2.0	mg/kg	19-OCT-22	19-OCT-22	R5878163
Plant Available Phosphorus and Potassium							
Available Phosphate-P	92		10	mg/kg	20-OCT-22	20-OCT-22	R5879059
Available Potassium	166		20	mg/kg	20-OCT-22	20-OCT-22	R5879059
Total N, P, K, S							
Metals in Soil by CRC ICPMS							
Aluminum (Al)	4300		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Antimony (Sb)	0.21		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Arsenic (As)	0.94		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Barium (Ba)	50.5		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-3 SITE 2A ZONE 1, 0-15 CM							
Sampled By: CLIENT on 11-OCT-22 @ 14:30							
Matrix: COMPOSITE SOIL							
Metals in Soil by CRC ICPMS							
Beryllium (Be)	0.16		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Boron (B)	10.8		5.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Bismuth (Bi)	<0.20		0.20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Cadmium (Cd)	0.310		0.020	mg/kg	19-OCT-22	19-OCT-22	R5877677
Calcium (Ca)	103000		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Chromium (Cr)	75.3		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Cobalt (Co)	2.78		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Copper (Cu)	11.2		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Iron (Fe)	5460		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Lead (Pb)	4.64		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Lithium (Li)	5.9		2.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Magnesium (Mg)	49600		20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Manganese (Mn)	167		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Molybdenum (Mo)	4.42		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Nickel (Ni)	43.1		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Phosphorus (P)	758		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Potassium (K)	720		100	mg/kg	19-OCT-22	19-OCT-22	R5877677
Selenium (Se)	0.32		0.20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Silver (Ag)	0.10		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Sodium (Na)	470		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Strontium (Sr)	39.4		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Sulfur (S)	2100		1000	mg/kg	19-OCT-22	19-OCT-22	R5877677
Thallium (Tl)	0.055		0.050	mg/kg	19-OCT-22	19-OCT-22	R5877677
Tin (Sn)	<1.0		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Titanium (Ti)	135		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Tungsten (W)	<0.50		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Uranium (U)	0.463		0.050	mg/kg	19-OCT-22	19-OCT-22	R5877677
Vanadium (V)	12.5		0.20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Zinc (Zn)	47.8		2.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Zirconium (Zr)	<1.0		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Total Nitrogen by combustion method							
Total Nitrogen by LECO	0.393		0.020	%	20-OCT-22	20-OCT-22	R5878623
Total Sulphur by combustion method							
Sulfur (S)-Total	2600		500	mg/kg	20-OCT-22	20-OCT-22	R5878623
Detailed Salinity							
Chloride (Cl) (Saturated Paste)							
Chloride (Cl)	109		20	mg/L	21-OCT-22	21-OCT-22	R5879196
Detail Salinity in mg/kg							
Chloride (Cl)	131		24	mg/kg		27-OCT-22	
Calcium (Ca)	620		30	mg/kg		27-OCT-22	
Magnesium (Mg)	125		30	mg/kg		27-OCT-22	
Potassium (K)	50		30	mg/kg		27-OCT-22	
Sodium (Na)	230		30	mg/kg		27-OCT-22	
Sulfur (as SO4)	473		30	mg/kg		27-OCT-22	
Nitrate-N	<1.2		1.2	mg/kg		27-OCT-22	
SAR, Cations and SO4 in saturated soil							
Calcium (Ca)	519	DLDS	25	mg/L	21-OCT-22	21-OCT-22	R5879657
Potassium (K)	42	DLDS	25	mg/L	21-OCT-22	21-OCT-22	R5879657
Magnesium (Mg)	104	DLDS	25	mg/L	21-OCT-22	21-OCT-22	R5879657
Sodium (Na)	193	DLDS	25	mg/L	21-OCT-22	21-OCT-22	R5879657
SAR	2.02		0.10	SAR	21-OCT-22	21-OCT-22	R5879657
Sulfur (as SO4)	396	DLDS	25	mg/L	21-OCT-22	21-OCT-22	R5879657

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-3 SITE 2A ZONE 1, 0-15 CM							
Sampled By: CLIENT on 11-OCT-22 @ 14:30							
Matrix: COMPOSITE SOIL							
Theoretical Gypsum Requirement							
TGR(brine)	<0.10		0.10	t/ha		27-OCT-22	
TGR(sodic)	<0.10		0.10	t/ha		27-OCT-22	
pH and EC (Saturated Paste)							
% Saturation	119		1.0	%	20-OCT-22	21-OCT-22	R5878938
pH in Saturated Paste	7.06		0.10	pH	20-OCT-22	21-OCT-22	R5878938
Conductivity Sat. Paste	3.06		0.10	dS m-1	20-OCT-22	21-OCT-22	R5878938
VOC routine							
VOC plus F1 by GCMS							
Acetone	4.7	DLHM	1.0	mg/kg	11-OCT-22	29-OCT-22	R5887957
Benzene	<0.010	DLHM	0.010	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromobenzene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromochloromethane	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromodichloromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromoform	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromomethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
n-Butylbenzene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
sec-Butylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
tert-Butylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Carbon disulfide	<0.50	DLHM	0.50	mg/kg	11-OCT-22	29-OCT-22	R5887957
Carbon Tetrachloride	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chloroform	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chloromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
2-Chlorotoluene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
4-Chlorotoluene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dibromochloromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dibromo-3-chloropropane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dibromoethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dibromomethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,3-Dichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,4-Dichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dichlorodifluoromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1-dichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1-dichloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
cis-1,2-Dichloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
trans-1,2-Dichloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dichloromethane	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dichloropropane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,3-Dichloropropane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
2,2-Dichloropropane	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1-Dichloropropene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
cis-1,3-Dichloropropene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
trans-1,3-Dichloropropene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Ethylbenzene	<0.030	DLHM	0.030	mg/kg	11-OCT-22	29-OCT-22	R5887957
Hexachlorobutadiene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Hexane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
2-Hexanone (Methyl butyl ketone)	<1.0	DLHM	1.0	mg/kg	11-OCT-22	29-OCT-22	R5887957
Isopropylbenzene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-3 SITE 2A ZONE 1, 0-15 CM							
Sampled By: CLIENT on 11-OCT-22 @ 14:30							
Matrix: COMPOSITE SOIL							
VOC plus F1 by GCMS							
4-Isopropyltoluene	109	DLHC	0.50	mg/kg	11-OCT-22	29-OCT-22	R5887957
MEK	<1.5	DLHM	1.5	mg/kg	11-OCT-22	29-OCT-22	R5887957
MIBK	<1.0	DLHM	1.0	mg/kg	11-OCT-22	29-OCT-22	R5887957
MTBE	<0.40	DLHM	0.40	mg/kg	11-OCT-22	29-OCT-22	R5887957
Styrene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,1,2-Tetrachloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,2,2-Tetrachloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Tetrachloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Toluene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,3-Trichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,4-Trichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,1-Trichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,2-Trichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Trichloroethene	<0.020	DLHM	0.020	mg/kg	11-OCT-22	29-OCT-22	R5887957
Trichlorofluoromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,3-Trichloropropane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,4-Trimethylbenzene	0.21	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,3,5-Trimethylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Vinyl Chloride	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
M+P-Xylenes	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
o-Xylene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Surrogate: 1,4-Difluorobenzene (SS)	114.9		70-130	%	11-OCT-22	29-OCT-22	R5887957
Surrogate: 4-Bromofluorobenzene (SS)	160.4	SHMI	70-130	%	11-OCT-22	29-OCT-22	R5887957

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D2: Primary biosolids- Zone 3 South Settling Basin

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-5 SITE 2A ZONE 3, 0-15 CM							
Sampled By: CLIENT on 11-OCT-22 @ 13:30							
Matrix: COMPOSITE SOIL							
Total Carbon, TOC and TIC in soil							
Inorganic Carbon as CaCO3 Equivalent							
Inorganic Carbon (as CaCO3 Equivalent)	28.9		0.40	%		21-OCT-22	
Total Carbon by combustion method							
Total Carbon by Combustion	26.5		0.05	%	20-OCT-22	20-OCT-22	R5878623
Total Inorganic Carbon in Soil							
Inorganic Carbon	3.47		0.050	%		21-OCT-22	R5879037
Total Organic Carbon Calculation							
Total Organic Carbon	23.0		0.050	%		22-OCT-22	
Miscellaneous Parameters							
Moisture	75.6		0.10	%		19-OCT-22	R5877597
Available Phosphate-P	28.1		1.0	mg/kg	20-OCT-22	20-OCT-22	R5878090
Specific Gravity	1070		10	kg/m3	22-OCT-22	22-OCT-22	R5879470
Conductivity (1:2)	1.11	FR5	0.050	dS m-1	19-OCT-22	19-OCT-22	R5877502
Mercury (Hg)	0.0088		0.0050	mg/kg	19-OCT-22	19-OCT-22	R5877496
Nitrate (as N)	<1.0		1.0	mg/L		16-OCT-22	R5879136
pH (1:2 CaCl2)	7.54	FR5	0.10	pH	19-OCT-22	19-OCT-22	R5877478
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	38.9	PSAL	1.0	%	28-OCT-22	29-OCT-22	R5883681
% Silt (0.05mm - 2um)	50.2	PSAL	1.0	%	28-OCT-22	29-OCT-22	R5883681
% Clay (<2um)	10.9	PSAL	1.0	%	28-OCT-22	29-OCT-22	R5883681
Texture	Silt loam	PSAL			28-OCT-22	29-OCT-22	R5883681
Available Micronutrients (Cu,Fe,Zn,Mn)							
Copper (Cu)	2.65		0.60	mg/kg	27-OCT-22	27-OCT-22	R5882816
Iron (Fe)	277		6.0	mg/kg	27-OCT-22	27-OCT-22	R5882816
Manganese (Mn)	37.5		0.15	mg/kg	27-OCT-22	27-OCT-22	R5882816
Zinc (Zn)	11.5		0.60	mg/kg	27-OCT-22	27-OCT-22	R5882816
Total Available N & NO3-N, NO2-N & NH4							
Available Ammonium-N							
Available Ammonium-N	11.1		5.0	mg/kg	19-OCT-22	19-OCT-22	R5878240
Available Ammonium-N - Calculation							
Total Available Nitrogen	11		11	mg/kg		20-OCT-22	
Nitrate, Nitrite & Nitrate+Nitrite-N(KCL							
Nitrite-N	<5.0		5.0	mg/kg	19-OCT-22	19-OCT-22	R5878168
Nitrate+Nitrite-N	<10		10	mg/kg	19-OCT-22	19-OCT-22	R5878168
Nitrate-N	<10		10	mg/kg	19-OCT-22	19-OCT-22	R5878168
Total Organic Nitrogen - Soil							
Nitrogen, Total Organic - calculation							
Total Organic Nitrogen	0.850		0.020	%		22-OCT-22	
Total Kjeldahl Nitrogen							
Total Kjeldahl Nitrogen	0.85		0.10	%	19-OCT-22	21-OCT-22	R5879057
Available N, P and K							
Available Nitrate-N							
Available Nitrate-N	<5.0	DLM	5.0	mg/kg	19-OCT-22	19-OCT-22	R5878163
Plant Available Phosphorus and Potassium							
Available Phosphate-P	75.7		4.0	mg/kg	20-OCT-22	20-OCT-22	R5879059
Available Potassium	226		20	mg/kg	20-OCT-22	20-OCT-22	R5879059
Total N, P, K, S							
Metals in Soil by CRC ICPMS							
Aluminum (Al)	4970		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Antimony (Sb)	0.79		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Arsenic (As)	0.86		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Barium (Ba)	72.1		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-5 SITE 2A ZONE 3, 0-15 CM							
Sampled By: CLIENT on 11-OCT-22 @ 13:30							
Matrix: COMPOSITE SOIL							
Metals in Soil by CRC ICPMS							
Beryllium (Be)	0.14		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Boron (B)	7.4		5.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Bismuth (Bi)	<0.20		0.20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Cadmium (Cd)	0.542		0.020	mg/kg	19-OCT-22	19-OCT-22	R5877677
Calcium (Ca)	65400		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Chromium (Cr)	27.3		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Cobalt (Co)	2.28		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Copper (Cu)	12.5		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Iron (Fe)	4440		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Lead (Pb)	4.85		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Lithium (Li)	4.5		2.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Magnesium (Mg)	16500		20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Manganese (Mn)	181		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Molybdenum (Mo)	2.51		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Nickel (Ni)	20.6		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Phosphorus (P)	865		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Potassium (K)	850		100	mg/kg	19-OCT-22	19-OCT-22	R5877677
Selenium (Se)	0.38		0.20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Silver (Ag)	0.17		0.10	mg/kg	19-OCT-22	19-OCT-22	R5877677
Sodium (Na)	951		50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Strontium (Sr)	39.6		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Sulfur (S)	2900		1000	mg/kg	19-OCT-22	19-OCT-22	R5877677
Thallium (Tl)	0.066		0.050	mg/kg	19-OCT-22	19-OCT-22	R5877677
Tin (Sn)	2.3		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Titanium (Ti)	108		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Tungsten (W)	<0.50		0.50	mg/kg	19-OCT-22	19-OCT-22	R5877677
Uranium (U)	0.479		0.050	mg/kg	19-OCT-22	19-OCT-22	R5877677
Vanadium (V)	12.0		0.20	mg/kg	19-OCT-22	19-OCT-22	R5877677
Zinc (Zn)	73.8		2.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Zirconium (Zr)	1.8		1.0	mg/kg	19-OCT-22	19-OCT-22	R5877677
Total Nitrogen by combustion method							
Total Nitrogen by LECO	0.651		0.020	%	20-OCT-22	20-OCT-22	R5878623
Total Sulphur by combustion method							
Sulfur (S)-Total	3200		500	mg/kg	20-OCT-22	20-OCT-22	R5878623
Detailed Salinity							
Chloride (Cl) (Saturated Paste)							
Chloride (Cl)	13		10	mg/L	21-OCT-22	21-OCT-22	R5879196
Detail Salinity in mg/kg							
Chloride (Cl)	100		77	mg/kg		27-OCT-22	
Calcium (Ca)	1910		38	mg/kg		27-OCT-22	
Magnesium (Mg)	250		38	mg/kg		27-OCT-22	
Potassium (K)	81		38	mg/kg		27-OCT-22	
Sodium (Na)	544		38	mg/kg		27-OCT-22	
Sulfur (as SO4)	373		38	mg/kg		27-OCT-22	
Nitrate-N	<7.7		7.7	mg/kg		27-OCT-22	
SAR, Cations and SO4 in saturated soil							
Calcium (Ca)	249		5.0	mg/L	21-OCT-22	21-OCT-22	R5879657
Potassium (K)	10.6		5.0	mg/L	21-OCT-22	21-OCT-22	R5879657
Magnesium (Mg)	32.6		5.0	mg/L	21-OCT-22	21-OCT-22	R5879657
Sodium (Na)	70.8		5.0	mg/L	21-OCT-22	21-OCT-22	R5879657
SAR	1.12		0.10	SAR	21-OCT-22	21-OCT-22	R5879657
Sulfur (as SO4)	48.5		5.0	mg/L	21-OCT-22	21-OCT-22	R5879657

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-5 SITE 2A ZONE 3, 0-15 CM							
Sampled By: CLIENT on 11-OCT-22 @ 13:30							
Matrix: COMPOSITE SOIL							
Theoretical Gypsum Requirement							
TGR(brine)	<0.10		0.10	t/ha		27-OCT-22	
TGR(sodic)	<0.10		0.10	t/ha		27-OCT-22	
pH and EC (Saturated Paste)							
% Saturation	769		1.0	%	20-OCT-22	21-OCT-22	R5878938
pH in Saturated Paste	6.63		0.10	pH	20-OCT-22	21-OCT-22	R5878938
Conductivity Sat. Paste	1.39		0.10	dS m-1	20-OCT-22	21-OCT-22	R5878938
VOC routine							
VOC plus F1 by GCMS							
Acetone	3.6	DLHM	1.0	mg/kg	11-OCT-22	29-OCT-22	R5887957
Benzene	<0.020	DLHM	0.020	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromobenzene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromochloromethane	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromodichloromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromoform	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Bromomethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
n-Butylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
sec-Butylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
tert-Butylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Carbon disulfide	<0.50	DLHM	0.50	mg/kg	11-OCT-22	29-OCT-22	R5887957
Carbon Tetrachloride	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chloroform	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Chloromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
2-Chlorotoluene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
4-Chlorotoluene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dibromochloromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dibromo-3-chloropropane	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dibromoethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dibromomethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,3-Dichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,4-Dichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dichlorodifluoromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1-dichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1-dichloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
cis-1,2-Dichloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
trans-1,2-Dichloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Dichloromethane	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2-Dichloropropane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,3-Dichloropropane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
2,2-Dichloropropane	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1-Dichloropropene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
cis-1,3-Dichloropropene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
trans-1,3-Dichloropropene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Ethylbenzene	<0.030	DLHM	0.030	mg/kg	11-OCT-22	29-OCT-22	R5887957
Hexachlorobutadiene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Hexane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
2-Hexanone (Methyl butyl ketone)	<1.0	DLHM	1.0	mg/kg	11-OCT-22	29-OCT-22	R5887957
Isopropylbenzene	<0.20	DLHM	0.20	mg/kg	11-OCT-22	29-OCT-22	R5887957

* Refer to Referenced Information for Qualifiers (if any) and Methodology

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2736640-5 SITE 2A ZONE 3, 0-15 CM Sampled By: CLIENT on 11-OCT-22 @ 13:30 Matrix: COMPOSITE SOIL							
VOC plus F1 by GCMS							
4-Isopropyltoluene	132	DLHC	0.50	mg/kg	11-OCT-22	29-OCT-22	R5887957
MEK	<1.0	DLHM	1.0	mg/kg	11-OCT-22	29-OCT-22	R5887957
MIBK	<1.0	DLHM	1.0	mg/kg	11-OCT-22	29-OCT-22	R5887957
MTBE	<0.40	DLHM	0.40	mg/kg	11-OCT-22	29-OCT-22	R5887957
Styrene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,1,2-Tetrachloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,2,2-Tetrachloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Tetrachloroethene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Toluene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,3-Trichlorobenzene	<0.50	DLHM	0.50	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,4-Trichlorobenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,1-Trichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,1,2-Trichloroethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Trichloroethene	<0.050	DLHM	0.050	mg/kg	11-OCT-22	29-OCT-22	R5887957
Trichlorofluoromethane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,3-Trichloropropane	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,2,4-Trimethylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
1,3,5-Trimethylbenzene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Vinyl Chloride	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
M+P-Xylenes	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
o-Xylene	<0.10	DLHM	0.10	mg/kg	11-OCT-22	29-OCT-22	R5887957
Surrogate: 1,4-Difluorobenzene (SS)	106.8		70-130	%	11-OCT-22	29-OCT-22	R5887957
Surrogate: 4-Bromofluorobenzene (SS)	106.1		70-130	%	11-OCT-22	29-OCT-22	R5887957

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D3: Secondary Biosolids from Aerated Settling Basin

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Report Date: 18-NOV-22 10:02 (MT)
Version: FINAL REV. 2

Client Phone: 204-623-8636

Certificate of Analysis

Lab Work Order #: L2737358
Project P.O. #: SV-32018
Job Reference:
C of C Numbers:
Legal Site Desc:

Comments:
18-NOV-2022 Revised report - Full metals reporting.

[redacted]
Hua Wo
Chemistry Laboratory Manager

ADDRESS: 1329 Niakwa Road East, Unit 12, Winnipeg, MB R2J 3T4 Canada | Phone: +1 204 255 9720 | Fax: +1 204 255 9721
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L2737358-2	CLF1 ZONE 2 ASB, 0-30 CM						
Sampled By:	CLIENT on 17-OCT-22 @ 15:00						
Matrix:	COMPOSITE SOIL						
Total Carbon, TOC and TIC in soil							
Inorganic Carbon as CaCO3 Equivalent							
Inorganic Carbon (as CaCO3 Equivalent)	30.7		0.40	%		26-OCT-22	
Total Carbon by combustion method							
Total Carbon by Combustion	33.3		0.05	%	26-OCT-22	26-OCT-22	R5882125
Total Inorganic Carbon in Soil							
Inorganic Carbon	3.69		0.050	%		26-OCT-22	R5881740
Total Organic Carbon Calculation							
Total Organic Carbon	29.6		0.050	%		27-OCT-22	
Miscellaneous Parameters							
Moisture	35.3		0.10	%		27-OCT-22	R5882518
% Saturation	231		1.0	%		24-OCT-22	R5879996
Available Phosphate-P	195		10	mg/kg	26-OCT-22	26-OCT-22	R5881778
Specific Gravity	1220		10	kg/m3	26-OCT-22	26-OCT-22	R5882117
Conductivity (1:2)	1.26	FR5	0.050	dS m-1	26-OCT-22	26-OCT-22	R5882122
Mercury (Hg)	0.0635		0.0050	mg/kg	25-OCT-22	26-OCT-22	R5881816
Nitrate (as N)	41		20	mg/L		24-OCT-22	R5882750
pH (1:2 CaCl2)	7.05		0.10	pH	26-OCT-22	26-OCT-22	R5882120
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	8.2	UMI	1.0	%	28-OCT-22	29-OCT-22	R5883677
% Silt (0.05mm - 2um)	81.9	UMI	1.0	%	28-OCT-22	29-OCT-22	R5883677
% Clay (<2um)	10.0	UMI	1.0	%	28-OCT-22	29-OCT-22	R5883677
Texture	Silt	UMI			28-OCT-22	29-OCT-22	R5883677
Note: PSA Results Unreliable. Insufficient soil for analysis.							
Available Micronutrients (Cu,Fe,Zn,Mn)							
Copper (Cu)	20.5		0.60	mg/kg	26-OCT-22	26-OCT-22	R5882436
Iron (Fe)	128		6.0	mg/kg	26-OCT-22	26-OCT-22	R5882436
Manganese (Mn)	770		0.15	mg/kg	26-OCT-22	26-OCT-22	R5882436
Zinc (Zn)	302		0.60	mg/kg	26-OCT-22	26-OCT-22	R5882436
Metals in Soil by CRC ICPMS							
Aluminum (Al)	9270		50	mg/kg	25-OCT-22	26-OCT-22	R5881797

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2737358-2 CLF1 ZONE 2 ASB, 0-30 CM							
Sampled By: CLIENT on 17-OCT-22 @ 15:00							
Matrix: COMPOSITE SOIL							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.50		0.10	mg/kg	25-OCT-22	26-OCT-22	R5881797
Arsenic (As)	1.96		0.10	mg/kg	25-OCT-22	26-OCT-22	R5881797
Barium (Ba)	345		0.50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Beryllium (Be)	0.29		0.10	mg/kg	25-OCT-22	26-OCT-22	R5881797
Boron (B)	5.9		5.0	mg/kg	25-OCT-22	26-OCT-22	R5881797
Bismuth (Bi)	<0.20		0.20	mg/kg	25-OCT-22	26-OCT-22	R5881797
Cadmium (Cd)	6.01		0.020	mg/kg	25-OCT-22	26-OCT-22	R5881797
Calcium (Ca)	118000		50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Chromium (Cr)	43.9		0.50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Cobalt (Co)	3.96		0.10	mg/kg	25-OCT-22	26-OCT-22	R5881797
Copper (Cu)	84.8		0.50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Iron (Fe)	5190		50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Lead (Pb)	12.0		0.50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Lithium (Li)	5.2		2.0	mg/kg	25-OCT-22	26-OCT-22	R5881797
Magnesium (Mg)	11100		20	mg/kg	25-OCT-22	26-OCT-22	R5881797
Manganese (Mn)	2860		1.0	mg/kg	25-OCT-22	26-OCT-22	R5881797
Molybdenum (Mo)	4.79		0.10	mg/kg	25-OCT-22	26-OCT-22	R5881797
Nickel (Ni)	41.9		0.50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Phosphorus (P)	3360		50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Potassium (K)	660		100	mg/kg	25-OCT-22	26-OCT-22	R5881797
Selenium (Se)	0.70		0.20	mg/kg	25-OCT-22	26-OCT-22	R5881797
Silver (Ag)	4.98		0.10	mg/kg	25-OCT-22	26-OCT-22	R5881797
Sodium (Na)	1310		50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Strontium (Sr)	223		0.50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Sulfur (S)	11200		1000	mg/kg	25-OCT-22	26-OCT-22	R5881797
Thallium (Tl)	0.270		0.050	mg/kg	25-OCT-22	26-OCT-22	R5881797
Tin (Sn)	1.2		1.0	mg/kg	25-OCT-22	26-OCT-22	R5881797
Titanium (Ti)	104		1.0	mg/kg	25-OCT-22	26-OCT-22	R5881797
Tungsten (W)	0.79		0.50	mg/kg	25-OCT-22	26-OCT-22	R5881797
Uranium (U)	1.81		0.050	mg/kg	25-OCT-22	26-OCT-22	R5881797
Vanadium (V)	18.7		0.20	mg/kg	25-OCT-22	26-OCT-22	R5881797
Zinc (Zn)	879		2.0	mg/kg	25-OCT-22	26-OCT-22	R5881797
Zirconium (Zr)	1.7		1.0	mg/kg	25-OCT-22	26-OCT-22	R5881797
Total Available N & NO3-N, NO2-N & NH4							
Available Ammonium-N							
Available Ammonium-N	3.5		2.0	mg/kg	25-OCT-22	25-OCT-22	R5881179
Available Ammonium-N - Calculation							
Total Available Nitrogen	94.4		4.5	mg/kg		26-OCT-22	
Nitrate, Nitrite & Nitrate+Nitrite-N(KCL							
Nitrite-N	<2.0	DLM	2.0	mg/kg	25-OCT-22	25-OCT-22	R5880796
Nitrate+Nitrite-N	90.9		4.0	mg/kg	25-OCT-22	25-OCT-22	R5880796
Nitrate-N	90.9		4.0	mg/kg	25-OCT-22	25-OCT-22	R5880796
Total Organic Nitrogen - Soil							
Nitrogen, Total Organic - calculation							
Total Organic Nitrogen	1.14		0.020	%		02-NOV-22	
Total Kjeldahl Nitrogen							
Total Kjeldahl Nitrogen	1.14		0.16	%	27-OCT-22	01-NOV-22	R5885857
Available N, P and K							
Available Nitrate-N							
Available Nitrate-N	94.4		2.0	mg/kg	26-OCT-22	26-OCT-22	R5881737
Plant Available Phosphorus and Potassium							
Available Phosphate-P	101		10	mg/kg	26-OCT-22	26-OCT-22	R5881817

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2737358-2 CLF1 ZONE 2 ASB, 0-30 CM							
Sampled By: CLIENT on 17-OCT-22 @ 15:00							
Matrix: COMPOSITE SOIL							
Plant Available Phosphorus and Potassium							
Available Potassium	99		20	mg/kg	26-OCT-22	26-OCT-22	R5881817
Total N, P, K, S							
Total Nitrogen by combustion method							
Total Nitrogen by LECO	1.22		0.020	%	26-OCT-22	26-OCT-22	R5882125
Total Sulphur by combustion method							
Sulfur (S)-Total	10400		500	mg/kg	26-OCT-22	26-OCT-22	R5882125
Detailed Salinity							
Ca,K,Mg,Na in Soil (Paste) by ICPOES							
Calcium (Ca)	522		5.0	mg/L		25-OCT-22	R5886097
Magnesium (Mg)	128		5.0	mg/L		25-OCT-22	R5886097
Potassium (K)	8.0		5.0	mg/L		25-OCT-22	R5886097
Sodium (Na)	88.2		5.0	mg/L		25-OCT-22	R5886097
Chloride in Soil (Paste) by Colorimetry							
Chloride (Cl)	<20		20	mg/L		10-NOV-22	R5890098
Conductivity in Soil (Paste) by Meter							
Conductivity Sat. Paste	2.79		0.010	dS/m		30-OCT-22	R5883767
Sodium Adsorption Ratio (Sat. Paste)							
SAR	0.90		0.10	SAR		02-NOV-22	
Sulphate (SO4)							
Sulfur (as SO4)	1590		6.0	mg/L		25-OCT-22	R5886097
pH (1:2 CaCl2)							
pH (1:2 CaCl2)	7.15		0.10	pH		03-NOV-22	R5886860
VOC routine							
VOC plus F1 by GCMS							
Acetone	0.60		0.50	mg/kg	17-OCT-22	22-OCT-22	R5886677
Benzene	<0.0050		0.0050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Bromobenzene	<0.10		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
Bromochloromethane	<0.10		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
Bromodichloromethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Bromoform	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Bromomethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
n-Butylbenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
sec-Butylbenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
tert-Butylbenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Carbon disulfide	<0.25		0.25	mg/kg	17-OCT-22	22-OCT-22	R5886677
Carbon Tetrachloride	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Chlorobenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Chloroethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Chloroform	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Chloromethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
2-Chlorotoluene	<0.10		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
4-Chlorotoluene	<0.10		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
Dibromochloromethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2-Dibromo-3-chloropropane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2-Dibromoethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Dibromomethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2-Dichlorobenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,3-Dichlorobenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,4-Dichlorobenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Dichlorodifluoromethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,1-dichloroethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2-Dichloroethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2737358-2 CLF1 ZONE 2 ASB, 0-30 CM							
Sampled By: CLIENT on 17-OCT-22 @ 15:00							
Matrix: COMPOSITE SOIL							
VOC plus F1 by GCMS							
1,1-dichloroethene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
cis-1,2-Dichloroethene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
trans-1,2-Dichloroethene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Dichloromethane	<0.10		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2-Dichloropropane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,3-Dichloropropane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
2,2-Dichloropropane	<0.10		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,1-Dichloropropene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
cis-1,3-Dichloropropene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
trans-1,3-Dichloropropene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Ethylbenzene	<0.015		0.015	mg/kg	17-OCT-22	22-OCT-22	R5886677
Hexachlorobutadiene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Hexane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
2-Hexanone (Methyl butyl ketone)	<0.50		0.50	mg/kg	17-OCT-22	22-OCT-22	R5886677
Isopropylbenzene	<0.10		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
4-Isopropyltoluene	0.21		0.10	mg/kg	17-OCT-22	22-OCT-22	R5886677
MEK	<0.50		0.50	mg/kg	17-OCT-22	22-OCT-22	R5886677
MIBK	<0.50		0.50	mg/kg	17-OCT-22	22-OCT-22	R5886677
MTBE	<0.20		0.20	mg/kg	17-OCT-22	22-OCT-22	R5886677
Styrene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,1,1,2-Tetrachloroethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Tetrachloroethene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Toluene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2,3-Trichlorobenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2,4-Trichlorobenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,1,1-Trichloroethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,1,2-Trichloroethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Trichloroethene	<0.010		0.010	mg/kg	17-OCT-22	22-OCT-22	R5886677
Trichlorofluoromethane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2,3-Trichloropropane	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,2,4-Trimethylbenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
1,3,5-Trimethylbenzene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Vinyl Chloride	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
M+P-Xylenes	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
o-Xylene	<0.050		0.050	mg/kg	17-OCT-22	22-OCT-22	R5886677
Surrogate: 1,4-Difluorobenzene (SS)	110.6		70-130	%	17-OCT-22	22-OCT-22	R5886677
Surrogate: 4-Bromofluorobenzene (SS)	111.6		70-130	%	17-OCT-22	22-OCT-22	R5886677

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E: Rob White Farm Soil Analysis – COA (attached)

ALS Canada Ltd.

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right partner.

CERTIFICATE OF ANALYSIS

Work Order	: **WP2319589**	Page	: 1 of 8
Client	: **Canadian Kraft Paper Industries Limited**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Leigh Johnston	Account Manager	: Judy Dalma jer
Address	: PO Box 1590 The Pas MB Canada R9A 1L4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg MB Canada R2J 3T4
Telephone	: 204 623 8528	Telephone	: +1 204 255 9720
Project	: ----	Date Samples Received	: 16-Aug-2023 10:32
PO	: SV-32761	Date Analysis Commenced	: 18-Aug-2023
C-O-C number	: ----	Issue Date	: 30-Aug-2023 08:38
Sampler	: ----		
Site	: ----		
Quote number	: Full Sludge Analysis 2022 (Q89546)		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Colby Bingham	Laboratory Supervisor	Inorganics, Saskatoon, Saskatchewan
Colby Bingham	Laboratory Supervisor	Metals, Saskatoon, Saskatchewan
George Huang	Supervisor - Inorganic	Metals, Calgary, Alberta
Hedy Lai	Team Leader - Inorganics	Sask Soils, Saskatoon, Saskatchewan
Jeremy Greuel	Laboratory Assistant	Sask Soils, Saskatoon, Saskatchewan
Maria Painchaud	Laboratory Assistant	Sask Soils, Saskatoon, Saskatchewan
Milad Khani	Laboratory Analyst	Inorganics, Saskatoon, Saskatchewan
Milad Khani	Laboratory Analyst	Metals, Saskatoon, Saskatchewan
Milad Khani	Laboratory Analyst	Sask Soils, Saskatoon, Saskatchewan
Nancy Cruse	Laboratory Assistant	Inorganics, Saskatoon, Saskatchewan
Rocio SeguradoRodezno	Laboratory Assistant	Organics, Saskatoon, Saskatchewan
Shirley Li	Team Leader - Inorganics	Inorganics, Calgary, Alberta

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
°C	degrees celsius
dS/m	decisiemens per metre
g/cm³	grams per cubic centimetre
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mS/cm	millisiemens per centimetre
pH units	pH units
t/ha	tonnes per hectare

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: Soil
(Matrix: Soil/Solid)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	ROB WHITE AG LAND (0-15)	ROB WHITE AG LAND (0-60)	----	----	----
					Client sampling date / time	12-Aug-2023 14:30	12-Aug-2023 14:30	----	----	----
						WP2319589-001	WP2319589-002	--------	--------	--------
						Result	Result	—	—	—
Sample Preparation										
Temperature, oven	----	EPP441/SK	1	°C		<38	<38	----	----	----
Physical Tests										
Conductivity (1:2 leachate)	----	E100/SK	0.010	mS/cm		0.227	0.226	----	----	----
Density	----	E150/SK	0.010	g/cm³		1.85	1.88	----	----	----
Moisture	----	E144/SK	0.25	%		21.2	19.8	----	----	----
pH (1:2 soil:water)	----	E108/SK	0.10	pH units		8.30	8.30	----	----	----
pH, saturated paste	----	E114/SK	0.10	pH units		7.81	7.90	----	----	----
TGR (brine)	----	EC106/SK	0.10	t/ha		<0.10	<0.10	----	----	----
TGR (sodic)	----	EC106/SK	0.10	t/ha		<0.10	<0.10	----	----	----
% Saturation	----	E141/SK	1.0	%		82.9	82.7	----	----	----
Percent Passing										
Passing (0.0312mm)	----	E184/SK	1.0	%		89.2	88.4	----	----	----
Passing (2.0mm)	----	E181/SK	1.0	%		99.9	99.9	----	----	----
Passing (4.75mm)	----	E181/SK	1.0	%		100	100	----	----	----
Passing (0.020mm)	----	E184/SK	1.0	%		83.4	81.9	----	----	----
Passing (1.0mm)	----	E182/SK	1.0	%		99.9	99.9	----	----	----
Passing (9.5mm)	----	E181/SK	1.0	%		100	100	----	----	----
Passing (0.005mm)	----	E184/SK	1.0	%		53.8	53.4	----	----	----
Passing (0.841mm)	----	E182/SK	1.0	%		99.8	99.8	----	----	----
Passing (19mm)	----	E181/SK	1.0	%		100	100	----	----	----
Passing (0.004mm)	----	E184/SK	1.0	%		50.6	50.3	----	----	----
Passing (0.50mm)	----	E182/SK	1.0	%		99.8	99.8	----	----	----
Passing (25.4mm)	----	E181/SK	1.0	%		100	100	----	----	----
Passing (0.002mm)	----	E184/SK	1.0	%		44.1	44.2	----	----	----
Passing (0.420mm)	----	E182/SK	1.0	%		99.7	99.7	----	----	----
Passing (38.1mm)	----	E181/SK	1.0	%		100	100	----	----	----
Passing (0.250mm)	----	E182/SK	1.0	%		99.6	99.6	----	----	----
Passing (50.8mm)	----	E181/SK	1.0	%		100	100	----	----	----
Passing (0.149mm)	----	E182/SK	1.0	%		99.3	99.5	----	----	----

Analytical Results

Sub-Matrix: Soil
(Matrix: Soil/Solid)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	ROB WHITE AG LAND (0-15)	ROB WHITE AG LAND (0-60)	----	----	----
					Client sampling date / time	12-Aug-2023 14:30	12-Aug-2023 14:30	----	----	----
						WP2319589-001	WP2319589-002	--------	--------	--------
						Result	Result	—	—	—
Percent Passing										
Passing (76.2mm)	----	E181/SK	1.0	%		100	100	----	----	----
Passing (0.125mm)	----	E182/SK	1.0	%		99.2	99.4	----	----	----
Passing (0.075mm)	----	E182/SK	1.0	%		99.0	99.3	----	----	----
Passing (0.063mm)	----	E182/SK	1.0	%		99.0	99.3	----	----	----
Passing (0.05mm)	----	E182/SK	1.0	%		98.9	99.2	----	----	----
Anions and Nutrients										
Nitrogen, total	7727-37-9	E366/SK	0.020	%		0.146	0.088	----	----	----
Nitrogen, total organic	----	EC363/SK	0.020	%		0.167	0.098	----	----	----
Organic / Inorganic Carbon										
Carbon, total [TC]	----	E351/SK	0.050	%		3.25	2.69	----	----	----
Carbon, inorganic [IC]	----	E354/SK	0.050	%		1.47	1.55	----	----	----
Carbon, inorganic [IC], (as CaCO3 equivalent)	----	E354/SK	0.40	%		12.2	12.9	----	----	----
Carbon, total organic [TOC]	----	EC356/SK	0.050	%		1.78	1.14	----	----	----
Organic matter	----	EC356/SK	0.10	%		3.07	1.96	----	----	----
Plant Available Nutrients										
Ammonium, available (as N)	14798-03-9	E312A/SK	1.0	mg/kg		12.3	9.6	----	----	----
Copper	7440-50-8	E496/SK	0.20	mg/kg		2.57	2.46	----	----	----
Nitrate + Nitrite, available (as N)	----	E269A.N+N/SK	2.0	mg/kg		7.7	3.6	----	----	----
Nitrate, available (as N)	14797-55-8	EC269.NO3/SK	2.0	mg/kg		6.9	4.6	----	----	----
Nitrite, available (as N)	14797-65-0	E269.NO2/SK	0.40	mg/kg		0.70	<0.40	----	----	----
Nitrogen, total available	7727-37-9	EC269A.N/SK	2.2	mg/kg		20.0	13.2	----	----	----
Phosphate, available (as P)	14265-44-2	E385/SK	1.0	mg/kg		14.6	4.9	----	----	----
Phosphate, available (as P)	14265-44-2	E384/SK	2.0	mg/kg		7.3	<2.0	----	----	----
Iron	7439-89-6	E496/SK	2.0	mg/kg		35.3	30.7	----	----	----
Manganese	7439-96-5	E496/SK	0.050	mg/kg		7.38	7.09	----	----	----
Potassium, available	7440-09-7	E390/SK	20	mg/kg		243	233	----	----	----
Nitrate + Nitrite, available (as N)	----	E269.N+N/SK	1.0	mg/kg		7.6	4.6	----	----	----
Sulfate, available (as S)	14808-79-8	E497.SO4/SK	3.0	mg/kg		12.4	12.6	----	----	----

Analytical Results

Sub-Matrix: Soil
(Matrix: Soil/Solid)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	ROB WHITE AG LAND (0-15)	ROB WHITE AG LAND (0-60)	----	----	----
					Client sampling date / time	12-Aug-2023 14:30	12-Aug-2023 14:30	----	----	----
						WP2319589-001	WP2319589-002	--------	--------	--------
						Result	Result	—	—	—
Plant Available Nutrients										
Zinc	7440-66-6	E496/SK	0.20	mg/kg		0.83	0.63	----	----	----
Saturated Paste Extractables										
Chloride, soluble ion content	16887-00-6	E266.Cl/SK	20	mg/L		189	<40 DLM	----	----	----
Conductivity, saturated paste	----	E102/SK	0.020	dS/m		0.454	0.383	----	----	----
Nitrate (as N), soluble ion content	14797-55-8	E239.NO3/CG	0.5	mg/L		7.6	2.6	----	----	----
Chloride, soluble ion content	16887-00-6	EC266A.Cl/SK	10	mg/kg		157	<33	----	----	----
Sulfur (as SO4), soluble ion content	14808-79-8	EC485/SK	8.0	mg/kg		52.9	44.6	----	----	----
Sodium, soluble ion content	17341-25-2	EC485/SK	5.0	mg/kg		7.5	8.4	----	----	----
Potassium, soluble ion content	7440-09-7	EC485/SK	5.0	mg/kg		<5.0	<5.0	----	----	----
Magnesium, soluble ion content	7439-95-4	EC485/SK	5.0	mg/kg		12.1	11.5	----	----	----
Calcium, soluble ion content	7440-70-2	EC485/SK	5.0	mg/kg		56.4	39.1	----	----	----
Boron, soluble ion content	7440-42-8	EC485/SK	0.25	mg/kg		0.28	<0.25	----	----	----
Boron, soluble ion content	7440-42-8	E485/SK	0.25	mg/L		0.34	0.30	----	----	----
Calcium, soluble ion content	7440-70-2	E485/SK	5.0	mg/L		68.0	47.3	----	----	----
Magnesium, soluble ion content	7439-95-4	E485/SK	5.0	mg/L		14.6	13.9	----	----	----
Potassium, soluble ion content	7440-09-7	E485/SK	5.0	mg/L		5.5	<5.0	----	----	----
Sodium, soluble ion content	17341-25-2	E485/SK	5.0	mg/L		9.1	10.1	----	----	----
Sulfur (as SO4), soluble ion content	14808-79-8	E485/SK	6.0	mg/L		63.8	53.9	----	----	----
Metals										
Aluminum	7429-90-5	E440/CG	50	mg/kg		----	17100	----	----	----
Aluminum	7429-90-5	E440/SK	50	mg/kg		15800	----	----	----	----
Antimony	7440-36-0	E440/CG	0.10	mg/kg		----	0.37	----	----	----
Antimony	7440-36-0	E440/SK	0.10	mg/kg		0.50	----	----	----	----
Arsenic	7440-38-2	E440/CG	0.10	mg/kg		----	8.23	----	----	----
Arsenic	7440-38-2	E440/SK	0.10	mg/kg		10.0	----	----	----	----
Barium	7440-39-3	E440/CG	0.50	mg/kg		----	286	----	----	----
Barium	7440-39-3	E440/SK	0.50	mg/kg		270	----	----	----	----
Beryllium	7440-41-7	E440/CG	0.10	mg/kg		----	0.86	----	----	----
Beryllium	7440-41-7	E440/SK	0.10	mg/kg		0.86	----	----	----	----
Bismuth	7440-69-9	E440/CG	0.20	mg/kg		----	0.20	----	----	----

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	ROB WHITE AG LAND (0-15)	ROB WHITE AG LAND (0-60)	----	----	----
					Client sampling date / time	12-Aug-2023 14:30	12-Aug-2023 14:30	----	----	----
						WP2319589-001	WP2319589-002	--------	--------	--------
						Result	Result	—	—	—
Metals										
Bismuth	7440-69-9	E440/SK	0.20	mg/kg		0.22	----	----	----	----
Boron	7440-42-8	E440/CG	5.0	mg/kg		----	7.2	----	----	----
Boron	7440-42-8	E440/SK	5.0	mg/kg		8.3	----	----	----	----
Cadmium	7440-43-9	E440/CG	0.020	mg/kg		----	0.315	----	----	----
Cadmium	7440-43-9	E440/SK	0.020	mg/kg		0.443	----	----	----	----
Calcium	7440-70-2	E440/CG	50	mg/kg		----	44200	----	----	----
Calcium	7440-70-2	E440/SK	50	mg/kg		43000	----	----	----	----
Chromium	7440-47-3	E440/CG	0.50	mg/kg		----	23.2	----	----	----
Chromium	7440-47-3	E440/SK	0.50	mg/kg		26.3	----	----	----	----
Cobalt	7440-48-4	E440/CG	0.10	mg/kg		----	9.26	----	----	----
Cobalt	7440-48-4	E440/SK	0.10	mg/kg		11.0	----	----	----	----
Copper	7440-50-8	E440/CG	0.50	mg/kg		----	21.8	----	----	----
Copper	7440-50-8	E440/SK	0.50	mg/kg		23.9	----	----	----	----
Iron	7439-89-6	E440/CG	50	mg/kg		----	23700	----	----	----
Iron	7439-89-6	E440/SK	50	mg/kg		24800	----	----	----	----
Lead	7439-92-1	E440/CG	0.50	mg/kg		----	12.1	----	----	----
Lead	7439-92-1	E440/SK	0.50	mg/kg		13.3	----	----	----	----
Lithium	7439-93-2	E440/CG	2.0	mg/kg		----	16.6	----	----	----
Lithium	7439-93-2	E440/SK	2.0	mg/kg		15.7	----	----	----	----
Magnesium	7439-95-4	E440/CG	20	mg/kg		----	11600	----	----	----
Magnesium	7439-95-4	E440/SK	20	mg/kg		13800	----	----	----	----
Manganese	7439-96-5	E440/CG	1.0	mg/kg		----	602	----	----	----
Manganese	7439-96-5	E440/SK	1.0	mg/kg		619	----	----	----	----
Mercury	7439-97-6	E510/SK	0.0050	mg/kg		0.0449	0.0473	----	----	----
Molybdenum	7439-98-7	E440/CG	0.10	mg/kg		----	0.77	----	----	----
Molybdenum	7439-98-7	E440/SK	0.10	mg/kg		1.18	----	----	----	----
Nickel	7440-02-0	E440/CG	0.50	mg/kg		----	25.6	----	----	----
Nickel	7440-02-0	E440/SK	0.50	mg/kg		29.4	----	----	----	----
Phosphorus	7723-14-0	E440/CG	50	mg/kg		----	588	----	----	----
Phosphorus	7723-14-0	E440/SK	50	mg/kg		759	----	----	----	----

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	ROB WHITE AG LAND (0-15)	ROB WHITE AG LAND (0-60)	----	----	----
					Client sampling date / time	12-Aug-2023 14:30	12-Aug-2023 14:30	----	----	----
						WP2319589-001	WP2319589-002	--------	--------	--------
						Result	Result	—	—	—
Metals										
Potassium	7440-09-7	E440/CG	100	mg/kg		----	1860	----	----	----
Potassium	7440-09-7	E440/SK	100	mg/kg		2190	----	----	----	----
Selenium	7782-49-2	E440/CG	0.20	mg/kg		----	0.24	----	----	----
Selenium	7782-49-2	E440/SK	0.20	mg/kg		0.35	----	----	----	----
Silver	7440-22-4	E440/CG	0.10	mg/kg		----	0.14	----	----	----
Silver	7440-22-4	E440/SK	0.10	mg/kg		0.13	----	----	----	----
Sodium	7440-23-5	E440/CG	50	mg/kg		----	131	----	----	----
Sodium	7440-23-5	E440/SK	50	mg/kg		122	----	----	----	----
Strontium	7440-24-6	E440/CG	0.50	mg/kg		----	90.6	----	----	----
Strontium	7440-24-6	E440/SK	0.50	mg/kg		86.1	----	----	----	----
Sulfur	7704-34-9	E440/CG	1000	mg/kg		----	<1000	----	----	----
Sulfur	7704-34-9	E440/SK	1000	mg/kg		<1000	----	----	----	----
Thallium	7440-28-0	E440/CG	0.050	mg/kg		----	0.217	----	----	----
Thallium	7440-28-0	E440/SK	0.050	mg/kg		0.228	----	----	----	----
Tin	7440-31-5	E440/CG	2.0	mg/kg		----	<2.0	----	----	----
Tin	7440-31-5	E440/SK	2.0	mg/kg		<2.0	----	----	----	----
Titanium	7440-32-6	E440/CG	1.0	mg/kg		----	35.1	----	----	----
Titanium	7440-32-6	E440/SK	1.0	mg/kg		73.6	----	----	----	----
Tungsten	7440-33-7	E440/CG	0.50	mg/kg		----	<0.50	----	----	----
Tungsten	7440-33-7	E440/SK	0.50	mg/kg		<0.50	----	----	----	----
Uranium	7440-61-1	E440/CG	0.050	mg/kg		----	0.989	----	----	----
Uranium	7440-61-1	E440/SK	0.050	mg/kg		1.13	----	----	----	----
Vanadium	7440-62-2	E440/CG	0.20	mg/kg		----	37.7	----	----	----
Vanadium	7440-62-2	E440/SK	0.20	mg/kg		40.4	----	----	----	----
Zinc	7440-66-6	E440/CG	2.0	mg/kg		----	71.8	----	----	----
Zinc	7440-66-6	E440/SK	2.0	mg/kg		83.0	----	----	----	----
Zirconium	7440-67-7	E440/CG	1.0	mg/kg		----	6.8	----	----	----
Zirconium	7440-67-7	E440/SK	1.0	mg/kg		6.6	----	----	----	----
Leachable Anions & Nutrients										
Kjeldahl nitrogen, total [TKN]	----	E319/SK	0.020	%		0.168	0.099	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WP2319589**	Page	: 1 of 18
Client	: **Canadian Kraft Paper Industries Limited**	Laboratory	: ALS Environmental - Winnipeg
Contact	: Leigh Johnston	Account Manager	: Judy Dalmaijer
Address	: PO Box 1590 The Pas MB Canada R9A 1L4	Address	: 1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	: 204 623 8528	Telephone	: +1 204 255 9720
Project	: ----	Date Samples Received	: 16-Aug-2023 10:32
PO	: SV-32761	Issue Date	: 30-Aug-2023 08:36
C-O-C number	: ----		
ampler	: ----		
Site	: ----		
Quote number	: Full Sludge Analysis 2022 (Q89546)		
No. of samples received	: 2		
No of samples analysed	: 2		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- Duplicate outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Plant Available Nutrients	QC-1100255-001	----	Copper	7440-50-8	E496	0.20 mg/kg B	0.2 mg/kg	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Duplicate (DUP) RPDs								
Metals	Anonymous	Anonymous	Molybdenum	7439-98-7	E440	43.8 % DUP-H	40%	Duplicate RPD does not meet the DQO for this test.

Result Qualifiers

Qualifier	Description
DUP-H	*Duplicate results outside ALS DQO, due to sample heterogeneity.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Nitrogen by Combustion										
LDPE bag										
ROB WHITE AG LAND (0-15)	E366	12-Aug-2023	24-Aug-2023	28 days	12 days	✓	24-Aug-2023	28 days	12 days	✓
Anions and Nutrients : Total Nitrogen by Combustion										
LDPE bag										
ROB WHITE AG LAND (0-60)	E366	12-Aug-2023	24-Aug-2023	28 days	12 days	✓	24-Aug-2023	28 days	12 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
LDPE bag										
ROB WHITE AG LAND (0-15)	E319	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Leachable Anions & Nutrients : Total Kjeldahl Nitrogen by Colourimetry										
LDPE bag										
ROB WHITE AG LAND (0-60)	E319	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-15)	E510	12-Aug-2023	24-Aug-2023	28 days	12 days	✓	25-Aug-2023	28 days	13 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-60)	E510	12-Aug-2023	24-Aug-2023	28 days	12 days	✓	25-Aug-2023	28 days	13 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-15)	E440	12-Aug-2023	24-Aug-2023	180 days	12 days	✓	25-Aug-2023	180 days	13 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-60)	E440	12-Aug-2023	19-Aug-2023	180 days	7 days	✓	21-Aug-2023	180 days	9 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
ROB WHITE AG LAND (0-15)	E351	12-Aug-2023	24-Aug-2023	----	----		24-Aug-2023	0 days	0 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
ROB WHITE AG LAND (0-60)	E351	12-Aug-2023	24-Aug-2023	----	----		24-Aug-2023	0 days	0 days	✓
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
LDPE bag										
ROB WHITE AG LAND (0-15)	E354	12-Aug-2023	----	----	----		24-Aug-2023	----	12 days	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve										
LDPE bag										
ROB WHITE AG LAND (0-60)	E354	12-Aug-2023	----	----	----		24-Aug-2023	----	12 days	
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag										
ROB WHITE AG LAND (0-15)	E184	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag										
ROB WHITE AG LAND (0-60)	E184	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag										
ROB WHITE AG LAND (0-15)	E182	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag										
ROB WHITE AG LAND (0-60)	E182	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
ROB WHITE AG LAND (0-15)	E181	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
ROB WHITE AG LAND (0-60)	E181	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-15)	E100	12-Aug-2023	24-Aug-2023	30 days	12 days	✓	24-Aug-2023	30 days	12 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-60)	E100	12-Aug-2023	24-Aug-2023	30 days	12 days	✓	24-Aug-2023	30 days	12 days	✓
Physical Tests : Density										
LDPE bag										
ROB WHITE AG LAND (0-15)	E150	12-Aug-2023	----	----	----		23-Aug-2023	180 days	11 days	✓
Physical Tests : Density										
LDPE bag										
ROB WHITE AG LAND (0-60)	E150	12-Aug-2023	----	----	----		23-Aug-2023	180 days	11 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-15)	E144	12-Aug-2023	----	----	----		18-Aug-2023	----	6 days	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-60)	E144	12-Aug-2023	----	----	----		18-Aug-2023	----	6 days	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-15)	E108	12-Aug-2023	24-Aug-2023	30 days	12 days	✓	24-Aug-2023	30 days	12 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
ROB WHITE AG LAND (0-60)	E108	12-Aug-2023	24-Aug-2023	30 days	12 days	✓	24-Aug-2023	30 days	12 days	✓
Physical Tests : pH by Meter (Saturated Paste)										
LDPE bag										
ROB WHITE AG LAND (0-15)	E114	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Physical Tests : pH by Meter (Saturated Paste)										
LDPE bag										
ROB WHITE AG LAND (0-60)	E114	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	365 days	12 days	✓
Physical Tests : Saturation Percentage										
LDPE bag										
ROB WHITE AG LAND (0-15)	E141	12-Aug-2023	24-Aug-2023	----	----		24-Aug-2023	0 days	12 days	✓
Physical Tests : Saturation Percentage										
LDPE bag										
ROB WHITE AG LAND (0-60)	E141	12-Aug-2023	24-Aug-2023	----	----		24-Aug-2023	0 days	12 days	✓
Plant Available Nutrients : Available Ammonium by Colourimetry (2N Potassium Chloride Ext.)										
LDPE bag										
ROB WHITE AG LAND (0-15)	E312A	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓
Plant Available Nutrients : Available Ammonium by Colourimetry (2N Potassium Chloride Ext.)										
LDPE bag										
ROB WHITE AG LAND (0-60)	E312A	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓
Plant Available Nutrients : Available Nitrate and Nitrite by Colourimetry (0.01M Calcium Chloride										
LDPE bag										
ROB WHITE AG LAND (0-15)	E269.N+N	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	3 days	0 days	✓
Plant Available Nutrients : Available Nitrate and Nitrite by Colourimetry (0.01M Calcium Chloride										
LDPE bag										
ROB WHITE AG LAND (0-60)	E269.N+N	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	3 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Plant Available Nutrients : Available Nitrate and Nitrite by Colourimetry (2N Potassium Chloride										
LDPE bag ROB WHITE AG LAND (0-15)	E269A.N+N	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	3 days	0 days	✓
Plant Available Nutrients : Available Nitrate and Nitrite by Colourimetry (2N Potassium Chloride										
LDPE bag ROB WHITE AG LAND (0-60)	E269A.N+N	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	3 days	0 days	✓
Plant Available Nutrients : Available Nitrite by Colourimetry (0.01M Calcium Chloride Ext.)										
LDPE bag ROB WHITE AG LAND (0-15)	E269.NO2	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	3 days	0 days	✓
Plant Available Nutrients : Available Nitrite by Colourimetry (0.01M Calcium Chloride Ext.)										
LDPE bag ROB WHITE AG LAND (0-60)	E269.NO2	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	3 days	0 days	✓
Plant Available Nutrients : Available Phosphorus by Colourimetry (Olsen)										
LDPE bag ROB WHITE AG LAND (0-15)	E385	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓
Plant Available Nutrients : Available Phosphorus by Colourimetry (Olsen)										
LDPE bag ROB WHITE AG LAND (0-60)	E385	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓
Plant Available Nutrients : Available Phosphorus by FIALab (Modified Kelowna)										
LDPE bag ROB WHITE AG LAND (0-15)	E384	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓
Plant Available Nutrients : Available Phosphorus by FIALab (Modified Kelowna)										
LDPE bag ROB WHITE AG LAND (0-60)	E384	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓
Plant Available Nutrients : Available Potassium by flame photometry (Modified Kelowna)										
LDPE bag ROB WHITE AG LAND (0-15)	E390	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Plant Available Nutrients : Available Potassium by flame photometry (Modified Kelowna)										
LDPE bag ROB WHITE AG LAND (0-60)	E390	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	0 days	✓
Plant Available Nutrients : Available Sulfate by ICPOES (0.01M Calcium Chloride Ext.)										
LDPE bag ROB WHITE AG LAND (0-15)	E497.SO4	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	28 days	0 days	✓
Plant Available Nutrients : Available Sulfate by ICPOES (0.01M Calcium Chloride Ext.)										
LDPE bag ROB WHITE AG LAND (0-60)	E497.SO4	12-Aug-2023	25-Aug-2023	180 days	13 days	✓	25-Aug-2023	28 days	0 days	✓
Plant Available Nutrients : Plant Available Micronutrients by ICPOES										
LDPE bag ROB WHITE AG LAND (0-15)	E496	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	13 days	✓
Plant Available Nutrients : Plant Available Micronutrients by ICPOES										
LDPE bag ROB WHITE AG LAND (0-60)	E496	12-Aug-2023	25-Aug-2023	----	----		25-Aug-2023	0 days	13 days	✓
Sample Preparation : Dry and Grind in Soil/Solid <38°C										
LDPE bag ROB WHITE AG LAND (0-15)	EPP441	12-Aug-2023	23-Aug-2023	----	----		----	3 days	11 days	✖ EHTR
Sample Preparation : Dry and Grind in Soil/Solid <38°C										
LDPE bag ROB WHITE AG LAND (0-60)	EPP441	12-Aug-2023	23-Aug-2023	----	----		----	3 days	11 days	✖ EHTR
Saturated Paste Extractables : Ca, K, Mg, Na, B and S by ICPOES (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-15)	E485	12-Aug-2023	24-Aug-2023	180 days	12 days	✓	25-Aug-2023	180 days	1 days	✓
Saturated Paste Extractables : Ca, K, Mg, Na, B and S by ICPOES (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-60)	E485	12-Aug-2023	24-Aug-2023	180 days	12 days	✓	25-Aug-2023	180 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Saturated Paste Extractables : Chloride by Colourimetry (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-15)	E266.Cl	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	25-Aug-2023	28 days	1 days	✓
Saturated Paste Extractables : Chloride by Colourimetry (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-60)	E266.Cl	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	25-Aug-2023	28 days	1 days	✓
Saturated Paste Extractables : Conductivity in Soil (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-15)	E102	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	28 days	0 days	✓
Saturated Paste Extractables : Conductivity in Soil (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-60)	E102	12-Aug-2023	24-Aug-2023	365 days	12 days	✓	24-Aug-2023	28 days	0 days	✓
Saturated Paste Extractables : Nitrate by IC (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-15)	E239.NO3	12-Aug-2023	18-Aug-2023	3 days	6 days	✖ EHTR	18-Aug-2023	3 days	0 days	✓
Saturated Paste Extractables : Nitrate by IC (Saturated Paste)										
LDPE bag ROB WHITE AG LAND (0-60)	E239.NO3	12-Aug-2023	18-Aug-2023	3 days	6 days	✖ EHTR	18-Aug-2023	3 days	0 days	✓

Legend & Qualifier Definitions

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Available Ammonium by Colourimetry (2N Potassium Chloride Ext.)	E312A	1102275	1	19	5.2	5.0	✓
Available Nitrate and Nitrite by Colourimetry (0 01M Calcium Chloride Ext.)	E269.N+N	1102256	1	14	7.1	5.0	✓
Available Nitrate and Nitrite by Colourimetry (2N Potassium Chloride Ext.)	E269A.N+N	1102274	1	2	50.0	5.0	✓
Available Nitrite by Colourimetry (0.01M Calcium Chloride Ext.)	E269.NO2	1102257	1	3	33.3	5.0	✓
Available Phosphorus by Colourimetry (Olsen)	E385	1100318	1	2	50.0	5.0	✓
Available Phosphorus by FIALab (Modified Kelowna)	E384	1103657	1	5	20.0	5.0	✓
Available Potassium by flame photometry (Modified Kelowna)	E390	1103658	1	5	20.0	5.0	✓
Available Sulfate by ICPOES (0.01M Calcium Chloride Ext.)	E497.SO4	1102255	1	13	7.6	5.0	✓
Ca, K, Mg, Na, B and S by ICPOES (Saturated Paste)	E485	1100182	1	18	5.5	5.0	✓
Chloride by Colourimetry (Saturated Paste)	E266.Cl	1100180	1	5	20.0	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction)	E100	1100214	1	8	12.5	5.0	✓
Conductivity in Soil (Saturated Paste)	E102	1100184	1	8	12.5	5.0	✓
Density	E150	1099696	2	2	100.0	10.0	✓
Mercury in Soil/Solid by CVAAS	E510	1101934	1	8	12.5	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	1093493	1	14	7.1	5.0	✓
Moisture Content by Gravimetry	E144	1092742	1	17	5.8	5.0	✓
Nitrate by IC (Saturated Paste)	E239.NO3	1092405	1	2	50.0	5.0	✓
Particle Size Analysis - Pipette Method	E184	1101952	1	2	50.0	5.0	✓
Particle Size Analysis - Sieve <2mm	E182	1101954	1	2	50.0	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	1100213	1	4	25.0	5.0	✓
pH by Meter (Saturated Paste)	E114	1100183	1	8	12.5	5.0	✓
Plant Available Micronutrients by ICPOES	E496	1100255	1	2	50.0	5.0	✓
Saturation Percentage	E141	1100181	1	8	12.5	5.0	✓
Total Carbon by Combustion	E351	1102037	1	20	5.0	5.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	1101959	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Colourimetry	E319	1101698	1	6	16.6	5.0	✓
Total Nitrogen by Combustion	E366	1102038	1	3	33.3	5.0	✓
Laboratory Control Samples (LCS)							
Available Ammonium by Colourimetry (2N Potassium Chloride Ext.)	E312A	1102275	2	19	10.5	10.0	✓
Available Nitrate and Nitrite by Colourimetry (0 01M Calcium Chloride Ext.)	E269.N+N	1102256	2	14	14.2	10.0	✓
Available Nitrate and Nitrite by Colourimetry (2N Potassium Chloride Ext.)	E269A.N+N	1102274	2	2	100.0	10.0	✓
Available Nitrite by Colourimetry (0.01M Calcium Chloride Ext.)	E269.NO2	1102257	2	3	66.6	10.0	✓
Available Phosphorus by Colourimetry (Olsen)	E385	1100318	2	2	100.0	10.0	✓
Available Phosphorus by FIALab (Modified Kelowna)	E384	1103657	2	5	40.0	10.0	✓
Available Potassium by flame photometry (Modified Kelowna)	E390	1103658	2	5	40.0	10.0	✓
Available Sulfate by ICPOES (0.01M Calcium Chloride Ext.)	E497.SO4	1102255	2	13	15.3	10.0	✓

Matrix: **Soil/Solid**

Evaluation: ✖ = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Ca, K, Mg, Na, B and S by ICPOES (Saturated Paste)	E485	1100182	2	18	11.1	10.0	✓
Chloride by Colourimetry (Saturated Paste)	E266.Cl	1100180	2	5	40.0	10.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction)	E100	1100214	2	8	25.0	10.0	✓
Conductivity in Soil (Saturated Paste)	E102	1100184	2	8	25.0	10.0	✓
Density	E150	1099696	1	2	50.0	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	1101934	2	8	25.0	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	1093493	2	14	14.2	10.0	✓
Moisture Content by Gravimetry	E144	1092742	1	17	5.8	5.0	✓
Nitrate by IC (Saturated Paste)	E239.NO3	1092405	1	2	50.0	5.0	✓
Particle Size Analysis - Pipette Method	E184	1101952	1	2	50.0	5.0	✓
Particle Size Analysis - Sieve <2mm	E182	1101954	1	2	50.0	5.0	✓
Particle Size Analysis - Sieve >2mm	E181	1101953	1	2	50.0	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	1100213	2	4	50.0	10.0	✓
pH by Meter (Saturated Paste)	E114	1100183	2	8	25.0	10.0	✓
Plant Available Micronutrients by ICPOES	E496	1100255	2	2	100.0	10.0	✓
Saturation Percentage	E141	1100181	2	8	25.0	10.0	✓
Total Carbon by Combustion	E351	1102037	2	20	10.0	10.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	1101959	2	20	10.0	10.0	✓
Total Kjeldahl Nitrogen by Colourimetry	E319	1101698	2	6	33.3	10.0	✓
Total Nitrogen by Combustion	E366	1102038	2	3	66.6	10.0	✓
Method Blanks (MB)							
Available Ammonium by Colourimetry (2N Potassium Chloride Ext.)	E312A	1102275	1	19	5.2	5.0	✓
Available Nitrate and Nitrite by Colourimetry (0 01M Calcium Chloride Ext.)	E269.N+N	1102256	1	14	7.1	5.0	✓
Available Nitrate and Nitrite by Colourimetry (2N Potassium Chloride Ext.)	E269A.N+N	1102274	1	2	50.0	5.0	✓
Available Nitrite by Colourimetry (0.01M Calcium Chloride Ext.)	E269.NO2	1102257	1	3	33.3	5.0	✓
Available Phosphorus by Colourimetry (Olsen)	E385	1100318	1	2	50.0	5.0	✓
Available Phosphorus by FIALab (Modified Kelowna)	E384	1103657	1	5	20.0	5.0	✓
Available Potassium by flame photometry (Modified Kelowna)	E390	1103658	1	5	20.0	5.0	✓
Available Sulfate by ICPOES (0.01M Calcium Chloride Ext.)	E497.SO4	1102255	1	13	7.6	5.0	✓
Ca, K, Mg, Na, B and S by ICPOES (Saturated Paste)	E485	1100182	1	18	5.5	5.0	✓
Chloride by Colourimetry (Saturated Paste)	E266.Cl	1100180	1	5	20.0	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction)	E100	1100214	1	8	12.5	5.0	✓
Conductivity in Soil (Saturated Paste)	E102	1100184	1	8	12.5	5.0	✓
Mercury in Soil/Solid by CVAAS	E510	1101934	1	8	12.5	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	1093493	1	14	7.1	5.0	✓
Moisture Content by Gravimetry	E144	1092742	1	17	5.8	5.0	✓
Nitrate by IC (Saturated Paste)	E239.NO3	1092405	1	2	50.0	5.0	✓
Plant Available Micronutrients by ICPOES	E496	1100255	1	2	50.0	5.0	✓
Total Carbon by Combustion	E351	1102037	1	20	5.0	5.0	✓

Matrix: **Soil/Solid**

Evaluation: ✖ = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	1101959	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Colourimetry	E319	1101698	1	6	16.6	5.0	✓
Total Nitrogen by Combustion	E366	1102038	1	3	33.3	5.0	✓
Matrix Spikes (MS)							
Nitrate by IC (Saturated Paste)	E239.NO3	1092405	1	2	50.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction)	E100 ALS Environmental - Saskatoon	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
Conductivity in Soil (Saturated Paste)	E102 ALS Environmental - Saskatoon	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)/AER D50	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a filtered extract from a soil sample prepared using the saturated paste procedure. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter (1:2 Soil:Water Extraction)	E108 ALS Environmental - Saskatoon	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 °C) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
pH by Meter (Saturated Paste)	E114 ALS Environmental - Saskatoon	Soil/Solid	Carter-CSSS / APHA 4500 H	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) on a soil produced by the saturated paste extraction procedure.
Saturation Percentage	E141 ALS Environmental - Saskatoon	Soil/Solid	CSSS Ch. 15 (mod)/AER D50	Saturation Percentage (SP) is determined as the total volume of water present in a saturated paste (in mL) divided by the dry weight of the sample (in grams), expressed as a percentage.
Moisture Content by Gravimetry	E144 ALS Environmental - Saskatoon	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by he wet weight of the sample, expressed as a percentage.
Density	E150 ALS Environmental - Saskatoon	Soil/Solid	ASTM D5057 (mod)	Density is determined by weighing a portion of sample in a container that is calibrated for volume. Density is reported as the mass per volume of sample
Particle Size Analysis - Sieve >2mm	E181 ALS Environmental - Saskatoon	Soil/Solid	ASTM D6913-17 (mod)	Soil samples are disaggregated and sieved through a 2mm sieve. Material retained on the sieve is then further sieved through a series of sieves. The amount passing through the sieves is measured gravimetrically.
Particle Size Analysis - Sieve <2mm	E182 ALS Environmental - Saskatoon	Soil/Solid	ASTM D6913-17 (mod)	Soil samples are disaggregated and sieved through a 2mm sieve. Material passed through the sieve is then further disaggregated using calgon solution and passed through a series of sieves. The amount passing through the sieves is measured gravimetrically.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Particle Size Analysis - Pipette Method	E184 ALS Environmental - Saskatoon	Soil/Solid	SSIR-51 Method 3.2.1	Soil material is separated from coarse material (>2mm). A specimen is then disaggregated through mixing with Calgon solution. The material is then suspended in solution wherein regular aliquots are taken using a mechanical pipette at specific time intervals. The aliquots are dried and material in suspension determined gravimetrically. The principles of Stokes' Law are applied to determine the amount of material remaining in solution as well as the maximum particle size remaining in solution at the specified time.
Nitrate by IC (Saturated Paste)	E239.NO3 ALS Environmental - Calgary	Soil/Solid	CSSS Ch. 15 (mod)/EPA 300.1 (mod)	Inorganic anions are analyzed by obtaining a soil extract produced by the saturated paste extraction procedure which is then analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride by Colourimetry (Saturated Paste)	E266.Cl ALS Environmental - Saskatoon	Soil/Solid	CSSS Ch. 15/APHA 4500-CL E (mod)/AER D50	Inorganic anions are analyzed by obtaining a soil extract produced by the saturated paste extraction procedure which is then analyzed by colourimetry using a discrete analyzer.
Available Nitrate and Nitrite by Colourimetry (0.01M Calcium Chloride Ext.)	E269.N+N ALS Environmental - Saskatoon	Soil/Solid	Alberta Agriculture/APHA 4500-NO3 I (mod)	Plant available nitrate and nitrite are analyzed by colourimetry using a flow injection analyzer on a soil sample extract that has been extracted using 0.01M Calcium Chloride, then shaken well and filtered prior to analysis.
Available Nitrite by Colourimetry (0.01M Calcium Chloride Ext.)	E269.NO2 ALS Environmental - Saskatoon	Soil/Solid	Alberta Agriculture/APHA 4500-NO2 B (mod)	Plant available nitrite is analyzed by colourimetry using a flow injection analyzer on a soil sample extract that has been extracted using 0.01M Calcium Chloride, then shaken well and filtered prior to analysis.
Available Nitrate and Nitrite by Colourimetry (2N Potassium Chloride Ext.)	E269A.N+N ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 6.2/APHA 4500-NO3 I (mod)	Plant available nitrate and nitrite is analyzed by colourimetry using a flow injection analyzer on a soil sample extract that has been extracted using 2N potassium chloride, then shaken well and filtered prior to analysis.
Available Ammonium by Colourimetry (2N Potassium Chloride Ext.)	E312A ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 6.2/Comm Soil Sci 19(6) (mod)	Plant available ammonium is analyzed by colourimetry on a soil sample extract that has been extracted using 2N Potassium Chloride, then shaken well and filtered prior to analysis.
Total Kjeldahl Nitrogen by Colourimetry	E319 ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 22.2.3	The soil is digested with sulfuric acid in the presence of $CuSO_4$ and K_2SO_4 catalysts. Ammonia in the soil extract is determined colourimetrically at 660 nm.
Total Carbon by Combustion	E351 ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 21.2 (mod)	Total Carbon is determined by he high temperature combustion method with measurement by an infrared detector.
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354 ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 20.2	Total Inorganic Carbon is determined by acetic acid pH standard curve, where a known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solu ion is measured and compared against a standard curve relating pH to weight of carbonate.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Nitrogen by Combustion	E366 ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 22.4	The sample is ignited in a combustion analyzer where nitrogen in the reduced nitrous oxide gas is determined using a thermal conductivity detector.
Available Phosphorus by FIALab (Modified Kelowna)	E384 ALS Environmental - Saskatoon	Soil/Solid	Comm. Soil Sci. Plant Anal, 25 (5&6)	Plant available phosphorus is extracted from air dried soil using a fixed ratio Modified Kelowna extraction. Phosphorus is determined by colorimetry using an flow injection analyzer.
Available Phosphorus by Colourimetry (Olsen)	E385 ALS Environmental - Saskatoon	Soil/Solid	Carter CSSS (2008) 8.3	Plant available phosphorus is extracted from air dried soil using a fixed ra io bicarbonate extraction. Phosphorus is determined by colorimetry.
Available Potassium by flame photometry (Modified Kelowna)	E390 ALS Environmental - Saskatoon	Soil/Solid	Comm. Soil Sci. Plant Anal, 25 (5&6)	Plant available potassium is extracted from soil using modified Kelowna solution. Potassium is determined by flame emission at 770 nm.
Metals in Soil/Solid by CRC ICPMS	E440 ALS Environmental - Saskatoon	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
Ca, K, Mg, Na, B and S by ICPOES (Saturated Paste)	E485 ALS Environmental - Saskatoon	Soil/Solid	CSSS CH15/EPA 6010B/AER D50	A soil extract produced by the saturated paste extraction procedure is analyzed for Calcium, Magnesium, Potassium, Sodium, Boron, and Sulfur (as SO4) by ICPOES.
Plant Available Micronutrients by ICPOES	E496 ALS Environmental - Saskatoon	Soil/Solid	CSSS (1993) 11	Plant available micro nutrients (Cu, Fe, Mn, Zn) are determined by extraction using 0.005 M DTPA followed by analysis using ICPOES.
Available Sulfate by ICPOES (0.01M Calcium Chloride Ext.)	E497.SO4 ALS Environmental - Saskatoon	Soil/Solid	Alberta Agriculture	Plant available sulfate is determined by ICPOES. Soil is extracted using a 0.01M calcium chloride solution. This extraction may also produce organic sulfur in the extracts when organic soils are analyzed.
Mercury in Soil/Solid by CVAAS	E510 ALS Environmental - Saskatoon	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Theoretical Gypsum Requirements (TGR) Saturated Paste	EC106 ALS Environmental - Saskatoon	Soil/Solid	J. Ashworth et al (1999)	Theoretical Gypsum Requirement is an estimate of the gypsum amendment required to remediate brine contaminated or sodic soils, and is provided in units of tonnes per hectare (t/ha) for a treatment depth of 15cm. TGR(brine), intended for brine-contaminated soils, is calculated using Method A from "A Comparison of Methods for Gypsum Requirement of Brine-Contaminated Soils", by J. Ashworth (Cdn J. of Soil Science, 1999), available at www.alsglobal.com. TGR(sodic), intended for naturally sodic soils, uses the Oster and Frenkel method (Method B) from he same paper. Reported TGR values are capped at 50 t/ha, considered the maximum practical gypsum amendment. To convert TGR from t/ha to tons/acre, multiply by 0.446. To determine a TGR value for an alternate treatment depth, multiply by [desired treatment depth (cm) / 15 cm].
Chloride by Colourimetry (Saturated Paste) (mg/kg)	EC266A.Cl ALS Environmental - Saskatoon	Soil/Solid	CSSS Ch. 15/APHA 4500-CL E (mod)	Inorganic anions are analyzed by obtaining a soil extract produced by the saturated paste extraction procedure which is then analyzed by colourimetry using a discrete analyzer.
Available Nitrate by Difference (0.01M Calcium Chloride Ext.)	EC269.NO3 ALS Environmental - Saskatoon	Soil/Solid	Alberta Agriculture/APHA 4500-NO3 I (mod)	Available Nitrate is determined by difference between Nitrate+Nitrite-N and Nitrite-N. A soil sample extract that has been extracted using 0.01M Calcium Chloride, then shaken well and filtered prior to analysis.
Total Available Nitrogen (Calculation)	EC269A.N ALS Environmental - Saskatoon	Soil/Solid	Calculation	Total available nitrogen is calculated as the sum of NO2-N+NO3-N and NH3-N extracted from soil using 2N potassium chloride solution.
Total Organic Carbon (Calculated) in soil	EC356 ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 21.2	Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon (TIC).
Total Organic Nitrogen (Calculation)	EC363 ALS Environmental - Saskatoon	Soil/Solid	APHA 4500-NORG	Total Organic Nitrogen is a calculated parameter. Total Organic Nitrogen = Total Kjeldahl Nitrogen - Ammonia.
Ca, K, Mg, Na, B and S by ICPOES (Saturated Paste) (mg/kg)	EC485 ALS Environmental - Saskatoon	Soil/Solid	CSSS CH15/EPA 6010B	A soil extract produced by the saturated paste extraction procedure is analyzed for Calcium, Magnesium, Potassium, Sodium, Boron, and Sulfur (as SO4) by ICPOES. Results are calculated in mg/kg using Saturation Percentage.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Saskatoon	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Fixed ratio 0.01M Calcium Chloride extraction for plant available nutrients	EP269 ALS Environmental - Saskatoon	Soil/Solid	Alberta Agriculture	Plant available nutrients (N&S) extracted using 0.01M calcium chloride, then shaken well and filtered prior to analysis.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
2N Potassium Chloride extraction for available nutrients	EP269A ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 6.2	A soil sample extract is generated by fixed ratio extraction using 2N Potassium Chloride, then shaken well and filtered prior to analysis.
Kjeldahl Digestion for soils	EP319 ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 22.2.3	The soil is digested with sulfuric acid in the presence of CuSO4 and K2SO4 catalysts.
Modified Kelowna Extraction for soil	EP384 ALS Environmental - Saskatoon	Soil/Solid	Comm. Soil Sci. Plant Anal, 25 (5&6)	Plant available phosphorus and potassium are extracted from the soil using fixed ratio Modified Kelowna solution.
Bicarbonate extraction for soil	EP385 ALS Environmental - Saskatoon	Soil/Solid	CSSS (2008) 8.2	Plant available phosphorus is extracted using fixed ratio sodium bicarbonate solution (Olsen method).
Digestion for Metals and Mercury	EP440 ALS Environmental - Saskatoon	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
0.005 M DTPA Extraction for micro nutrients	EP496 ALS Environmental - Saskatoon	Soil/Solid	CSSS (1993) 11	Plant available micro nutrients are extracted from soil using 0.005 M diethylenetrianime (DTPA). The sample is mixed in a fixed ratio with dilute DTPA, shaken then filtered.
Dry and Grind in Soil/Solid <38°C	EPP441 ALS Environmental - Saskatoon	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of coarse fragments a portion of homogenized sample is set in a tray and dried at less than 38°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.
Dry and Grind in Soil/Solid <60°C	EPP442 ALS Environmental - Saskatoon	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

QUALITY CONTROL REPORT

Work Order	:**WP2319589**	Page	: 1 of 21
Client	:Canadian Kraft Paper Industries Limited	Laboratory	:ALS Environmental - Winnipeg
Contact	:Leigh Johnston	Account Manager	:Judy Dalmaijer
Address	:PO Box 1590 The Pas MB Canada R9A 1L4	Address	:1329 Niakwa Road East, Unit 12 Winnipeg, Manitoba Canada R2J 3T4
Telephone	:	Telephone	:+1 204 255 9720
Project	:----	Date Samples Received	:16-Aug-2023 10:32
PO	:SV-32761	Date Analysis Commenced	:18-Aug-2023
C-O-C number	:----	Issue Date	:30-Aug-2023 08:36
Sampler	:---- 204 623 8528		
Site	:----		
Quote number	:Full Sludge Analysis 2022 (Q89546)		
No. of samples received	:2		
No. of samples analysed	:2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Sp ke (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Colby Bingham	Laboratory Supervisor	Saskatoon Inorganics, Saskatoon, Saskatchewan
Colby Bingham	Laboratory Supervisor	Saskatoon Metals, Saskatoon, Saskatchewan
George Huang	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta
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General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 1092742)											
GP2301623-001	Anonymous	Moisture	---	E144	0.25	%	80 6	79.0	1.99%	20%	---
Physical Tests (QC Lot: 1099696)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Density	---	E150	0.010	g/cm³	1.85	1.79	3.54%	20%	---
WP2319589-002	ROB WHITE AG LAND (0-60)	Density	---	E150	0.010	g/cm³	1.88	1.76	6.83%	20%	---
Physical Tests (QC Lot: 1100213)											
WP2319589-001	ROB WHITE AG LAND (0-15)	pH (1:2 soil:water)	---	E108	0.10	pH units	8.30	8 30	0.00%	10%	---
Physical Tests (QC Lot: 1100214)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Conductivity (1:2 leachate)	---	E100	10	µS/cm	0.227 mS/cm	225	0.885%	20%	---
Percent Passing (QC Lot: 1101952)											
WP2319589-001	ROB WHITE AG LAND (0 15)	Passing (0 002mm)	---	E184	1.0	%	44.1	45.4	2.85%	15%	---
		Passing (0.004mm)	---	E184	1.0	%	50 6	51.7	2.25%	15%	---
		Passing (0.005mm)	---	E184	1.0	%	53 8	54.9	2.00%	15%	---
		Passing (0.020mm)	---	E184	1.0	%	83.4	84.0	0.629%	15%	---
		Passing (0.0312mm)	---	E184	1.0	%	89 2	89.6	0.482%	15%	---
Percent Passing (QC Lot: 1101954)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Passing (0.05mm)	---	E182	1.0	%	98 9	99.2	0.274%	15%	---
		Passing (0.063mm)	---	E182	1.0	%	99 0	99.2	0.260%	15%	---
		Passing (0.075mm)	---	E182	1.0	%	99 0	99.2	0.246%	15%	---
		Passing (0.125mm)	---	E182	1.0	%	99 2	99.4	0.189%	15%	---
		Passing (0.149mm)	---	E182	1.0	%	99 3	99.5	0.172%	15%	---
		Passing (0.250mm)	---	E182	1.0	%	99 6	99.7	0.104%	15%	---
		Passing (0.420mm)	---	E182	1.0	%	99.7	99.8	0.0632%	15%	---
		Passing (0.50mm)	---	E182	1.0	%	99 8	99.8	0.0442%	15%	---
		Passing (0.841mm)	---	E182	1.0	%	99 8	99.8	0.0141%	15%	---
		Passing (1.0mm)	---	E182	1.0	%	99 9	99.9	0.00%	15%	---
Anions and Nutrients (QC Lot: 1102038)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Nitrogen, total	7727-37-9	E366	0.020	%	0.146	0.149	0.003	Diff <2x LOR	---

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Organic / Inorganic Carbon (QC Lot: 1101959)											
VA23B9251-001	Anonymous	Carbon, inorganic [IC]	---	E354	0.050	%	<0.050	<0.050	0	Diff <2x LOR	---
Organic / Inorganic Carbon (QC Lot: 1102037)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Carbon, total [TC]	---	E351	0.050	%	3.25	3 20	1.51%	20%	---
Plant Available Nutrients (QC Lot: 1100255)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Copper	7440-50-8	E496	0.20	mg/kg	2.57	2 66	3.36%	30%	---
		Iron	7439-89-6	E496	2.0	mg/kg	35 3	40.9	14.8%	30%	---
		Manganese	7439-96-5	E496	0.050	mg/kg	7.38	7 91	6.98%	30%	---
		Zinc	7440-66-6	E496	0.20	mg/kg	0.83	0 83	0.006	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1100318)											
WP2319589-002	ROB WHITE AG LAND (0-60)	Phosphate, available (as P)	14265-44-2	E385	1.0	mg/kg	4.9	4.7	0.2	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1102255)											
WP2319589-002	ROB WHITE AG LAND (0-60)	Sulfate, available (as S)	14808-79-8	E497.SO4	3.0	mg/kg	12 6	11.7	0.9	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1102256)											
WP2319589-002	ROB WHITE AG LAND (0-60)	Nitrate + Nitrite, available (as N)	---	E269 N+N	1.0	mg/kg	4.6	4.2	0.4	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1102257)											
WP2319589-002	ROB WHITE AG LAND (0-60)	Nitrite, available (as N)	14797-65-0	E269 NO2	0.40	mg/kg	<0.40	<0.40	0	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1102274)											
YL2301056-001	Anonymous	Nitrate + Nitrite, available (as N)	---	E269A.N+N	55 0	mg/kg	<55.9	<55.0	0	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1102275)											
YL2301056-001	Anonymous	Ammonium, available (as N)	14798-03-9	E312A	27 5	mg/kg	<27.9	<27.5	27.9	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1103657)											
WP2319589-002	ROB WHITE AG LAND (0-60)	Phosphate, available (as P)	14265-44-2	E384	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	---
Plant Available Nutrients (QC Lot: 1103658)											
WP2319589-002	ROB WHITE AG LAND (0-60)	Potassium, available	7440-09-7	E390	20	mg/kg	233	211	10.0%	30%	---
Saturated Paste Extractables (QC Lot: 1092405)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Nitrate (as N), soluble ion content	14797-55-8	E239 NO3	0.5	mg/L	7.6	7.7	0.371%	30%	---
Saturated Paste Extractables (QC Lot: 1100180)											
SK2304272-002	Anonymous	Chloride, soluble ion content	16887-00-6	E266.Cl	100	mg/L	189	182	7	Diff <2x LOR	---
Saturated Paste Extractables (QC Lot: 1100181)											
SK2304272-002	Anonymous	% Saturation	---	E141	1.0	%	41.4	39.9	3.78%	20%	---

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Saturated Paste Extractables (QC Lot: 1100182)											
SK2304272-002	Anonymous	Boron, soluble ion content	7440-42-8	E485	0.25	mg/L	0.29	0.28	0.010	Diff <2x LOR	---
		Calcium, soluble ion content	7440-70-2	E485	5.0	mg/L	122	123	1.47%	30%	---
		Magnesium, soluble ion content	7439-95-4	E485	5.0	mg/L	37.3	37.8	1.44%	30%	---
		Potassium, soluble ion content	7440-09-7	E485	5.0	mg/L	14.3	14.6	0.3	Diff <2x LOR	---
		Sodium, soluble ion content	17341-25-2	E485	5.0	mg/L	11.5	11.1	0.5	Diff <2x LOR	---
		Sulfur (as SO4), soluble ion content	14808-79-8	E485	6	mg/L	521	533	2.27%	30%	---
Saturated Paste Extractables (QC Lot: 1100183)											
SK2304272-002	Anonymous	pH, saturated paste	---	E114	0.10	pH units	7.77	7.80	0.385%	10%	---
Saturated Paste Extractables (QC Lot: 1100184)											
SK2304272-002	Anonymous	Conductivity, saturated paste	---	E102	20	µS/cm	0.884 dS/m	893	1.01%	20%	---
Metals (QC Lot: 1093493)											
CG2311265-001	Anonymous	Aluminum	7429-90-5	E440	50	mg/kg	15800	14500	8.52%	40%	---
		Antimony	7440-36-0	E440	0.10	mg/kg	0.31	0.28	0.02	Diff <2x LOR	---
		Arsenic	7440-38-2	E440	0.10	mg/kg	7.42	6.53	12.8%	30%	---
		Barium	7440-39-3	E440	0.50	mg/kg	219	204	7.21%	40%	---
		Beryllium	7440-41-7	E440	0.10	mg/kg	0.78	0.70	11.5%	30%	---
		Bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	---
		Boron	7440-42-8	E440	5.0	mg/kg	5.3	<5.0	0.3	Diff <2x LOR	---
		Cadmium	7440-43-9	E440	0.020	mg/kg	0.283	0.261	7.85%	30%	---
		Calcium	7440-70-2	E440	50	mg/kg	4620	4170	10.1%	30%	---
		Chromium	7440-47-3	E440	0.50	mg/kg	22.1	20.7	6.25%	30%	---
		Cobalt	7440-48-4	E440	0.10	mg/kg	10.4	8.82	16.6%	30%	---
		Copper	7440-50-8	E440	0.50	mg/kg	15.3	13.9	9.86%	30%	---
		Iron	7439-89-6	E440	50	mg/kg	20800	18500	11.9%	30%	---
		Lead	7439-92-1	E440	0.50	mg/kg	12.8	10.4	20.5%	40%	---
		Lithium	7439-93-2	E440	2.0	mg/kg	15.7	14.2	10.5%	30%	---
		Magnesium	7439-95-4	E440	20	mg/kg	3920	3500	11.3%	30%	---
		Manganese	7439-96-5	E440	1.0	mg/kg	574	442	26.0%	30%	---
		Molybdenum	7439-98-7	E440	0.10	mg/kg	0.85	0.77	10.2%	40%	---
		Nickel	7440-02-0	E440	0.50	mg/kg	23.2	21.5	7.64%	30%	---
		Phosphorus	7723-14-0	E440	50	mg/kg	733	625	15.9%	30%	---
		Potassium	7440-09-7	E440	100	mg/kg	2080	1980	5.01%	40%	---
		Selenium	7782-49-2	E440	0.20	mg/kg	0.30	0.33	0.02	Diff <2x LOR	---
		Silver	7440-22-4	E440	0.10	mg/kg	0.15	0.13	0.01	Diff <2x LOR	---

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 1093493) - continued											
CG2311265-001	Anonymous	Sodium	7440-23-5	E440	50	mg/kg	102	95	8	Diff <2x LOR	---
		Strontium	7440-24-6	E440	0.50	mg/kg	29 0	27.4	5.68%	40%	---
		Sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	---
		Thallium	7440-28-0	E440	0.050	mg/kg	0.167	0.155	0.011	Diff <2x LOR	---
		Tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	---
		Titanium	7440-32-6	E440	1.0	mg/kg	20.7	16.5	22.3%	40%	---
		Tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0 50	0	Diff <2x LOR	---
		Uranium	7440-61-1	E440	0.050	mg/kg	0.755	0.701	7.35%	30%	---
		Vanadium	7440-62-2	E440	0.20	mg/kg	43 2	40.3	7.11%	30%	---
		Zinc	7440-66-6	E440	2.0	mg/kg	74 5	69.0	7.74%	30%	---
		Zirconium	7440-67-7	E440	1.0	mg/kg	1.3	1.2	0.2	Diff <2x LOR	---
Metals (QC Lot: 1101933)											
EO2307533-001	Anonymous	Aluminum	7429-90-5	E440	50	mg/kg	11200	10600	5.74%	40%	---
		Antimony	7440-36-0	E440	0.10	mg/kg	0.44	0.43	0.008	Diff <2x LOR	---
		Arsenic	7440-38-2	E440	0.10	mg/kg	7.61	6 95	9.11%	30%	---
		Barium	7440-39-3	E440	0.50	mg/kg	169	162	4.26%	40%	---
		Beryllium	7440-41-7	E440	0.10	mg/kg	0.60	0 55	0 04	Diff <2x LOR	---
		Bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0 20	0	Diff <2x LOR	---
		Boron	7440-42-8	E440	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	---
		Cadmium	7440-43-9	E440	0.020	mg/kg	0.229	0.224	2.06%	30%	---
		Calcium	7440-70-2	E440	50	mg/kg	5190	5150	0.828%	30%	---
		Chromium	7440-47-3	E440	0.50	mg/kg	39 8	30.7	25.8%	30%	---
		Cobalt	7440-48-4	E440	0.10	mg/kg	9.49	9 29	2.21%	30%	---
		Copper	7440-50-8	E440	0.50	mg/kg	16 9	16.9	0.0974%	30%	---
		Iron	7439-89-6	E440	50	mg/kg	21200	20300	4.64%	30%	---
		Lead	7439-92-1	E440	0.50	mg/kg	10 0	9 83	1.88%	40%	---
		Lithium	7439-93-2	E440	2.0	mg/kg	11 3	11.0	0.3	Diff <2x LOR	---
		Magnesium	7439-95-4	E440	20	mg/kg	3770	3700	1.88%	30%	---
		Manganese	7439-96-5	E440	1.0	mg/kg	488	485	0.695%	30%	---
		Molybdenum	7439-98-7	E440	0.10	mg/kg	2.82	1 81	43.8%	40%	DUP-H
		Nickel	7440-02-0	E440	0.50	mg/kg	34 2	28.6	18.0%	30%	---
		Phosphorus	7723-14-0	E440	50	mg/kg	508	477	6.22%	30%	---
		Potassium	7440-09-7	E440	100	mg/kg	810	770	4.99%	40%	---
		Selenium	7782-49-2	E440	0.20	mg/kg	0.37	0 37	0.006	Diff <2x LOR	---

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 1101933) - continued											
EO2307533-001	Anonymous	Silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	---
		Sodium	7440-23-5	E440	50	mg/kg	<50	<50	0	Diff <2x LOR	---
		Strontium	7440-24-6	E440	0.50	mg/kg	21 8	21.8	0.268%	40%	---
		Sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	---
		Thallium	7440-28-0	E440	0.050	mg/kg	0.148	0.136	0.012	Diff <2x LOR	---
		Tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	---
		Titanium	7440-32-6	E440	1.0	mg/kg	63 0	55.7	12.2%	40%	---
		Tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0 50	0	Diff <2x LOR	---
		Uranium	7440-61-1	E440	0.050	mg/kg	1.32	1.40	6.09%	30%	---
		Vanadium	7440-62-2	E440	0.20	mg/kg	29.7	28.4	4.49%	30%	---
		Zinc	7440-66-6	E440	2.0	mg/kg	58 3	57.7	0.989%	30%	---
		Zirconium	7440-67-7	E440	1.0	mg/kg	1.6	1.6	0.10	Diff <2x LOR	---
Metals (QC Lot: 1101934)											
EO2307533-001	Anonymous	Mercury	7439-97-6	E510	0 0050	mg/kg	0 0339	0.0335	1.20%	40%	---
Leachable Anions & Nutrients (QC Lot: 1101698)											
WP2319589-001	ROB WHITE AG LAND (0-15)	Kjeldahl nitrogen, total [TKN]	---	E319	200	mg/kg	0.168 %	1740	60	Diff <2x LOR	---

Qualifiers

Qualifier	*Description*
DUP-H	*Duplicate results outside ALS DQO, due to sample heterogeneity.*

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 1092742)						
Moisture	---	E144	0.25	%	<0.25	---
Physical Tests (QCLot: 1100214)						
Conductivity (1:2 leachate)	---	E100	10	µS/cm	<10	---
Anions and Nutrients (QCLot: 1102038)						
Nitrogen, total	7727-37-9	E366	0.02	%	<0.020	---
Organic / Inorganic Carbon (QCLot: 1101959)						
Carbon, inorganic [IC]	---	E354	0.05	%	<0.050	---
Organic / Inorganic Carbon (QCLot: 1102037)						
Carbon, total [TC]	---	E351	0.05	%	<0.050	---
Plant Available Nutrients (QCLot: 1100255)						
Copper	7440-50-8	E496	0.2	mg/kg	# 0.20	B
Iron	7439-89-6	E496	2	mg/kg	<2.0	---
Manganese	7439-96-5	E496	0.05	mg/kg	<0.050	---
Zinc	7440-66-6	E496	0.2	mg/kg	<0.20	---
Plant Available Nutrients (QCLot: 1100318)						
Phosphate, available (as P)	14265-44-2	E385	1	mg/kg	<1.0	---
Plant Available Nutrients (QCLot: 1102255)						
Sulfate, available (as S)	14808-79-8	E497.SO4	3	mg/kg	<3.0	---
Plant Available Nutrients (QCLot: 1102256)						
Nitrate + Nitrite, available (as N)	---	E269.N+N	1	mg/kg	<1.0	---
Plant Available Nutrients (QCLot: 1102257)						
Nitrite, available (as N)	14797-65-0	E269.NO2	0.4	mg/kg	<0.40	---
Plant Available Nutrients (QCLot: 1102274)						
Nitrate + Nitrite, available (as N)	---	E269A.N+N	2	mg/kg	<2.0	---
Plant Available Nutrients (QCLot: 1102275)						
Ammonium, available (as N)	14798-03-9	E312A	1	mg/kg	<1.0	---
Plant Available Nutrients (QCLot: 1103657)						
Phosphate, available (as P)	14265-44-2	E384	2	mg/kg	<2.0	---
Plant Available Nutrients (QCLot: 1103658)						
Potassium, available	7440-09-7	E390	20	mg/kg	<20	---
Saturated Paste Extractables (QCLot: 1092405)						
Nitrate (as N), soluble ion content	14797-55-8	E239.NO3	0.5	mg/L	<0.5	---

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Saturated Paste Extractables (QCLot: 1100180)						
Chloride, soluble ion content	16887-00-6	E266.Cl	20	mg/L	<20	—
Saturated Paste Extractables (QCLot: 1100182)						
Boron, soluble ion content	7440-42-8	E485	0.25	mg/L	<0.25	—
Calcium, soluble ion content	7440-70-2	E485	5	mg/L	<5.0	—
Magnesium, soluble ion content	7439-95-4	E485	5	mg/L	<5.0	—
Potassium, soluble ion content	7440-09-7	E485	5	mg/L	<5.0	—
Sodium, soluble ion content	17341-25-2	E485	5	mg/L	<5.0	—
Sulfur (as SO4), soluble ion content	14808-79-8	E485	6	mg/L	<6.0	—
Saturated Paste Extractables (QCLot: 1100184)						
Conductivity, saturated paste	—	E102	20	µS/cm	<20	—
Metals (QCLot: 1093493)						
Aluminum	7429-90-5	E440	50	mg/kg	<50	—
Antimony	7440-36-0	E440	0.1	mg/kg	<0.10	—
Arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	—
Barium	7440-39-3	E440	0 5	mg/kg	<0.50	—
Beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	—
Bismuth	7440-69-9	E440	0 2	mg/kg	<0.20	—
Boron	7440-42-8	E440	5	mg/kg	<5.0	—
Cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	—
Calcium	7440-70-2	E440	50	mg/kg	<50	—
Chromium	7440-47-3	E440	0 5	mg/kg	<0.50	—
Cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	—
Copper	7440-50-8	E440	0 5	mg/kg	<0.50	—
Iron	7439-89-6	E440	50	mg/kg	<50	—
Lead	7439-92-1	E440	0 5	mg/kg	<0.50	—
Lithium	7439-93-2	E440	2	mg/kg	<2.0	—
Magnesium	7439-95-4	E440	20	mg/kg	<20	—
Manganese	7439-96-5	E440	1	mg/kg	<1.0	—
Molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	—
Nickel	7440-02-0	E440	0 5	mg/kg	<0.50	—
Phosphorus	7723-14-0	E440	50	mg/kg	<50	—
Potassium	7440-09-7	E440	100	mg/kg	<100	—
Selenium	7782-49-2	E440	0 2	mg/kg	<0.20	—
Silver	7440-22-4	E440	0.1	mg/kg	<0.10	—
Sodium	7440-23-5	E440	50	mg/kg	<50	—

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1093493) - continued						
Strontium	7440-24-6	E440	0 5	mg/kg	<0.50	—
Sulfur	7704-34-9	E440	1000	mg/kg	<1000	—
Thallium	7440-28-0	E440	0.05	mg/kg	<0.050	—
Tin	7440-31-5	E440	2	mg/kg	<2.0	—
Titanium	7440-32-6	E440	1	mg/kg	<1.0	—
Tungsten	7440-33-7	E440	0 5	mg/kg	<0.50	—
Uranium	7440-61-1	E440	0.05	mg/kg	<0.050	—
Vanadium	7440-62-2	E440	0 2	mg/kg	<0.20	—
Zinc	7440-66-6	E440	2	mg/kg	<2.0	—
Zirconium	7440-67-7	E440	1	mg/kg	<1.0	—
Metals (QCLot: 1101933)						
Aluminum	7429-90-5	E440	50	mg/kg	<50	—
Antimony	7440-36-0	E440	0.1	mg/kg	<0.10	—
Arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	—
Barium	7440-39-3	E440	0 5	mg/kg	<0.50	—
Beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	—
Bismuth	7440-69-9	E440	0 2	mg/kg	<0.20	—
Boron	7440-42-8	E440	5	mg/kg	<5.0	—
Cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	—
Calcium	7440-70-2	E440	50	mg/kg	<50	—
Chromium	7440-47-3	E440	0 5	mg/kg	<0.50	—
Cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	—
Copper	7440-50-8	E440	0 5	mg/kg	<0.50	—
Iron	7439-89-6	E440	50	mg/kg	<50	—
Lead	7439-92-1	E440	0 5	mg/kg	<0.50	—
Lithium	7439-93-2	E440	2	mg/kg	<2.0	—
Magnesium	7439-95-4	E440	20	mg/kg	<20	—
Manganese	7439-96-5	E440	1	mg/kg	<1.0	—
Molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	—
Nickel	7440-02-0	E440	0 5	mg/kg	<0.50	—
Phosphorus	7723-14-0	E440	50	mg/kg	<50	—
Potassium	7440-09-7	E440	100	mg/kg	<100	—
Selenium	7782-49-2	E440	0 2	mg/kg	<0.20	—
Silver	7440-22-4	E440	0.1	mg/kg	<0.10	—
Sodium	7440-23-5	E440	50	mg/kg	<50	—

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1101933) - continued						
Strontium	7440-24-6	E440	0 5	mg/kg	<0.50	—
Sulfur	7704-34-9	E440	1000	mg/kg	<1000	—
Thallium	7440-28-0	E440	0.05	mg/kg	<0.050	—
Tin	7440-31-5	E440	2	mg/kg	<2.0	—
Titanium	7440-32-6	E440	1	mg/kg	<1.0	—
Tungsten	7440-33-7	E440	0 5	mg/kg	<0.50	—
Uranium	7440-61-1	E440	0.05	mg/kg	<0.050	—
Vanadium	7440-62-2	E440	0 2	mg/kg	<0.20	—
Zinc	7440-66-6	E440	2	mg/kg	<2.0	—
Zirconium	7440-67-7	E440	1	mg/kg	<1.0	—
Metals (QCLot: 1101934)						
Mercury	7439-97-6	E510	0.005	mg/kg	<0 0050	—
Leachable Anions & Nutrients (QCLot: 1101698)						
Kjeldahl nitrogen, total [TKN]	—	E319	200	mg/kg	<200	—

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1092742)									
Moisture	---	E144	0.25	%	50 %	104	90 0	110	---
Physical Tests (QCLot: 1099696)									
Density	---	E150	---	g/cm³	1 g/cm³	100	98 0	102	---
Physical Tests (QCLot: 1100213)									
pH (1 2 soil:water)	---	E108	---	pH units	7 pH units	101	97 0	103	---
Physical Tests (QCLot: 1100214)									
Conductivity (1 2 leachate)	---	E100	10	µS/cm	1000 µS/cm	96 9	80 0	120	---
Anions and Nutrients (QCLot: 1102038)									
Nitrogen, total	7727-37-9	E366	0.02	%	22 37 %	97 2	90 0	110	---
Organic / Inorganic Carbon (QCLot: 1101959)									
Carbon, inorganic [IC]	---	E354	0.05	%	0.5 %	96 9	90 0	110	---
Organic / Inorganic Carbon (QCLot: 1102037)									
Carbon, total [TC]	---	E351	0.05	%	48 %	97.7	90 0	110	---
Plant Available Nutrients (QCLot: 1100255)									
Copper	7440-50-8	E496	0.2	mg/kg	2 mg/kg	108	80 0	120	---
Iron	7439-89-6	E496	2	mg/kg	40 mg/kg	97 8	80 0	120	---
Manganese	7439-96-5	E496	0.05	mg/kg	1 mg/kg	102	80 0	120	---
Zinc	7440-66-6	E496	0.2	mg/kg	4 mg/kg	99 6	80 0	120	---
Plant Available Nutrients (QCLot: 1100318)									
Phosphate, available (as P)	14265-44-2	E385	1	mg/kg	20 mg/kg	108	80 0	120	---
Plant Available Nutrients (QCLot: 1102255)									
Sulfate, available (as S)	14808-79-8	E497.SO4	3	mg/kg	200 mg/kg	113	70 0	130	---
Plant Available Nutrients (QCLot: 1102256)									
Nitrate + Nitrite, available (as N)	---	E269 N+N	1	mg/kg	40 mg/kg	105	70 0	130	---
Plant Available Nutrients (QCLot: 1102257)									
Nitrite, available (as N)	14797-65-0	E269 NO2	0.4	mg/kg	20 mg/kg	101	70 0	130	---
Plant Available Nutrients (QCLot: 1102274)									
Nitrate + Nitrite, available (as N)	---	E269A.N+N	2	mg/kg	40 mg/kg	106	70 0	130	---
Plant Available Nutrients (QCLot: 1102275)									

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Plant Available Nutrients (QCLot: 1102275) - continued									
Ammonium, available (as N)	14798-03-9	E312A	1	mg/kg	10 mg/kg	106	80 0	120	—
Plant Available Nutrients (QCLot: 1103657)									
Phosphate, available (as P)	14265-44-2	E384	2	mg/kg	12 5 mg/kg	109	80 0	120	—
Plant Available Nutrients (QCLot: 1103658)									
Potassium, available	7440-09-7	E390	20	mg/kg	125 mg/kg	112	70 0	130	—
Saturated Paste Extractables (QCLot: 1092405)									
Nitrate (as N), soluble ion content	14797-55-8	E239 NO3	0.5	mg/L	2 5 mg/L	101	80 0	120	—
Saturated Paste Extractables (QCLot: 1100180)									
Chloride, soluble ion content	16887-00-6	E266.Cl	20	mg/L	50 mg/L	103	80 0	120	—
Saturated Paste Extractables (QCLot: 1100181)									
% Saturation	—	E141	—	%	100 %	99.1	80 0	120	—
Saturated Paste Extractables (QCLot: 1100182)									
Boron, soluble ion content	7440-42-8	E485	0.25	mg/L	2 mg/L	100	80 0	120	—
Calcium, soluble ion content	7440-70-2	E485	5	mg/L	100 mg/L	103	80 0	120	—
Magnesium, soluble ion content	7439-95-4	E485	5	mg/L	100 mg/L	101	80 0	120	—
Potassium, soluble ion content	7440-09-7	E485	5	mg/L	100 mg/L	98 6	80 0	120	—
Sodium, soluble ion content	17341-25-2	E485	5	mg/L	100 mg/L	100	80 0	120	—
Sulfur (as SO4), soluble ion content	14808-79-8	E485	6	mg/L	300 mg/L	105	80 0	120	—
Saturated Paste Extractables (QCLot: 1100183)									
pH, saturated paste	—	E114	—	pH units	7 pH units	100	97 0	103	—
Saturated Paste Extractables (QCLot: 1100184)									
Conductivity, saturated paste	—	E102	20	µS/cm	1000 µS/cm	99 0	80 0	120	—
Metals (QCLot: 1093493)									
Aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	103	80 0	120	—
Antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	101	80 0	120	—
Arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	99.7	80 0	120	—
Barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	101	80 0	120	—
Beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	99.1	80 0	120	—
Bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	96 8	80 0	120	—
Boron	7440-42-8	E440	5	mg/kg	100 mg/kg	95.4	80 0	120	—
Cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	97 9	80 0	120	—
Calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	98 5	80 0	120	—
Chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	98 8	80 0	120	—
Cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	97.1	80 0	120	—

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 1093493) - continued									
Copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	95 3	80 0	120	—
Iron	7439-89-6	E440	50	mg/kg	100 mg/kg	108	80 0	120	—
Lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	101	80 0	120	—
Lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	105	80 0	120	—
Magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	111	80 0	120	—
Manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	99 8	80 0	120	—
Molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	102	80 0	120	—
Nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	96 3	80 0	120	—
Phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	104	80 0	120	—
Potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	104	80 0	120	—
Selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	93 5	80 0	120	—
Silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	96 2	80 0	120	—
Sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	102	80 0	120	—
Strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	104	80 0	120	—
Sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	96.7	80 0	120	—
Thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	98 3	80 0	120	—
Tin	7440-31-5	E440	2	mg/kg	50 mg/kg	98 0	80 0	120	—
Titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	91.7	80 0	120	—
Tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	91 0	80 0	120	—
Uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	94 8	80 0	120	—
Vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	98 0	80 0	120	—
Zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	92 0	80 0	120	—
Zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	100	80 0	120	—
Metals (QCLot: 1101933)									
Aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	98 6	80 0	120	—
Antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	110	80 0	120	—
Arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	104	80 0	120	—
Barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	103	80 0	120	—
Beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	93 8	80 0	120	—
Bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	102	80 0	120	—
Boron	7440-42-8	E440	5	mg/kg	100 mg/kg	91.1	80 0	120	—
Cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	104	80 0	120	—
Calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	94 6	80 0	120	—
Chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	103	80 0	120	—
Cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	101	80 0	120	—
Copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	99 6	80 0	120	—

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 1101933) - continued									
Iron	7439-89-6	E440	50	mg/kg	100 mg/kg	100	80 0	120	---
Lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	105	80 0	120	---
Lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	87.7	80 0	120	---
Magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	99 9	80 0	120	---
Manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	100	80 0	120	---
Molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	107	80 0	120	---
Nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	99.4	80 0	120	---
Phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	108	80 0	120	---
Potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	101	80 0	120	---
Selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	96 5	80 0	120	---
Silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	93 0	80 0	120	---
Sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	101	80 0	120	---
Strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	106	80 0	120	---
Sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	107	80 0	120	---
Thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	101	80 0	120	---
Tin	7440-31-5	E440	2	mg/kg	50 mg/kg	106	80 0	120	---
Titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	102	80 0	120	---
Tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	103	80 0	120	---
Uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	102	80 0	120	---
Vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	101	80 0	120	---
Zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	99 5	80 0	120	---
Zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	98.1	80 0	120	---
Metals (QCLot: 1101934)									
Mercury	7439-97-6	E510	0 005	mg/kg	0.1 mg/kg	94 3	80 0	120	---
Leachable Anions & Nutrients (QCLot: 1101698)									
Kjeldahl nitrogen, total [TKN]	---	E319	200	mg/kg	1000 mg/kg	94.4	80 0	120	---

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Saturated Paste Extractables (QCLot: 1092405)										
WP2319589-002	ROB WHITE AG LAND (0-60)	Nitrate (as N), soluble ion content	14797-55-8	E239 NO3	246 mg/L	250 mg/L	98.2	60 0	140	---

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 1100213)									
	RM	pH (1:2 soil:water)	---	E108	8.13 pH units	101	96.0	104	---
Physical Tests (QCLot: 1100214)									
	RM	Conductivity (1:2 leachate)	---	E100	273 µS/cm	95.2	80.0	120	---
Percent Passing (QCLot: 1101952)									
	RM	Passing (0.002mm)	---	E184	22.46 %	108	74.1	126	---
	RM	Passing (0.004mm)	---	E184	25.14 %	106	76.8	123	---
	RM	Passing (0.005mm)	---	E184	26.48 %	106	77.9	122	---
	RM	Passing (0.020mm)	---	E184	41.82 %	100	85.8	114	---
	RM	Passing (0.0312mm)	---	E184	45.61 %	103	88.0	112	---
Percent Passing (QCLot: 1101953)									
	RM	Passing (19mm)	---	E181	100 %	100	90.0	110	---
	RM	Passing (2.0mm)	---	E181	100 %	100	90.0	110	---
	RM	Passing (25.4mm)	---	E181	100 %	100	90.0	110	---
	RM	Passing (38.1mm)	---	E181	100 %	100	90.0	110	---
	RM	Passing (4.75mm)	---	E181	100 %	100	90.0	110	---
	RM	Passing (50 8mm)	---	E181	100 %	100	90.0	110	---
	RM	Passing (76 2mm)	---	E181	100 %	100	90.0	110	---
	RM	Passing (9.5mm)	---	E181	100 %	100	90.0	110	---
Percent Passing (QCLot: 1101954)									
	RM	Passing (0.05mm)	---	E182	54.08 %	103	90.0	110	---
	RM	Passing (0.063mm)	---	E182	57.14 %	102	90.8	109	---
	RM	Passing (0.075mm)	---	E182	60.15 %	100	91.4	109	---
	RM	Passing (0.125mm)	---	E182	68.19 %	102	92.7	107	---
	RM	Passing (0.149mm)	---	E182	72.05 %	100 0	93.1	107	---
	RM	Passing (0.250mm)	---	E182	82.27 %	100	94.1	106	---
	RM	Passing (0.420mm)	---	E182	89.94 %	98.6	94.6	105	---
	RM	Passing (0.50mm)	---	E182	91.15 %	100	94.7	105	---
	RM	Passing (0.841mm)	---	E182	95.64 %	99.3	94.9	105	---

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Recovery (%): RM	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Percent Passing (QCLot: 1101954) - continued									
	RM	Passing (1.0mm)	----	E182	96.31 %	100	94.9	105	----
Anions and Nutrients (QCLot: 1102038)									
	RM	Nitrogen, total	7727-37-9	E366	0.11 %	88.1	80.0	120	----
Organic / Inorganic Carbon (QCLot: 1101959)									
	RM	Carbon, inorganic [IC]	----	E354	0.383 %	99.7	80.0	120	----
Organic / Inorganic Carbon (QCLot: 1102037)									
	RM	Carbon, total [TC]	----	E351	1.4 %	98.7	80.0	120	----
Plant Available Nutrients (QCLot: 1100255)									
	RM	Copper	7440-50-8	E496	1.42 mg/kg	117	70.0	130	----
	RM	Iron	7439-89-6	E496	57.9 mg/kg	112	70.0	130	----
	RM	Manganese	7439-96-5	E496	22.5 mg/kg	121	70.0	130	----
	RM	Zinc	7440-66-6	E496	1.79 mg/kg	108	70.0	130	----
Plant Available Nutrients (QCLot: 1100318)									
	RM	Phosphate, available (as P)	14265-44-2	E385	15.3 mg/kg	114	80.0	120	----
Plant Available Nutrients (QCLot: 1102255)									
	RM	Sulfate, available (as S)	14808-79-8	E497.SO4	459 mg/kg	118	70.0	130	----
Plant Available Nutrients (QCLot: 1102256)									
	RM	Nitrate + Nitrite, available (as N)	----	E269 N+N	11.3 mg/kg	108	70.0	130	----
Plant Available Nutrients (QCLot: 1102257)									
	RM	Nitrite, available (as N)	14797-65-0	E269 NO2	0.1 mg/kg	31.8	0	570	----
Plant Available Nutrients (QCLot: 1102274)									
	RM	Nitrate + Nitrite, available (as N)	----	E269A.N+N	11.1 mg/kg	113	70.0	130	----
Plant Available Nutrients (QCLot: 1102275)									
	RM	Ammonium, available (as N)	14798-03-9	E312A	70.1 mg/kg	101	80.0	120	----
Plant Available Nutrients (QCLot: 1103657)									
	RM	Phosphate, available (as P)	14265-44-2	E384	31.1 mg/kg	108	80.0	120	----
Plant Available Nutrients (QCLot: 1103658)									
	RM	Potassium, available	7440-09-7	E390	397 mg/kg	106	70.0	130	----
Saturated Paste Extractables (QCLot: 1100180)									
	RM	Chloride, soluble ion content	16887-00-6	E266.Cl	1237 mg/L	94.5	70.0	130	----
Saturated Paste Extractables (QCLot: 1100181)									
	RM	% Saturation	----	E141	48 3 %	94.5	70.0	130	----

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Recovery (%): RM	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Saturated Paste Extractables (QCLot: 1100182)									
	RM	Boron, soluble ion content	7440-42-8	E485	11.1 mg/L	86.3	70.0	130	----
	RM	Calcium, soluble ion content	7440-70-2	E485	776 mg/L	104	70.0	130	----
	RM	Magnesium, soluble ion content	7439-95-4	E485	261 mg/L	96.4	70.0	130	----
	RM	Potassium, soluble ion content	7440-09-7	E485	111 mg/L	82.5	70.0	130	----
	RM	Sodium, soluble ion content	17341-25-2	E485	330 mg/L	106	70.0	130	----
	RM	Sulfur (as SO4), soluble ion content	14808 79 8	E485	1841 mg/L	115	70.0	130	----
Saturated Paste Extractables (QCLot: 1100183)									
	RM	pH, saturated paste	----	E114	7.59 pH units	97.6	96.0	104	----
Saturated Paste Extractables (QCLot: 1100184)									
	RM	Conductivity, saturated paste	----	E102	5970 µS/cm	102	70.0	130	----
Metals (QCLot: 1093493)									
	RM	Aluminum	7429-90-5	E440	9817 mg/kg	85.9	70.0	130	----
	RM	Antimony	7440-36-0	E440	3.99 mg/kg	110	70.0	130	----
	RM	Arsenic	7440-38-2	E440	3.73 mg/kg	87.2	70.0	130	----
	RM	Barium	7440-39-3	E440	105 mg/kg	90.6	70.0	130	----
	RM	Beryllium	7440-41-7	E440	0 349 mg/kg	89.3	70.0	130	----
	RM	Boron	7440-42-8	E440	8.5 mg/kg	87.5	40.0	160	----
	RM	Cadmium	7440-43-9	E440	0.91 mg/kg	85.8	70.0	130	----
	RM	Calcium	7440-70-2	E440	31082 mg/kg	84.4	70.0	130	----
	RM	Chromium	7440-47-3	E440	101 mg/kg	84.0	70.0	130	----
	RM	Cobalt	7440-48-4	E440	6.9 mg/kg	86.9	70.0	130	----
	RM	Copper	7440-50-8	E440	123 mg/kg	91.8	70.0	130	----
	RM	Iron	7439-89-6	E440	23558 mg/kg	88.3	70.0	130	----
	RM	Lead	7439-92-1	E440	267 mg/kg	101	70.0	130	----
	RM	Lithium	7439-93-2	E440	9.5 mg/kg	102	70.0	130	----
	RM	Magnesium	7439-95-4	E440	5509 mg/kg	94.4	70.0	130	----
	RM	Manganese	7439-96-5	E440	269 mg/kg	85.8	70.0	130	----
	RM	Molybdenum	7439-98-7	E440	1.03 mg/kg	93.4	70.0	130	----
	RM	Nickel	7440-02-0	E440	26.7 mg/kg	89.2	70.0	130	----
	RM	Phosphorus	7723-14-0	E440	752 mg/kg	91.7	70.0	130	----
	RM	Potassium	7440-09-7	E440	1587 mg/kg	80.4	70.0	130	----

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Recovery (%): RM	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Metals (QCLot: 1093493) - continued									
	RM	Silver	7440-22-4	E440	4.06 mg/kg	81.0	70.0	130	---
	RM	Sodium	7440-23-5	E440	797 mg/kg	80.4	70.0	130	---
	RM	Strontium	7440-24-6	E440	86.1 mg/kg	89.7	70.0	130	---
	RM	Thallium	7440-28-0	E440	0.0786 mg/kg	91.5	40.0	160	---
	RM	Tin	7440-31-5	E440	10.6 mg/kg	87.3	70.0	130	---
	RM	Titanium	7440 32 6	E440	839 mg/kg	74 8	70.0	130	---
	RM	Uranium	7440-61-1	E440	0.52 mg/kg	85.8	70 0	130	
	RM	Vanadium	7440-62-2	E440	32.7 mg/kg	83.2	70.0	130	---
	RM	Zinc	7440-66-6	E440	297 mg/kg	84.8	70.0	130	---
	RM	Zirconium	7440-67-7	E440	5.73 mg/kg	85.9	70.0	130	---
Metals (QCLot: 1101933)									
	RM	Aluminum	7429-90-5	E440	9817 mg/kg	90.2	70.0	130	---
	RM	Antimony	7440-36-0	E440	3.99 mg/kg	107	70.0	130	---
	RM	Arsenic	7440-38-2	E440	3.73 mg/kg	99.6	70.0	130	---
	RM	Barium	7440-39-3	E440	105 mg/kg	102	70.0	130	---
	RM	Beryllium	7440-41-7	E440	0 349 mg/kg	101	70.0	130	---
	RM	Boron	7440-42-8	E440	8.5 mg/kg	101	40.0	160	---
	RM	Cadmium	7440-43-9	E440	0.91 mg/kg	93.9	70.0	130	---
	RM	Calcium	7440-70-2	E440	31082 mg/kg	91.5	70.0	130	---
	RM	Chromium	7440-47-3	E440	101 mg/kg	93.3	70.0	130	---
	RM	Cobalt	7440-48-4	E440	6.9 mg/kg	97.1	70.0	130	---
	RM	Copper	7440-50-8	E440	123 mg/kg	96.8	70.0	130	---
	RM	Iron	7439-89-6	E440	23558 mg/kg	95.3	70.0	130	---
	RM	Lead	7439-92-1	E440	267 mg/kg	101	70.0	130	---
	RM	Lithium	7439-93-2	E440	9.5 mg/kg	91.5	70.0	130	---
	RM	Magnesium	7439-95-4	E440	5509 mg/kg	96.3	70.0	130	---
	RM	Manganese	7439-96-5	E440	269 mg/kg	95.0	70.0	130	---
	RM	Molybdenum	7439-98-7	E440	1.03 mg/kg	106	70.0	130	---
	RM	Nickel	7440-02-0	E440	26.7 mg/kg	98.4	70.0	130	---
	RM	Phosphorus	7723-14-0	E440	752 mg/kg	101	70.0	130	---
	RM	Potassium	7440-09-7	E440	1587 mg/kg	98.1	70.0	130	---

ub Matrix

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report: RM Target Concentration	Recovery (%): RM	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Metals (QCLot: 1101933) - continued									
	RM	Silver	7440 22 4	E440	4 06 mg/kg	82 8	70.0	130	---
	RM	Sodium	7440-23-5	E440	797 mg/kg	102	70 0	130	
	RM	Strontium	7440-24-6	E440	86.1 mg/kg	104	70.0	130	---
	RM	Thallium	7440-28-0	E440	0.0786 mg/kg	95.2	40.0	160	---
	RM	Tin	7440-31-5	E440	10.6 mg/kg	109	70.0	130	---
	RM	Titanium	7440-32-6	E440	839 mg/kg	90.5	70.0	130	---
	RM	Uranium	7440-61-1	E440	0.52 mg/kg	97.2	70.0	130	---
	RM	Vanadium	7440-62-2	E440	32.7 mg/kg	93.6	70.0	130	---
	RM	Zinc	7440-66-6	E440	297 mg/kg	97.7	70.0	130	---
	RM	Zirconium	7440-67-7	E440	5.73 mg/kg	91.4	70.0	130	---
Metals (QCLot: 1101934)									
	RM	Mercury	7439-97-6	E510	0 059 mg/kg	90.5	70.0	130	---
Leachable Anions & Nutrients (QCLot: 1101698)									
	RM	Kjeldahl nitrogen, total [TKN]	---	E319	1040 mg/kg	101	80.0	120	---

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 -

Page of 1/2

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Report To	Contact and company name below will appear on the final report
Company:	Canadian Kraft Paper
Contact:	Leigh Johnston/Lisa Jones
Phone:	204 623 78450
	Company address below will appear on the final report
Street:	PO Box 1590
City/Province:	The Pas, MB
Postal Code:	R9A 1L4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Reports / Recipients	
Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Merge QC/QCI Reports with COA	☑ YES ☐ NO ☐ N/A
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	lisa.jones@ckpi.com
Email 2	leigh.johnston@ckpi.com
Email 3	

Invoice Recipients	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	lisa.jones@ckpi.com
Email 2	emie.ballantyne@ckpi.com

Project Information	
ALS Account # / Quote #:	WP2022CKPI100-003
Job #:	
PO / AFE:	SV-32761
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (ALS use only):

ALS Contact:

Sampler: Emmanuel

Turnaround Time (TAT) Requested

- ☑ Routine [R] if received by 3pm M-F - no surcharges apply
- ☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
- ☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
- ☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
- ☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
- ☐ Same day [E2] if received by 10am M-S - 200% rush surcharge.

Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm

For all tests with rush TATs requested, please contact your AM to confirm availability.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	S32-total available nitrogen	S351- TC,TIC,TOC		E144- Moisture Content	E312A	E319	EC363	E269.NO2	EC269.NO3						SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
						P	P		P	P	P	P	P	P								
	Rob White Ag Land (0-15)	12-Aug-23	14:30	composite	1	R	R		R	R	R	R	R	R								
	Rob White Ag Land (0-60)	12-Aug-23	14:30	composite	1	R	R		R	R	R	R	R	R								

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT

Cooling Method: ☐ NONE ☐ ICE ☐ ICE P

Submission Comments identified on Sample Re

Cooler Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C

15.1

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (ALS use only)

Received by:	Date:	Time:
[redacted]	AUG 16 2023	10:32

FINAL SHIPMEN

Received by:	Da

Environmental Division
Winnipeg
Work Order Reference
WP2319589

Telephone : +1 204 255 9720

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 -

Page of

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

[redacted]

Report To	Contact and company name below will appear on the final report
Company:	Canadian Kraft Paper
Contact:	Lisa Jones
Phone:	204 623 8450
	Company address below will appear on the final report
Street:	PO Box 1590
City/Province:	The Pas, MB
Postal Code:	R9A 1L4
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Reports / Recipients

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: lisa.jones@ckpi.com

Email 2: leigh.johnston@ckpi.com

Email 3: emmanuel.badewa@ckpi.com

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: lisa.jones@ckpi.com

Email 2: ernie.ballantyne@ckpi.com

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge.

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm

For all tests with rush TATs requested, please contact your AM to confirm availability.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	WP2022CKPI100-003	AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	SV-32761	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):		ALS Contact:	Sampler: Emmanuel

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	P Soil- SAL-Detail	P Misc-E150-Density	P E100-Conductivity (1:2 Soil; Water Ex	P E108- Ph by meter (1:2 Soil; Water E	P E184- Partical Size Analysis Pipette M	P E141-Saturation Percentage	P E239.NO3- Nitrate by IC	P E366- Total Nitrogen by combustion I	P E385-Available Phosphate	P E440-Metals in Soil	P E496-Available Micronutrients (Cu, F	P E510- Mercury in Soil	P S269.NPK- Available NPK in Soil	P S269.NPKS - Available N,P,K,S in so	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	Rob White Ag Land (0-15)	12-Aug-23	14:30	composite	1	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	Rob White Ag Land (0-60)	12-Aug-23	14:30	composite	1	R	R	R	R	R	R	R	R	R	R	R	R	R	R			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☐ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by: [redacted]	Date: AUG 16 2023	Time: 10:32	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FINAL

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.