October 10, 2022

Manager of Licensing
Nunavut Water Board
P. O. Box 119
Gjoa Haven, NU X0B 1J0

By Email: licensing@nwb-oen.ca

Dear Sir/Madam,

Re: Water Licence 1AR-NAN2030 – 2022 Exceedance of Action Level for Zinc at Station 159-14

Geotechnical inspections and water quality monitoring were undertaken at the Nanisivik mine in August 2022, as required by Water Licence 1AR-NAN2030. The water quality monitoring identified an exceedance of the station-specific Action Level for zinc at station 159-14 in the Chris Creek watershed.

The *Contingency Plan for Surface Water Quality Exceedances*[1] requires that the following procedure be followed in case of an exceedance of a station-specific Action Level:

1. Confirm the parameter(s) and sampling station(s) where site-specific action levels have been exceeded based on laboratory measurements.
2. Reconcile the observation(s) against site conditions documented at the time of sampling (e.g., prevailing temperatures, seasonal precipitation, and associated natural processes such as erosion within the natural channel of Twin Lakes Creek), as well as the condition of site infrastructure and natural areas of the site, to determine whether the exceedance is likely due to a natural process, or may be indicative of changes in the functioning or integrity of site infrastructure.
3. Document the data evaluation and assessment process and present a recommendation as to whether an on-site follow-up investigation is required (i) during the present calendar year; (ii) during the following calendar year; or (iii) during the next scheduled sampling period.
4. Submit the above documentation and recommendation to the Nunavut Water Board for their review.

The required contingency procedure has been implemented and the completed actions and assessments are described in the attached memorandum from BGC Engineering.

Based on the evaluation of the analytical data and site observations, BGC recommends that a site investigation be undertaken in 2023. The purpose of the investigation is to assess potential source(s) and pathways that may have contributed to the elevated zinc concentration at station 159-14 in 2022. Canzinco agrees with the recommendation from BGC and commits to implementing it in 2023.

[1] Stantec Consulting Ltd., March 27, 2020. *2020 Contingency Plan for Surface Water Quality Exceedances Former Nanisivik Mine, Nanisivik, Nunavut, Canada Final Report*

We look forward to the Water Board’s review of the attached documentation and would be pleased to address any questions that you may have.

Sincerely,

Zied Tebaibi
Site Manager Langlois Mine

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Project Memorandum

To:	**CanZinco**		
Attention:	**Zied Tebaibi, P.Geo.**	**cc:**	**Johan Skoglund**
From:	**Scott Garrison, P.Eng., Sharon Blackmore, P.Geo.**	**Date:**	**October 4, 2022**
Subject:	**Zinc Action Level Exceedance at Station 159-14**		
Project No.:	**0255034**		

1.0 INTRODUCTION

The Nanisivik Mine (the Mine) was an underground lead and zinc mine located on the northern tip of Baffin Island, Nunavut that operated from 1976 to 2002, following which reclamation activities began. BGC Engineering Inc. (BGC) was retained by CanZinco Mines Ltd. to undertake a visual geotechnical site inspection, geotechnical instrumentation monitoring, water quality monitoring, and associated reporting services at the Mine in 2022. BGC has provided geotechnical engineering, mine waste and mine closure support to the Mine since 2000, including the development and implementation of the reclamation plan for tailings deposits, waste rock piles, portals and open pits. BGC has also overseen the implementation of the post-closure geotechnical and geothermal performance monitoring plan since completion of the bulk of the reclamation measures in 2004 and 2005. Since 2020, BGC has also provided post-closure water quality monitoring at the Mine, which is required under the Water Licence 1AR-NAN2030 (Nunavut Water Board (NWB), January 9, 2020) to assess the site's overall performance of reclamation and closure activities.

Six water quality monitoring stations are outlined in Water Licence 1AR-NAN2030 (i.e., NML-23, 159-4, 159-6, 159-14, NML-29, NML-30), along with station-specific effluent criteria or Action Levels that (if exceeded) necessitate additional steps to be taken in accordance with the Mine *Contingency Plan for Water Quality Exceedances* (Stantec Consulting Ltd. [Stantec], March 27a, 2020). Results from the water quality monitoring program carried out by BGC at the Mine in August 2022 identified a zinc Action Level exceedance at one (of the six) stations (i.e., Station 159-14).

This document satisfies the steps to be taken within one month of the Action Level exceedance, as outlined in Stantec (March 27a, 2020). The four steps are (paraphrased):

1. Confirm the parameter(s) and sampling station where the Action Level was exceeded.
2. Reconcile the Action Level against site conditions and the condition of infrastructure.
3. Document the data evaluation and recommend an appropriate timeline for a follow-up investigation.
4. Submit the documentation and recommendation to the NWB for review.

A description of field observations made during the August 2022 water quality monitoring event, followed by laboratory results are provided in Sections 2.0 and 3.0, respectively. Recommendations are provided in Section 4.0.

2.0 2022 MONITORING EVENT - FIELD OBSERVATIONS

Mr. Scott Garrison, P.Eng. (NU), and Ms. Christy Rouault, P.Eng. (AB/BC), conducted the annual geotechnical site inspection and water quality monitoring at the Mine from August 18 to 23, 2022. Conditions during the visit were cloudy, cool (i.e., daytime maximum temperatures ranged from approximately 2 to 5 degrees Celsius) and no precipitation occurred. The station exhibiting the zinc Action Level exceedance, Station 159-14 (Figure 2-1), was sampled on August 20, 2022, and Photo 1 (appended at the end of this document) shows the field conditions at the time of sample collection.

Station 159-14 is located within Chris Creek watershed, approximately 50 m upstream of where the main surface drainage or runoff from the East Open Pit area discharges to Chris Creek. The mine workings within the Chris Creek watershed and upstream of Station 159-14 include East Trench, Area 14 and K-baseline mine workings, which contain cover systems that were visually inspected in August 2022. Visual observations made by the field crew noted the covers to be physically stable, with no visual signs of deformation nor erosion, and seepage was not observed at the toes of these cover systems. Photo 2 presents an image taken by an unmanned aerial vehicle (UAV) during August 2022 of the K-baseline mine workings and cover.

The Chris Creek watershed has several smaller tributaries discharging to Chris Creek (see Figure 2-1). Those tributaries located in the headwater region of the watershed have commonly presented visually observed evidence of oxidation and staining on surface, interpreted by BGC to be associated with zones of natural mineralization based on sulphide-bearing bedrock outcroppings in the area. Photos 3 and 4 were taken along the upper reaches of the Chris Creek watershed, and show one of the tributaries with noticeable oxidation/staining along the drainage channel, which is not associated with mine workings.

The natural mineralization and discolored water in the Chris Creek watershed were previously noted in the 2004 Nanisivik Mine Closure and Reclamation Plan (CanZinco, March 2004). This report also described water sampling undertaken in late July of 1974, before the mine was developed, whereby elevated levels of zinc were found in Chris Creek. Specifically, one tributary measured a zinc concentration of 15 mg/L, while the mouth of Chris Creek at Strathcona Sound measured a zinc concentration of 0.7 mg/L. The location of the tributary containing the higher zinc concentration (of 15 mg/L) was described in CanZinco (March 2004) as "*a tributary to Chris Creek near the (future) east adit area*". Hence, it is interpreted to be the drainage emanating north-eastwards from the East Open Pit towards Chris Creek and discharging downstream of Station 159-14.

During the 2022 site inspection, data collected from thermistors and frost gauges indicated active layer thaw depths comparable to recent years. It was also noted that surface water conditions on site were generally drier than recent years. The site observations are supported by air

temperature monitoring at Arctic Bay (Arctic Bay Airport YAB) and the Mine, where data in the past year were comparable to recent years, with a cooler than average winter 2022 and a warmer than average fall of 2021. The surface water conditions are supported anecdotally by locals in Arctic Bay who commented on the 2021/2022 winter having little snow and the 2022 spring/summer having less rain than recent years.

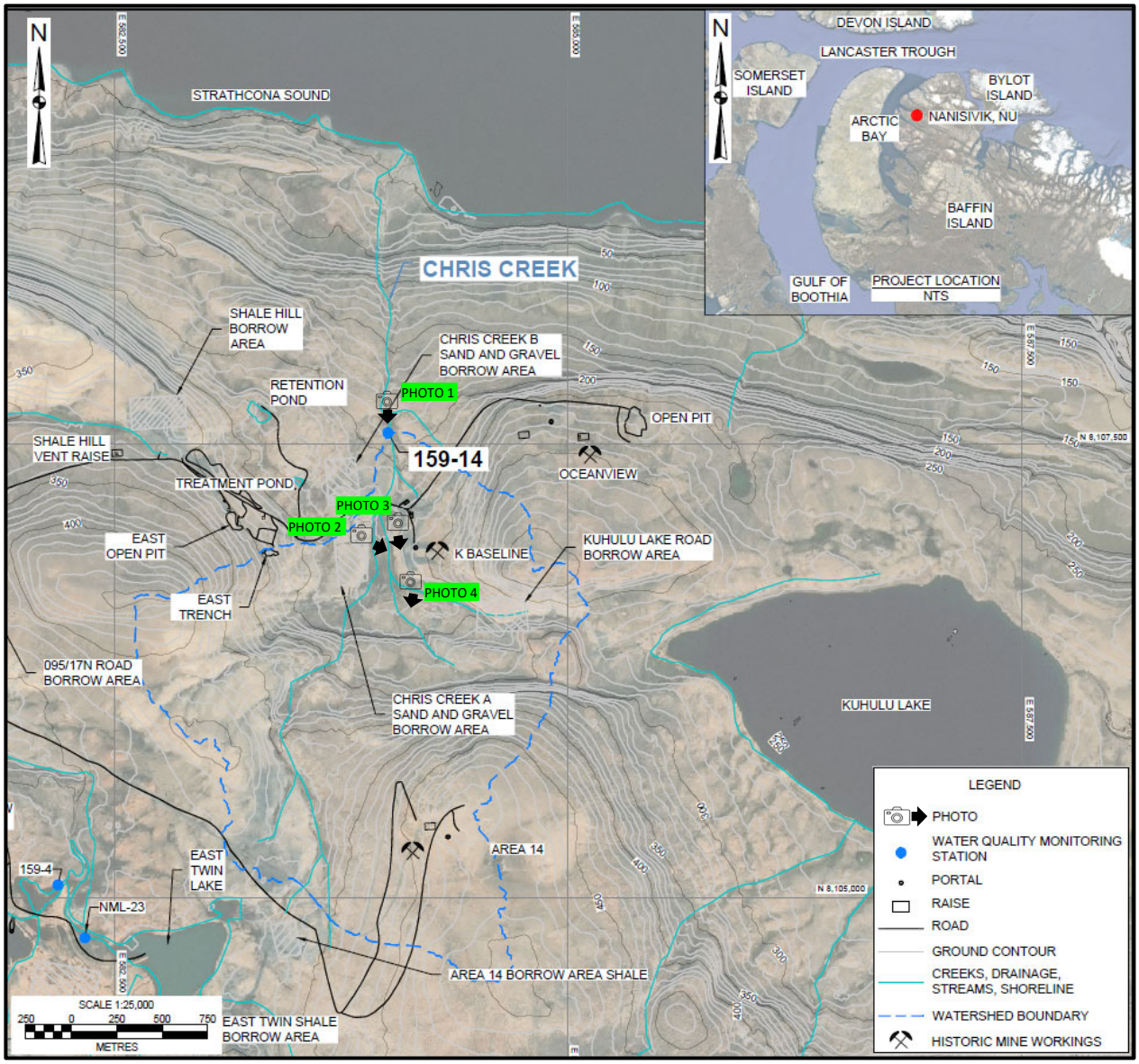

Figure 2-1. Site plan map displaying mine facilities, creeks and currently monitored water quality stations within and near the Chris Creek watershed at the Nanisivik Mine. Photo labels relate to images appended to this document, with arrows denoting the direction of the field of view.

3.0 LABORATORY RESULTS

3.1. Previous Results

Action Level exceedances of zinc at Station 159-14 have been previously noted during post-closure monitoring at the Mine site. From 2009 to 2019, the Action Level used for comparison of zinc values at Station 159-14 was 0.13 mg/L, which was based on the 95th percentile value of the station-specific historical dataset and outlined in previous Water Licences (1AR-NAN1419 and 1AR-N0914). As part of the current Water Licence (1AR-NAN2030), Action Levels are based on 99th percentile values from the station's dataset and the zinc Action Level is raised to 0.68 mg/L.

The historical dataset of zinc concentrations at Station 159-14 is shown in Figure 3-1, which indicates there have been 10 other zinc Action Level exceedances (i.e., >0.13 mg/L) at Station 159-14 prior the most recent in 2022, as follows:

- 2011 (n = 3): Elevated zinc values were noted to be "*within the range of natural background levels recorded in Chris Creek prior to mine development".* The report compared the 2011 values to those collected prior to mine development near Station 159-14 and downstream towards the mouth of Chris Creek, as described in CanZinco (March 2004). No further investigation was recommended (Stantec, March 9, 2012).
- 2012 (n = 3): Increases in zinc were noted to be a "*generalized observation*" for the 2012 monitoring program. In accordance with the Mine's *Contingency Plan for Water Quality Exceedances* (Stantec, September 9, 2009), further investigation in 2013 was recommended in the area from upstream of Area 14 to K-Baseline to assess the cause of the 2012 exceedances (Stantec, March 25, 2013).
- 2013 (n = 1): Zinc exceedances in 2013 were only noted at one (of three) station in the Chris Creek watershed (i.e., Station 159-14), which was described as a contrast to the previous year whereby zinc exceedances were noted at all Chris Creek stations (i.e., Stations 159-14, 159-15, and 159-17). The report stated that zinc concentrations at Station 159-14 were within the "*range of natural background levels recorded in Chris Creek prior to mine development*". No supplemental investigation in the Chris Creek watershed, as recommended in 2012, was reported (Stantec, February 28, 2014).
- 2016 (n = 2): Zinc levels were described as elevated but within the historical levels recorded for the Mine prior to mining and within the concentration range reported for the post-decommissioning period (2007 – 2016). Elevated concentrations were interpreted as likely associated with warmer and wetter conditions, and deeper than usual melting of surface permafrost in 2016 (Stantec, February 9, 2017).
- 2019 (n = 1): Zinc exceeded the Station 159-14 Action Level in one of the three monitoring events conducted in 2019 (i.e., September 4, 2019). The exceedance was interpreted as likely associated with a natural weathering process involving sulphide minerals within the Chris Creek watershed and may have been mobilized by seasonal thawing of near-surface permafrost. A follow-up investigation into the source area(s) of these elevated September 2019 values was not recommended as the previous Water Licence 1AR-NAN1419 required additional investigative measures only if Action Level values were exceeded in two consecutive monitoring events (Stantec, March 10, 2020).

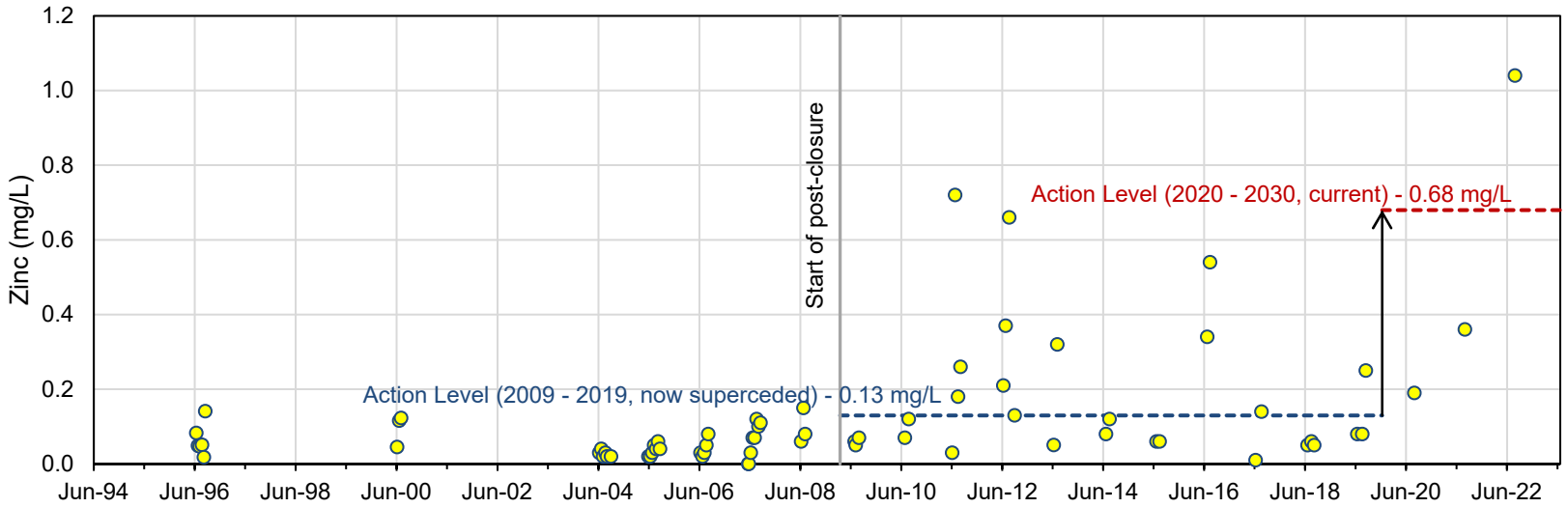

Figure 3-1. Station 159-14 zinc dataset.

3.2. 2022 Results

During the August 2022 site inspection, water quality samples were collected at the six stations outlined in the Water Licence 1AR-NAN2030. Samples were sent to Eurofins Environment Testing Inc. (Eurofins; Ottawa, Ontario) for analysis of a specified analyte panel, as outlined in Schedule H, Table 2 of the Water Licence 1AR-NAN2030. Duplicate samples were also collected as part of the water quality sampling event in 2022, in accordance with the Mine's *Quality Assurance and Quality Control (QA/QC) Plan* (Stantec, March 27b, 2020).

In 2022, a duplicate sample was collected at Station 159-14 (i.e., Sample ID: Field Duplicate 2). The measured zinc values provided by Eurofins on September 2, 2022 are shown in Table 3-1, and results at Station 159-14 reflect the highest zinc value measured to date at this station (i.e., 1.04 mg/L; refer to Figure 3-1). Upon review of these values and identification of the zinc Action Level exceedance, a re-analysis was requested by BGC (S. Blackmore, email communication, September 16, 2022) to Eurofins. The re-analyzed values were comparable to the original values (i.e., ±4%), which is also shown in Table 3-1 and confirms the original measured zinc values. The comparability of the chemistry measured from Field Duplicate 2 and the labelled sample collected at Station 159-14 confirms consistent field sampling procedures were applied and the sample is considered representative of site conditions.

Table 3-1. Station 159-14 zinc concentrations - August 20, 2022.

Sample ID	August 20, 2022[1]	Re-analysis[2]
159-14	1.04	1.05
Field Duplicate 2[3]	1.08	1.04

Notes:

1. Certificate of Analysis received September 2, 2022 – Report #1984822.
2. Re-analysis was requested by BGC and re-analyzed values were received from Eurofins on September 21, 2022 (R. Koshy, email communication, September 21, 2022). No re-issue of a Certificate of Analysis was provided.
3. S. Garrison and C. Rouault confirmed Field Duplicate 2 was taken at Station 159-14.

4.0 SUMMARY AND RECOMMENDATIONS

Zinc has been denoted as commonly elevated above applied Action Levels at Station 159-14 during the post-closure monitoring period. Previous monitoring events have not explicitly noted the origin of these elevated zinc values and have generally commented that these concentrations have been within the range of natural background levels recorded in Chris Creek prior to mine development. Observed field conditions in 2022 do not provide a clear assessment as to the zinc source. However, warmer and wetter periods (and deeper thawing) were suggested as a possible reason for higher values in 2016 (Stantec, February 9, 2017). In 2022, conditions were described as drier, with a warmer than average fall in 2021 and cooler than average winter in 2022; hence, this only partially aligns with the interpretation from 2016 water quality monitoring. Furthermore, oxidation was noted in 2022 along tributaries located in the headwater region of the Chris Creek watershed and upstream of Station 159-14, but such observations were similar to previous years.

Based on field and laboratory results, the origin of the 2022 zinc Action Level exceedance at Station 159-14 is unclear, and the zinc concentrations measured in 2022 were the highest in the post-closure period. Therefore, BGC recommends a site investigation be undertaken at the Mine in 2023, to assess the potential source(s) and pathways that may have contributed to the elevated zinc value at Station 159-14 in 2022. Data from this investigation should also be used to perform a statistical assessment on the historical data, to assess for potential trends and/or correlation with other parameters.

5.0 CLOSURE

BGC Engineering Inc. (BGC) prepared this document for the account of CanZinco. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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Yours sincerely,

BGC ENGINEERING INC.
per:

Sharon Blackmore, Ph.D., P.Geo.
Senior Hydrogeochemist

Scott Garrison, M.Eng., P.Eng.
Geological Engineer

Reviewed by:

B. Marc Adams, M.Sc., P.Eng.
Principal Geoenvironmental Engineer

SG/MA/gc/js

Attachment(s): Appendix A – Photo Compendium

REFERENCES

CanZinco Mines Ltd. (2004, March). *Nanisivik Mine 2004 Reclamation and Closure Plan*. [Report]

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Stantec Consulting Ltd. (2020, March 27a). *2020 Contingency Plan for Surface Water Quality Exceedances, Former Nanisivik Mine, Nanisivik, Nunavut, Canada.* Prepared for Canzinco Mines Ltd.

Stantec Consulting Ltd. (2020, March 27b). *2020 Quality Assurance/Quality Control Plan for Surface Water Monitoring Samples, Former Nanisivik Mine, Nanisivik, Nunavut, Canada.* Prepared for CanZinco Mines Ltd.

APPENDIX A
PHOTO COMPENDIUM

Photo 1. Station 159-14, looking southeast (upstream).

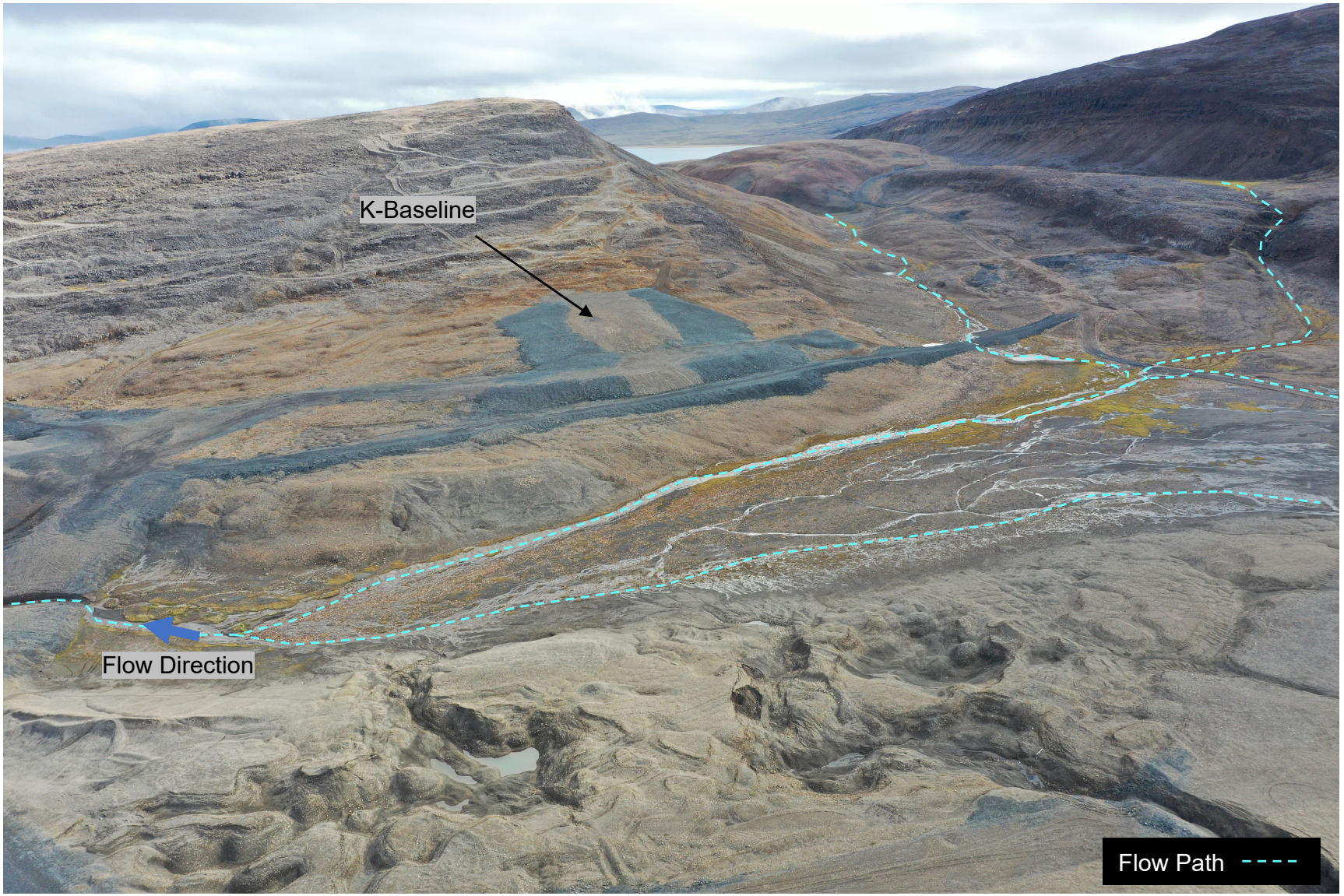

Photo 2. UAV image looking east-southeast toward an upper portion of the Chris Creek watershed, and the K-baseline cover system. Station 159-14 is located out of the frame to the left (north) of the photo.

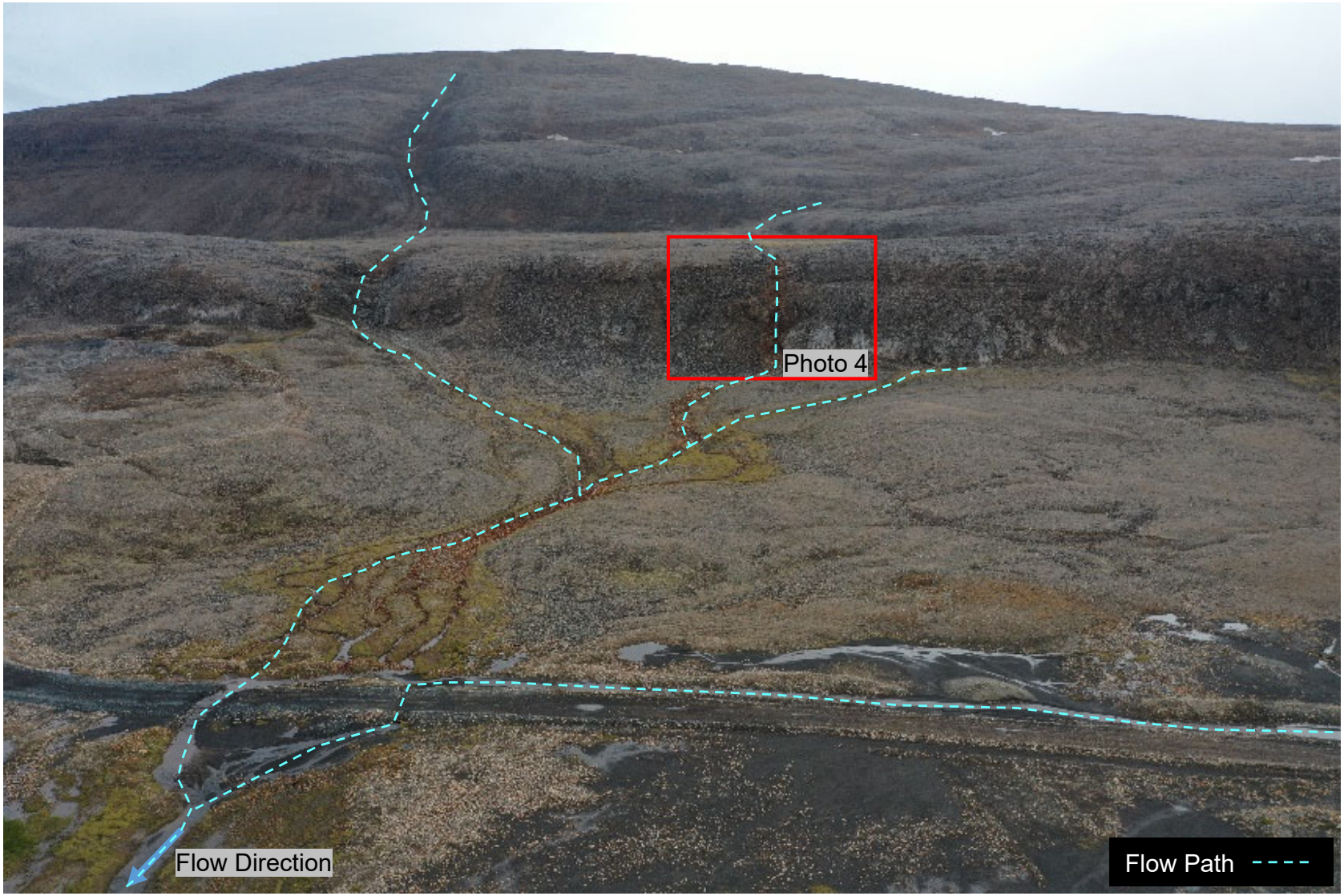

Photo 3. UAV image (looking south) of upper reaches of the Chris Creek watershed. Station 159-14 is located outside of the image frame, to the bottom (north) of the photo. K-Baseline is to the left (northeast) of the photo frame.

Photo 4. UAV image (looking south) at a natural stream within the 159-14 watershed, upstream of Station 159-14. Visual observations of oxidation and iron-staining commonly noted.