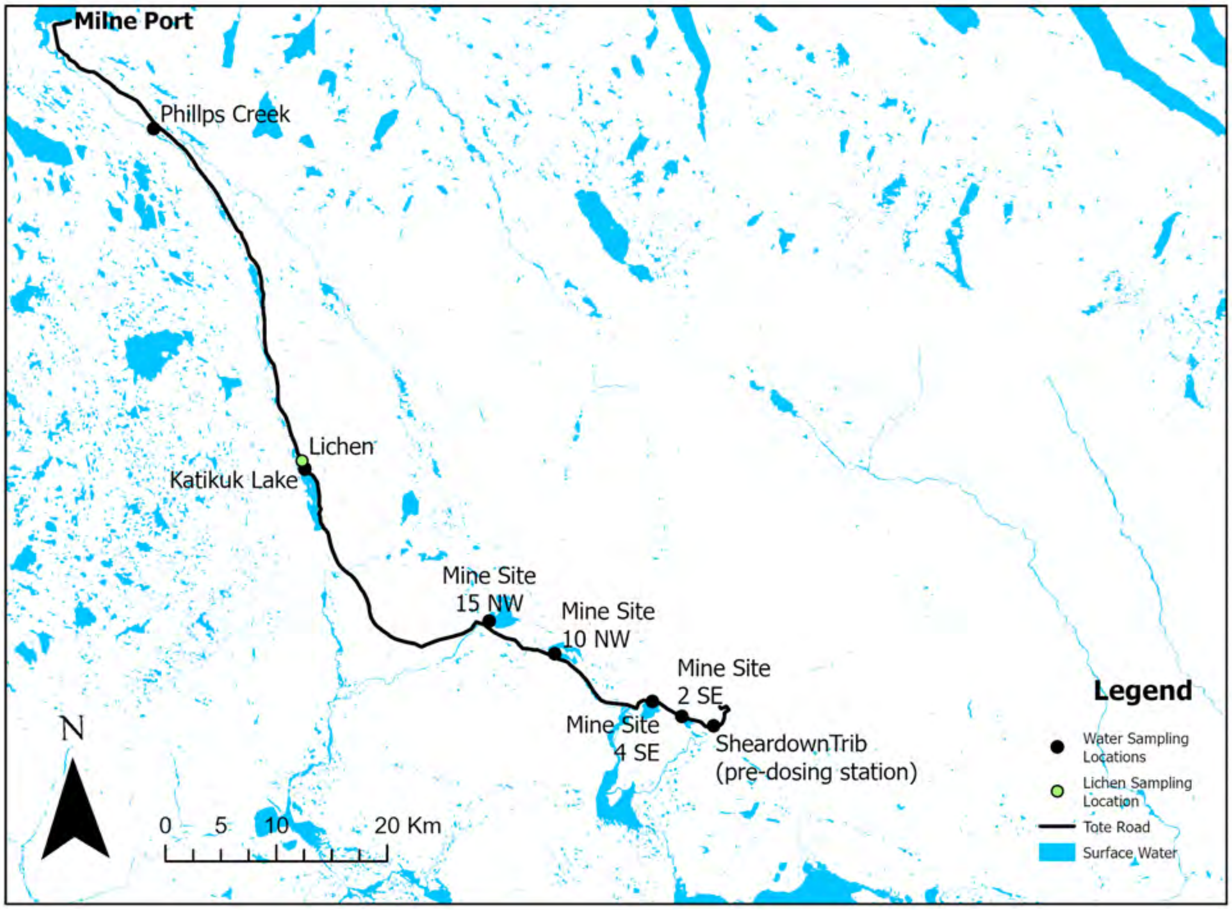

Figure 1. Map showing the study area where water samples (black dots) and lichen sample (green dot) were collected. The Tote Road is denoted by the black bold line.

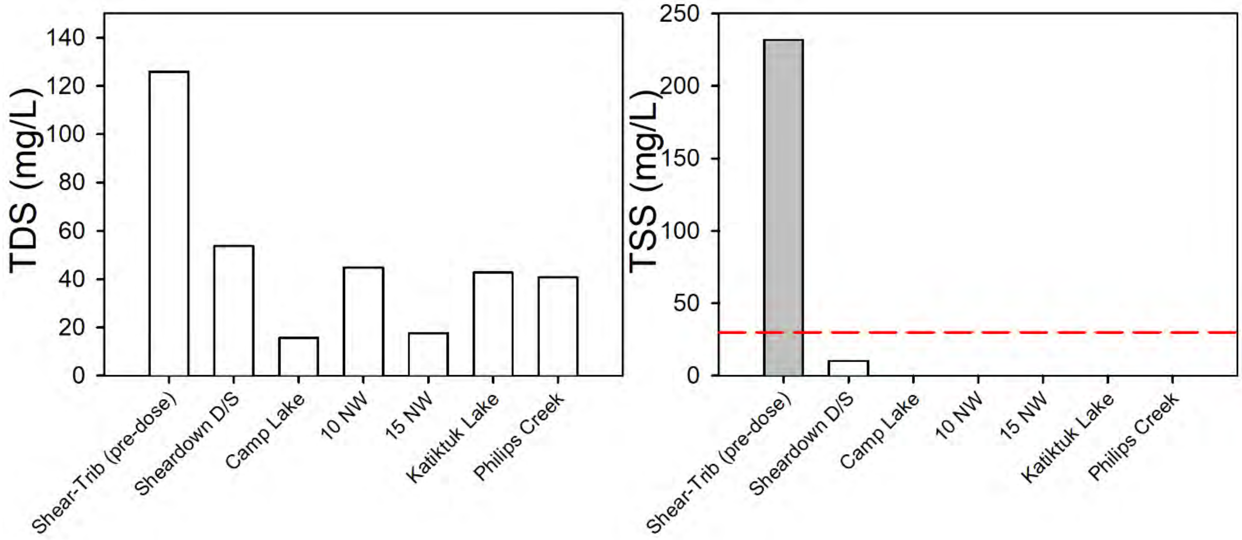

Figure 1. Total dissolved solids and total suspended solids for water samples collected at the 7 monitoring sites. The grey bars represent concentrations that exceed the water quality guideline, which is displayed as a red dashed line. Shear-Trib (pre-dose) water sample was collected prior to the pre-dosing station.

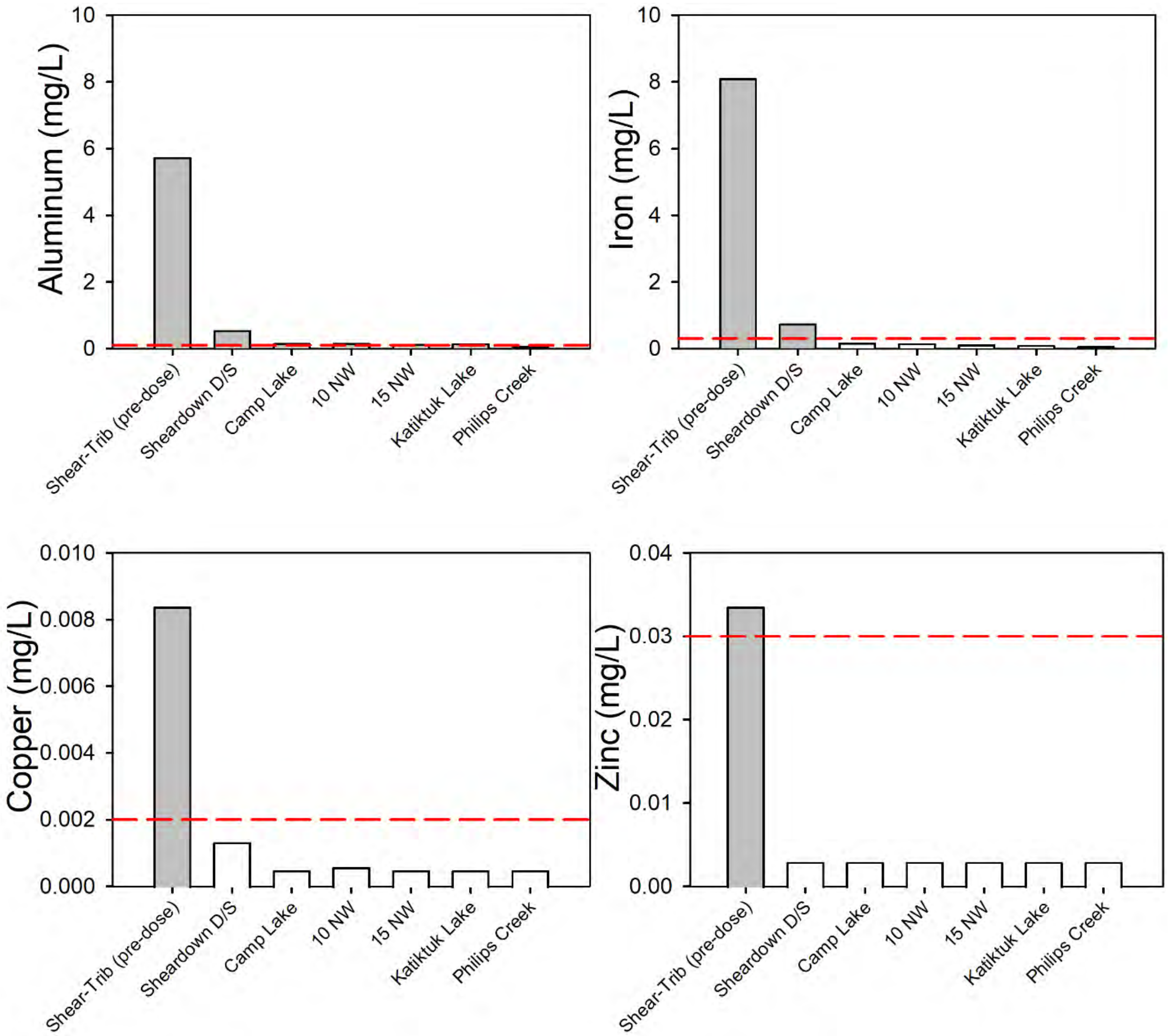

Figure 2. Total aluminum, iron, copper and zinc concentrations for freshwater samples collected at the 7 sampling sites. The grey bars represent concentrations that exceed the water quality guideline, which is displayed as a red dashed line. Shear-Trib (pre-dose) water sample was collected prior to the pre-dosing station.

Appendix C

A single lichen sample was collected at Katiktuk Lake to complement the 5 lake water, and 2 river water samples obtained previously. Approximately 10 g of lichen was collected from the ground and stored in a plastic vessel. The field crew used nitrile gloves for sampling and did not use metal instruments to prevent contamination. The lichen sample was placed in a cooler with ice and transported back to the field base at Mary River Mine – Sailiivik Camp where it was kept at 4 °C. The laboratory analyses were performed by ALS Environmental Ltd (Burlington, Ontario) within 1 week of arriving back after the sampling campaign. Two different analyses were conducted on the lichen sample, metals in tissue by ICPMS and mercury in tissue by CVAAS. The preparation procedure followed the EPA Method 3052 for both, and analytical method followed EPA Method 6020B and EPA Method 7470A, respectively. In short, for metals in tissue, samples were homogenized and sub-sampled, then digested using a closed-vessel microwave process. Instrumental analysis was performed via collision-reaction cell ICMPS. For mercury in tissue, after microwave digestion, a sub-sample was re-digested in oxidizing reagents using an open vessel hotblock method. Samples were treated with a reductant to facilitate analysis by CVAA. Metal(loid)s and mercury concentrations are presented as wet weight and dry weight (Table C1).

To our knowledge, there are no guidelines available currently for concentration of metal(loid)s in lichen. In the absence of guidelines, concentrations of lichen metal(loid)s collected in 2024 were compared to concentrations of lichen metal(loid)s collected in 2023 at Katiktuk Lake. In general, results reveal concentrations of lichen metal(loid)s were similar or lower than concentrations in 2023. Notably, similar to the ArctiConnexion report (2023), concentrations of aluminum and iron were also higher than concentrations of alpine tundra lichen measured near industrial areas of Alaska, Europe and Asia. However, concentrations of lead, chromium, copper, nickel, zinc and mercury are similar to concentrations reported from studies in Alaska, Europe and Asia (ArctiConnexion 2023). The varying concentrations of key metal(loid)s between industrial regions of Alaska, Europe, Asia, and the 2023 and 2024 Katiktuk Lake samples are likely due to a combination of factors such as different species of lichen, seasonality, precipitation patterns or quantity of fugitive dust. Vegetation can trap significant amounts of fugitive dust during the spring freshet and airborne dust deposition during the summer. However, given the high quantities of fugitive dust observed on the tundra and the Tote Road, it appears unlikely lower quantities of fugitive dust would be the main factor. More likely, different species of lichen, seasonality and precipitation patterns are the reason for different concentrations of metal(loid)s. In addition, only one lichen sample was collected at Katiktuk Lake by the Environmental Inspectors, which does not represent the environmental conditions of lichen across the region. Rather, it continues to support the need for long-term monitoring to understand the variability of the sensitive terrestrial environment.

Table C1. Concentrations of metal(loid)s from the lichen sample collected at Katiktuk Lake in 2024 by LGL and 2023 collected by ArctiConnexion. The 2024 lichen sample is presented as wet and dry weight.

Metal(loid)	**Concentration wet weight (mg/kg)**	**Concentration dry weight (mg/kg)**	**Katiktuk Lake 2023 dry weight (mg/kg)**
Aluminum	2460	1335	4720
Antimony	0.006	0.003	N/A
Arsenic	0.49	0.27	0.52
Barium	15.80	8.58	30.40
Beryllium	0.13	0.07	0.22
Bismuth	0.04	0.02	0.01
Boron	10.10	5.48	19.70
Cadmium	0.05	0.03	0.03
Calcium	36100	19602	50400
Chromium	5.18	2.81	10.50
Cobalt	1.15	0.62	2.04
Copper	3.09	1.68	5.36
Iron	4910	2666	7420
Lead	3.32	1.80	3.10
Lithium	8.87	4.82	24.1
Magnesium	6880	3735	23600
Manganese	99.80	54.20	162.00
Mercury	0.03	0.01	0.04
Molybdenum	0.55	0.30	1.32
Nickel	2.81	1.53	5.46
Phosphorus	173	94	633
Potassium	960	521	2450
Rubidium	8.77	4.76	16.20
Selenium	0.08	0.04	0.10
Silver	0.02	0.01	N/A
Sodium	89.6	48.7	107.0
Strontium	24	13	33
Tellurium	<0.020	<0.020	<0.020
Thallium	0.05	0.03	0.10
Tin	0.26	0.14	1.45
Tungsten	0.05	0.03	N/A
Uranium	1.01	0.55	1.90
Vanadium	4.61	2.50	7.37
Zinc	16.20	8.80	25.20
Zirconium	4.56	2.48	3.10

December 5, 2024

Connor Devereaux
Environmental Manager
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RE: Baffinland Iron Mines Corporation's Mary River Project – Qikiqtani Inuit Association September 2024 2nd Annual Site Inspection Findings and Recommendations

Dear Mr. Devereaux,

Consistent with requirements under Schedule E, Item 12 of the Commercial Lease No.: Q13C301 (CPL), issued to Baffinland Iron Mines Corporation (Baffinland) by the Qikiqtani Inuit Association (QIA), the QIA conducted a Site Inspection (Inspection) of the Mary River Mine (Project) in September 2024. Amoudla Kootoo of QIA conducted the inspection with technical support provided by Joe Cavallo and Mitchell Kay of LGL Ltd. An overview of the inspectors' findings and recommendations is provided below.

The 2024 September Environmental Inspection Report has been appended to this letter for Baffinland's reference. Requested actions are outlined in **Table 1** and can be found on page 15 of the report.

If you have any questions or would like to discuss details, please feel free to contact me at your earliest convenience.

Nakurmiik,

Amoudla Kootoo

Amoudla Kootoo
Water Specialist
Qikiqtani Inuit Association
(P)867.975.8364 or toll-free 1.800.667.2742
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[1] QIA and Baffinland (2013). Commercial Lease No. Q13C301. September 6, 2013.

Table 1: Recommendations

Item No.	Project Location	Requested Action – **UPDATE FROM September 2024 Inspection (BOLD)**
1.	Ditches along the Mine Haul Road	(June 2023 Inspection) The ditches should be reconstructed and sized to convey high flows, and rock check dams should be installed per typical specifications to reduce velocities, allow for settling and to reduce erosion in the ditches. (June 2023 Inspection) Reduction of TSS entering KM 105 pond in upstream catchment will significantly aid in reducing treatment issues in the control pond. **The source of the sediment-laden runoff observed at approximately KM 106.5 should be assessed and remediated to prevent further sedimentation into the Haul Road ditch. We recommend effort be placed on prevention of sediment laden sources of water from entering runoff which contributes to the KM 105 pond input and placing emphasis of treatment at the source.**
2.	KM 105 Pond Sedimentation Pond (North Embankment)	**A report documenting the status of the KM 105 embankment foundation repair is requested.** **The design, operation, and performance criteria specified for the newly installed KM 105 Water Treatment Plant are requested.** **Can BIM confirm what contingency measures will be implemented to ensure that water with elevated TSS from the mine area is not released into the receiving environment downstream of the secondary pond adjacent to the downstream toe of the NW embankment under the full range of flow conditions expected at the site?**
3.	KM 105 Sedimentation Pond (Southwest Embankment)	**A map providing the as-built names and locations of all thermistors that were installed at and are associated with the KM 105 SCP is requested.** **Plots of collected thermistor profile data are requested to assess the nature of permafrost at the locations where thermistors have been installed.**
4.	Throughout the project	**We recommend that an effective sediment and erosion plan be implemented, and that regular and post-flow event monitoring occur by**

	area but particularly at stream crossings	**qualified individuals. ESC controls such as coir logs, sediment curtains and other measures (as possible for this environment) be used liberally.** **Examples of locations to use these measures include:** **• Roadside margins to prevent and/or divert sediment-laden water from flowing towards streams and/or lakes** **• Areas adjacent to waterbodies to prevent sediment-laden water from entering streams and/or lakes.** **We suggest that sediments be controlled at the source as the first step in the treatment train of measures. A maintenance staff and program are recommended to respond to issues in a timely and effective manner. Issues should be proactively addressed (i.e., prior to rain events or spring freshet).**
5.	Immediately downstream of pond KM 105	(June 2023 Inspection) Remediation of the KM 105 pond dam and upstream channel will minimize the amounts of fine sediments able to travel downstream. (June 2023 Inspection) Continue to monitor turbidity, water levels and chemical parameters in pond KM 105. (June 2023 Inspection) Increased ESC controls should be employed to minimize entrained sediments and encourage settling (turbidity curtains, silt fencing, filter logs, etc.) **The functionality of the water treatment system would help to effectively treat water quality.**
6.	Immediately south of the mine road adjacent to the Sheardown Lake Tributary	(June 2023 Inspection) Sediment control fencing or other method of erosion and sediment control (ESC) should be installed at the base of the road to minimize/prevent future sedimentation impacts. **Snow clearing operations should avoid pushing snow into the stream channel.** **Effective marking of the area, visible during the winter would avoid this issue.**
7.	Waste Rock Facility	(June 2023 Inspection) Continue to monitor turbidity and other chemical parameters of effluent and ensure no exceedances.

	Water Treatment Plant at top of Mine Site	(June 2023 Inspection) Ensure contingency plan in the event of large quantities of runoff exceeding capability of the treatment infrastructure. **Complete the leak detection investigation that was scheduled to be completed during the snow free period of 2024 or devise alternate plan to ensure that contents of SCP are not released to the environment.**
8.	KM 106 Ore Stockpile (Glencore)	**A safety plan should be developed to ensure that another flow failure event is not triggered if heavy equipment is operated on the surface of the stockpile whenever the stockpile is relocated.**
9.	KM 81 Stream Crossing	**We suggest that the amount of fine materials in the short section on channel downstream of the culverts, and upstream of the lake, be monitored over time and that an assessment of whether any impacts to fish habitat in Muriel Lake, has occurred.**
10.	SDCT-1 Tributary at KM 63	(June 2023 Inspection) Mitigate the perched condition of the CSP's to ensure free passage of fish through the structure. **Monitor the streambank erosion downstream of the culverts**
11.	KM 33 Stream Crossing	**This area should be observed over time to determine whether fine materials will accumulate to a degree enough to encourage surface flows.**
12.	Milne Port	**A plan to prevent these sediments from entering the nearshore area and ultimately the marine environment should be developed and implemented.**

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December 5, 2024

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Dear Conor:

Re: Water License 2AM-MRY1325 - Mary River Project
Follow up Report to September 11th to September 13th Environmental Inspection
LGL Limited - Commercial Lease Q13C301

Introduction

Consistent with requirements under Schedule E, Item 12 of the Commercial Lease issued to Baffinland Iron Mines Corporation (Baffinland) by the Qikiqtani Inuit Association (QIA), LGL Limited (LGL), along with QIA representative Amoudla Kootoo, conducted the second Annual Environmental Site Inspection (Inspection) of the Mary River Mine Project (Project) on September 11th to 12th, 2024. Joseph Cavallo and Dr. Mitchell Kay, conducted the Inspection on LGL's behalf. A sample of the beach sand at Milne Port was taken by LGL for analysis, the results of which are provided below. This report includes input from Dr. Lois Boxill based on the results of laboratory analyses received recently, as well as other input to critical recommended actions.

The governing objective of this report is to identify issues that in any way undermine or compromise QIA's mission to safeguard "the land, waters and resources" that sustain Qikiqtani Inuit within the Inuit homeland. "Requested actions" describe measures deemed necessary to be taken by Baffinland to correct identified conditions of concern. In response to this report, Baffinland is requested to indicate how each "requested action" will be addressed. Additionally, this report tracks where requested actions from the June 2024 Inspection have or have not been addressed.

Report Structure

Photographs associated with the findings and requested actions made by LGL are provided in **Appendix A**. Findings, figures and tables related to a sample of sand at Milne Port is provided in **Appendix B.** Findings of a mineralogical and chemical analysis of a sample of granular material used for maintenance of the Tote Road can be found in **Appendix C**. An overview of site visit activities, Inspector findings, analysis results and requested actions follow.

Overview of Site Visit Activities

The inspection team composed of representatives from QIA and LGL arrived at site on the evening of Tuesday September 10th, 2024. On the morning of September 11th, the Environmental Inspectors travelled via light duty truck from Sailiivik Camp (also referred to as the Mary River Mine site) to the waste rock facility at the top of the mountain. The weather consisted of 2 – 5 ºC and overcast, with some rain experienced the previous day. Inspectors were driven by a member of Baffinland's Site Services department, Katie Babin, Environmental Superintendent (Baffinland). The Inspection started at the water treatment system for the waste rock facility, which was not on-line as the system was in winter shutdown condition. Observations at the waste rock facility included pooled water at the base of the treatment pond berm. It was indicated that this was likely collected from surface runoff, as the pond had been drained and was holding a fraction of its capacity. Katie Babin communicated Layfield had not yet completed the liner testing of this facility as had been indicated originally during 2023 when seepage was observed. An arctic hare was observed at this location.

At approximately KM 106.5 the Inspectors noticed sediment-laden runoff originating from up-slope on the mountain and running into the north ditch of the haul road. The sediment laden water was visibly turbid. A noticeable increase in turbidity was observed when sediment laden water mixed with the relatively clear runoff from the haul road ditch. The Inspectors walked up slope for a short distance, but the source of the runoff was not determined. Katie Babin indicated that drone imagery could be taken and provided to determine the source and cause of the turbidity.

The Environmental Inspectors evaluated pond KM 105 and the new water treatment system. The treatment system was not functional as it was in winter shutdown condition. It was clarified to the Inspectors that the treatment system was functional only when the dam was holding sufficient water in the upstream holding area. We understood that the water treatment system was not functional for the majority of the time from the end of the June Inspector visit to the winter shutdown. The water held in the area downstream of the dam (seepage water) contained visibly high levels of turbidity, which was conveyed to the natural tundra area downstream of the dam. This area appeared to be inundated with turbid water, indicating much of the sediment dropped out of suspension in this area, creating a sink for fine sediments. No notable efforts since the previous June visit were made to repair the dam seepage issue. It should be noted that the flows from the Sheardown Tributary at the Mine Road were relatively clear with no visible turbidity, indicating sediments are dropping from suspension between the dam and road.

The Inspectors proceeded to the area upstream of the dam where a small amount of discharge was observed, which stopped at the limit of the berm constructed for the grouting equipment. The southwest berm was observed, and no issues were noted.

The Camp Lake drinking water inlet was inspected where several section of deteriorated turbidity curtain was observed. Several areas of sediment control fencing holding back natural sand and gravel accumulations were noted along the southeast limit of the lake. From Camp Lake, the Inspectors proceeded to the landfill. No issues of note were observed.

The Inspectors inspected the two Sheardown Lake Tributaries on the mine site and the two road-culvert crossings. There was less turbidity than observed previously during the June Inspection although there were visible accumulations of fine sediment along the streambed. A conversation during the June visit occurred where we were informed a new surface water treatment pond was being proposed east of Sailiivik Camp on the south side of the road in the area of the Sheardown Tributary. No follow up on the proposal was provided, although we understand this treatment facility is no longer being advanced. The Sheardown Lake tributary was observed along the mine road where no major issues were noted, other than what appeared to be the presence of coarse sand/gravel deposits in the mid-channel where snow dumping was observed during the June visit.

The second day of Inspection on September 12, consisted of 0 ºC and overcast and began at the KM 97 stream crossing of the tote road where no issues were observed. It should be noted one old abutment is still present SW of the stream/tote road crossing. The next stop was at KM 94 where a robust rock revetment along both sides of the road was implemented. The three CSP culverts appeared to be in good condition. Next, the Inspectors observed the KM 81 stream crossing where five CSP culverts have been used to convey water across the Tote Road. It should be noted there was a road washout before the visit and road repairs were ongoing. Three of the culverts at this location are in water, while two are dry and used to convey higher flow events. We were made aware that further culvert work will be completed at this location with DFO input, during January 2025 to finalize repair of the culverts.

The stream crossing at KM 63 was observed where the two CSP culverts located south of the bridge are perched and causing some minor bank erosion downstream. Previously reported since 2022, these two culverts convey flows for a side channel of this stream but are creating a fish barrier for any upstream migration. At KM 33 the stream crossing was repaired recently where two new CSP culverts were installed with rock treatment along the streambed and banks. The channel was noted as dry with no recent evidence of flows upstream of the culvert and to an area approximately 10 m downstream. It appears there are flows under the new rock substrate, but it does not emerge until it proceeds to a previously undisturbed section of streambed. The crossing at KM 17 was inspected and no issues were noted.

The Inspectors looked at the rock quarry where a white substance was observed previously by QIA staff. The substance was identified as road salt used for road maintenance and had been removed and cleaned up from the previous visit.

Milne Port was the final visit of the day where the Inspectors walked along the nearshore area west of the port loading area. This area appears to accumulate wind or water-borne fine iron-ore particulates from the ore stockpiles, which is visible as darker areas in the sand. The inspectors took a sample from a particularly dark sandy area and provided a duplicate sample to Katie Babin. The results of the analysis are provided in this report summarized below and in **Appendix B**. The Environmental Inspectors then returned to Sailiivik Camp to prepare for outgoing flights the following day.

Significant airborne dust was not noted during this Inspection along the tote road, likely due to the relatively wet conditions due to recent rain.

Results of Field Testing

Milne Port Sediment Sample

A sediment sample was collected by LGL Limited from the beach at Milne Port on September 12th, 2024 (coordinates: 71.887356°, -80.912839°) during the scheduled September Inspection. Baffinland received a replicate at the same time and location as LGL. The site is located proximally to both the Milne Port stockpile and marine environment and was identified as a potential area of concern during a previous site visit. The sediment sample represents a snapshot of elemental concentrations at Milne Port beach and likely characterizes the accumulation of dust during the 2024 ice- and snow-free season.

The sediment sample was analyzed by ALS Environmental, an accredited laboratory in Waterloo, Ontario, following EPA Method 6020B (mod), which is used commonly for determination of elemental concentrations in sediment. The concentrations of each element are reported in **Table 1**. Results reveal concentrations did not exceed sediment or soil quality guidelines where applicable. Notably, concentration of iron was 212,000 mg/kg, which is approximately four times (4x) higher than the average concentration of iron in the Earth's crust. Commonly, the Earth's crust serves as an estimate of background concentrations in the absence of site-specific background or sediment quality guidelines. The higher-than-expected concentration of iron is not surprising given the banded iron deposit mined by Baffinland is rich in iron (~67.5%) but does present a potential pathway for elevated concentrations of iron to enter the marine environment. Continued monitoring of this region is recommended to ensure fines and ultra fines carrying potentially elevated concentrations of substances of concern do not enter the marine environment.

Table 1. Concentrations of elements from sediment collected at Milne Port on September 12th, 2024. The concentrations are reported in mg/kg.

Element	Concentration (mg/kg)
Aluminum	6900
Antimony	0.19
Arsenic	7.11
Barium	10.7
Beryllium	0.53
Bismuth	<0.20
Boron	7.6
Cadmium	<0.020
Calcium	4590
Chromium	24.1
Cobalt	16.2
Copper	13.4
Iron	212000
Lead	3.35
Lithium	11.0
Magnesium	5910
Manganese	709
Molybdenum	4.16
Nickel	30.1
Phosphorus	244
Potassium	290
Selenium	<0.20
Silver	<0.10
Sodium	<50
Strontium	4.37
Sulfur	<1000
Thallium	<0.050
Tin	<2.0
Titanium	108
Tungsten	0.54
Uranium	1.85
Vanadium	9.46
Zinc	16.8
Zirconium	2.8

Mineralogical Analysis of Dust Source Materials
Consistent with the recommendation made in the December 2023 inspection report, samples of material used to maintain the Tote Road's running surface, and the fine-grained ore stockpiled and loaded out from Milne Port, were requested to enable completion of mineralogical analysis of the particle sizes that typically create dust (2-10 microns) at the site. At the time of this report, only the requested sample of Tote Road maintenance material had been provided by Baffinland Iron Mines (BIM) for analysis. The test program was developed to characterize the mineralogy of the size fraction of materials that typically produce dust. This information allows dust mitigation measures to be developed using a scientific basis to identify and select binding mechanisms (chemical and physical) best suited for the mineral composition of tested dust source materials.

The materials used to maintain the Tote Road are the suspected source of dust produced from the surface of the Tote Road, especially when used by heavy trucks and equipment. Dust sized particles of the fine-grained ore product stockpiled at and loaded out from Milne Port are the suspected source of iron ore dust observed on ship loading equipment and buildings located at Milne Port.

The Tote Road maintenance material sample was collected during the June 2024 site inspection from one of the two stockpiles located at KM 4. The sampled stockpile contained the most consistently course materials. It was noted stockpiled materials in the other stockpile (Appendix B, Photo 1), were breaking down in place under ambient conditions.

Dust Source Sample Testing Program
The sample of Tote Road Maintenance material was received by the Technology Access Center for Energy & Environment at the Northern Alberta Institute of Technology (NAIT) on July 9 with contracting completed to advance testing on August 8, 2024.

The scope of the test work completed by NAIT on the sample received was as follows:
1. Particle Size Analysis and Bulk XRD/XRF: Initial particle size analysis combined with bulk X-ray Diffraction (XRD) and X-ray Fluorescence (XRF).
2. >75-micron Size Processing: The sample was passed through a 200-mesh sieve and subjected to laser particle size analysis. Using centrifugation, the sample was sorted into the 75- to 10-micron size range. After drying the slurry in an oven at 65°C, bulk XRD/XRF analysis was conducted.
3. 75-micron to 10-micron Size Processing: The sample under 75 microns was centrifuged to isolate the 10-micron to 2-micron particle size range. Laser particle size analysis was then performed on the slurry, and after drying in an oven at 65°C, bulk XRD/XRF analysis was conducted on the 10-micron to 2-micron size fraction.
4. 10-micron to 2-micron Size Processing: The sample under 10 microns was subjected to additional centrifugation to separate particles smaller than 2-microns. Laser particle size analysis was performed on this slurry, and after drying in an oven at 65°C, bulk XRD/XRF analysis was conducted on the fraction smaller than 2-microns.
5. Detailed Clay Analysis: Detailed clay analysis was performed on the fraction smaller than 2-microns.

Findings for Tote Road Maintenance Materials

The final report from NAIT was released on October 29, 2024. The key findings of the completed analyses were as follows:

- 72% of the material was non dusting (>75 microns) and comprised mostly of quartz.
- 28% of the material created dust with 5% of the material being in the <10micron size of most concern for human health and environmental impact.
- The dust fraction is comprised primarily of feldspars (26% K-feldspar and 39% Plag-Feldspar), 23% quartz, with a minimum of 6% total clay minerals.
- The K-feldspar was found in all the dusting fractions at higher amounts than would be expected if all the minerals contributed equally to the dust. This indicates that the K-feldspar is naturally fine or is more susceptible to breakdown than the Quartz and Plag-Feldspar phases.
- **The clay minerals and the K-feldspar were enriched in the dusting fractions and may be the major contributors to dust formation**.
- The clay minerals present are Chlorite and Illite.
- Ca-Montmorillonite is a swelling clay that will change volume depending on degree of saturation. **The presence of Ca-Montmorillonite at grain boundaries of larger phases could contribute to disaggregation/dusting during repeated wetting-drying cycles.**
- **Chlorite** while not a swelling mineral **is expected to be less responsive to traditional coagulant based dust suppressants due to its more hydrophobic nature and more stable interlayer**.

These findings confirm several observations that have been made at site to date:

1. While road wetting with water is used as the primary means of dust suppression, the Ca-Montmorillonite component is impacted by repeated wetting and drying cycles and can lead to the contribution of these clay minerals to dust generated when vehicles are driven on dry road surfaces.
2. The high feldspar content would explain why some stockpiled Tote Road maintenance materials were observed to be breaking down into finer particles under ambient conditions. This elevated feldspar content also explains why dusting readily occurs when these materials are subjected to loads exerted by the haul trucks, and other vehicles/equipment use the Tote Road.
3. Traditional coagulant type dust suppressants would offer limited effect given the hydrophobic nature of the chlorite present.

Critical Recommended Actions

The liner at the Waste Rock Facility treatment pond remains untested by the supplier and therefore carries a risk of seepage of untreated water into the adjacent tundra. We recommend the liner be tested as soon as feasible (i.e. when the pond holds adequate volume), and repair, if necessary, to the liner take place to prevent future seepage.

The source of the sediment-laden runoff observed at approximately KM 106.5 should be assessed and remediated to prevent further sedimentation into the Haul Road ditch. We have learned since the Inspection, the source is likely from a fracture in the bedrock that is receiving sediment laden water from somewhere in the active mining area. High-level drone imagery was provided of the area, but did not provide a clear image of the source of the sediment laden water. We recommend this be remediated and the amount of sediment laden water be minimized to the greatest degree possible. We also would encourage effort be placed on prevention of sediment laden sources of water from entering runoff which contributes to the KM 105 pond input and placing emphasis of treatment at the source of sedimentation.

As described to the Inspectors, the water treatment system at KM 105 is not functional while the dam is not able to hold back water. The water treatment system would, therefore, appear to not be a viable form of water treatment until dam repairs are completed. QIA is of the opinion a clear plan is required for the repair of the KM 105 dam, or an effective alternative should be presented. The treatment of runoff from the active mining area and haul roads, remains the utmost of importance to QIA. The long-term effects to all areas downstream of the dam and to Sheardown Lake are at risk. It is our professional opinion that some of the concerns, namely the exceedances of TSS and the sustained high concentrations of high levels of TSS could be in contravention of section 34(1) *deleterious substance* of the federal *Fisheries Act*. Areas a few hundred metres downstream of KM 105 pond directly support fish and fish habitat, and as such, increased priority should be placed on preventing sediments from entering these waters. Control of the source of sediments is crucial and the fundamental principal in sediment and erosion control. As with the previous inspections, the extent of sediment loading into Sheardown Lake is unacceptable and effective measures should be taken to rectify all sediment transport conditions

We continue to recommend a more robust implementation of erosion and sediment control (ESC) and other mitigation measures when concerns are noted. Part of this process is the immediate identification of issues with the potential to impact waterbodies or other sensitive environmental areas, prior to them occurring. This should be followed by clear plans and implementation of measures that are demonstrably effective. We suggest stockpiles of ESC controls such as coir logs be kept on site and ready for use as needed as these have shown to be effective for controlling runoff in this environment.

At the KM 81 stream crossing, a failure of the road materials caused the Tote Road to be closed days prior to the inspection visit. The road was re-opened during our inspection and we were able to observe the repairs to the road and the culverts. Five CSP culverts at various elevations have been installed at the location of this small, permanently flowing stream that flows into Muriel Lake a short distance downstream. It is unknown how much of the road granular material had washed into Muriel Lake, but observations immediately upstream of the lake did suggest some accumulation of material, particularly fine materials appearing to be fine sand, silt and possibly clay. Some mid-channel accumulations of material were observed, but it is unknown if this was a result of the road failure. We suggest the amount of fine materials in the short section of channel downstream of the culverts, and upstream of the lake, be monitored over time to ensure there have been no impacts to fish habitat in Muriel Lake. It is possible that fine materials from the road have covered important habitat for Arctic Char in Muriel Lake.

The two CSPs located south of the bridge at the KM 63 stream crossing have been addressed previously in past inspection reports. The structures remain perched above the channel they convey, creating a barrier to fish passage within this side channel of the stream. Streambank erosion has also been noted downstream, likely resulting from turbulent flows caused by the CSP's. We understand DFO has observed this location and has not provided any mitigative advice.

We suggest the culverts should be installed at the correct channel invert elevation, and/or embedded with native substrate, to eliminate this barrier.

At KM 33 the stream crossing recent rock revetment work was completed. Water flow was not observed upstream, or at the culvert and for the length (approx. 10 m) of the revetment work downstream. However, flows were observed from under the rocks placed for the revetment work and into the channel. The voids in the recently placed rock material are allowing flow to proceed under the material, which does not allow for fish passage into and upstream of the culvert. Finer materials should have been mixed into the rocks to prevent this situation. This area should be observed over time to determine whether fine materials will accumulate to a degree enough to encourage surface flows.

The dark coloured sediments at Milne Port we believe are a result of wind and water borne accumulations of iron-ore from nearby stockpiles. The geochemical analysis presented in this report indicated the samples contained an elevated level of iron (4x the level of the earth's crust). While iron is not acutely toxic to aquatic, terrestrial or marine life, accumulations could cause unknown results over the long-term. The proximity of the iron rich sediments to the marine environment of Milne Inlet presents an unknown risk of this material entering the water and the food chain. This presents an unknown risk to sensitive marine species, many of which the Inuit rely on for subsistence. A plan to prevent these sediments from entering the nearshore area and ultimately the marine environment should be developed and implemented.

The tables immediately following this portion of the report, describe identified concerns, many of which are associated with observations reported following the 2023 inspections. In that table, new or updated recommended actions are written in **bold**.

Closing

It is our professional opinion that efforts must continue to reduce and eliminate elevated TSS loadings to fish habitat and receiving environments. Freshet remains a period of primary focus and efforts must be taken to ensure that sediment laden water entering the KM 105 SCP do not provide sources for elevated sediment loading to Sheardown Lake. While the Inspectors understand persisting challenges associated with trying to render the foundation of the northwest embankment of KM 105 watertight. The inability to restore proper function of this facility does not eliminate the requirement for BIM to adequately reduce and avoid elevated TSS loading to fish bearing habitat downstream of this facility. It is hoped recommendations related to consistent use of ESC controls including coconut coir logs and treatment at the source of issues, will be heeded to limit sediment loadings to all areas where protection is required.

It is also hoped that Baffinland seizes opportunities to improve overall management of dust along the Tote Road, that are enabled by increased awareness of the mineralogy of the materials used to maintain this road. Analytical data received from the sample evaluated at NAIT indicates how mineralogical information can confirm the source and nature of dust-sized particles to be treated. This information enables more effective identification and screening of mitigation measures, especially at lab/bench scale where the performance efficacy of dust mitigation measures can be evaluated prior to completing trials at field scale. Such opportunities would be extended to the management of ore dust, especially at the Milne Port site and adjacent areas if the requested sample of the fine-grained ore materials was provided for the analysis that was completed on Tote Road maintenance materials.

For further description of concerns and requested actions, please the comments and recommendations table that follows. Should you wish to discuss any aspects of this letter, please feel free to contact either of the undersigned.

Sincerely,

Joseph Cavallo	***Mitchell Kay, Ph.D***
Senior Biologist	***Senior Aquatic Scientist***
LGL Limited	**LGL Limited**

LGL Limited – Ecological Review of the Mary River Project				
Item No.	**Project Location**	**Description of Concern – UPDATED FROM JUNE 2024 VISIT (BOLD)**	**QIA Requested Action – UPDATE FROM JUNE 2024 VISIT (BOLD)**	**Has the Concern Been Addressed from June 2024 Recommendations**
1	Ditches along the Mine Haul Road	The informal ditches are collecting road and hillslope runoff and is flowing downstream unchecked and with no controls during high flow periods. **Sediment-laden runoff was observed on September 11 originating from up-slope at approximately KM 106.5 running into the north ditch of the haul road.**	• The ditches should be reconstructed and sized to convey high flows, and rock check dams should be installed per typical specifications to reduce velocities, allow for settling and to reduce erosion in the ditches. • Reduction of TSS entering KM 105 pond in upstream catchment will significantly aid in reducing treatment issues in the control pond. • **The source of the sediment-laden runoff observed at approximately KM 106.5 should be assessed and remediated to prevent further sedimentation into the Haul Road ditch. We recommend effort be placed on prevention of sediment laden sources of water from entering runoff which contributes to the KM 105 pond input, and**	No action observed.

LGL Limited – Ecological Review of the Mary River Project				
Item No.	**Project Location**	**Description of Concern – UPDATED FROM JUNE 2024 VISIT (BOLD)**	**QIA Requested Action – UPDATE FROM JUNE 2024 VISIT (BOLD)**	**Has the Concern Been Addressed from June 2024 Recommendations**
			placing emphasis of treatment at the source.	
2	KM 105 Pond Sedimentation Pond (North Embankment)	Seepage under the constructed dam structure related to the incident on July 14/15, 2022, and May 20, 2023. **The new water treatment system is not functional until the dam is repaired, and water is held back upstream of the dam.**	**A report documenting the status of the KM 105 embankment foundation repair is requested.** **The design, operation, and performance criteria specified for the new installed KM 105 Water Treatment Plant are requested.** **Can BIM confirm what contingency measures will be implemented to ensure that water with elevated TSS from the mine area is not released into the receiving environment downstream of the secondary pond adjacent to the downstream toe of the NW embankment under the full range of flow conditions expected at the site?**	Yes, but attempts to repair in the leak in early 2024 have been unsuccessful.
3	KM 105 Sedimentation Pond (Southwest Embankment)	Significant failure of the upstream slope. **Cables and readout boxes for two thermometer strings were observed adjacent to the crest. BIM staff explained that the cables had been extended data**	**A map providing the as-built names and locations of all thermistors that were installed at and are associated with the KM 105 SCP is requested.**	No action required.

LGL Limited – Ecological Review of the Mary River Project				
Item No.	**Project Location**	**Description of Concern – UPDATED FROM JUNE 2024 VISIT (BOLD)**	**QIA Requested Action – UPDATE FROM JUNE 2024 VISIT (BOLD)**	**Has the Concern Been Addressed from June 2024 Recommendations**
		collected by personnel designated as responsible for collecting this data. **What is the operational state of all installed thermistors and has the collected data been plotted and analyzed?**	**Plots of collected thermistor profile data are requested to assess the nature of permafrost at the locations where thermistors have been installed.**	
4	Throughout the project area but particularly at stream crossings	High amounts of road sediments are entering stream channels and lakes throughout the site. Rain and snowmelt events exacerbate this.	**We recommend that an effective sediment and erosion plan be implemented and that regular and post-flow event monitoring occur by qualified individuals. ESC controls such as coir logs, sediment curtains and other measures (as possible for this environment) be used liberally. Examples of locations to use these measures include:** • **Roadside margins to prevent and/or divert sediment-laden water from flowing towards streams and/or lakes** • **Areas adjacent to waterbodies to prevent sediment-laden water from entering streams and/or lakes.**	**Yes, some stream crossings have been lined with extensive areas of angular rock. We continue to recommend more liberal use of coir logs along any of the roads, to prevent sedimentation into the streams and lakes**

LGL Limited – Ecological Review of the Mary River Project				
Item No.	**Project Location**	**Description of Concern – UPDATED FROM JUNE 2024 VISIT (BOLD)**	**QIA Requested Action – UPDATE FROM JUNE 2024 VISIT (BOLD)**	**Has the Concern Been Addressed from June 2024 Recommendations**
			We suggest that sediments be controlled at the source as the first step in the treatment train of measures. A maintenance staff and program are recommended to respond to issues in a timely and effective manner. Issues should be proactively addressed (i.e., prior to rain events or spring freshet).	
5	Immediately downstream of pond KM 105	Fine sediments (silt/clay) were observed in the areas downstream of the KM 105 dam. These sediments are believed to be a result of the dam bypass and from high sediment load events. The sediments appear to be fine silts/clays. These introduced fine sediments have the potential to change the shallow soil characteristics (nutrient balance, pH, and other edaphic characteristics) and have an altering effect on the native vegetation.	• Remediation of the KM 105 pond dam and upstream channel will minimize the amounts of fine sediments able to travel downstream. • Continue to monitor turbidity, water levels and chemical parameters in pond KM 105. • Increased ESC controls should be employed to minimize entrained sediments and encourage settling (turbidity curtains, silt fencing, filter logs, etc.) • **The functionality of the water treatment system would help to effectively treat water quality**	Yes, but attempts to repair KM 105 pond have been unsuccessful.
6	Immediately south of the mine road adjacent to the	The mine road is immediately adjacent to the Sheardown Lake	• Sediment control fencing or other method of erosion and	No action observed.

LGL Limited – Ecological Review of the Mary River Project				
Item No.	**Project Location**	**Description of Concern – UPDATED FROM JUNE 2024 VISIT (BOLD)**	**QIA Requested Action – UPDATE FROM JUNE 2024 VISIT (BOLD)**	**Has the Concern Been Addressed from June 2024 Recommendations**
	Sheardown Lake Tributary	tributary for approximately 200 m on the south side of the mine road. There is a potential for sediments from the road to directly enter the tributary following rain and snowmelt events. **Snow with high sediment load was observed in the stream channel in June 2024. No actions to prevent this from occurring again were observed.**	sediment control (ESC) should be installed at the base of the road to minimize/prevent future sedimentation impacts. • **Snow clearing operations should avoid pushing snow into the stream channel. Effective marking of the area, visible during the winter would avoid this issue.**	The installation of coir logs or other ESC measures could help to prevent road sediments from entering the stream channel.
7	Waste Rock Facility Water Treatment Plant at top of Mine Site	We observed the Treatment Plant at the top of the Mine Site where ferric-flocculant- lime treatment train was in use to mitigate low pH runoff from the mining areas. Effluent was discharged several hundred metres to the east onto the tundra. No issues were noted on the date of observation. Conditions were snow covered and the plant was not yet running. **The treatment pond leakage planned to be tested in the summer of 2024 to diagnose the source of the loss of water did not occur.**	• Continue to monitor turbidity and other chemical parameters of effluent and ensure no exceedances. • Ensure contingency plan in the event of large quantities of runoff exceeding capability of the treatment infrastructure.	**Complete the leak detection investigation that was scheduled to be completed during the snow free period of 2024 or devise alternate plan to ensure that contents of SCP are not released to the environment.**

LGL Limited – Ecological Review of the Mary River Project				
Item No.	**Project Location**	**Description of Concern – UPDATED FROM JUNE 2024 VISIT (BOLD)**	**QIA Requested Action – UPDATE FROM JUNE 2024 VISIT (BOLD)**	**Has the Concern Been Addressed from June 2024 Recommendations**
8	KM 106 Ore Stockpile (Glencore)	It was understood from BIM staff that the entire stockpile is owned by Glencore and is planned to be transported to Steensby Port upon completion. An area of fines was observed in the upper reaches of the north facing slope of the stockpile.	• **A safety plan should be developed to ensure that another flow failure event is not triggered if heavy equipment is operated on the surface of the stockpile whenever the stockpile is relocated.**	No further actions have been taken at this location.
9	KM 81 Stream Crossing	**A road washout previous to the visit had occurred and road repairs were ongoing during the inspection.**	• **We suggest that the amount of fine materials in the short section of channel downstream of the culverts, and upstream of the lake, be monitored over time and that an assessment of whether any impacts to fish habitat in Muriel Lake, has occurred.**	New concern
10	SDCT-1 Tributary at KM 63	The two CSP's south of the main bridge structure are significantly perched creating a barrier to fish passage. Streambank erosion has occurred downstream of the two CSP culverts due to scour.	• Mitigate the perched condition of the CSP's to ensure free passage of fish through the structure. • **Monitor the streambank erosion downstream of the culverts**	No action observed.
11	KM 33 Stream Crossing	Recent rock revetment work was completed. Water is flowing under	• **This area should be observed over time to determine whether fine**	New concern.

LGL Limited – Ecological Review of the Mary River Project				
Item No.	**Project Location**	**Description of Concern – UPDATED FROM JUNE 2024 VISIT (BOLD)**	**QIA Requested Action – UPDATE FROM JUNE 2024 VISIT (BOLD)**	**Has the Concern Been Addressed from June 2024 Recommendations**
		the recently placed rocks preventing fish passage.	**materials will accumulate to a degree enough to encourage surface flows.**	
12	Milne Port	**Dark coloured sediments at Milne Port have been observed since 2023. A sample of the material was collected and analyzed and reported an elevated level of iron.**	• **A plan to prevent these sediments from entering the nearshore area and ultimately the marine environment should be developed and implemented.**	New concern.

Appendix A – Photo Appendix

Photo 1 – Waste Rock Facility treatment pond (Sep 2024).

Photo 2 – Waste Rock Facility treatment pond – pooled water at base of berm (Sep 2024).

Photo 3 – Sediment laden runoff from upslope at KM106.5 (Sep 2024).

Photo 4 – Upstream of sediment laden runoff from upslope at KM106.5 (Sep 2024).

Photo 5 – Downstream of sediment laden runoff from upslope at KM106.5 (Sep 2024).

Photo 6 – Upstream of KM105 pond with SW Embankment visible on the right side (Sep 2024).

Photo 7 – Downstream of KM105 Dam (Sep 2024).

Photo 8 – Downstream of KM105 Dam looking at sediment laden runoff on the tundra (Sep 2024).

Photo 9 – Downstream of KM105 Dam looking at sediment laden runoff on the tundra (Sep 2024).

Photo 10 – Fine sediment accumulation on rocks – Sheardown Tributary east of Sailiivik Camp (Sep 2024).

Photo 11 – Fine sediment accumulation on rocks – Sheardown Tributary east of Sailiivik Camp. Example of location where use of coir logs could be implemented (Sep 2024).

Photo 12 – Sheardown Tributary north of Sailiivik Camp where snow management is required (Sep 2024).

Photo 13 – KM81 watercourse crossing where road has washed out – downstream side (Sep 2024).

Photo 14 – KM81 watercourse crossing where road has washed out – upstream side (Sep 2024).

Photo 15 – KM81 watercourse crossing where road has washed out – area of possible deposition of road materials with Muriel lake in background (Sep 2024).

Photo 16 – KM63 watercourse crossing – perched CSP culverts (Sep 2024).

Photo 17 – KM63 watercourse crossing – streambank erosion downstream of perched CSP culverts (Sep 2024).

Photo 18 – KM33 watercourse crossing – flow under recently placed rocks (Sep 2024).

Photo 19 – KM33 watercourse crossing – flow emerging from under recently placed rocks visible (Sep 2024).

Photo 20 – Milne Port beach with dark coloured iron-ore rich sand visible to the left (Sep 2024).

Photo 21 – Milne Port beach sample location (Sep 2024).

Appendix B – Milne Port Beach Sample Analysis

right solutions.
right partner.

CERTIFICATE OF ANALYSIS

Work Order	:	**WT2431364**			
Client	:	**LGL Limited, Environmental Research Associates**	Laboratory	:	ALS Environmental - Waterloo
Contact	:	Mitchell Kay	Account Manager	:	Andrew Martin
Address	:	445 Thompson Dr Unit 2 Cambridge Ontario Canada N1T 2K7	Address	:	60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	:	----	Telephone	:	+1 519 886 6910
Project	:	FA0238-I	Date Samples Received	:	21-Oct-2024 18:35
PO	:	----	Date Analysis Commenced	:	26-Oct-2024
C-O-C number	:	----	Issue Date	:	29-Oct-2024 13:50
Sampler	:	Client			
Site	:	----			
Quote number	:	Ontario 2024 SOA			
No. of samples received	:	1			
No. of samples analysed	:	1			

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*
Walt Kippenhuck	Supervisor - Inorganic	Metals, Waterloo, Ontario

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*
mg/kg	milligrams per kilogram

<: 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.

Analytical Results

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

				Client sample ID	Milne Port Beach Sediment	----	----	----	----
				Client sampling date / time	21-Oct-2024 00:00	----	----	----	----
Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	WT2431364-001	----	----	----	----
					Result	----	----	----	----
Metals									
Aluminum	7429-90-5	E440C/WT	50	mg/kg	6900	----	----	----	----
Antimony	7440-36-0	E440C/WT	0.10	mg/kg	0.19	----	----	----	----
Arsenic	7440-38-2	E440C/WT	0.10	mg/kg	7.11	----	----	----	----
Barium	7440-39-3	E440C/WT	0.50	mg/kg	10.7	----	----	----	----
Beryllium	7440-41-7	E440C/WT	0.10	mg/kg	0.53	----	----	----	----
Bismuth	7440-69-9	E440C/WT	0.20	mg/kg	<0.20	----	----	----	----
Boron	7440-42-8	E440C/WT	5.0	mg/kg	7.6	----	----	----	----
Cadmium	7440-43-9	E440C/WT	0.020	mg/kg	<0.020	----	----	----	----
Calcium	7440-70-2	E440C/WT	50	mg/kg	4590	----	----	----	----
Chromium	7440-47-3	E440C/WT	0.50	mg/kg	24.1	----	----	----	----
Cobalt	7440-48-4	E440C/WT	0.10	mg/kg	16.2	----	----	----	----
Copper	7440-50-8	E440C/WT	0.50	mg/kg	13.4	----	----	----	----
Iron	7439-89-6	E440C/WT	50	mg/kg	212000	----	----	----	----
Lead	7439-92-1	E440C/WT	0.50	mg/kg	3.35	----	----	----	----
Lithium	7439-93-2	E440C/WT	2.0	mg/kg	11.0	----	----	----	----
Magnesium	7439-95-4	E440C/WT	20	mg/kg	5910	----	----	----	----
Manganese	7439-96-5	E440C/WT	1.0	mg/kg	709	----	----	----	----
Molybdenum	7439-98-7	E440C/WT	0.10	mg/kg	4.16	----	----	----	----
Nickel	7440-02-0	E440C/WT	0.50	mg/kg	30.1	----	----	----	----
Phosphorus	7723-14-0	E440C/WT	50	mg/kg	244	----	----	----	----
Potassium	7440-09-7	E440C/WT	100	mg/kg	290	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method/Lab/Accreditation	LOR	Unit	Milne Port Beach Sediment	----	----	----	----
				Client sampling date / time	21-Oct-2024 00:00	----	----	----	----
					WT2431364-001	----	----	----	----
					Result	----	----	----	----
Metals									
Selenium	7782-49-2	E440C/WT	0.20	mg/kg	<0.20	----	----	----	----
Silver	7440-22-4	E440C/WT	0.10	mg/kg	<0.10	----	----	----	----
Sodium	7440-23-5	E440C/WT	50	mg/kg	<50	----	----	----	----
Strontium	7440-24-6	E440C/WT	0.50	mg/kg	4.37	----	----	----	----
Sulfur	7704-34-9	E440C/WT	1000	mg/kg	<1000	----	----	----	----
Thallium	7440-28-0	E440C/WT	0.050	mg/kg	<0.050	----	----	----	----
Tin	7440-31-5	E440C/WT	2.0	mg/kg	<2.0	----	----	----	----
Titanium	7440-32-6	E440C/WT	1.0	mg/kg	108	----	----	----	----
Tungsten	7440-33-7	E440C/WT	0.50	mg/kg	0.54	----	----	----	----
Uranium	7440-61-1	E440C/WT	0.050	mg/kg	1.85	----	----	----	----
Vanadium	7440-62-2	E440C/WT	0.20	mg/kg	9.46	----	----	----	----
Zinc	7440-66-6	E440C/WT	2.0	mg/kg	16.8	----	----	----	----
Zirconium	7440-67-7	E440C/WT	1.0	mg/kg	2.8	----	----	----	----

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.

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	:**WT2431364**	Page	: 1 of 5
Client	:**LGL Limited, Environmental Research Associates**	Laboratory	: ALS Environmental - Waterloo
Contact	:Mitchell Kay	Account Manager	: Andrew Martin
Address	:445 Thompson Dr Unit 2 Cambridge ON Canada N1T 2K7	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:----	Telephone	: +1 519 886 6910
Project	:FA0238-I	Date Samples Received	: 21-Oct-2024 18:35
PO	:----	Issue Date	: 29-Oct-2024 13:37
C-O-C number	:----		
Sampler	:Client		
Site	:----		
Quote number	:Ontario 2024 SOA		
No. of samples received	:1		
No. of samples analysed	:1		

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 Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- 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)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

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 : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Non compliant container Milne Port Beach Sediment	E440C	21-Oct-2024	25-Oct-2024	180 days	5 days	✓	26-Oct-2024	180 days	6 days	✓

Legend & Qualifier Definitions

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)							
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	1725601	1	7	14.2	5.0	✓
Laboratory Control Samples (LCS)							
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	1725601	2	7	28.5	10.0	✓
Method Blanks (MB)							
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	1725601	1	7	14.2	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*
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C ALS Environmental - Waterloo	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 355 µm 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.

Preparation Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
Digestion for Metals and Mercury (355 µm Sieve)	EP440C ALS Environmental - Waterloo	Soil/Solid	EPA 200.2 (mod)	Samples are sieved through a 355 µm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.

ALS Canada Ltd.

QUALITY CONTROL REPORT

Work Order	: **WT2431364**		Page	: 1 of 10
Client	: LGL Limited, Environmental Research Associates		Laboratory	: ALS Environmental - Waterloo
Contact	: Mitchell Kay		Account Manager	: Andrew Martin
Address	: 445 Thompson Dr Unit 2 Cambridge ON Canada N1T 2K7		Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----		Telephone	: +1 519 886 6910
Project	: FA0238-I		Date Samples Received	: 21-Oct-2024 18:35
PO	: ----		Date Analysis Commenced	: 25-Oct-2024
C-O-C number	: ----		Issue Date	: 29-Oct-2024 13:37
Sampler	: Client			
Site	: ----			
Quote number	: Ontario 2024 SOA			
No. of samples received	: 1			
No. of samples analysed	: 1			

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
- 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*
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario

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
Metals (QC Lot: 1725601)											
WT2431379-001	Anonymous	Aluminum	7429-90-5	E440C	50	mg/kg	12200	13000	6.42%	40%	----
		Antimony	7440-36-0	E440C	0.10	mg/kg	0.22	0.23	0.01	Diff <2x LOR	----
		Arsenic	7440-38-2	E440C	0.10	mg/kg	4.72	4.87	3.12%	30%	----
		Barium	7440-39-3	E440C	0.50	mg/kg	137	148	7.65%	40%	----
		Beryllium	7440-41-7	E440C	0.10	mg/kg	0.60	0.61	0.01	Diff <2x LOR	----
		Bismuth	7440-69-9	E440C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		Boron	7440-42-8	E440C	5.0	mg/kg	11.8	11.8	0.03	Diff <2x LOR	----
		Cadmium	7440-43-9	E440C	0.020	mg/kg	0.135	0.142	4.78%	30%	----
		Calcium	7440-70-2	E440C	50	mg/kg	66100	72500	9.26%	30%	----
		Chromium	7440-47-3	E440C	0.50	mg/kg	19.3	20.2	4.48%	30%	----
		Cobalt	7440-48-4	E440C	0.10	mg/kg	9.22	9.63	4.38%	30%	----
		Copper	7440-50-8	E440C	0.50	mg/kg	17.6	18.6	5.44%	30%	----
		Iron	7439-89-6	E440C	50	mg/kg	22200	23200	4.32%	30%	----
		Lead	7439-92-1	E440C	0.50	mg/kg	13.0	13.7	5.08%	40%	----
		Lithium	7439-93-2	E440C	2.0	mg/kg	22.3	21.7	2.51%	30%	----
		Magnesium	7439-95-4	E440C	20	mg/kg	20200	21400	5.63%	30%	----
		Manganese	7439-96-5	E440C	1.0	mg/kg	755	801	5.93%	30%	----
		Molybdenum	7439-98-7	E440C	0.10	mg/kg	0.96	1.05	9.66%	40%	----
		Nickel	7440-02-0	E440C	0.50	mg/kg	21.7	22.7	4.37%	30%	----
		Phosphorus	7723-14-0	E440C	50	mg/kg	599	638	6.30%	30%	----
		Potassium	7440-09-7	E440C	100	mg/kg	2310	2110	9.11%	40%	----
		Selenium	7782-49-2	E440C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		Silver	7440-22-4	E440C	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		Sodium	7440-23-5	E440C	50	mg/kg	292	305	4.43%	40%	----
		Strontium	7440-24-6	E440C	0.50	mg/kg	133	135	1.66%	40%	----
		Sulfur	7704-34-9	E440C	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		Thallium	7440-28-0	E440C	0.050	mg/kg	0.102	0.099	0.003	Diff <2x LOR	----
		Tin	7440-31-5	E440C	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		Titanium	7440-32-6	E440C	1.0	mg/kg	198	203	2.33%	40%	----
		Tungsten	7440-33-7	E440C	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Metals (QC Lot: 1725601) - continued											
WT2431379-001	Anonymous	Uranium	7440-61-1	E440C	0.050	mg/kg	0.733	0.756	3.02%	30%	----
		Vanadium	7440-62-2	E440C	0.20	mg/kg	26.5	27.5	3.54%	30%	----
		Zinc	7440-66-6	E440C	2.0	mg/kg	57.4	61.8	7.32%	30%	----
		Zirconium	7440-67-7	E440C	1.0	mg/kg	7.9	8.4	6.92%	30%	----

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
Metals (QCLot: 1725601)						
Aluminum	7429-90-5	E440C	50	mg/kg	<50	----
Antimony	7440-36-0	E440C	0.1	mg/kg	<0.10	----
Arsenic	7440-38-2	E440C	0.1	mg/kg	<0.10	----
Barium	7440-39-3	E440C	0.5	mg/kg	<0.50	----
Beryllium	7440-41-7	E440C	0.1	mg/kg	<0.10	----
Bismuth	7440-69-9	E440C	0.2	mg/kg	<0.20	----
Boron	7440-42-8	E440C	5	mg/kg	<5.0	----
Cadmium	7440-43-9	E440C	0.02	mg/kg	<0.020	----
Calcium	7440-70-2	E440C	50	mg/kg	<50	----
Chromium	7440-47-3	E440C	0.5	mg/kg	<0.50	----
Cobalt	7440-48-4	E440C	0.1	mg/kg	<0.10	----
Copper	7440-50-8	E440C	0.5	mg/kg	<0.50	----
Iron	7439-89-6	E440C	50	mg/kg	<50	----
Lead	7439-92-1	E440C	0.5	mg/kg	<0.50	----
Lithium	7439-93-2	E440C	2	mg/kg	<2.0	----
Magnesium	7439-95-4	E440C	20	mg/kg	<20	----
Manganese	7439-96-5	E440C	1	mg/kg	<1.0	----
Molybdenum	7439-98-7	E440C	0.1	mg/kg	<0.10	----
Nickel	7440-02-0	E440C	0.5	mg/kg	<0.50	----
Phosphorus	7723-14-0	E440C	50	mg/kg	<50	----
Potassium	7440-09-7	E440C	100	mg/kg	<100	----
Selenium	7782-49-2	E440C	0.2	mg/kg	<0.20	----
Silver	7440-22-4	E440C	0.1	mg/kg	<0.10	----
Sodium	7440-23-5	E440C	50	mg/kg	<50	----
Strontium	7440-24-6	E440C	0.5	mg/kg	<0.50	----
Sulfur	7704-34-9	E440C	1000	mg/kg	<1000	----
Thallium	7440-28-0	E440C	0.05	mg/kg	<0.050	----
Tin	7440-31-5	E440C	2	mg/kg	<2.0	----
Titanium	7440-32-6	E440C	1	mg/kg	<1.0	----
Uranium	7440-61-1	E440C	0.05	mg/kg	<0.050	----
Vanadium	7440-62-2	E440C	0.2	mg/kg	<0.20	----
Zinc	7440-66-6	E440C	2	mg/kg	<2.0	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1725601) - continued						
Zirconium	7440-67-7	E440C	1	mg/kg	<1.0	----

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	Target Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 1725601)									
Aluminum	7429-90-5	E440C	50	mg/kg	200 mg/kg	98.5	80.0	120	----
Antimony	7440-36-0	E440C	0.1	mg/kg	100 mg/kg	105	80.0	120	----
Arsenic	7440-38-2	E440C	0.1	mg/kg	100 mg/kg	108	80.0	120	----
Barium	7440-39-3	E440C	0.5	mg/kg	25 mg/kg	109	80.0	120	----
Beryllium	7440-41-7	E440C	0.1	mg/kg	10 mg/kg	99.5	80.0	120	----
Bismuth	7440-69-9	E440C	0.2	mg/kg	100 mg/kg	96.5	80.0	120	----
Boron	7440-42-8	E440C	5	mg/kg	100 mg/kg	97.3	80.0	120	----
Cadmium	7440-43-9	E440C	0.02	mg/kg	10 mg/kg	98.8	80.0	120	----
Calcium	7440-70-2	E440C	50	mg/kg	5000 mg/kg	100	80.0	120	----
Chromium	7440-47-3	E440C	0.5	mg/kg	25 mg/kg	104	80.0	120	----
Cobalt	7440-48-4	E440C	0.1	mg/kg	25 mg/kg	101	80.0	120	----
Copper	7440-50-8	E440C	0.5	mg/kg	25 mg/kg	100	80.0	120	----
Iron	7439-89-6	E440C	50	mg/kg	100 mg/kg	100	80.0	120	----
Lead	7439-92-1	E440C	0.5	mg/kg	50 mg/kg	102	80.0	120	----
Lithium	7439-93-2	E440C	2	mg/kg	25 mg/kg	99.3	80.0	120	----
Magnesium	7439-95-4	E440C	20	mg/kg	5000 mg/kg	107	80.0	120	----
Manganese	7439-96-5	E440C	1	mg/kg	25 mg/kg	104	80.0	120	----
Molybdenum	7439-98-7	E440C	0.1	mg/kg	25 mg/kg	104	80.0	120	----
Nickel	7440-02-0	E440C	0.5	mg/kg	50 mg/kg	101	80.0	120	----
Phosphorus	7723-14-0	E440C	50	mg/kg	1000 mg/kg	108	80.0	120	----
Potassium	7440-09-7	E440C	100	mg/kg	5000 mg/kg	108	80.0	120	----
Selenium	7782-49-2	E440C	0.2	mg/kg	100 mg/kg	102	80.0	120	----
Silver	7440-22-4	E440C	0.1	mg/kg	10 mg/kg	98.6	80.0	120	----
Sodium	7440-23-5	E440C	50	mg/kg	5000 mg/kg	104	80.0	120	----
Strontium	7440-24-6	E440C	0.5	mg/kg	25 mg/kg	102	80.0	120	----
Sulfur	7704-34-9	E440C	1000	mg/kg	5000 mg/kg	95.8	80.0	120	----
Thallium	7440-28-0	E440C	0.05	mg/kg	100 mg/kg	97.1	80.0	120	----
Tin	7440-31-5	E440C	2	mg/kg	50 mg/kg	102	80.0	120	----
Titanium	7440-32-6	E440C	1	mg/kg	25 mg/kg	103	80.0	120	----
Uranium	7440-61-1	E440C	0.05	mg/kg	0.5 mg/kg	97.8	80.0	120	----
Vanadium	7440-62-2	E440C	0.2	mg/kg	50 mg/kg	105	80.0	120	----
Zinc	7440-66-6	E440C	2	mg/kg	50 mg/kg	99.1	80.0	120	----
Zirconium	7440-67-7	E440C	1	mg/kg	10 mg/kg	96.2	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier

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:

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: 1725601)									
QC-1725601-003	RM	Aluminum	7429-90-5	E440C	22500 mg/kg	104	70.0	130	----
QC-1725601-003	RM	Antimony	7440-36-0	E440C	24.8 mg/kg	83.4	70.0	130	----
QC-1725601-003	RM	Arsenic	7440-38-2	E440C	21.2 mg/kg	96.4	70.0	130	----
QC-1725601-003	RM	Barium	7440-39-3	E440C	788 mg/kg	106	70.0	130	----
QC-1725601-003	RM	Beryllium	7440-41-7	E440C	1.82 mg/kg	98.9	70.0	130	----
QC-1725601-003	RM	Bismuth	7440-69-9	E440C	1.78 mg/kg	90.6	70.0	130	----
QC-1725601-003	RM	Cadmium	7440-43-9	E440C	2.15 mg/kg	97.4	70.0	130	----
QC-1725601-003	RM	Calcium	7440-70-2	E440C	4900 mg/kg	98.9	70.0	130	----
QC-1725601-003	RM	Chromium	7440-47-3	E440C	56.9 mg/kg	99.7	70.0	130	----
QC-1725601-003	RM	Cobalt	7440-48-4	E440C	32 mg/kg	97.9	70.0	130	----
QC-1725601-003	RM	Copper	7440-50-8	E440C	969 mg/kg	106	70.0	130	----
QC-1725601-003	RM	Iron	7439-89-6	E440C	32700 mg/kg	101	70.0	130	----
QC-1725601-003	RM	Lead	7439-92-1	E440C	919 mg/kg	96.9	70.0	130	----
QC-1725601-003	RM	Lithium	7439-93-2	E440C	47.3 mg/kg	100	70.0	130	----
QC-1725601-003	RM	Magnesium	7439-95-4	E440C	7780 mg/kg	106	70.0	130	----
QC-1725601-003	RM	Manganese	7439-96-5	E440C	8640 mg/kg	109	70.0	130	----
QC-1725601-003	RM	Molybdenum	7439-98-7	E440C	25.1 mg/kg	98.5	70.0	130	----
QC-1725601-003	RM	Nickel	7440-02-0	E440C	1000 mg/kg	108	70.0	130	----
QC-1725601-003	RM	Phosphorus	7723-14-0	E440C	660 mg/kg	95.7	70.0	130	----
QC-1725601-003	RM	Potassium	7440-09-7	E440C	10800 mg/kg	101	70.0	130	----
QC-1725601-003	RM	Selenium	7782-49-2	E440C	1.04 mg/kg	107	60.0	140	----
QC-1725601-003	RM	Silver	7440-22-4	E440C	8.98 mg/kg	93.0	70.0	130	----
QC-1725601-003	RM	Sodium	7440-23-5	E440C	1770 mg/kg	98.9	70.0	130	----
QC-1725601-003	RM	Strontium	7440-24-6	E440C	41 mg/kg	99.2	70.0	130	----
QC-1725601-003	RM	Sulfur	7704-34-9	E440C	3940 mg/kg	90.0	50.0	150	----
QC-1725601-003	RM	Thallium	7440-28-0	E440C	0.907 mg/kg	92.0	70.0	130	----
QC-1725601-003	RM	Tin	7440-31-5	E440C	3.79 mg/kg	94.3	40.0	160	----
QC-1725601-003	RM	Titanium	7440-32-6	E440C	2790 mg/kg	103	70.0	130	----
QC-1725601-003	RM	Tungsten	7440-33-7	E440C	6.99 mg/kg	97.5	70.0	130	----
QC-1725601-003	RM	Uranium	7440-61-1	E440C	3.97 mg/kg	100	70.0	130	----
QC-1725601-003	RM	Vanadium	7440-62-2	E440C	66.2 mg/kg	100	70.0	130	----
QC-1725601-003	RM	Zinc	7440-66-6	E440C	828 mg/kg	96.0	70.0	130	----
QC-1725601-003	RM	Zirconium	7440-67-7	E440C	6.91 mg/kg	101	70.0	130	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

COC Number: 22 -

Page of

Environmental Division
Waterloo
Work Order Reference
WT2431364

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	LGL Limited
Contact:	Mitchell Kay
Phone:	519 - 622 - 3300 x 49
	Company address below will appear on the final report
Street:	445 thompson Drive.
City/Province:	Cambridge ontario
Postal Code:	N1T 2K7
Invoice To	Same as Report To ☒ YES ☐ NO
	Copy of Invoice with Report ☒ YES ☐ NO
Company:	LGL Limited
Contact:	Mitchell Kay

Project Information

ALS Client Code / QUOTE #:	
Job / Project #:	FA0238 - I
PO / AFE:	
LSD:	
ALS Lab Work Order # (ALS use only):	WT2431364

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: MKay@LGL.com

Email 2

Email 3

Invoice Recipients

Select Invoice Distribution: ☐ EMAIL ☒ MAIL ☐ FAX

Email 1 or Fax: AP@LGL.com

Email 2

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

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
- ☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge
- ☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge
- ☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge
- ☐ Same day [E2] if received by 10am M-S - 200% rush su

Additional fees may apply to rush requests on we

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, p

Analys

Indicate Filtered (F), Preserved (P) or Filtered ...

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	EPA 6020B(mod)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIR	SUSPECTED HAZARD (see notes)
	Milne Port Beach Sediment	21-10-24		Sediment	1	X			
	→ EPA 6020B (modified)								

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

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

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C: 8.1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date: 21-Oct-24	Time: 18:35

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Appendix C – Tote Road-Side Maintenance Granular Material Sample Analysis

NAIT | APPLIED RESEARCH

Migmatic Gneiss

Mineralogical Study of Migmatic Gneiss, A Sample from Quarry Site

10/22/2024

Prepared for:

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Executive Summary

The NAIT Technology Access Centre for Energy & Environmental Sustainability (TACEES) conducted a comprehensive analysis of migmatic gneiss samples from a quarry to address environmental concerns. These concerns revolve around the dust generated by quarry operations, which poses a threat to a nearby fish habitat on Baffin Island. A key sample labeled "Tote Road-Site Maintenance, Fines bucket" was analyzed by conducting a thorough characterization of rock types and analyzing the composition of dust generated at the QMR2 Quarry, we aim to provide valuable insights into the sources of dust generation and potential mitigation strategies. The sample from a quarry site was fractioned into four categories based on particle size (>75 microns, 75-10 microns, 10-2 microns, and <2 microns) to allow precise characterization. Particle size directly influences dusting, with smaller particles remaining airborne longer and poising greater health risks, while larger particles settle quickly and contribute less to dust. The >75 microns fraction represents the coarse particles that settle quickly and typically have limited atmospheric transport. The >75 microns particles are also often considered as non-dusting materials. The 10-75 microns (coarse dusts) includes the moderately-sized particles that can suspend in the air for longer time but have relatively short transport distances. The 2-10 microns fraction contains fine dust and silts particles that can remain airborne for extended periods and can be transported over longer distance. The <2 microns fraction are clay sized and these particles can remain airborne for a very long time, contributing significantly to dust generation and severely impact human health. Our size separation results show that 72% of the material consists of non-dusting particles (i.e. >75 micron), while the remaining 28% constitute potentially dusting material. Of the dusting material, 5% is under 10 microns, which presents the greatest risk for human health and environmental impact.

Bulk X-ray Diffraction (XRD), X-ray Fluorescence (XRF), and laser particle size analysis were performed on each size fraction. Special attention was given to the clay fraction (<2 microns) using pre-treatment techniques to identify the presence of swelling clays.

Mineralogically, the bulk sample is dominated by feldspars (38% Plagioclase Feldspar, 20% K-Feldspar) and quartz (35%). Clay minerals, accounting for approximately 6.6% of the total sample, are more prevalent in the finer dust fractions, particularly in the <2-micron range, which includes Chlorite, Illite, and smectitic clay (Ca-Montmorillonite). Quartz was predominantly found in the non-dusting fraction (78%).

The key findings indicate that K-Feldspar and clay minerals, particularly swelling clay (Ca-Montmorillonite), are enriched in the dusting fractions and likely contribute to the generation of dust. The presence of Ca-Montmorillonite, which changes volume with moisture variation, could exacerbate dust formation due to its tendency to swell & shrink during wetting and drying cycles, while Chlorite's hydrophobic nature may make it resistant to traditional dust suppressants. These insights will guide the development of strategies to mitigate dust-related environmental impacts.

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1 Introduction

Quarry operations, particularly those involving the extraction of migmatic gneiss, can generate significant amounts of dust, raising concerns about environmental and health impacts. Dust emissions from such operations not only affect air quality but also pose a threat to sensitive ecosystems. In this context, the NAIT Technology Access Centre for Energy & Environmental Sustainability (TACEES) was tasked with analyzing dust samples from a quarry site on Baffin Island. This study focuses on the mineralogical and particle size characterization of the dust, with a particular emphasis on a sample labeled "Tote Road-Site Maintenance, Fines bucket."

The primary objective is identifying the mineral phases and size fractions contributing to dust generation and assessing their potential impact on nearby pristine fish habitats by fractioning the sample into four distinct particle sizes (>75µm, 75-10 µm, 10-2 µm and <2 µm) categories and conducting comprehensive mineralogical analyses. The >75 microns fraction consists of coarse particles that settle quickly and generally have minimal atmospheric transport, often regarded as non-dusting materials. The 10-75 microns range includes moderately sized dust particles that can linger in the air longer than coarser particles but typically have limited transport distances. The 2-10 microns fraction contains fine dust and silt, which can stay airborne for extended periods and be carried over greater distances. Finally, the <2 microns fraction represents clay-sized particles that can remain suspended for a long time, making them significant contributors to dust generation and posing serious health risks to humans. Each size category is chosen based on its specific behavior in the environment and its impact on air quality and health. Larger particles settle more rapidly and contribute less to dust, whereas tiny particles stay in the air longer and pose greater health risks. Particle size directly affects dusting potential. The study aims to provide critical insights into dust formation mechanisms. This information will inform the development of surface treatments and management strategies to mitigate dust-related environmental risks, ensuring the protection of the local habitat and broader ecosystem.

2 Experimental Conditions

2.1 Sample Selection

A sample has been received from a client from the quarry with ID "Tote Road-Site Maintenance, Fines bucket"**.** By conducting a thorough characterization of rock types and analyzing the composition of dust generated at the QMR2 Quarry, we aim to provide valuable insights into the sources of dust generation, including **particle size analysis, bulk mineralogy, and clay mineralogy**. Additionally, we aim to analyze the composition of the dust generated on the haul road to identify the constituents responsible for its composition. This will facilitate the identification of specific rocks within the quarry that are breaking down to cause the dust, and evaluate potential surface treatments or management strategies to mitigate dust generation.

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2.2 Sample Preparation, Data Acquisition

2.2.1 Wet sieving, Size Sorting and Laser Particle Size Analysis from Each Sorting Portion

Approximately 187g of sample was taken and soaked with 0.015M sodium bicarbonate buffer at 9.6 pH for at least 12 hours before wet sieving. After 12 hours, the mixture was boiled while mixing for 15 minutes to ensure that the sample was properly dispersed. The dispersed sample was cooled to 25°C before it was sieved through a No. 200 sieve with 75 µm openings. The solids collected on top of the No. 200 sieve were dried in the oven at 65°C overnight and saved for further analysis if necessary.

Using Stokes equation as a reference, the <75 µm portion was separated into 3 size fractions: <2 µm, 2-10 µm, and 10-75 µm, for further investigation of the sample. First, the <75 µm solution was allowed to settle for 20 minutes in a graduated cylinder. After 20 minutes, the top 10 centimeters of the solution containing <10 µm particles was separated into 250mL centrifuge bottles. The solution at the bottom of the graduate cylinder, 10-75 µm size fraction, was transferred to a drying pan, dried in the oven at 65°C overnight, and collected for bulk XRD analysis. Then, the <10 µm portion transferred to centrifuge bottles was spun at 1000 RPM for 3 minutes. After this centrifugation process, a portion of the supernatant containing <2 µm particles was used to make oriented clay slides. The remaining supernatant was dried at 65°C and collected for bulk XRD analysis. The solids at the bottom of the bottles, 2-10 µm portion, were transferred to a drying pan, dried at 65°C and collected for bulk XRD analysis. Additionally, before drying, a small portion of each of the size fractions, <2 µm, 2-10 µm, and 10-75 µm were saved to perform a laser particle size distribution analysis (Appendix 1).

$$T = \frac{\eta \log_{10}\left(\frac{R_2}{R_1}\right)}{3.81 r^2 N^2 (\rho - \rho_o)} + \frac{2(t_a + t_d)}{3}$$

Where,

T = Total settling time in seconds

ta = time of centrifuge acceleration in seconds

td = time of centrifuge acceleration in seconds

η = viscosity of water in poise (recall 1 P = g s-1 cm-1)

R1 = initial distance of particle from axis of rotation

R2 = final distance of particle from axis of rotation

r = radius of particle in cm

N = angular velocity in revolutions per second

ρ = density of particle in g / cm3

ρo = density of medium (i.e., water) in g / cm3

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The material was separated, without any further crushing or grinding, into four size fractions: >75 microns (large, non-dusting particles), 10-75 microns (coarse dust), 2-10 microns (fine dust and silts), and <2 microns (clays). Of the total material, 72% was classified as non-dusting, while 28% was dusting, with only 5% falling into the <10 micron size range

2.2.2 Bulk XRD Analysis

From each sorted portion (bulk sample, 75-10 μm, 10-2 μm and <2 μm) a sample of approximately 5 grams was micronized using a McCrone micronizing mill with corundum pellets lubricated and rinsed with isopropanol. After drying the subsample in an oven at 65°C, it was lightly disaggregated with a mortar and pestle. The subsample was then analyzed with a Bruker D8 Advance X-Ray Diffractometer, set to measure from 5° to 65° 2 theta at a step size of 0.02° with a scan speed of 2 s/step for bulk XRD analysis. To reduce preferred orientation and achieve a degree of random orientation, the samples were passed through a 400-micron sieve and placed in a front-loading sample holder. The Co X-ray tube used generated X-rays with a wavelength of 1.79 Å.

The bulk XRD patterns were interpreted and quantified using Jade Pro software in combination with the PDF 4+ mineral database. For the >75μm portions the w% of mineral phases were calculated based on the bulk xrd results. The micronized samples were then subjected to bulk XRF analysis, followed by preliminary drying and calcination to determine the loss on ignition (LOI) values.

2.2.3 Bulk XRF Analysis

Fused beads were prepared from the same samples after ignition to collect XRF data while minimizing the effects of mineral and particle size. Using the fusion sample preparation technique, 1 gram of the calcined sample was mixed with 7 grams of flux (a mixture of lithium metaborate and lithium tetraborate) and fused in a LeNeo electric furnace (Claisse, Canada) to obtain glass beads suitable for minimizing matrix effects. Certified reference materials (RMs) from the FLUXert calibration set (CS-0007-CP10a, CS-0007-VP10a) were used to construct calibration curves.

The XRF data for the bulk rock samples were collected using an S8 Tiger wavelength dispersive X-ray fluorescence spectrometer (Bruker AXS, USA). The instrumental operating conditions for the main rock-forming elements as oxides (Na2O, MgO, Al2O3, SiO2, P2O5, K2O, CaO, TiO2, Mn2O3, and Fe2O3) were 50 kV at 20 mA for the NaKα, MgKα, AlKα, SiKα, PKα, KKα, TiKα, MnKα, FeKα, and CaKα analytical lines. The XRF analysis technique included estimates of measurement errors, shown in Table 1.

Table 1 Concentration ranges and measurement errors of the calibration from round robin (QC) sample

Compound	Na2O	MgO	Al2O3	SiO2	P2O5	K2O	TiO2	Fe2O3	Mn2O3
Accuracy Test SD	±0.014	±0.009	±0.087	±0.139	±0.002	±0.003	±0.002	±0.007	±0.016

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2.2.4 Clay Slide Preparation: Calcium Saturated Slide

A scoop of calcium chloride was dissolved in an aliquot from the clay portion from the size separation process, size fraction of <2 µm was separated by centrifugation according to Stokes' law. The mixture was filtered using a 0.45 µm filter to get a thin solid cake. The solid cake was transferred onto a glass slide to make ca-saturated oriented clay slide.

The ca-saturated clay slide was stored in a desiccator with the bottom filled with a saturated solution of magnesium nitrate which provides a constant 54% relative humidity for a minimum of 24 hours. After 24 hours, the clay slide was analyzed by the Bruker D8 Advance X-Ray Diffractometer. Diffraction patterns were collected using CoKα radiation and step scanning from 2 to 40 ° 2Θ in 0.05° steps, counting for 2 s per step.

After the first acquisition, the ca saturated clay slide was placed in a desiccator with ethylene glycol. The desiccator was heated at 65°C for a minimum of 12 hours. After 12 hours, the desiccator was removed from the oven and allowed to cool at room temperature. The clay slide was equilibrated in the desiccator at room temperature for a minimum of 24 hours before being analyzed again by the Bruker D8 Advance X-Ray Diffractometer with the same setup to check the presence of expandable minerals.

2.2.5 Clay Slide Preparation: Potassium Saturated Slide

A scoop of potassium chlorite was dissolved in an aliquot from the remaining clay portion from the size separation process, size fraction of <2 µm was separated by centrifugation according to Stokes' law. The mixture was filtered using a 0.45 µm filter to get a thin solid cake. The solid cake was transferred onto a glass slide to make oriented clay potassium saturated slide.

The potassium-saturated slide was placed in an oven at 105°C for 12 hours to drive off any water in the interlayer. The sample was then placed back into a desiccator at 0% RH until samples are cooled and the clay slide was analyzed by the Bruker D8 Advance X-Ray Diffractometer. Diffraction patterns were collected using CoKα radiation and step scanning from 2 to 40 ° 2Θ in 0.05° steps, counting for 2 s per step as K0%RH.

After completing the above procedures, the slide was placed in a desiccator maintained at 54% RH and allowed to equilibrate for 24 hours then were analyzed by using the same setup as K54%RH.

The slide was placed in a furnace at 300°C for 6 hours. The sample was cooled to room temperature and the XRD pattern was collected using the same device and setup as K300°C.

For the final step, the slide was placed in a muffle furnace at 550°C for 5 hours, removed, and cooled to room temperature before collecting a final XRD pattern at K550°C.

3 Results and Discussion

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3.1 Wet Sive, Size Sorting, Laser Particle Size Analysis

Particle size analysis was performed on the collected dust samples by following the wet sieve and centrifugation procedure (using the Stokes equation as a reference). The mass of solids and wt% in each frach size fraction are shown in Table 2. Figure 1 shows the mass distribution of the dust and confirmation of the particle size using Laser Particle size analysis.

Laser particle size analysis (Horiba LA 950) was performed on each size fraction to make sure the sizes were within the specified range, which are in appendix 1.

Table 2: Results from wet Sieve particle size analysis

Amount of sample used (g)	Mass of sample (>75µm) (g)	Mass of sample (10-75µm) (g)	Mass of sample (2-10µm) (g)	Mass of sample (<2µm) (g)
187.18	132.87	41.7	7.98	1.79
100%	70.99%	22.28%	4.26%	0.96%

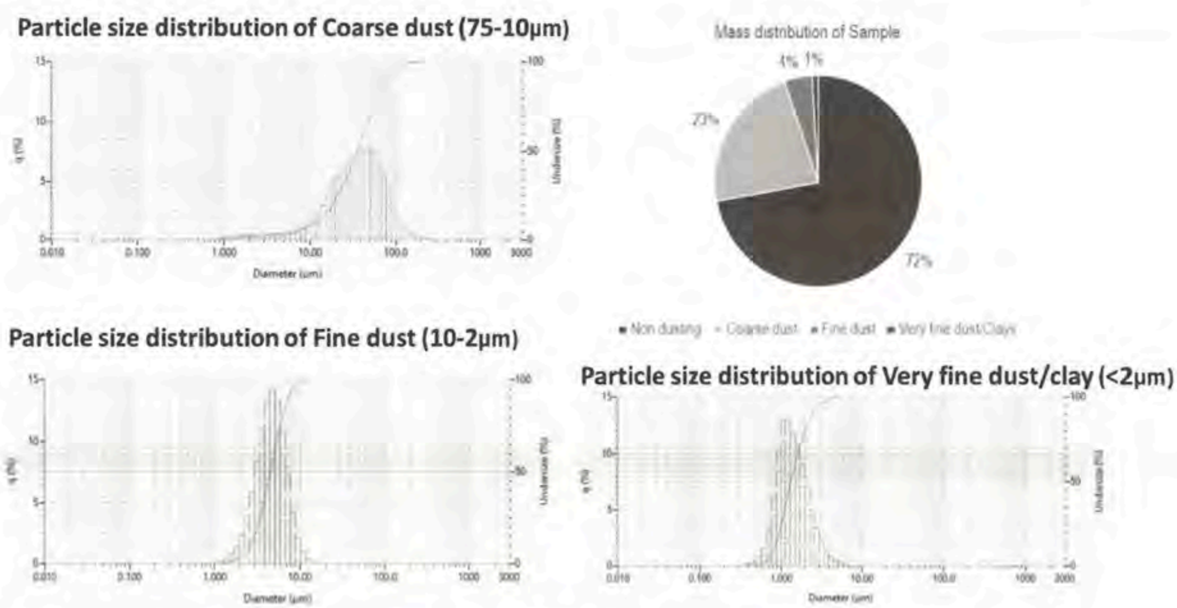

Figure 1: Mass distribution of the dust and confirmation of the particle size using Laser Particle size analysis

Note each sample size is separated by centrifuging to an equivalent settling diameter of 75-10 µm, 10-2 µm, and <2 µm. Shape effects mean some particles show up in the larger laser scattering size, details of the report in appendix 1.

3.2 Elemental Analysis

Using X-ray fluorescence (XRF) and Loss of Ignition (LOI)% of each sample, Table 3 shows the elemental analysis findings from each sorted section (bulk, 75-10µ, 10-2µ, <2µ) of clean solids.

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This ensures that the existence of elements in oxide form and w% matches with XRD phases. The data shows the percentage composition of 16 different oxides in each sample. These oxides are Sodium oxide (Na_2O), Magnesium oxide (MgO), Aluminum oxide (Al_2O_3), Silicon dioxide (SiO_2), Phosphorus pentoxide (P_2O_5), Sulfur trioxide (SO_3), Potassium oxide (K_2O), Calcium oxide (CaO), Titanium dioxide (TiO_2), Vanadium pentoxide (V_2O_5), Chromium oxide (Cr_2O_3), Iron oxide (Fe_2O_3), Zinc oxide (ZnO), Barium oxide (BaO), Strontium oxide (SrO), and Zirconium dioxide (ZrO_2).

Each row in the tables represents a different sample, and the columns indicate the percentage composition of each oxide in that sample including LOI %. The ratios of different oxides provide significant information about the composition of each sample and can help identify the different types of phases present in the XRD pattern. For instance, the SiO_2 percentage mainly comes from the Quartz phase but is also related to feldspars and clay minerals. Al_2O_3 is primarily from clays but can also be from feldspars.

In some cases, trace elements that may be detected in quantities of <1% in the XRF may not be quantifiable in the XRD patterns depending on how many other minerals have peaks that overlap with the characteristic peaks of the trace phase.

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Table 3: Elemental analysis from XRF on bulk sample and the separated size fractions

Sample ID	Na2O (%)	MgO (%)	Al2O3 (%)	SiO2 (%)	P2O5 (%)	SO3 (%)	K2O (%)	CaO (%)	TiO2 (%)	V2O5 (%)	Cr2O3 (%)	Fe2O3 (%)	ZnO (%)	BaO (%)	SrO (%)	ZrO2 (%)	Mn2O3 (%)	LOI (%)
MGC_BULK	3.97	0.27	13.61	77.27	0.02	0.00	3.92	0.84	0.12	0.00	0.03	1.21	0.00	0.08	0.03	0.01	0.05	0.91
MGC_10-75Micron	3.90	0.30	14.35	74.87	0.03	0.00	4.84	1.00	0.14	0.01	0.03	1.68	0.00	0.10	0.03	0.03	0.04	1.62
MGC_2-10Micron	4.29	0.88	16.41	69.98	0.03	0.00	5.24	1.53	0.30	0.01	0.04	2.29	0.00	0.10	0.03	0.02	0.05	2.28
MGC_lessthan2Micron	19.26	1.71	14.72	46.75	0.03	0.82	3.68	1.18	0.23	0.01	0.05	3.45	0.01	0.09	0.03	0.04	0.08	22.00

Note: LOI = Loss of Ignition

The elevated % of NaO2 in less than 2-micron size portion, is due to the contamination of Sodium bicarbonate from the separation procedure, which is confirmed by the presence of Trona (Na3H(CO3)2,2H2O) phase in XRD pattern, as well as the high % of LOI. The detection limit for each oxide is in Table 1 .

3.3 Bulk XRD Analysis

The x-ray diffraction patterns from different size portions of the dust were evaluated using whole pattern fitting (WPF) and Rietveld refinement of crystal structures, which are the primary features of MDI Jade. The ICDD database was also utilized for phase identification. The Rietveld approach, also known as the Pawley method, is appropriate when the crystal structures are unknown, but a reference pattern is available, including d's, i's, and lattice constants. Non-linear least-square optimization was used to fit a diffraction model to the measured pattern, and background, profile parameters, and lattice constants were considered as modeling parameters. Appendix 2 includes attachments for all Whole Pattern Fitting Reports.

Identification of minerals was performed from PDF4+ with the pattern and conducting multiple refinements by selectively adding or removing phases or changing the specific structure in the database to obtain the best match with the phases in the sample (Kaminsky, H. (2008)). The W% of mineral phases for >75micron particle size were calculated based on the measured bulk XRD phases. The residual error was minimized, and the composition calculated from the XRD results was compared with that of the XRF results. The WPF report (Appendix 2) shows the simulated and observed patterns, along with a difference plot with a threshold of $\pm 3\sigma$, and Table 4 represents the w% of mineral phases from bulk XRD analysis.

The bulk XRD data for all size portions (bulk, 75-10μ, 10-2 μ, <2μ) confirmed the presence of different phases of feldspars (K-feldspar and plagioclase), along with quartz with Illite/Mica and chlorite as clay minerals.

If a result is blank in the table, it means that the signal from that mineral was not sufficient to be detected in quantitative analysis and was left out of the refinement. This does not necessarily mean that none of the minerals are present; it simply means that the signal is too weak to be detected over the other minerals and is present in small quantities or poorly crystalline forms. It should be noted that the clay minerals identified in the bulk pattern are representative of the total clay minerals but are not specific to particular clay mineral species. For example, mica is likely a mixture of illite, illite-smectite, and potentially discrete smectite. Such nuances cannot be detected in bulk XRD, and clay identification and quantification are required to confirm their presence. The bulk mineralogy of each dust fraction is presented in Table 4 for the samples analyzed for this purpose. Figure 2 to Figure 6 represent the w% mineral phases distribution of each of the bulk and size separated fractions in graphical format.

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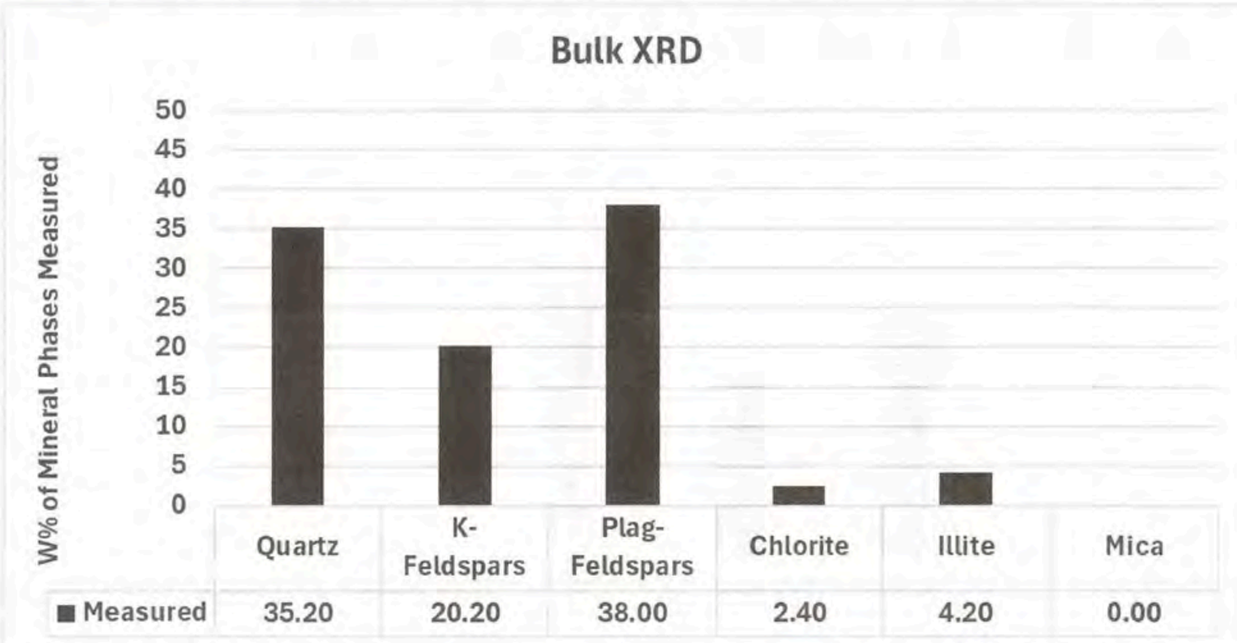

Figure 2: Graphical distribution of the w% of mineral phases from Bulk XRD analysis

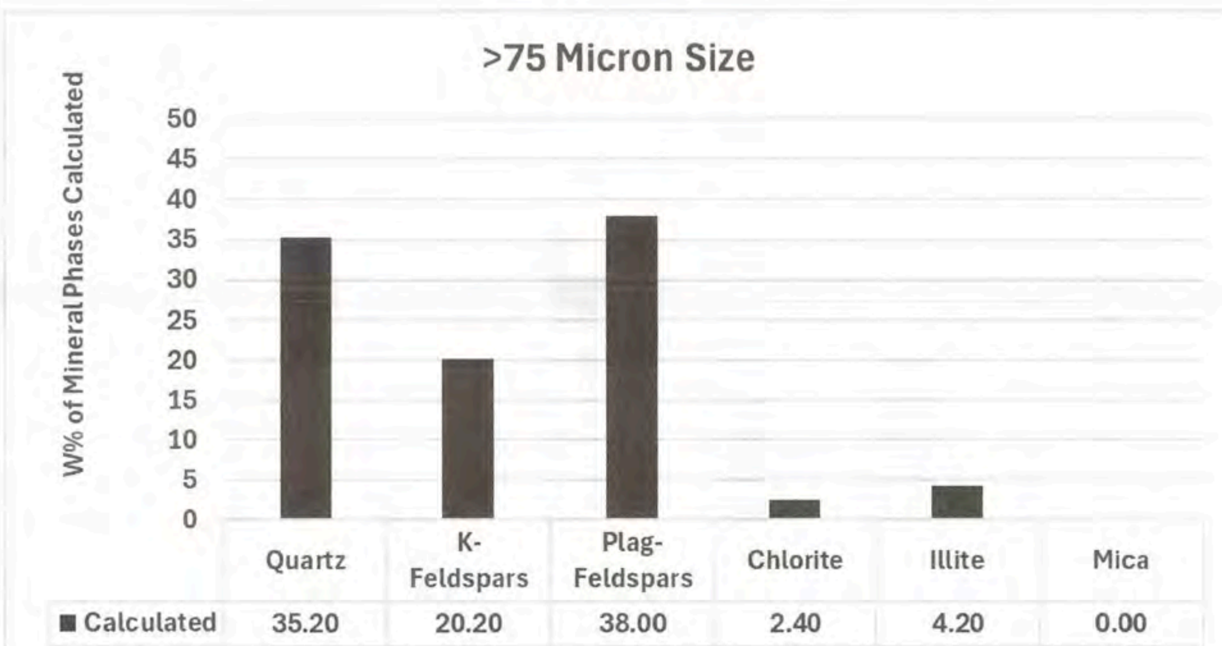

Figure 3: Graphical distribution of the w% of calculated mineral phases for >75 micron size fractions based on Bulk XRD analysis

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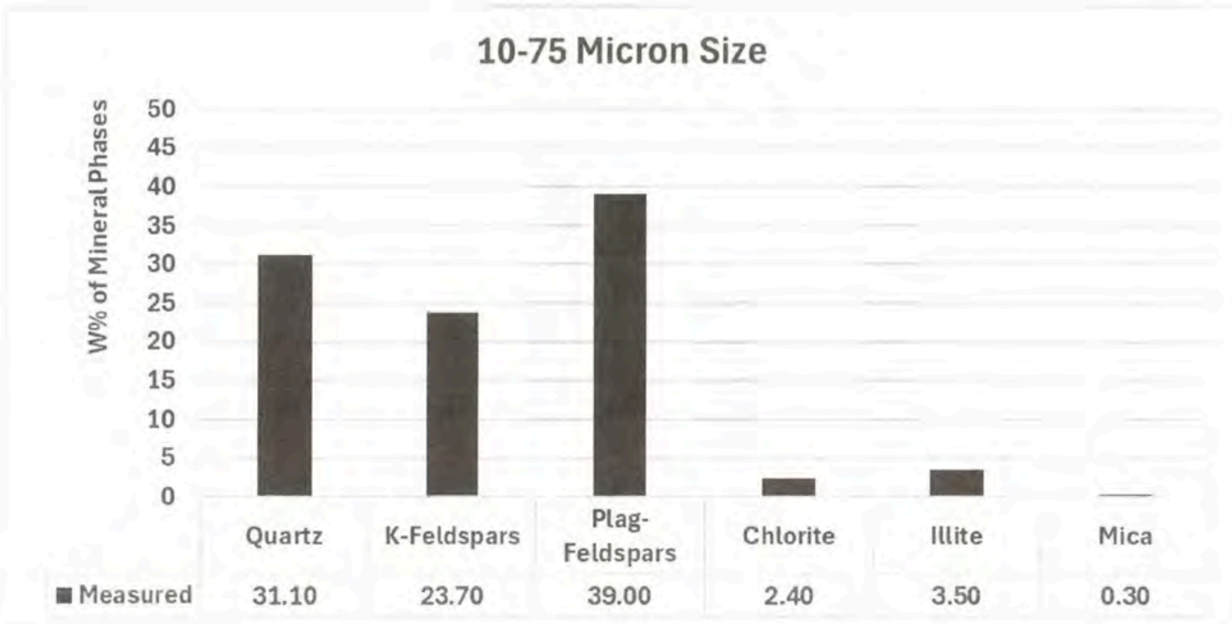

Figure 4: Graphical distribution of the w% of mineral phases for 75-10 micron size fractions XRD analysis

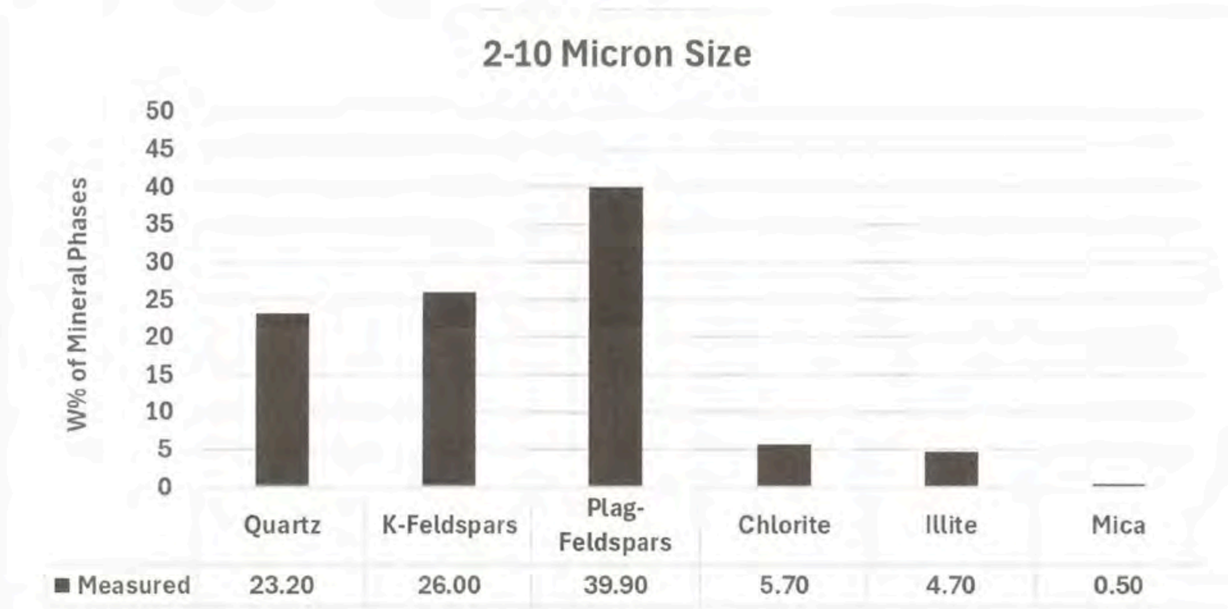

Figure 5: Graphical distribution of the w% of mineral phases for 10-2 micron size fractions XRD analysis

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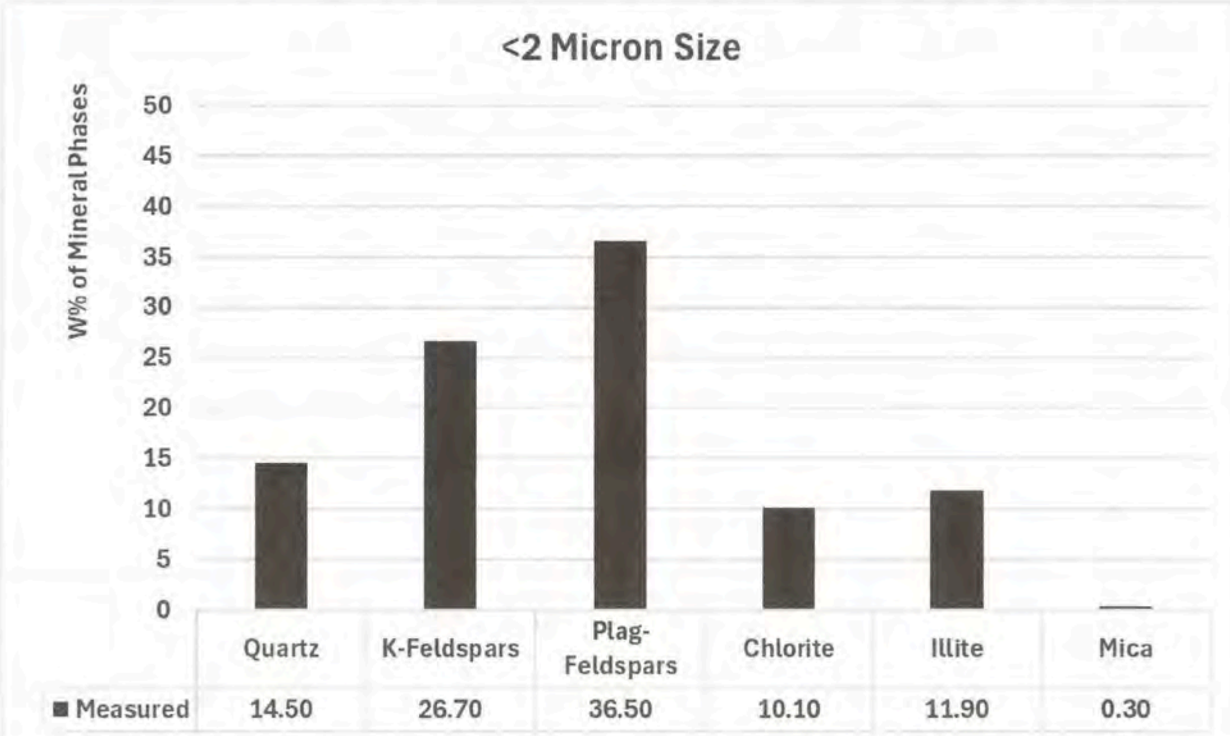

Figure 6: Graphical distribution of the w% of mineral phases for less than 2 micron size fractions XRD analysis

Table 4: Bulk XRD Analysis

	The w% of Mineral Phases from Different size fractions			
Mineral Phases	**Bulk Sample**	**10-75 micron size (coarse dust)**	**2-10 micron size (fine dust)**	**<2 micron size (very fine dust/clay)**
Quartz	**35.20**	**31.10**	**23.20**	**14.50**
K-Feldspars	**20.20**	**23.70**	**26.00**	**26.70**
Plag-Feldspars	**38.00**	**39.00**	**39.90**	**36.50**
Chlorite	**2.40**	**2.40**	**5.70**	**10.10**
Illite/Montmorillonite	**4.20**	**3.50**	**4.70**	**11.90**
Mica/illite2	**0.00**	**0.30**	**0.50**	**0.30**

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3.4 Clay Mineral Analysis

The characterization of clay minerals can be divided into two main components: phase identification and quantification. Phase identification was conducted using oriented clay slides subjected to various treatments. To induce the absorption of two water layers into the interlayers of smectite and vermiculite clay minerals, a treatment involving calcium-saturated 54% relative humidity (CaAir) was employed. Ethylene glycol (EG) is commonly used as a solvent for identifying expandable clay minerals, as the degree of expansion provides additional information for their identification. Solvation with EG slightly modifies the diffraction patterns of air-dried illite/smectite, facilitating their preliminary identification. The identified clay minerals in the Migmatic Gneiss samples include illite/mica, chlorite, and smectite (ca-montmorillonite) (Figure 7).

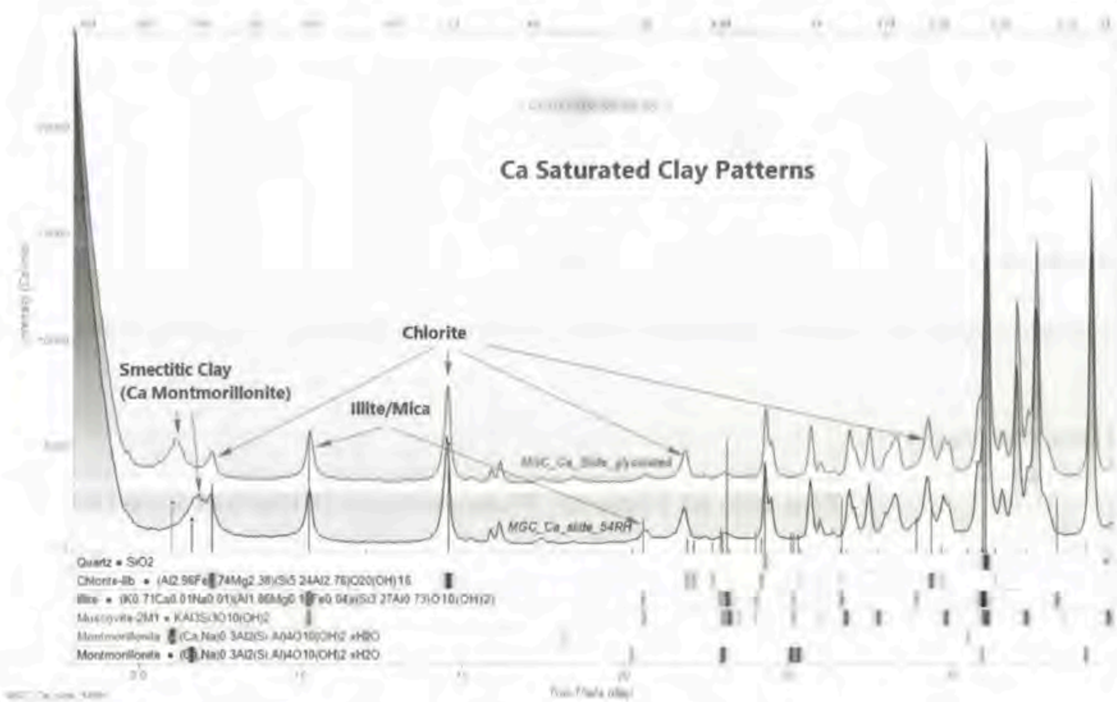

Figure 7: Ca Saturated Clay Patterns for Identification of Clay Mineral Phases

Heat treatments at various temperatures are often used to help identify clay minerals by revealing changes in crystal structure spacings or structural degradation due to dehydration. Depending on the temperature and the specific mineral species, these treatments can cause the structure to collapse. The presence of chlorite in this sample was confirmed by the collapse of the ~7Å, 4.7A° and 3.5A° peaks and the intensifying and slight shifting of 14A° peak after heating the potassium-saturated slide at 550°C, as shown in Figure 8. No additional observations were made when the potassium slide was treated differently (Hathaway, J.C. (1956)).

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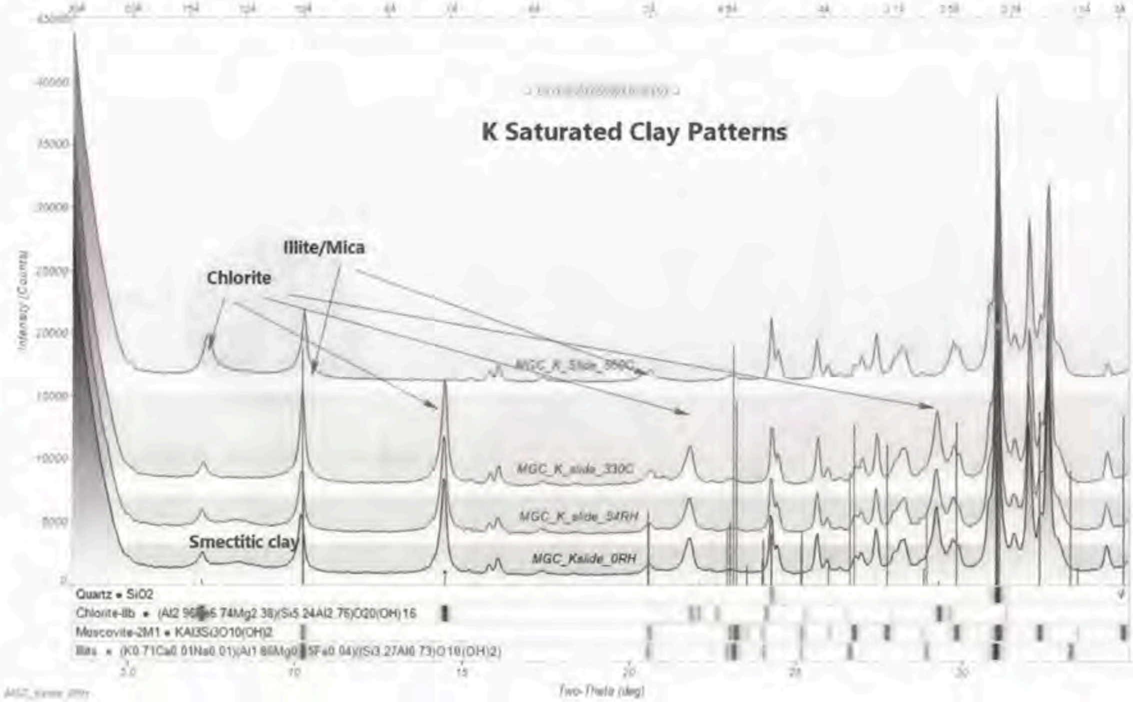

Figure 8: K Saturated Clay Patterns for Identification of Clay Mineral Phases

After phase identification, the MDI-Taos (oriented clay) program was used to quantify each mineral present based on the ethylene glycol-oriented clay pattern. The diffraction pattern from the oriented clay slide of the magmatic gneiss sample (<2 microns) is the illite/mica 1st major, chlorite as the 2nd major phase, and Smectite (Montmorillonite) is the 3rd major phase, with various treatments.

The unaffected peaks at about 10A°, 5A°, and 3.38A° with various treatment indicate the presence of Illite in the sample. The glycol-treated preparation gives a very strong 001 reflection at about 16.9Å which is in airdried condition, shifts to about 15Å with air and moderate humidity, which confirms the presence of smectitic clay in the sample. The potassium-saturated slide, after heating at 550ºC for 5 hours, and intensifying, slightly shifting 14Å peak, and by the collapse of the ~7Å, 4.7A° and 3.5Aº peaks further indicate the presence of chlorite in the sample. MDI-Taos was also used to determine the presence of Illite, Chlorite and Smctite in the sample.

Detailed clay analysis results are presented in Table 5, and simulated patterns are shown in Figure 9 using MDI-Taos (oriented clay) clay mineral modeling software following (Daune M. Moore Robert C. Reynolds) clay mineral modeling.

Table 5: Clay Analysis (<2 micron size fraction)

Clay Mineral Phases	W%
Illite/Mica	44
Chlorite	45
Smectite (Montmorillonite)	11

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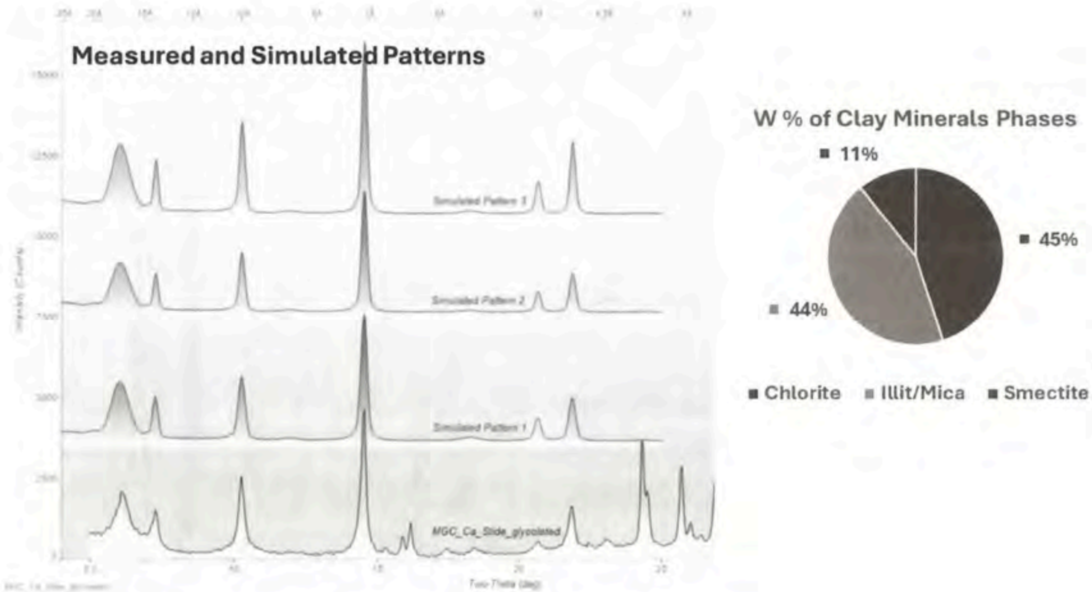

Figure 9: W% of Clay Mineral Phases and simulated clay patterns

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4 Findings and Implications

The material was separated (without additional crushing/grinding) into 4 size fractions >75 microns (large, non-dusting particles), 10-75 microns (coarse dust), 2-10 microns (fine dust/silts), <2 microns (clays), 72% of the material was non-dusting and 28% of the material was dusting with 5% of the material being in the <10micron size of most concern for human health and environmental impact.

The distribution of the minerals between size fractions was calculated, as expected 78% of the quartz was found in the non-dusting size fraction, 18% of the quartz in the coarse dust and only 4% of the quartz in the finer fractions (Table 2). Quartz is a highly abrasive and durable mineral and is known to resist mechanical breakdown. There was less quartz in the dusting fractions than would be expected if all the minerals contributed equally to the dust. Also as expected, more clay minerals were found in the fine & very fine size fraction than would be expected if all the minerals contributed equally to the dust. Clay minerals are known to be naturally very fine particles and are typically found in this range (Table 4).

The mineralogy for each dusting size fraction was determined. The phase composition of each size fraction is shown in Table 4. The overall material is primarily feldspars (20% K-feldspar and 38% Plagio-feldspar) and quartz, with about 6.6% total clay minerals. Note that it is very difficult to differentiate between clay minerals in the bulk patterns so "illite" and "mica" are used for all the 2:1 layer clays in this analysis.

The Plagio-feldspar was found to be at all size fractions in the amount expected if all the minerals contributed equally to the dust. The K-feldspar was found in all the dusting fractions at higher amounts than would be expected if all the minerals contributed equally to the dust, this indicates that the K-feldspar is likely naturally fine or is more susceptible to breakdown than the Quartz and Plagio-feldspar phases. The clay minerals and the K-feldspar were enriched in the dusting fractions and may be the major contributors to dust formation.

Table 5 presents the phase composition of < 2-micron size fraction indicating the relative abundance of three clay mineral phases: Illite/Mica, Chlorite, and Smectite (Ca-Montmorillonite). These minerals have significant implications for dust generation due to their physical and chemical properties. Illite/mica is well-known for its platy structure and limited swelling capacity. Due to its relative resistance to weathering, it tends to produce more durable particles, which can contribute to dust formation when disturbed (Grim 1968). Under some conditions, its platy texture has been suggested to improve dust suspension, potentially leading to the formation of finer particles. However, the idea that its platy texture enhances dust suppression seems unlikely. Given its hydrophilic nature, illite/mica likely responds well to wetting, which would cause the particles to agglomerate, making them "bigger" and less prone to dusting. Chlorite is another clay mineral known for its limited swelling capacity, similar to illite/mica. However, chlorite tends to exhibit greater cohesion, which may make it less prone to fragmentation, potentially resulting in the production of fewer fine particles when disturbed (Bailey, S. W. (1988). Despite this, chlorite-rich samples can still contribute to dust formation. A significant concern with chlorite is that it is relatively hydrophobic, which suggests it may not respond effectively to water-based dust suppression techniques, making it more challenging to control dust generated from chlorite-rich environments. Smectite (montmorillonite) can absorb a lot of water and has a high swelling capacity. This property reduces the formation of dust in damp environments by increasing

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cohesiveness when wet. Smectite, however, can form small, easily dispersible particles in dry environments, which might add to airborne dust.

Overall, clay minerals and K-feldspar are the major contributors to dust generation, with their physical and chemical properties influencing the dust's behavior in different environmental conditions.

5 Reference

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Grim, R. E. (1968). Clay Mineralogy. McGraw-Hill Book Company.

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6 Appendix1 -Laser Particle Size Distribution

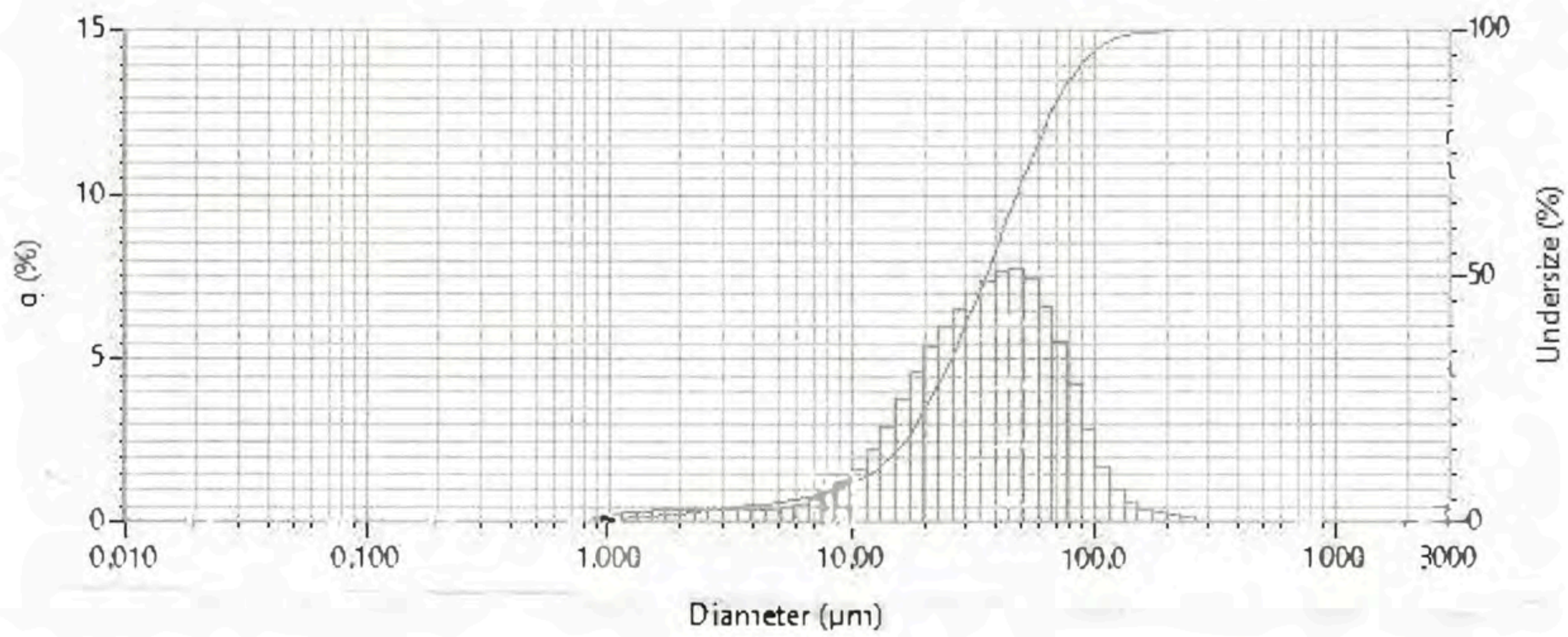
HORIBA Laser Scattering Particle Size Distribution Analyzer LA-950

Sample Name	: 10-75 micron slurry portion		Test or Assay Number
ID#	: 20240827112128 5	Median size	: 36.31170 (µm)
Data name	: 2024082711121285	Mean size	: 42.66055 (µm)
Transmittance (R)	: 84.6 (%)	St. Dev.	: 30.1736 (µm)
Transmittance (B)	: 88.5 (%)	Geo. mean size	: 32.3796 (µm)
Circulation speed	: 3	Geo. St. Dev.	: 2.3172 (µm)
Agitation speed	: 2	Mode size	: 47.9861 (µm)
Ultrasound	: Off	Span	: Off
Iteration mode	: Auto	Diameter on cumulative %	: (2)10.00 (%)- 12.3331 (µm)
Distribution base	: Volume		: (9)90.00 (%)- 80.1302 (µm)

Refractive index (R) : 1.550000-0.100000i(1.333000)
[1.550000-0.100000(1.550 - 0.100i),1.333000(1.333)]

Refractive index (B) : 1.550000-0.100000i(1.333000)
[1.550000-0.100000(1.550 - 0.100i),1.333000(1.333)]

Material :
Source :
Lot Number :



No.	Diameter (µm)	q (%)	Undersize (%)
1	0.011	0.000	0.000
2	0.013	0.000	0.000
3	0.015	0.000	0.000
4	0.017	0.000	0.000
5	0.020	0.000	0.000
6	0.023	0.000	0.000
7	0.026	0.000	0.000
8	0.030	0.000	0.000
9	0.034	0.000	0.000
10	0.039	0.000	0.000
11	[illegible]	0.000	0.000
12	0.051	0.000	0.000
13	0.058	0.000	0.000
14	0.067	0.000	0.000
15	[illegible]	0.000	0.000
16	0.087	0.000	0.000
17	0.100	0.000	0.000
18	0.115	0.000	0.000
19	0.131	0.000	0.000
20	0.150	0.000	0.000
21	0.172	0.000	0.000
22	0.197	0.000	0.000
23	0.226	0.000	0.000
24	0.258	0.000	0.000
25	0.296	0.000	0.000

No.	Diameter (µm)	q (%)	Undersize (%)
25	0.339	0.000	0.000
27	0.389	0.000	0.000
28	0.445	0.000	0.000
25	0.510	0.000	0.000
60	0.584	0.000	0.000
21	0.669	0.000	0.000
32	0.766	0.000	0.000
33	0.877	0.000	0.000
34	1.005	0.115	0.115
35	1.151	0.184	0.299
36	1.318	0.238	0.537
37	1.510	0.255	0.846
35	1.729	0.312	1.118
39	1.981	0.343	1.461
40	2.269	0.330	1.810
41	2.599	0.340	2.150
42	2.976	0.324	2.474
43	3.409	0.311	2.765
44	3.905	0.307	3.092
45	4.472	0.316	3.416
46	5.122	0.330	3.761
47	5.867	0.409	4.170
48	6.720	0.506	4.676
46	7.697	0.654	5.330
50	8.816	0.873	6.203

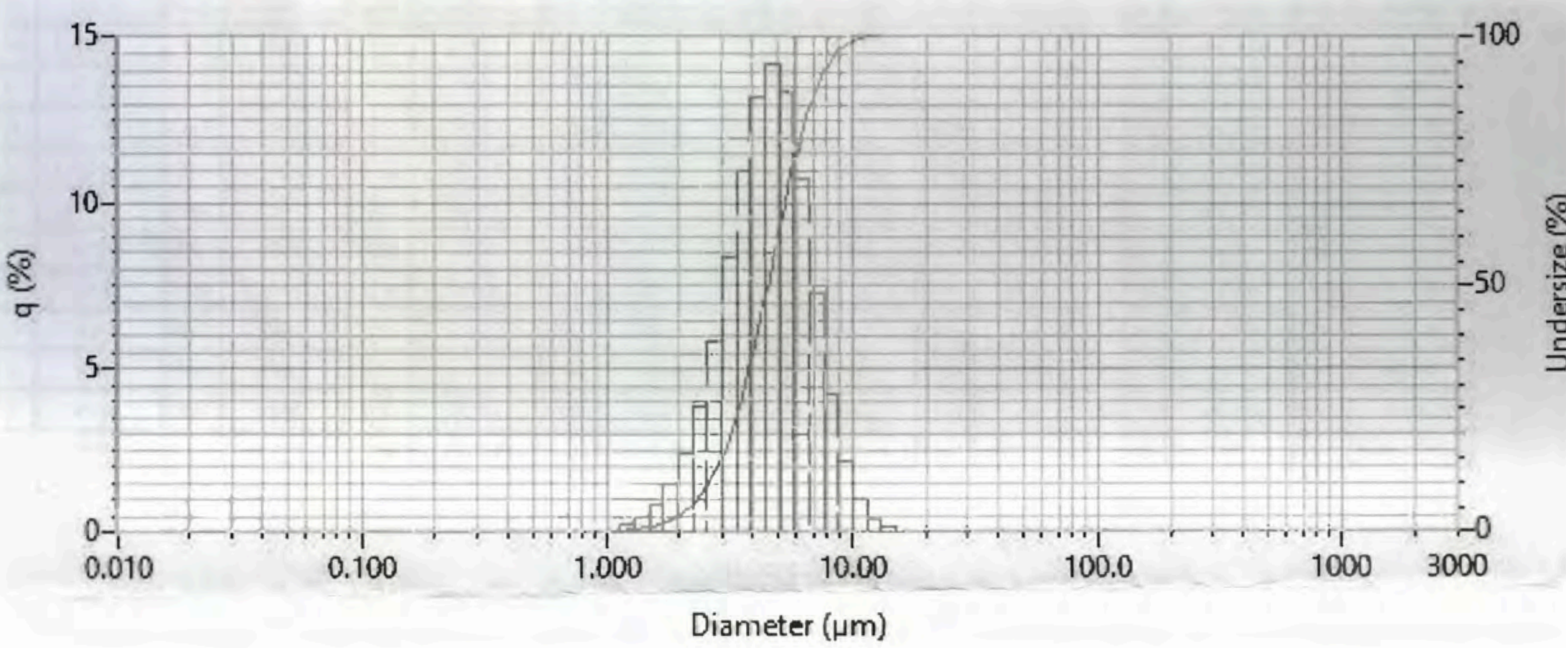
No.	Diameter (µm)	q (%)	Undersize (%)
51	10.097	1.173	7.351
53	11.565	1.591	8.976
53	13.246	2.164	11.139
51	15.172	2.861	14.019
55	17.377	3.666	17.717
66	19.904	4.535	22.251
57	22.797	5.305	27.556
66	26.111	5.952	33.508
66	29.907	6.369	39.877
60	34.255	6.393	46.270
61	39.234	7.225	51.135
62	44.933	7.626	61.782
63	51.471	7.709	[illegible]
6.	58.953	7.373	76.663
66	67.523	6.545	83.407
66	77.340	5.499	86.907
67	85.583	4.187	93.093
66	101.460	2.763	96.201
69	116.210	1.664	97.535
70	133.103	0.979	98.634
71	152.453	0.588	99.122
72	174.616	0.351	99.486
73	200.000	6.236	59.722
74	229.075	0.161	98.853
75	262.376	0.117	100.000

No.	Diameter (µm)	q (%)	Undersize (%)
76	300.512	0.000	100.000
77	344.206	0.000	100.000
78	[illegible]	0.000	100.000
79	451.536	0.000	100.000
80	517.200	0.000	100.000
61	592.367	0.000	100.000
63	678.304	0.000	100.000
63	777.141	0.000	100.000
84	890.116	0.000	100.000
85	1019.515	0.000	100.000
66	1167.725	0.000	100.000
87	1337.481	0.000	100.000
66	1531.914	0.000	100.000
69	1754.613	0.000	100.000
90	[illegible]	0.000	100.000
61	2301.851	0.000	100.000
52	2635.467	0.000	100.000
63	3000.000	0.000	100.000

HORIBA Laser Scattering Particle Size Distribution Analyzer LA-950

Test or Assay. Number

Sample Name	: 2-10 micron slurry portion		
ID#	: 202408271117284	Median size	: 4.59899 (µm)
Data name	: 202408271117284	Mean size	: 4.85246 (µm)
Transmittance (R)	: 89.1 (%)	St. Dev.	: 1.8925 (µm)
Transmittance (B)	: 87.5 (%)	Geo. mean size	: 4.4981 (µm)
Circulation speed	: 3	Geo. St. Dev.	: 1.4866 (µm)
Agitation speed	: 2	Mode size	: 4.7892 (µm)
Ultrasound	: Off	Span	: Off
Iteration mode	: Auto	Diameter on cumulative %	: (2)10.00 (%)- 2.6614 (µm)
Distribution base	: Volume		: (9)90.00 (%)- 7.3646 (µm)
Refractive index (R)	: 1.55 0000-0.100000i(1.333000) [1.550000-0.100000(1.550 - 0.100i),1.333000(1.333)]		
Refractive index (B)	: 1.550000-0.100000i(1.333000) [1.550000-0.100000(1.550 - 0.100i),1.333000(1.333)]		
Material	:		
Source	:		
Lot Number	:		



No.	Diameter (µm)	q (%)	Undersize (%)
1	0.011	0.000	0.000
2	0.013	0.000	0.000
3	0.015	0.000	0.000
4	0.017	0.000	0.000
5	0.020	0.000	0.000
6	0.023	0.000	0.000
7	0.026	0.000	0.000
8	0.030	0.000	0.000
9	0.034	0.000	0.000
10	0.039	0.000	0.000
11	0.044	0.000	0.000
12	0.051	0.000	0.000
13	0.058	0.000	0.000
14	0.067	0.000	0.000
15	0.076	0.000	0.000
16	0.087	0.000	0.000
17	0.100	0.000	0.000
18	0.115	0.000	0.000
19	0.131	0.000	0.000
20	0.150	0.000	0.000
21	0.172	0.000	0.000
22	0.197	0.000	0.000
23	0.226	0.000	0.000
24	0.259	0.000	0.000
25	0.296	0.000	0.000

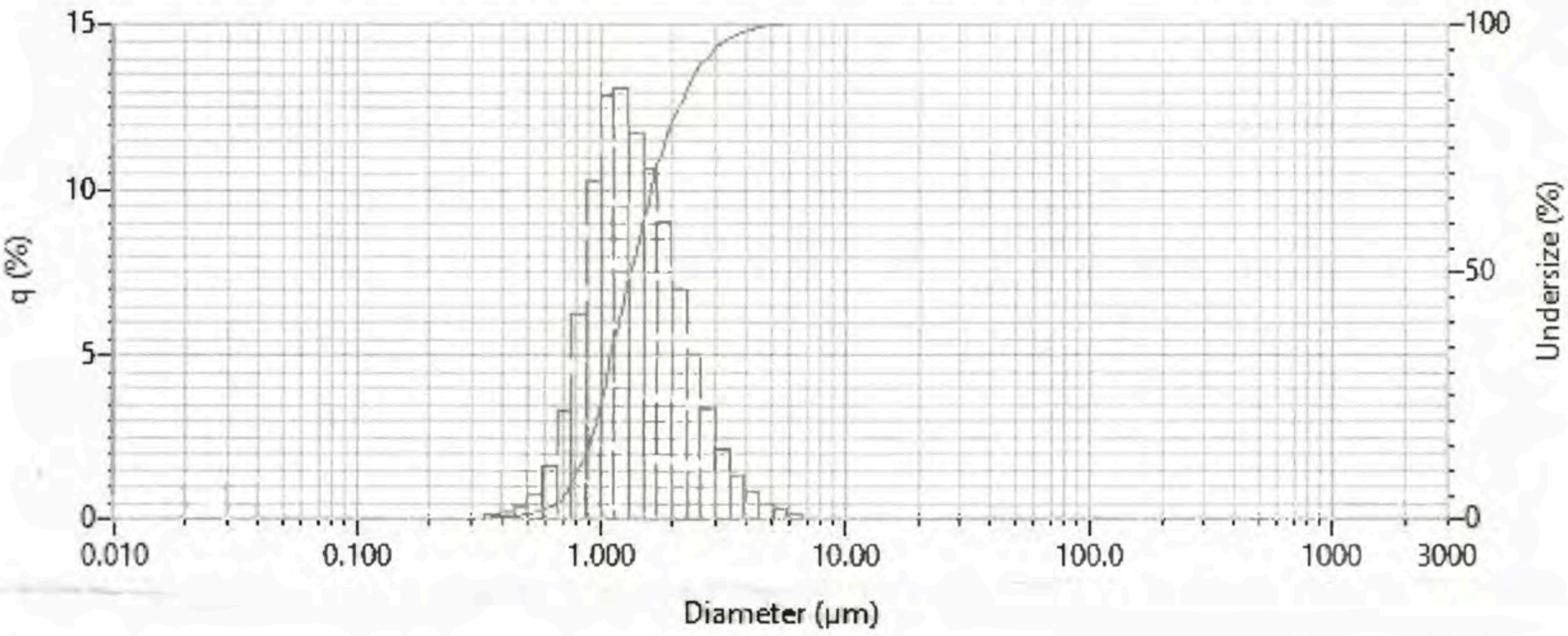
No.	Diameter (µm)	q (%)	Undersize (%)
26	0.339	0.000	0.000
27	0.389	0.000	0.000
28	0.445	0.000	0.000
29	0.510	0.000	0.000
30	0.584	0.000	0.000
31	0.669	0.000	0.000
32	0.766	0.000	0.000
33	0.877	0.000	0.000
34	1.005	0.000	0.000
35	1.151	0.000	0.000
36	1.318	0.204	0.204
37	1.510	0.412	0.616
38	1.729	0.779	1.395
39	1.981	1.394	2.789
40	2.269	2.369	5.158
41	2.599	3.819	8.977
42	2.976	5.811	14.788
43	3.409	8.279	23.067
44	3.905	10.916	33.983
45	4.472	13.114	47.097
46	5.122	14.086	61.184
47	5.867	13.245	74.429
48	6.720	10.677	85.106
49	7.697	7.250	92.356
50	8.816	4.164	96.519

No.	Diameter (µm)	q (%)	Undersize (%)
51	10.097	2.102	98.621
52	11.565	0.932	99.553
53	13.246	0.344	99.897
54	15.172	0.104	100.000
55	17.377	0.000	100.000
56	19.904	0.000	100.000
57	22.797	0.000	100.000
58	26.111	0.000	100.000
59	29.907	0.000	100.000
60	34.255	0.000	100.000
61	39.234	0.000	100.000
62	44.938	0.000	100.000
63	51.471	0.000	100.000
64	58.953	0.000	100.000
65	67.523	0.000	100.000
66	77.340	0.000	100.000
67	88.583	0.000	100.000
68	101.460	0.000	100.000
69	116.210	0.000	100.000
70	133.103	0.000	100.000
71	152.453	0.000	100.000
72	174.616	0.000	100.000
73	200.000	0.000	100.000
74	229.075	0.000	100.000
75	262.376	0.000	100.000

No.	Diameter (µm)	q (%)	Undersize (%)
76	300.518	0.000	100.000
77	344.206	0.000	100.000
78	394.244	0.000	100.000
79	451.556	0.000	100.000
80	517.200	0.000	100.000
81	592.387	0.000	100.000
82	678.504	0.000	100.000
83	777.141	0.000	100.000
84	890.116	0.000	100.000
85	1019.515	0.000	100.000
86	1167.725	0.000	100.000
87	1337.481	0.000	100.000
88	1531.914	0.000	100.000
89	1754.613	0.000	100.000
90	2009.687	0.000	100.000
91	2301.841	0.000	100.000
92	2636.467	0.000	100.000
93	3000.000	0.000	100.000

HORIBA Laser Scattering Particle Size Distribution Analyzer LA-950

Sample Name	: <2 micron slurry portion				Test or Assay. Number
ID#	: 202408271112283	Median size	:	1.34278 (µm)	
Data name	: 202408271112283	Mean size	:	1.54005 (µm)	
Transmittance (R)	: 97.5 (%)	St. Dev.	:	0.7575 (µm)	
Transmittance (B)	: 94.9 (%)	Geo. mean size	:	1.3956 (µm)	
Circulation speed	: 3	Geo. St. Dev.	:	1.5410 (µm)	
Agitation speed	: 2	Mode size	:	1.2247 (µm)	
Ultrasound	: Off	Span	:	Off	
Iteration mode	: Auto	Diameter on cumulative %	:	(2)10.00 (%)- 0.8336 (µm)	
Distribution base	: Volume		:	(9)90.00 (%)- 2.4837 (µm)	
Refractive index (R)	: 1.550000-0.100000i(1.333000) [1.550000-0.100000(1.550 - 0.100i),1.333000(1.333)]				
Refractive index (B)	: 1.550000-0.100000i(1.333000) [1.550000-0.100000(1.550 - 0.100i),1.333000(1.333)]				
Material	:				
Source	:				
Lot Number	:				



No.	Diameter (µm)	q (%)	Undersize (%)
1	0.011	0.000	0.000
2	0.013	0.000	0.000
3	0.015	0.000	0.000
4	0.017	0.000	0.000
5	0.020	0.000	0.000
6	0.023	0.000	0.000
7	0.026	0.000	0.000
8	0.030	0.000	0.000
9	0.034	0.000	0.000
10	0.039	0.000	0.000
11	0.044	0.000	0.000
12	0.051	0.000	0.000
13	0.058	0.000	0.000
14	0.067	0.000	0.000
15	0.076	0.000	0.000
16	0.087	0.000	0.000
17	0.100	0.000	0.000
18	0.115	0.000	0.000
19	0.131	0.000	0.000
20	0.150	0.000	0.000
21	0.172	0.000	0.000
22	0.197	0.000	0.000
23	0.226	0.000	0.000
24	0.259	0.000	0.000
25	0.296	0.000	0.000

No.	Diameter (µm)	q (%)	Undersize (%)
26	0.339	0.000	0.000
27	0.389	0.113	0.113
28	0.445	0.181	0.294
29	0.510	0.338	0.632
30	0.584	0.709	1.340
31	0.669	1.549	2.889
32	0.766	3.252	6.141
33	0.877	6.188	12.329
34	1.005	10.238	22.567
35	1.151	12.804	35.371
36	1.318	13.039	48.410
37	1.510	11.697	60.107
38	1.729	10.619	70.726
39	1.981	9.010	79.736
40	2.269	6.957	86.693
41	2.599	4.958	91.652
42	2.976	3.313	94.965
43	3.409	2.106	97.071
44	3.905	1.292	98.363
45	4.472	0.773	99.136
46	5.122	0.454	99.589
47	5.867	0.262	99.851
48	6.720	0.149	100.000
49	7.697	0.000	100.000
50	8.816	0.000	100.000

No.	Diameter (µm)	q (%)	Undersize (%)
51	10.097	0.000	100.000
52	11.565	0.000	100.000
53	13.246	0.000	100.000
54	15.172	0.000	100.000
55	17.377	0.000	100.000
56	19.904	0.000	100.000
57	22.797	0.000	100.000
58	26.111	0.000	100.000
59	29.907	0.000	100.000
60	34.255	0.000	100.000
61	39.234	0.000	100.000
62	44.938	0.000	100.000
63	51.471	0.000	100.000
64	58.953	0.000	100.000
65	67.523	0.000	100.000
66	77.340	0.000	100.000
67	88.583	0.000	100.000
68	101.460	0.000	100.000
69	116.210	0.000	100.000
70	133.103	0.000	100.000
71	152.453	0.000	100.000
72	174.616	0.000	100.000
73	200.000	0.000	100.000
74	229.075	0.000	100.000
75	262.376	0.000	100.000

No.	Diameter (µm)	q (%)	Undersize (%)
76	300.518	0.000	100.000
77	344.206	0.000	100.000
78	394.244	0.000	100.000
79	451.556	0.000	100.000
80	517.200	0.000	100.000
81	592.387	0.000	100.000
82	678.504	0.000	100.000
83	777.141	0.000	100.000
84	890.116	0.000	100.000
85	1019.515	0.000	100.000
86	1167.725	0.000	100.000
87	1337.481	0.000	100.000
88	1531.914	0.000	100.000
89	1754.613	0.000	100.000
90	2009.687	0.000	100.000
91	2301.841	0.000	100.000
92	2636.467	0.000	100.000
93	3000.000	0.000	100.000

7 Appendix 2- WPF Reports (Bulk XRD)

Scan ID: MGC_Bulk.raw • MGC_Bulk

Scan Parameters: 5.0°/64.956°/0.0195°/384(s), I(p)=101601/244, Co(35kV,40mA), August 30, 2024, 8:53 AM

✔ Zero Offset = 0.0003 (0.0005)	Displacement = 0.0	Distance Slack = 0.0
✔ Kα2 Peaks Present	Kα2/Kα1 Ratio = 0.5	X-Ray Polarization = 1.0

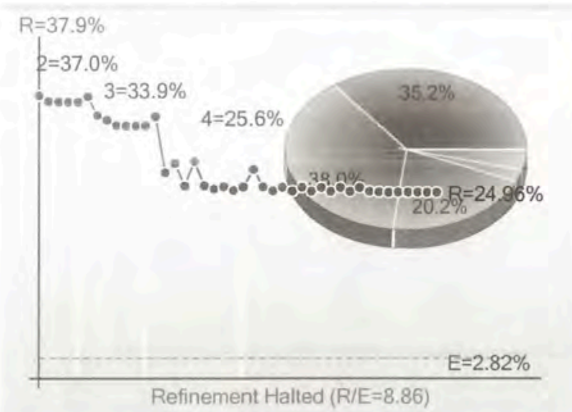
Geometry: Diffractometer Lp **Fitted-Range:** 5.0° - 65.0° **BG-Model:** Polynomial (5) **λ:** 1.78899Å (Co)

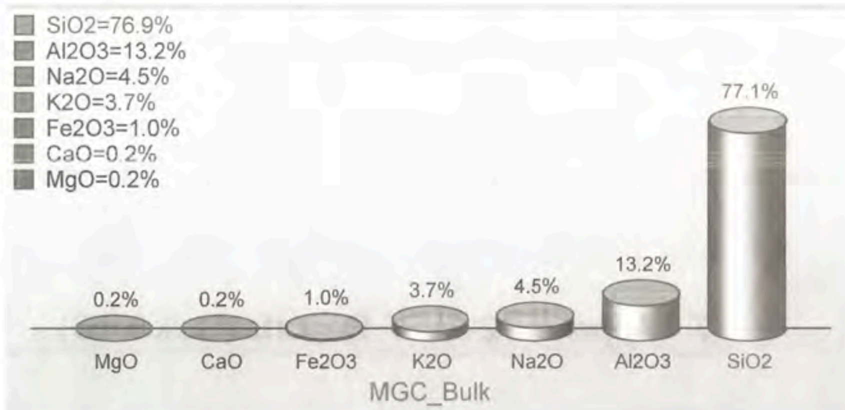
PSF: pseudo-Voigt **Broadening:** Individual FWHM Curve **Instrument:** Constant FWHM = 0.1°

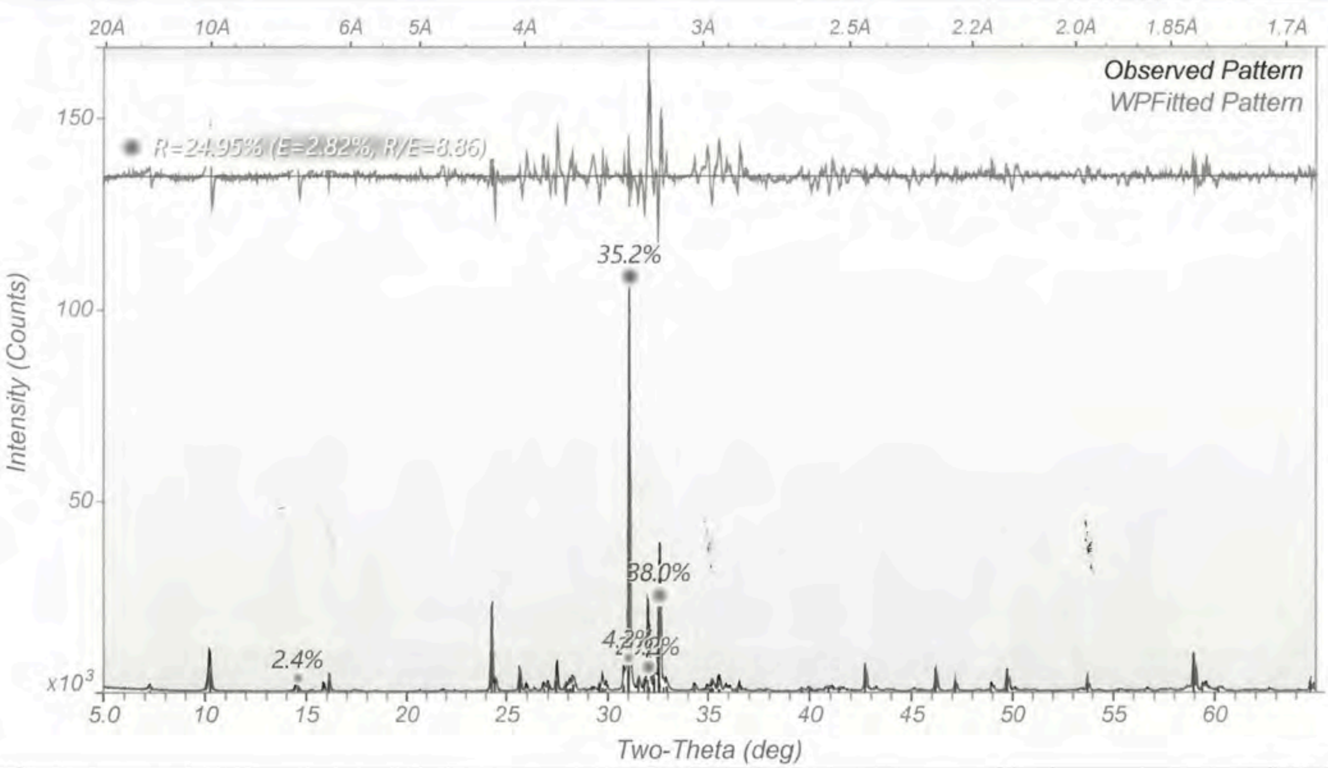
Phase ID (6)	Chemical Formula	PDF-#	Wt% (σ)	DD% (σ)	RIR	μ
Quartz	SiO2	98-000-0369	35.2 (1.1)	33.4 (2.2)	4.27	140.6
Albite	Na0.98Ca0.02Al1.02Si2.98O8	04-017-1022	38.0 (1.1)	30.2 (2.3)	0.69	133.6
Microcline	K0.96Na0.04AlSi3O8	04-026-3260	20.2 (0.8)	23.1 (1.5)	0.62	186.2
Chlorite-IIb | aluminum iron magnesiu	(Al2.96Fe6.74Mg2.38)(Si5.24Al2.76)	01-090-3233	2.4 (0.3)	5.2 (0.5)	2.01	138.2
Illite	(K0.71Ca0.01Na0.01)(Al1.86Mg0.15	01-078-5138	4.2 (0.2)	8.1 (0.3)	0.65	167.4
Muscovite-2M1	KAl3Si3O10(OH)2	04-011-5240	0.0 (0.0)	0.0 (0.0)	0.67	183.0

XRF(Wt%): Fe2O3=1.0%, CaO=0.2%, K2O=3.7%, SiO2=76.9%, Al2O3=13.2%, MgO=0.2%, Na2O=4.5%

Refinement Halted (R/E=8.86), ♣ Round=4, Iter=6, P=31, R=24.95% (E=2.82%, EPS=0.5)







Scan ID: MGC_10-75_Bulk.raw • MGC_10-75_Bulk

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✔ Zero Offset = -0.0164 (0.0005)	Displacement = 0.0	Distance Slack = 0.0
✔ Kα2 Peaks Present	Kα2/Kα1 Ratio = 0.5	X-Ray Polarization = 1.0

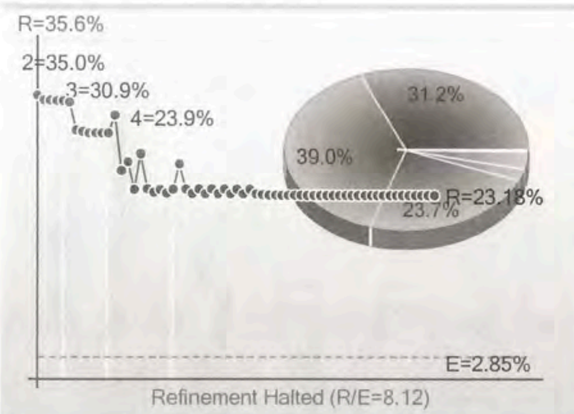
Geometry: Diffractometer Lp **Fitted-Range:** 5.0° - 65.0° **BG-Model:** Polynomial (5) **λ:** 1.78899Å (Co)

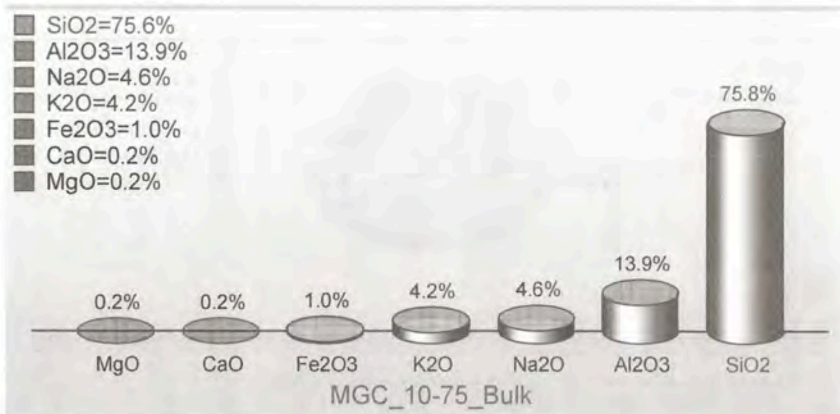
PSF: pseudo-Voigt **Broadening:** Individual FWHM Curve **Instrument:** Constant FWHM = 0.1°

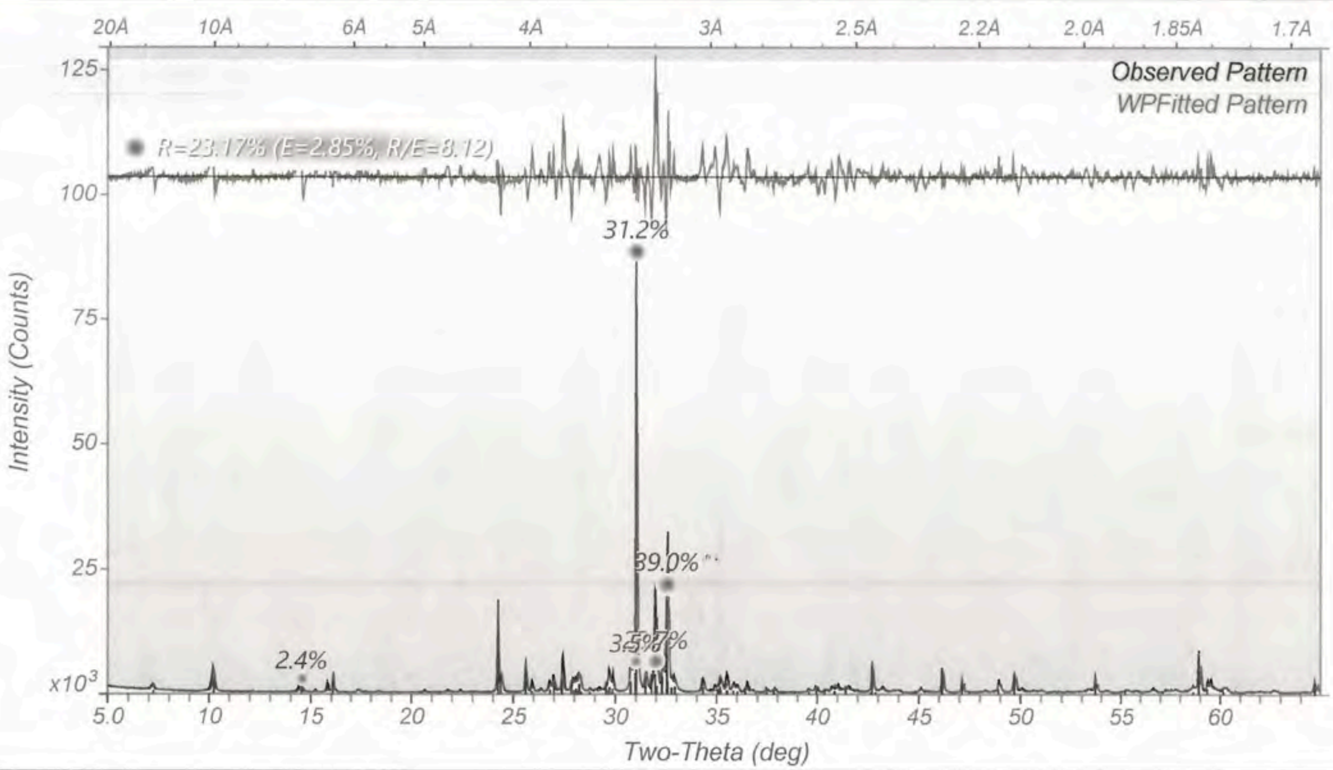
Phase ID (6)	Chemical Formula	PDF-#	Wt% (σ)	DD% (σ)	RIR	μ
Quartz	SiO2	98-000-0369	31.2 (1.0)	29.5 (2.1)	4.27	140.6
Albite	Na0.98Ca0.02Al1.02Si2.98O8	04-017-1022	39.0 (1.2)	28.9 (2.3)	0.69	133.6
Microcline	K0.96Na0.04AlSi3O8	04-026-3260	23.7 (0.9)	28.7 (1.7)	0.62	186.2
Chlorite-IIb | aluminum iron magnesiu	(Al2.96Fe6.74Mg2.38)(Si5.24Al2.76)	01-090-3233	2.4 (0.2)	5.7 (0.4)	2.01	138.2
Illite	(K0.71Ca0.01Na0.01)(Al1.86Mg0.15l	01-078-5138	3.5 (0.1)	6.9 (0.3)	0.65	167.4
Muscovite-2M1	KAl3Si3O10(OH)2	04-011-5240	0.3 (0.1)	0.3 (0.2)	0.67	183.0

XRF(Wt%): Fe2O3=1.0%, CaO=0.2%, K2O=4.2%, SiO2=75.6%, Al2O3=13.9%, MgO=0.2%, Na2O=4.6%

Refinement Halted (R/E=8.12), ♣ Round=4, Iter=6, P=31, R=23.17% (E=2.85%, EPS=0.5)







Scan ID: MGC_2-10_Bulk.raw • MGC_2-10_Bulk

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✔ Kα2 Peaks Present Kα2/Kα1 Ratio = 0.5 X-Ray Polarization = 1.0

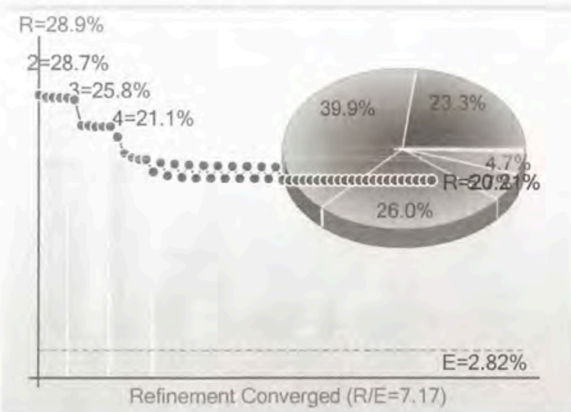
Geometry: Diffractometer Lp Fitted-Range: 5.0° - 65.0° BG-Model: Polynomial (5) λ: 1.78899Å (Co)

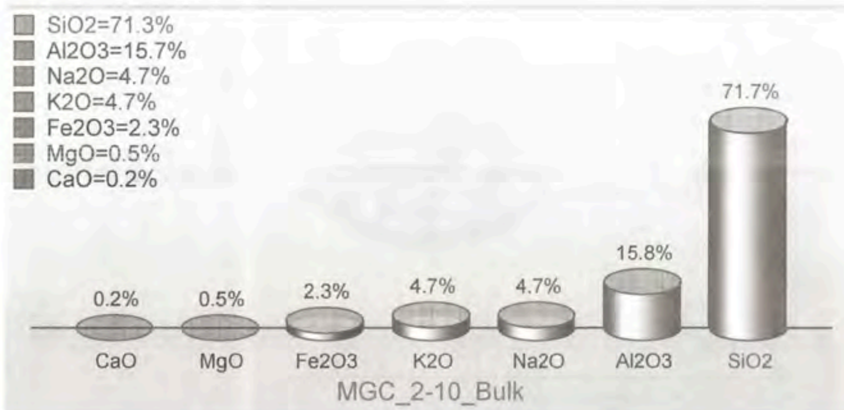
PSF: pseudo-Voigt Broadening: Individual FWHM Curve Instrument: Constant FWHM = 0.1°

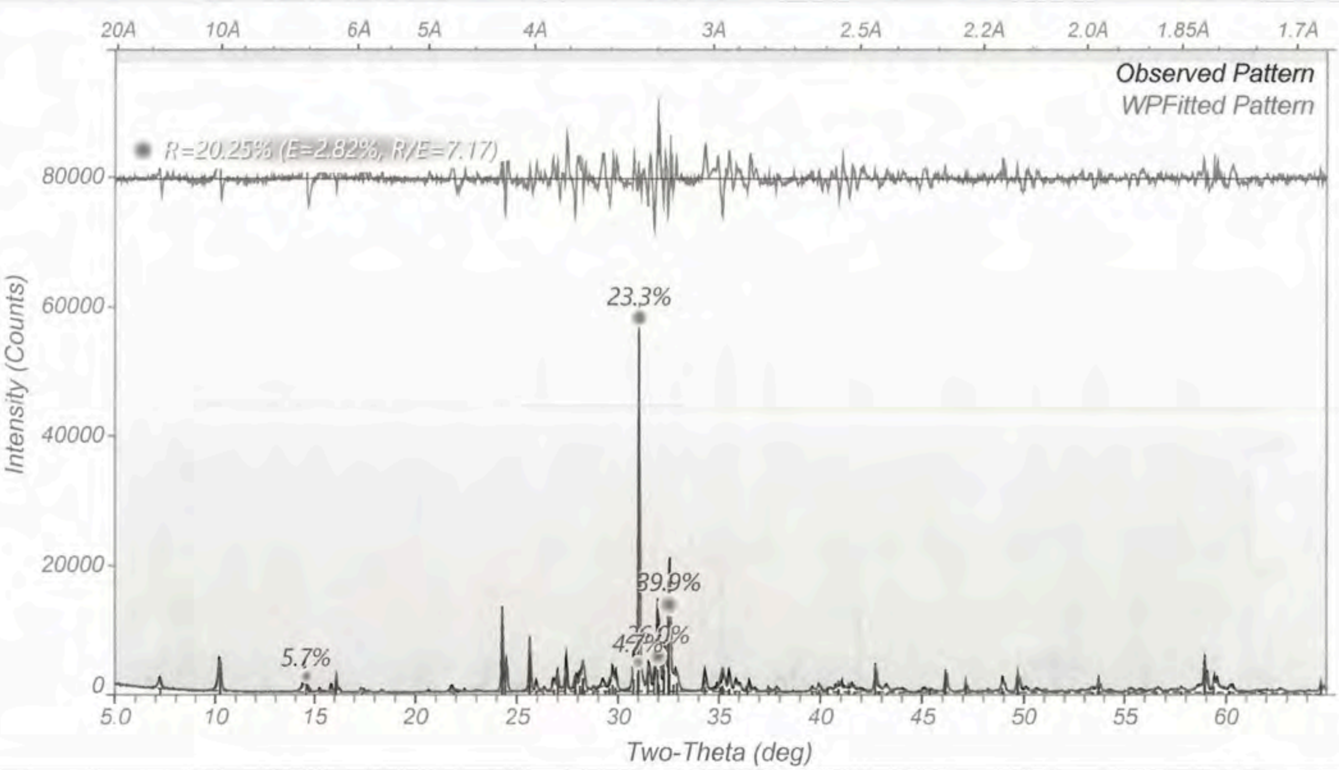
Phase ID (6)	Chemical Formula	PDF-#	Wt% (σ)	DD% (σ)	RIR	μ
Quartz	SiO2	98-000-0369	23.3 (0.9)	20.9 (1.8)	4.27	140.6
Albite	Na0.98Ca0.02Al1.02Si2.98O8	04-017-1022	39.9 (1.2)	30.5 (2.4)	0.69	133.6
Microcline	K0.96Na0.04AlSi3O8	04-026-3260	26.0 (0.9)	27.5 (1.7)	0.62	186.2
Chlorite-IIb | aluminum iron magnesit	(Al2.96Fe6.74Mg2.38)(Si5.24Al2.76)	01-090-3233	5.7 (0.3)	14.3 (0.5)	2.01	138.2
Illite	(K0.71Ca0.01Na0.01)(Al1.86Mg0.15	01-078-5138	4.7 (0.2)	6.3 (0.4)	0.65	167.4
Muscovite-2M1	KAl3Si3O10(OH)2	04-011-5240	0.5 (0.1)	0.6 (0.2)	0.67	183.0

XRF(Wt%): Fe2O3=2.3%, CaO=0.2%, K2O=4.7%, SiO2=71.3%, Al2O3=15.7%, MgO=0.5%, Na2O=4.7%

Refinement Converged (R/E=7.17), ♣ Round=4, Iter=4, P=32, R=20.25% (E=2.82%, EPS=0.5)







MGC_less than 2_Bulk — WPF Report

Scan ID: MGC_less than 2_Bulk.raw • MGC_less than 2_Bulk

Scan Parameters: 5.0°/64.956°/0.0195°/384(s), I(p)=22166/556, Co(35kV,40mA), August 30, 2024, 8:53 AM

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✔ Kα2 Peaks Present — Kα2/Kα1 Ratio = 0.5 — X-Ray Polarization = 1.0

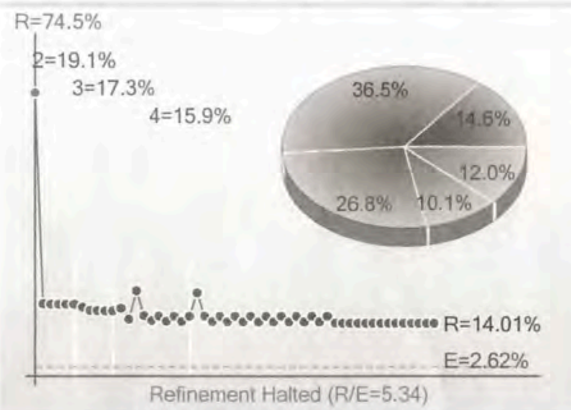
Geometry: Diffractometer Lp **Fitted-Range:** 5.0° - 65.0° **BG-Model:** Polynomial (5) **λ:** 1.78899Å (Co)

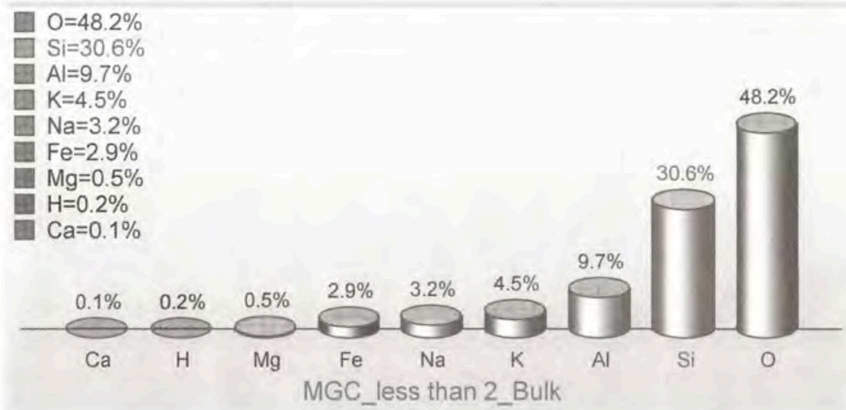
PSF: pseudo-Voigt **Broadening:** Individual FWHM Curve **Instrument:** Constant FWHM = 0.1°

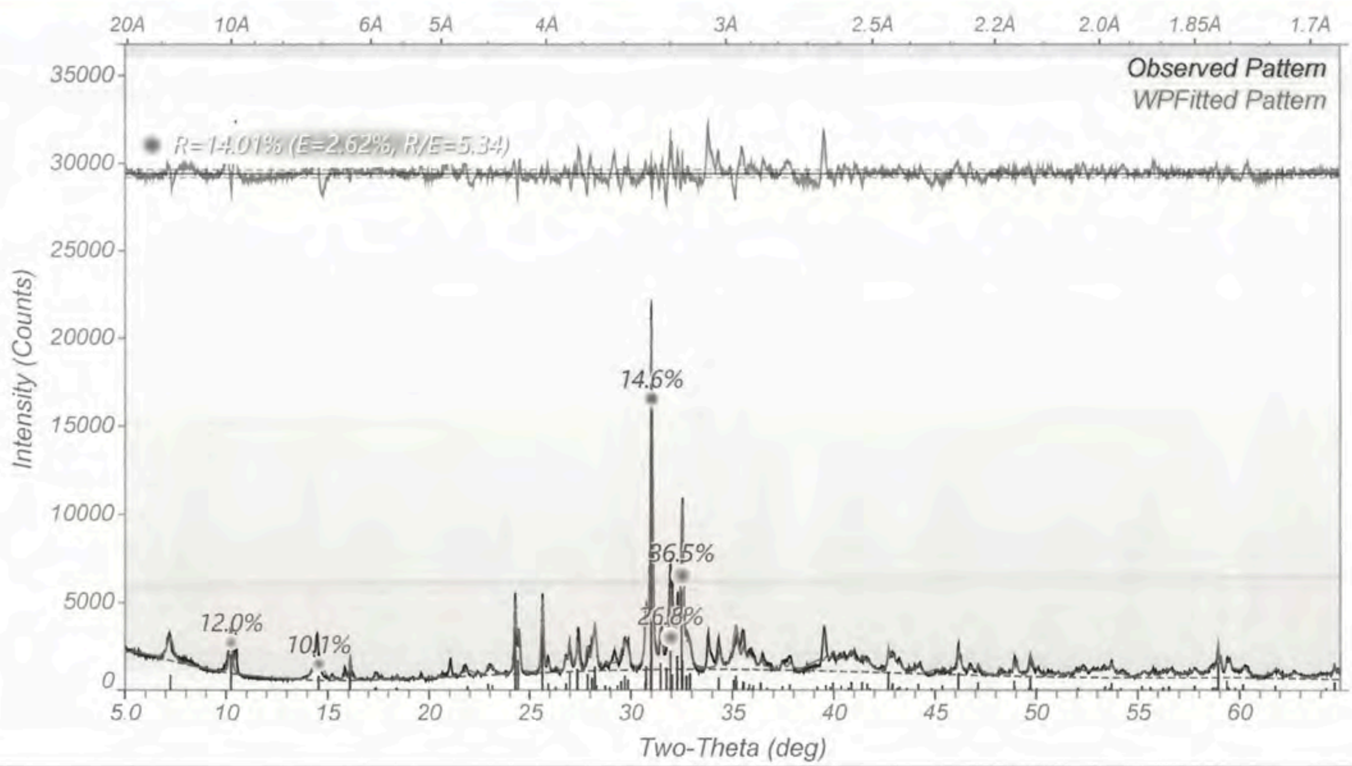
Phase ID (6)	Chemical Formula	PDF-#	Wt% (σ)	DD% (σ)	RIR	μ
Quartz	SiO2	98-000-0369	14.6 (0.8)	13.5 (1.4)	4.27	140.6
Albite	Na0.98Ca0.02Al1.02Si2.98O8	04-017-1022	36.5 (1.4)	31.0 (2.3)	0.69	133.6
Microcline	K0.96Na0.04AlSi3O8	04-026-3260	26.8 (1.1)	27.4 (1.8)	0.62	186.2
Chlorite-IIb | aluminum iron magnesiu	(Al2.96Fe6.74Mg2.38)(Si5.24Al2.76)	01-090-3233	10.1 (0.4)	19.7 (0.6)	2.01	138.2
Illite	(K0.71Ca0.01Na0.01)(Al1.86Mg0.15	01-078-5138	12.0 (0.5)	8.4 (0.8)	0.65	167.4
Muscovite-2M1	KAl3Si3O10(OH)2	04-011-5240	0.0 (0.0)	0.0 (0.0)	0.67	183.0

XRF(Wt%): Fe=2.9%, Ca=0.1%, K=4.5%, Si=30.6%, Al=9.7%, Mg=0.5%, Na=3.2%, O=48.2%, H=0.2%

Refinement Halted (R/E=5.34), ♣ Round=4, Iter=6, P=32, R=14.01% (E=2.62%, EPS=0.5)







December 11, 2024

Connor Devereaux
Environmental Manager
360 Oakville Place Drive
Suite 300, Oakville, Ontario, Canada, L6H 6K8
connor.devereaux@baffinland.com

RE: Baffinland Iron Mines Corporation's Mary River Project – Qikiqtani Inuit Association September 2024 Unscheduled Site Inspection Findings and Recommendations

Dear Mr. Devereaux,

Consistent with requirements under Schedule E, Item 12 of the Commercial Lease No.: Q13C301 (CPL), issued to Baffinland Iron Mines Corporation (Baffinland) by the Qikiqtani Inuit Association (QIA), the QIA conducted an Unscheduled Site Inspection (Inspection) of the Mary River Mine (Project) in September 2024. Mitch Kay of LGL Ltd., conducted the inspection on behalf of QIA. An overview of the inspectors' findings and recommendations is provided below.

The 2024 Unscheduled September Environmental Inspection Report has been appended to this letter for Baffinland's reference. Recommended actions are outlined in **Table 1** and can be found on page 9 of the report.

QIA commends and acknowledges the difficulties faced in dealing with this event and Baffinland's responsiveness.

If you have any questions or would like to discuss details, please feel free to contact me at your earliest convenience.

Nakurmiik,

Amoudla Kootoo
Water Specialist
Qikiqtani Inuit Association
(P)867.975.8364 or toll-free 1.800.667.2742
akootoo@qia.ca

[1] QIA and Baffinland (2013). Commercial Lease No. Q13C301. September 6, 2013.

Table 1: Recommendations

Item No.	Project Location/Topic	Requested Action
1.	Tote Road and Infrastructure at Mary River and Milne Port	Baffinland reported initially the full extent of damage to the Tote Road was unknown. Can Baffinland please provide an update on damage to the Tote Road and other infrastructure at Mary River and Milne Port. Have the timeframes for repairs changed since the full extent of damage had been assessed. During the inspection, culverts were scattered across the tundra at KM63.5 and no plan was provided on how the culverts would be retrieved. We recommend Baffinland develop and execute a plan for retrieval of culverts and other materials and describe the associated timeframe.
2.	ESC measures across entire project area	As recommended previously, Baffinland needs to implement more robust erosion and sediment control measures across the entire project area. This concern is amplified during extreme weather events. We continue to suggest stockpiles of erosion and sediment controls such as coir logs be kept on site and ready for use as necessary. An example during the inspection was the inspector identified runoff derived from the road behind Sailiivik Camp entering Sheardown Tributary. The Baffinland Environmental Service team placed coir logs at key locations, which rapidly decreased runoff and concentrations of TSS in Sheardown Tributary.
3.	KM 105	The shortcomings of the KM105 Dam have been well-documented during previous inspections and subsequent reports. The extreme rain event highlighted many of the concerns QIA has voiced regarding treatment of runoff from the active mine area and haul roads. The quantities of sediment deposited on the tundra and farther downstream of the KM105 Dam is unacceptable and a clear plan needs to be developed to rectify the situation. Areas just downstream of the KM105 Dam support fish and fish habitat, which means sustained high concentrations of TSS and potentially other contaminant on concerns could be in contravention of section 34(1) *deleterious substance* of the federal *Fisheries Act.*
4.	Clarification on methodology for determining rainfall event.	During the Unscheduled Environmental Inspection, Baffinland communicated the rain event was considered to be a 1 in 200-year event but since has revised this to a 1 in 1000-year event. understands the revision was based on rainfall records between 2013 and 2023 at the Mary River Mine Site. However, long-term records are likely available from Pond Inlet or Iqaluit, which could be used in enhance the temporal resolution. Environment Climate Change Canada has operated weather stations (ID

		2403200; 2403206 etc.) since the early 20th century at Pond Inlet. Data are sparse at times but could be used to supplement current information. Additionally, larger climate indices such as the North Atlantic Oscillation fluctuate often on decadal timesteps. These regional climate indices will strongly influence the quantity of precipitation. requests Baffinland provide the methodology used to calculate the frequency and return period of this rainfall event.
5.	Explore the potential effects of the rain event on the aquatic environment.	The unprecedented rainfall event has led to large-scale erosional events occurring across the Mary River Mine Site. High concentrations of TSS in water is often transient and sediment settling rates are related to the size of the sediment particles. recommends Baffinland further explore the potential effects of the rain event on the aquatic environment near where the washout occurred and at Sailiivik Camp. understands this action is untenable to conduct during the winter months but should be incorporated into aquatic monitoring efforts during the 2025 ice-free season.

Unscheduled Inspection

To: ᑯᓇᕐ ᔨᐱᖕᓱ / ᒪᓕᒐᓕᕆᔾᔪᑎᓄᑦ ᐊᐅᓚᑦᑎᔨ
Conor Goddard / Manager of Project Compliance and Monitoring
CGoddard@qia.ca / Office: 867.975.8385

ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖕᒋᑦ
Qikiqtani Inuit Association
1.800.667.2742
ᓱᑲᑦᑐᒃᑯᑦ / Fax: 867.979.3238
www.qia.ca

From: Mitchell Kay, Senior Aquatic Scientist, LGL Limited
Joesph Cavallo, Senior Fisheries Biologist, LGL Limited

Date: December 11th, 2024

RE: Water License 2AM-MRY1325 – Mary River Project Follow up Report to October 2024 Unscheduled Environmental Inspection

1 Introduction

Consistent with requirements under Schedule E, Item 6 of the Commercial Lease issued to Baffinland Iron Mines Corporation (Baffinland) by the Qikiqtani Inuit Association (QIA), LGL conducted an Unscheduled Environmental Inspection (Inspection) of the Mary River Mine on Oct 1st and Oct 2nd. The Inspection was prompted by an unprecedented rain event across the Mary River Project Area and was carried out by Mitchell Kay, PhD on LGL's behalf. Baffinland reported 82.2 mm of rainfall was recorded during a 24-hour period and 108.0 mm of precipitation occurred during a 72-hr period. An overview of the Inspectors' findings and requested actions are provided below. Photographs associated with the findings and requested actions made by LGL are provided in Appendix A.

2 Review of Reports

The following reports were received and reviewed prior to and following the completion of the Inspection. A quick summary produced by Baffinland is provided for each report.

Unprecedented Rainfall Event – September 21 Follow-up to Spill; 2024-478 Mary River Project – Water Licence No.2AM-MRY1325

- Baffinland's Mary River Mine Site and the surrounding region experienced unprecedented levels of rainfall from September 20 through September 22, resulting in significant erosion and infrastructure damage to the Tote Road. Over the three-day period, a maximum of 82.2 mm of rainfall was recorded at the Mary River Mine Site weather station in a 24-hour period, extrapolated to be a 200 year 24-hour rainfall event, with rainfall continuing and accumulating a maximum of 108 mm of precipitation over a 72-hour period. Unprecedented high flows in watercourses resulted in overland flooding, and significant erosion occurring along the Tote Road between kilometres 50 and 87.5. Hazardous weather conditions prevailed throughout the period which hindered response and monitoring initiatives on the Tote Road and the Mary River Mine Site.

Follow-up to Spill #2024-366 Mary River Project - Water Licence No.2AM-MRY1325

- The Milne Port Ore Stockpile Sedimentation Pond (East) (MP-05) on September 22, 2024, experienced an uncontrolled release of surface water stored within the water management infrastructure. The overtopping event was minor in nature and was observed to occur from September 22 08:00 to 16:00. The sedimentation pond experienced the release of water at the Northwest corner of the pond berm as well as the engineered spillway. Due to the nature of the event, the volume of surface water that overtopped MP-05 was not able to be quantified.
- Prior to the event, from September 20-22, a significant rainfall event occurred, resulting in Ore Stockpile Sedimentation Pond water levels to rise significantly. The Milne Port weather station recorded 26.8 mm of rain during September 20-22. Milne Port Ore Stockpile Sedimentation Pond water levels were managed diligently in August and early September with a total of 17,013m^3 being compliantly discharged to the receiving environment. The water levels within MP-05 are continually managed by pumping stored surface water to the Milne Port Ore Stockpile Sedimentation Pond (West) (MP-06) where pumping discharge infrastructure is resident. Water transfers were initiated upon the onset of the rain event and a controlled discharge was initiated on September 20 from MP-06 to manage water levels.

Water Licence 2AM-MRY1325 Monthly Surveillance Network Program (SNP) Report September 2024

- This report presents a list of samples/monitoring conducted in September under the Licence at sites with discharge/flowing water conditions and the details concerning the collected water quality samples, including sample dates and laboratory identification numbers.
- In September 2024, there were no exceedances from applicable water licence monitoring stations with the exception of seven (7) exceedances in September at SNP surface water monitoring stations. Elevated levels of TSS were observed at MS-C-A (September 22), MS-C-B (September 22), MS-C-C (September 22), MS-C-E (September 22), and MS-C-F (September 8, September 19, and September 22) from natural sedimentation events and Project related run-off associated with a severe rainfall event.

Information Request – October 2024 Unscheduled Inspection

- This is a follow up report from Baffinland Iron Mines Corporation (Baffinland) in response to QIA with respect to the September 2024 Unscheduled Inspection as per the QIA-Baffinland Commercial Lease No.: Q13C301 (Lease). It should be noted that this inspection occurred between Oct 1-2, 2024.

Water Licence 2AM-MRY1325 Monthly Surveillance Network Program (SNP) Report October 2024

- This report presents a list of samples/monitoring conducted in October under the Licence at sites with discharge/flowing water conditions and the details concerning the collected water quality samples, including sample dates and laboratory identification numbers.
- Baffinland has since worked with consultants and determined this to be greater than a 1 in 1,000-year rainfall event based on rainfall records between 2013 and 2023. Rainfall continued past this 24-hr event and accumulated a maximum of 108 mm of precipitation over a 72-hour period.
- Elevated levels of Total Suspended Solids (TSS) were observed on October 2 at MS-C-F, located downstream of the KM 105 dam infrastructure within a ponded area. The exceedance is a result of natural erosion, sedimentation events, and Project-related run-off associated with the severe rainfall event experienced in late September. MS-C-F was sampled the following week and TSS levels were well below the specified Water Licence criteria.

3 Site Inspection Observations

Dr. Mitchell Kay arrived at site on the evening of Tuesday October 1st and departed on the evening of Wednesday October 2nd. Mitchell was escorted by a member of Baffinland's Site Service department, Todd Swenson, Environmental Superintendent (Baffinland). The evening of October 1st was used to identify critical regions to evaluate the effects of the rain event as it was not possible to complete an inspection of the entire Project Area due to time constraints.

The weather was hovering around 0 °C with heavy fog, which led to limited visibility as well as freezing rain, snow and sleet scattered throughout the day. The difficult weather conditions did not hamper the overall objectives of the inspection. However, rapid snowfall on the evening of October 1st and the early morning of October 2nd may have hidden some erosional events that occurred previously due to the rain event. The Inspection started at ~7:30 am on October 2nd. Mitchell and Todd were joined by Jesse and Shannon from Baffinland during the morning and afternoon, respectively.

Waste Rock Facility

On the morning of October 2nd, Mitchell travelled with Todd and Jesse via light duty truck from Sailiivik Camp (also referred to as the Mary River Mine site) to the waste rock facility at the top of the mountain. The visibility was extremely bad at the top of the mountain due to fog, and we were not able to enter the facility. The treatment facility was not on-line as the system was in winter shutdown conditions. The rain event resulted in water levels of the waste rock facility treatment pond to increase above acceptable winter levels. Baffinland was testing water quality parameters of the treatment pond following the rain event. Baffinland was discharging the water directly as it met acceptable criteria but did not discharge during the rain event due to high concentrations of total suspended solids (TSS). The goal was to have to the water level of the pond reduced greatly prior to the spring freshet. There was no emergency spillway activated during the rain event. However, due to additional run off/rain this pond was filling up faster than Baffinland could pump the water out but was indicated to Mitchell they were expecting to catch up prior to freezing conditions.

KM106 Stockpile and Treatment Pond

There was no evidence of erosion events at the KM106 Stockpile nor the Treatment Pond. The surrounding area was snow covered, which may have hidden potential erosion events due to the heavy rainfall. The pond here did not fill up nearly as much as the one at the waste rock facility. The total suspended solids (TSS) were still extremely high and Baffinland had not discharged here at all. My understanding during the inspection was they were waiting for the rain to stop and the TSS to settle before discharging. This process needed to occur prior to freeze up as there was no room in the pond for the spring freshet. Follow up information provided by Baffinland suggested they were able to discharge this pond prior to freezing conditions and indicated there should be room in the pond for the spring freshet without having to activate the emergency spillway.

Mine Haul Road Ditches

The mine haul ditches were flowing fast with extremely high TSS water. There was no evidence of freezing occurring despite the below 0 °C temperatures. During the September 2024 Environmental Inspection, inspectors identified a stream of high TSS/sediment rich water entering the mine haul ditches from the side of the mountain. Further investigations revealed this stream was entering the mine haul ditches from the active mining area. Baffinland provided done imagery of the region as requested. However, if the dam downstream at KM105 is not working as indented, turbid and sediment laden water entering the mine haul ditches provides direct passage to fish bearing habitat and the natural environment, which could have deleterious effects on aquatic life.

Inflow to KM105 Dam

The pre-dosing facility was shut down for the season. Baffinland was not currently treating any of the sediment rich water flowing down the mine ditches, which eventually flows into KM105 Dam Settling Pond. There were some concerns communicated by Todd and Jesse that as temperatures dropped below freezing, the lime may freeze but not the acid. Visual observations suggest the water here had high concentrations of TSS as it flowed over the waterfall prior to the dosing station. There was a lot of sediment deposited on the banks, which was mainly sand indicating high flows previously. The rain event produced enough flow to develop a second channel that completely circumvented the dosing station. Baffinland communicated they will attempt to rectify this situation during the winter months and will provide a permanent solution prior to the next spring freshet.

KM105 Dam Area

There were no obvious major erosion events observed upstream or around KM105 due to the rainfall event. We inspected the upstream reach of the tributary feeding into the KM105 Dam Settling Pond, which in the past had erosional problems. The large snowfall hindered the visibility farther upstream, but the inspector didn't see any clear evidence of erosion. The treatment pond at KM105 rose ~5.0 m during the rain event, but water levels receded quickly due to well-documented leaks and sub-surface flows. Downstream of KM105 Dam, before the tundra was pooling of extremely turbid water, which was not being pumped or treated actively. The water treatment facility was also not operation, which was the same as the September Environmental Inspection. The tundra region downstream of the KM105 Dam was covered in high TSS water and there was clear evidence of sediment deposition occurring. The pooling was worse than the September Environmental Inspection. The filter bag was at the bottom of the dam was also not operational. There were no plans in place for future remediation. The inability of the dam to function as intended has provided a direct conduit for sediment laden water, which could be potentially enriched in contaminant of concerns to enter fish bearing habitat. These concerns are amplified under environmental conditions such as large rain events or spring freshets when runoff from the project area, specifically active mining areas, is increased greatly.

Pond Behind the MSC

This pond was observed from behind the MSC, which is directly downstream of the dam and the sediment covered tundra. There was high quantities of turbid water and water levels were higher than usual. The sediment curtain installed previously in the pond had little to no effect. Anecdotally, Todd pointed out regions where water was flowing off the side of the mountain outside the project area. Downstream of the pond looked a little less turbid than water in the pond but the inspector did not have clear visibility downstream due to freezing rain, high wind and snow.

Crusher Pad

Baffinland was not currently hauling any ore down the Tote Road and were stockpiling all material at the crusher pad. None of the three crushers were currently operational since the stockpiles were full. They were in full maintenance mode on the machines with the hopes of having all three crusher pads operational when the road is functional. The crusher pond was about half full, with concerns about the spring freshet here as well. They were not discharging water because of the high concentrations of TSS, but the emergency spillway was not activated.

Sewage Treatment Facility

No reported problems here. The facility was able to handle the rain, but discharge was higher than normal. The water quality reported was better than normal likely due to dilution.

Sheardown Tributary

The inspector observed the confluence of Sheardown Tributary with Sheardown Lake. As illustrated in Appendix A, extremely turbid water and potentially iron-rich sediment was documented flowing into Sheardown Lake from Sheardown Tributary. The silt curtains installed at the mouth of Sheardown Tributary had little to no effect on reducing concentrations of TSS prior to Sheardown Lake. This is a clear example of the downstream consequences of KM105 Dam not functioning as intended. The sources of sediment and turbid water were likely from the road, KM105 infrastructure system and the tundra region beside Sailiivik Camp. The inspector identified two or three locations while evaluating Sheardown Tributary where runoff from the road was entering the tributary. One of the locations was rectified immediately by Baffinland as coir logs were installed. Coir logs continue to demonstrate their superior utility compared to other sediment erosion control options and should be ubiquitous across the project area. Todd provided some insight on the tundra region by Sailiivik Camp, where a dam similar to KM105 was proposed. At the time of this inspection, Baffinland will not be going forward with the dam but are continuously evaluating other options.

Tote Road – KM63.5

During the afternoon on October 2nd, Todd and Mitchell were escorted to the Tote Road by Shannon. We drove initially to the farthest planned location (KM63.5) and worked our way back to Sailiivik Camp. Between ~KM63 and KM64 was where one of the major erosion events occurred. At KM63.5 there were 5 culverts composed of 20 smaller pieces connecting each side underneath the road. The rain event completely washed out the road and associated culverts and scattered them on the tundra downstream of the washout location. At the time of the inspection, there were no plans on how to collect the culverts, but Baffinland suggested retrieval could occur during the winter months. There was evidence of sediment erosion from the stream banks, which had clearly been carried downstream and deposited into the lake. The inspector and Baffinland team did not hike downstream to inspect the lake and surrounding terrestrial environment as there were time constraints and the team was unsure if it was safe or not. The culvert repair here was temporary and will be reconstructed completely during winter months. Nonetheless, the culvert repair looked very good as it was reinforced/armoured, level with the stream and water was flowing at a good rate through the culvert(s). On the opposite side of the road, check dams were updated. All the source material was extracted from the quarry. Where possible, Baffinland tried to retrieve material from the washout event. Baffinland indicated runoff occurred from an extremely large catchment in the area and merged with the natural water path, which resulted in extremely high flow. Notably, at KM64 the entire road was washed away due to overland flow. The Tote Road was open for light duty vehicles but not heavy duty during the inspection.

KM72 Dip

Some washout occurred here, but the check dam held up extremely well and likely prevented some of the washout from being worse. The check dam was covered in sediment and likely would need some maintenance to operate effectively for future sediment erosion events.

KM80 Bridge

Water levels of the river rose ~1.0 m above normal levels during the rain event but did not cause any damage to the abutments or the bridge. The water in the tributary was quite turbid, which flowed into Murial Lake. Baffinland also pointed out a large erosion event they observed on the far side of the lake away from the Tote Road. Visual observation of Murial Lake indicated the water was very turbid due to the washout and erosion event(s).

KM86 Washout

The area surrounding KM86 was another region of concern for Baffinland following the rain event. There are local depressions here similar to ~KM63 that helped facilitate the washout event. The culverts here were slated to be repaired, which was sorely needed prior to and following the rain event. The water course here has been changed permanently due to the sediment erosion unless Baffinland excavates the material that entered the stream. However, there were no plans to excavate the material. The washout event produced overland flow that spanned ~250 m of the Tote Road. There was sand deposited all over the road and surrounding tundra, but did not hamper light vehicle transit on the Tote Road. Sediment and other materials entered the lake as the lake was noticeably turbid.

KM97 Bridge

Water levels of the river rose to ~0.5 m below the bottom of the bridge. There was no visible damage to the abutments or the bridge. Water deposited sediment everywhere at this location. The culverts were still in tack here and no visible damage was observed.

4 Summary and Information Request

An Unscheduled Environmental Inspection of the Mary River Project Area was conducted by Dr. Mitchell Kay on October 1st and October 2nd, 2024, following an unprecedented rain event, which was characterized originally by Baffinland as a 1 in 200-year event. Since Baffinland has revised the characterization to be a 1 in 1000-year event. The overall impression of the Inspector was large-scale sediment erosional events occurred on and outside the project area. Some of these events were outside of the control of Baffinland while others were due to a lack of effective sediment and erosion controls throughout the project. The Inspector commends Baffinland for the rapid response and emergency measures taken to repair regions of the Tote Road. Following the unscheduled inspection, QIA submitted an information request and scheduled a debrief meeting with key members of Baffinland Environmental Staff.

The major themes of the information request are listed below.

1. QIA requests an update on the compromised infrastructure and the timeframe for repairs at these locations should be provided.
2. QIA requests an update on whether DFO has visited the site and had any input into repairs at stream crossings.
3. QIA requests information on the magnitude of the event experienced, such as whether it was a 1:50-year event or a 1:200-year event.
4. QIA requests information on the strategy and future of the KM105 pond and provides a schematic of the existing and/or future layout for those unfamiliar with it (i.e. schematic to show how the pond is currently functioning or will function in the future, in conjunction with the water treatment system).
5. QIA requests an update on issues in the lower Tote Road and Milne Port where LGL was unable to inspect.
6. QIA requests a timeline for discharging sedimentation ponds. Is BIM confident this can be done before Spring Freshet?
7. QIA welcomes further discussion on post-inspection de-briefings with QIA and BIM staff. We encourage further discussion on this.

5 Critical Recommended Actions

Baffinland reported initially the full extent of damage to the Tote Road was unknown. Can Baffinland please provide an update on damage to the Tote Road and other infrastructure at Mary River and Milne Port. Have the timeframes for repairs changed since the full extent of damage had been assessed. During the inspection, culverts were scattered across the tundra at KM63.5 and no plan was provided on how the culverts would be retrieved. We recommend Baffinland develop and execute a plan for retrieval of culverts and other materials and describe the associated timeframe.

As recommended previously, Baffinland needs to implement more robust erosion and sediment control measures across the entire project area. This concern is amplified during extreme weather events. We continue to suggest stockpiles of erosion and sediment controls such as coir logs be kept on site and ready for use as necessary. An example during the inspection was the inspector identified runoff derived from the road behind Sailiivik Camp entering Sheardown Tributary. The Baffinland Environmental Service team placed coir logs at key locations, which rapidly decreased runoff and concentrations of TSS in Sheardown Tributary.

The shortcomings of the KM105 Dam have been well-documented during previous inspections and subsequent reports. The extreme rain event highlighted many of the concerns QIA has voiced regarding treatment of runoff from the active mine area and haul roads. The quantities of sediment deposited on the tundra and farther downstream of the KM105 Dam is of significant concern and a clear plan needs to be developed to rectify the situation. Areas just downstream of the KM105 Dam support fish and fish habitat, which means sustained high concentrations of TSS and potentially other contaminant on concerns could be in contravention of section 34(1) *deleterious substance* of the federal *Fisheries Act.*

During the Unscheduled Environmental Inspection, Baffinland communicated the rain event was considered to be a 1 in 200-year event but since has revised this to a 1 in 1000-year event. LGL understands the revision was based on rainfall records between 2013 and 2023 at the Mary River Mine Site. However, long-term records are likely available from Pond Inlet or Iqaluit, which could be used in enhance the temporal resolution. Environment Climate Change Canada has operated weather stations (ID 2403200; 2403206 etc.) since the early 20th century at Pond Inlet. Data are sparse at times but could be used to supplement current information. Additionally, larger climate indices such as the North Atlantic Oscillation fluctuate often on decadal timesteps. These regional climate indices will strongly influence the quantity of precipitation. LGL requests Baffinland provide the methodology used to calculate the frequency and return period of this rainfall event.

The unprecedented rainfall event has led to large-scale erosional events occurring across the Mary River Mine Site. High concentrations of TSS in water is often transient and sediment settling rates are related to the size of the sediment particles. LGL recommends Baffinland further explore the potential effects of the rain event on the aquatic environment near where the washout occurred and at Sailiivik Camp. LGL understands this action is untenable to conduct during the winter months but should be incorporated into aquatic monitoring efforts during the 2025 ice-free season.

For further description of concerns and requested actions, please the comments and recommendations table that follows. Should you wish to discuss any aspects of this letter, please feel free to contact either of the undersigned.

Respectfully submitted,

LGL LIMITED

Mitchell Kay, Ph.D.
Senior Aquatic Scientist

Joseph Cavallo
Senior Biologist

Photo 1 – White out conditions at the Waste Rock Facility that prevented access (Oct 2nd, 2024).

Photo 2 – KM106 Pond after the rain event (Oct 2nd, 2024).

Photo 3 – KM106 Stockpile (Oct 2nd, 2024).

Photo 4 – Downstream view of the dosing facility upstream of KM105 infrastructure. Note the new channel by passing the dosing facility (Oct 2nd, 2024).

Photo 5 – Runoff collection upstream of KM105 Pond, turbidity is noticeable (Oct 2nd, 2024).

Photo 6 – Collection area upstream of KM105 Pond, turbidity is noticeable (June 10, 2024).

Photo 7 – KM105 Pond (Oct 2nd, 2024).

Photo 8 – KM105 Dam looking downstream towards Sailiivik Camp (Oct 2nd, 2024).

Photo 9 – Water pooling below the KM105 Dam, noticeable turbid (Oct 2nd, 2024).

Photo 10 – Tundra below KM105 Dam (Oct 2nd, 2024).

Photo 11 – Stockpile at the crusher pad. (Oct 2nd, 2024).

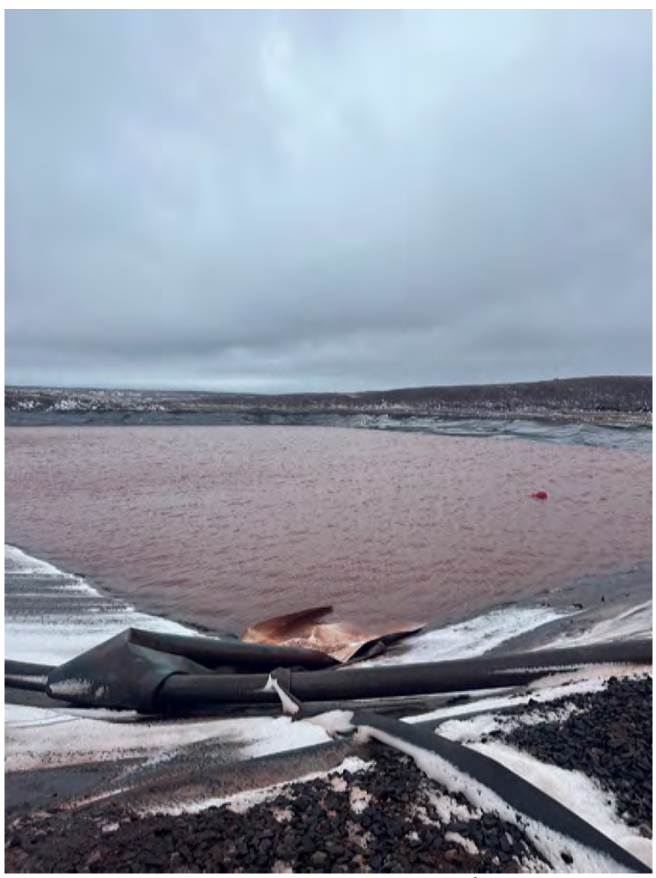


Photo 12 – Crusher Pond (Oct 2nd, 2024).

Photo 13 – Sheardown Tributary entering Sheardown Lake. The water is noticeable turbid in the tributary and lake (Oct 2nd, 2024).

Photo 14 – Runoff from the road behind Sailiivik Camp entering Sheardown Tributary (Oct 2nd, 2024)

Photo 15 – Source of run off from the road. Water is noticeably turbid (Oct 2nd, 2024).

Photo 16 – Status of the Tote Road (Oct 2nd, 2024)

Photo 17 – Culvert replacement at ~KM63.5 (Oct 2nd, 2024).

Photo 18 – Sediment erosion due to the unprecedented rain event (~KM63.5; Oct 2nd, 2024).

Photo 19 – Culverts scattered across the landscape at KM63.5 (Oct 2nd, 2024).

Photo 20 – Culvert replacement at KM63.5 from the opposite side of the Tote Road as Photo 17 (Oct 2nd, 2024).

Photo 21 – Example of sediment erosion adjacent to the Tote Road (Oct 2nd, 2024).

Photo 22 – Check dam at KM72 Dip (Oct 2nd, 2024).

Photo 23 – KM86 washout event deposited high quantities of material and altered the natural watercourse (Oct 2nd, 2024).

Photo 24 – Quantity of sand deposited at KM86 washout (Oct 2nd, 2024).

Photo 25 – Extent of erosion and increased channel size compared to erosion trap (Oct 2nd, 2024).

Photo 26 – Bridge close to Sailiivik Camp and sediment deposited due to erosion (Oct 2nd, 2024)

Baffinland MARY RIVER PROJECT

March 23, 2025

Conor Goddard
Manager of Project Compliance and Monitoring
Qikiqtani Inuit Association
Iqaluit, NU
X0A 0H0

Re: Response to Recommendations – 2024 Environmental Inspection Reports – September & October

The following submission from Baffinland Iron Mine Corporation (Baffinland) is a follow up in response to the Qikiqtani Inuit Association's (QIA) 2024 Environmental Inspection Reports for inspections conducted in September and October of 2024.[1] [2] Attachment 1 and 2 provide a summary of the QIA's inspection recommendations and Baffinland's responses to these items. Appendix 1 and 2 provide photos regarding specific responses.

Should you have any additional concerns or questions regarding the attached responses, please do not hesitate to contact the undersigned at your convenience.

Regards,

Todd Swenson
Environmental Superintendent

CC: Lou Kamermans, William Bowden, Katie Babin

Attachments

Attachment 1 – Baffinland Responses to QIA's September Environmental Inspection Report
Attachment 2 – Baffinland Responses to QIA's October Environmental Inspection Report
Appendix 1 – Photos Regarding September Environmental Inspection Report
Appendix 2 – Photos Regarding October's Environmental Inspection Report

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[1] QIA (2024) QIA Baffinland Iron Mines Corporation Commercial Lease Environmental Inspection Report – September, 2024, dated December 5, 2024.
[2] QIA (2024) QIA Baffinland Iron Mines Corporation Commercial Lease Unscheduled Environmental Inspection Report – October, 2024, dated December 11, 2024.

Attachment 1 - Baffinland Responses to QIA's September Environmental Inspection Report

Item No.	Project Location	QIA Requested Action – UPDATE FROM September 2023 VISIT (BOLD)	Baffinland Response/Speaking Points
1	Ditches along the Mine Haul Road	A. (June 2023 Inspection) The ditches should be reconstructed and sized to convey high flows, and rock check dams should be installed per typical specifications to reduce velocities, allow for settling and to reduce erosion in the ditches. B. (June 2023 Inspection) Reduction of TSS entering KM 105 pond in upstream catchment will significantly aid in reducing treatment issues in the control pond. C. We recommend effort be placed on prevention of sediment laden sources of water from entering runoff which contributes to the KM 105 pond input and placing emphasis of treatment at the source. D. The source of the sediment-laden runoff observed at approximately KM 106.5 should be assessed and remediated to prevent further sedimentation into the Haul Road ditch.	A. These ditches are designed to convey high flows and sediment traps have been installed near historical culverts. Armoring of the ditches will continue to be completed to protect these features from erosion/degradation, but TSS removal is difficult given the grade of the ditches and primarily happens within the pond/treatment system below. B. Settling of entrained sediments is best designed in areas of low velocity where waters are sufficiently slowed. The first opportunity for that decrease in velocity is within the KM 105 valley. Water management structures and the natural topography of this area promote reduction in velocity and TSS. A 2025 mitigation strategy for this area was submitted to QIA on January 22, 2025 as part of an overall update on the KM 105 Pond. C. A 2025 mitigation strategy for this area has been submitted to the QIA on January 22 as part of an overall update on the KM 105 Pond. D. The Mine Haul Road ditch is designed to capture typical water sources such as the observed. Water collected by the Mine Haul Road ditch system is conveyed to the KM105 Pond facility, where flocculent treatment and settling occur to remove the sediments, as designed in the Mine Site Water Management Plan approved by the NWB as Modification Number 13 in 2021. Refer to the KM 105 update submitted on January 22 for the mitigation strategy in 2025.
2	KM105 Pond Sedimentation Pond (North Embankment)	A. A report documenting the status of the KM 105 embankment foundation repair is requested. B. The design, operation, and performance criteria specified for the newly installed KM 105 Water Treatment Plant are requested. C. Can BIM confirm what contingency measures will be implemented to ensure that water with elevated TSS from the mine area is not released into the receiving environment downstream of the secondary pond adjacent to the downstream toe of the NW embankment under the full range of flow conditions expected at the site?	A. The 2024 Annual Geotechnical Report submitted on October 26 evaluates the stability of the Km 105 Dam infrastructure and provides the most up to date status. B. A significant ponded area is required to feed the pumping system for the Water Treatment Plant which is not available due to the KM 105 Dam seepage. Chemical injections are planned for Freshet 2025 to batch treat influent water. Performance criteria are water licence guidelines. C. A 2025 mitigation strategy for this area has been submitted to the QIA on January 22 as part of an overall update on the KM 105 Pond.
3	KM 105 Sedimentation Pond (Southwest Embankment)	A. A map providing the as-built names and locations of all thermistors that were installed at and are associated with the KM 105 SCP is requested. B. Plots of collected thermistor profile data are requested to assess the nature of permafrost at the locations where thermistors have been installed.	A./B. This information was supplied to QIA in Baffinland's Response to QIA's 2024 June Environmental Inspection – Information Request addressed to Conor Goddard and submitted by email to Amoudla Kootoo on July 4, 2024.
4	Throughout the project area but particularly at stream crossings	A. We recommend that an effective sediment and erosion plan be implemented, and that regular and post-flow event monitoring occur by qualified individuals. ESC controls such as coir logs, sediment curtains and other measures (as possible for this environment) be used liberally. i. Examples of locations to use these measures include: • Roadside margins to prevent and/or divert sediment-laden water from flowing towards streams and/or lakes • Areas adjacent to waterbodies to prevent sediment-laden water from entering streams and/or lakes. B. We suggest that sediments be controlled at the source as the first step in the treatment train of measures. A maintenance staff and program are recommended to respond to issues in a timely and effective manner.	A. Baffinland will continue to implement ESC measures in accordance with the Surface Water Aquatic Ecosystem Management Plan (SWAEMP). Baffinland will continue to investigate alternative ESC controls that can be appropriately deployed considering the unique conditions encountered on northern Baffin Island. B. Baffinland will continue to implement ESC measures at the source, proactively when possible.

		Issues should be proactively addressed (i.e., prior to rain events or spring freshet).	
5	Immediately Downstream of pond KM105	A. (June 2023 Inspection) Remediation of the KM 105 pond dam and upstream channel will minimize the amounts of fine sediments able to travel downstream. B. (June 2023 Inspection) Continue to monitor turbidity, water levels and chemical parameters in pond KM 105. C. (June 2023 Inspection) Increased ESC controls should be employed to minimize entrained sediments and encourage settling (turbidity curtains, silt fencing, filter logs, etc.) D. The functionality of the water treatment system would help to effectively treat water quality.	A./B./C./D. Baffinland has developed a 2025 mitigation strategy to address water quality and sediment transport issued related to the KM 105 Dam and has submitted this information to QIA on January 22, 2025. Monitoring is performed as per approved water licence frequencies. Silt curtains are installed in the Km 105 valley and increased sediment and erosion controls including filter berms are planned for 2025.
6	Immediately south of the mine road adjacent to the Sheardown Lake Tributary	A. (June 2023 Inspection) Sediment control fencing or other method of erosion and sediment control (ESC) should be installed at the base of the road to minimize/prevent future sedimentation impacts. B. Snow clearing operations should avoid pushing snow into the stream channel. C. Effective marking of the area, visible during the winter would avoid this issue.	A. The suggested silt fencing was installed and observed by Dr. Kay during his inspection in October. B. Revisions to the SMP (Snow Management Plan) for 2025 winter season were employed, with additional snow management controls established for this area. Awareness training on these controls has been taking place with involved departments. See Appendix 1 for photos. C. Marking of fish bearing crossings was performed as part of the revised SMP. Ongoing maintenance of the marking will be required.
7	Waste Rock Facility Water treatment Plant at the top of Mine Site	A. (June 2023 Inspection) Continue to monitor turbidity and other chemical parameters of effluent and ensure no exceedances. B. (June 2023 Inspection) Ensure contingency plan in the event of large quantities of runoff exceeding capability of the treatment infrastructure. C. Complete the leak detection investigation that was scheduled to be completed during the snow free period of 2024 or devise alternate plan to ensure that contents of SCP are not released to the environment.	A. Baffinland will continue to monitor and submit reports containing results of turbidity and other required parameters as required under the Water License and MDMER. B. As required by Section 30 of the Metal Diamond Mining Effluent Regulations, Baffinland does have an emergency response plan in place for this facility as well as all other Metal and Diamond Mining Effluent Regulations sites. Upgrades to pumping infrastructure is planned for 2025. C. For the 2025 operational year, Baffinland will continue to monitor potential seepage and implement suitable controls to ensure proper management of potential seepage from containment facilities. Potential seepage is contained by ditching and pumped back to the lined facility.
8	KM 106 Ore Stockpile (Glencore)	A safety plan should be developed to ensure that another flow failure event is not triggered if heavy equipment is operated on the surface of the stockpile whenever the stockpile is relocated.	Baffinland will continue to take the precautions necessary to ensure that another flow failure does not occur, as per the Working Near Slopes, Pit Walls, Dumps and Stockpiles SOP.
9	KM 81 Stream Crossing	We suggest that the amount of fine materials in the short section on channel downstream of the culverts, and upstream of the lake, be monitored over time and that an assessment of whether any impacts to fish habitat in Muriel Lake, has occurred.	This crossing (CV-216) is a priority crossing for additional remediation in winter 2025, and is already subject to ongoing performance monitoring.
10	SDCT-1 Tributary at KM 63	A. (June 2023 Inspection) Mitigate the perched condition of the CSP's to ensure free passage of fish through the structure. B. Monitor the streambank erosion downstream of the culverts.	A. Fish passage is maintained via the bridge. This area has not been identified as a concern by annual fisheries assessments. Baffinland will continue to reference regulatory experts and third party fisheries biologists to inform our fish passage mitigation plans. B. Baffinland continues to monitor the streambank erosion in accordance with the TRMP.

11	KM 33 Stream Crossing	This area should be observed over time to determine whether fine materials will accumulate to a degree enough to encourage surface flows.	This crossing (CV-106) has previously been identified for ongoing monitoring of the remedial construction completed in 2024.
12	Milne Port	A plan to prevent these sediments from entering the nearshore area and ultimately the marine environment should be developed and implemented.	As referenced in the inspection report, results from the sample taken by the inspectors reveal that concentrations did not exceed sediment or soil quality guidelines. The concentrations of iron may be higher in comparison to the earth's crust, but this is due to the rich iron deposit Baffinland is mining. Baffinland proposes that site-specific background or sediment quality guidelines are more informative to utilize as opposed to the earth's crust. Baffinland will continue to monitor environmental effects in the marine environment in accordance with the Surveillance Network Program (SNP) and Marine Environmental Effects Monitoring Program (MEEMP).

Attachment 2 – Baffinland Responses to QIA's October Environmental Inspection

Item No.	Project Location	QIA Requested Action – UPDATE FROM JUNE 2023 VISIT (BOLD)	Baffinland Response/Speaking Points
1	Tote Road and Infrastructure at Mary River and Milne Port	a) Baffinland reported initially the full extent of damage to the Tote Road was unknown. Can Baffinland please provide an update on damage to the Tote Road and other infrastructure at Mary River and Milne Port. Have the timeframes for repairs changed since the full extent of damage had been assessed. b) During the inspection, culverts were scattered across the tundra at KM63.5 and no plan was provided on how the culverts would be retrieved. We recommend Baffinland develop and execute a plan for retrieval of culverts and other materials and describe the associated timeframe.	a) Despite limited access to the full scope of the Tote Road at the time of reporting, damages to the Tote Road as reported to the QIA on September 24 submission (Swenson to Goddard) address all significant damages observed across both sites and the length of the Tote Road with the exception of km 51. Additionally, an update to spill 2024-478 was provided on October 22, 2024. b) A plan to retrieve the scattered culverts at KM 63.5 was developed and required the stream and tundra to be fully frozen to facilitate travel by an excavator without doing damage to the sensitive tundra and streambed. Full retrieval of the culverts was completed on November 26, 2024, and photographs are provided in Appendix 2.
2	KM105 Pond Sedimentation Pond (North Embankment)	As recommended previously, Baffinland needs to implement more robust erosion and sediment control measures across the entire project area. This concern is amplified during extreme weather events. We continue to suggest stockpiles of erosion and sediment controls such as coir logs be kept on site and ready for use as necessary. An example during the inspection was the inspector identified runoff derived from the road behind Sailiivik Camp entering Sheardown Tributary. The Baffinland Environmental Service team placed coir logs at key locations, which rapidly decreased runoff and concentrations of TSS in Sheardown Tributary.	Baffinland routinely deploys Erosion and Sediment Controls as per the “toolkit” within the Surface Water and Aquatic Environmental Management Plan (SWAEMP). The performance of controls utilized inform future decisions to be made. ESC implementations are evaluated and adjusted as required depending on effectiveness and monitoring in downstream receiving areas. Baffinland agrees that coir logs are a strong mitigation measure that will be used in the future.
3	KM 105 Sedimentation Pond (South Embankment)	The shortcomings of the KM105 Dam have been well-documented during previous inspections and subsequent reports. The extreme rain event highlighted many of the concerns QIA has voiced regarding treatment of runoff from the active mine area and haul roads. The quantities of sediment deposited on the tundra and farther downstream of the KM105 Dam is unacceptable and a clear plan needs to be developed to rectify the situation. Areas just downstream of the KM105 Dam support fish and fish habitat, which means sustained high concentrations of TSS and potentially other contaminant on concerns could be in contravention of section 34(1) *deleterious substance* of the federal *Fisheries Act.*	Baffinland believes QIA is referencing tundra that is part of the Km 105 valley infrastructure area as submitted within the Mine Site Water Management Plan. The area is not fish bearing. As summarized within the January 22 Km 105 report, water quality monitoring down-gradient of Km 105 water management infrastructure at D1-05, a CREMP station just above fish bearing habitat, did not yield TSS data above Water Licence limits. Additional monitoring will continue under the full scope of the CREMP evaluating sediment chemistry, water chemistry, fish health and benthic invertebrate health within down-gradient receiving environments.

4	Throughout the project area but particularly at stream crossings	During the Unscheduled Environmental Inspection, Baffinland communicated the rain event was considered to be a 1 in 200-year event but since has revised this to a 1 in 1000-year event. QIA understands the revision was based on rainfall records between 2013 and 2023 at the Mary River Mine Site. However, long-term records are likely available from Pond Inlet or Iqaluit, which could be used in enhance the temporal resolution. Environment Climate Change Canada has operated weather stations (ID 2403200; 2403206 etc.) since the early 20th century at Pond Inlet. Data are sparse at times but could be used to supplement current information. Additionally, larger climate indices such as the North Atlantic Oscillation fluctuate often on decadal timesteps. These regional climate indices will strongly influence the quantity of precipitation. Requests Baffinland provide the methodology used to calculate the frequency and return period of this rainfall event.	The revision to a 1 in 1000 year event has been made following a full assessment by third party hydrologists after a full review of on site and externally available data was performed, and included an assessment of return period for Pond Inlet using data from 1975-2023, Mary River, and Milne Port.
5	Explore the potential effects of the rain event on the aquatic environment.	The unprecedented rainfall event has led to large-scale erosional events occurring across the Mary River Mine Site. High concentrations of TSS in water is often transient and sediment settling rates are related to the size of the sediment particles. Recommends Baffinland further explore the potential effects of the rain event on the aquatic environment near where the washout occurred and at Sailiivik Camp. Understands this action is untenable to conduct during the winter months but should be incorporated into aquatic monitoring efforts during the 2025 ice-free season.	Baffinland firmly believes that our existing monitoring programs under the CREMP are sufficient to assess impacts from this event on the area near Sailiivik Camp. Notably, lake sedimentation traps were deployed as part of the CREMP throughout the event, and potential sediment deposition rates should be incorporated into the lake sedimentation data from the traps retrieved in early October. Assessing impacts at the location of the washouts along the tote road will be limited to the information that can be interpreted from monitoring related to our Tote Road Monitoring Program under our Roads Management Plan. Sediment and benthic background data for these areas is not available. The areas where washouts occurred will be inspected during freshet to inform on required mitigations, and the repairs to the road and culverts are functioning as intended.

Appendix 1 – Photos Regarding September Environmental Inspection Report

Photo 1 – Temporary snow stockpile immediately south of the mine road to be removed in order to ensure no sediment be deposited into Sheardown Lake Tributary - February 9, 2025

Photo 2 – Sheardown Tributary North of Sailiivik Camp showing clear delineation of road and no snow pushed into the stream channel – February 9, 2025

Appendix 2 – Photos Regarding October's Environmental Inspection Report

Photo 1. KM 63.5 Culverts deposited downstream from Tote Road crossing during September rain event, 2024-09-22

Photo 2. KM 63.5, Culverts deposited downstream from Tote Road crossing during September rain event, 2024-09-22

Photo 3. KM 63.5, excavator tracks leading out to retrieve culverts down stream of crossing, 2024-11-28

Photo 4. KM 63.5, Culverts retrieved from watercourse, staged next to Tote Road for pick-up and final disposal, 2024-11-28

Photo 5. KM 63.5, Culverts retrieved from watercourse, staged next to Tote Road for pick-up and final disposal, 2024-11-28

Photo 6. KM 63.5, Culverts retrieved from watercourse, staged next to Tote Road for pick-up and final disposal, 2024-11-28

Photo 7. KM 63.5, Culvert staging area empty, after transporting culvert debris for disposal, 2024-11-29