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OQM | Organizational Quality Management Program

Memorandum

To	Karyn Lewis (LMI)	**Project #**	924-3
CC	Sara Wilkins (Norwest)	**Date**	November 30, 2017
From	Alvin Tong, P.Eng.		
Subject	Ulu Access Road Maintenance		

1. Introduction

The Ulu Project (Project) is an advance exploration project currently in care and maintenance status, located in Nunavut owned by Bonito Capital Corporation. The inspector from the Indigenous and Northern Affairs Canada (INAC) issued an inspection form on July 11, 2017 for the Project, under water license 2BM-ULU1520 (INAC 2017).

Section 1, Comment 5 of the inspection form stated "erosion/maintenance issues on the road to Camp 3 appear to be caused by compromised drainage on the up-slope side of the road. An inspection by a geotechnical engineer should be undertaken to determine the best course of action." Section 3C, Required Action, stated that "maintenance issues with respect to the road should be examined in light of site drainage issues, and in conjunction with the report on culverts to be submitted by September 30, 2017. If possible, before the end of the season, implement the recommendations of the engineer that will improve the integrity of the roads and reduce erosion and sediment issues."

This memorandum outlines the preliminary observations made during the August 30th, 2017 site visit carried out by the Project geotechnical engineer on the road issues and recommendations to mitigate erosion and sediment issues.

2. 2016 Observations by INAC Inspector

Three photographs provided in the INAC July 6, 2017 inspection form (INAC 2016) and shown below outline the inspector observed road issues. The approximate locations of the issued are shown in Figure 1, and the photograph numbers and coordinates are referenced from the inspection form. The coordinate provided for Photo 10 in the inspection form corresponds to non-disturbed area north of the site. The photo location shown in Figure 1 is adjusted based on Norwest field observation.

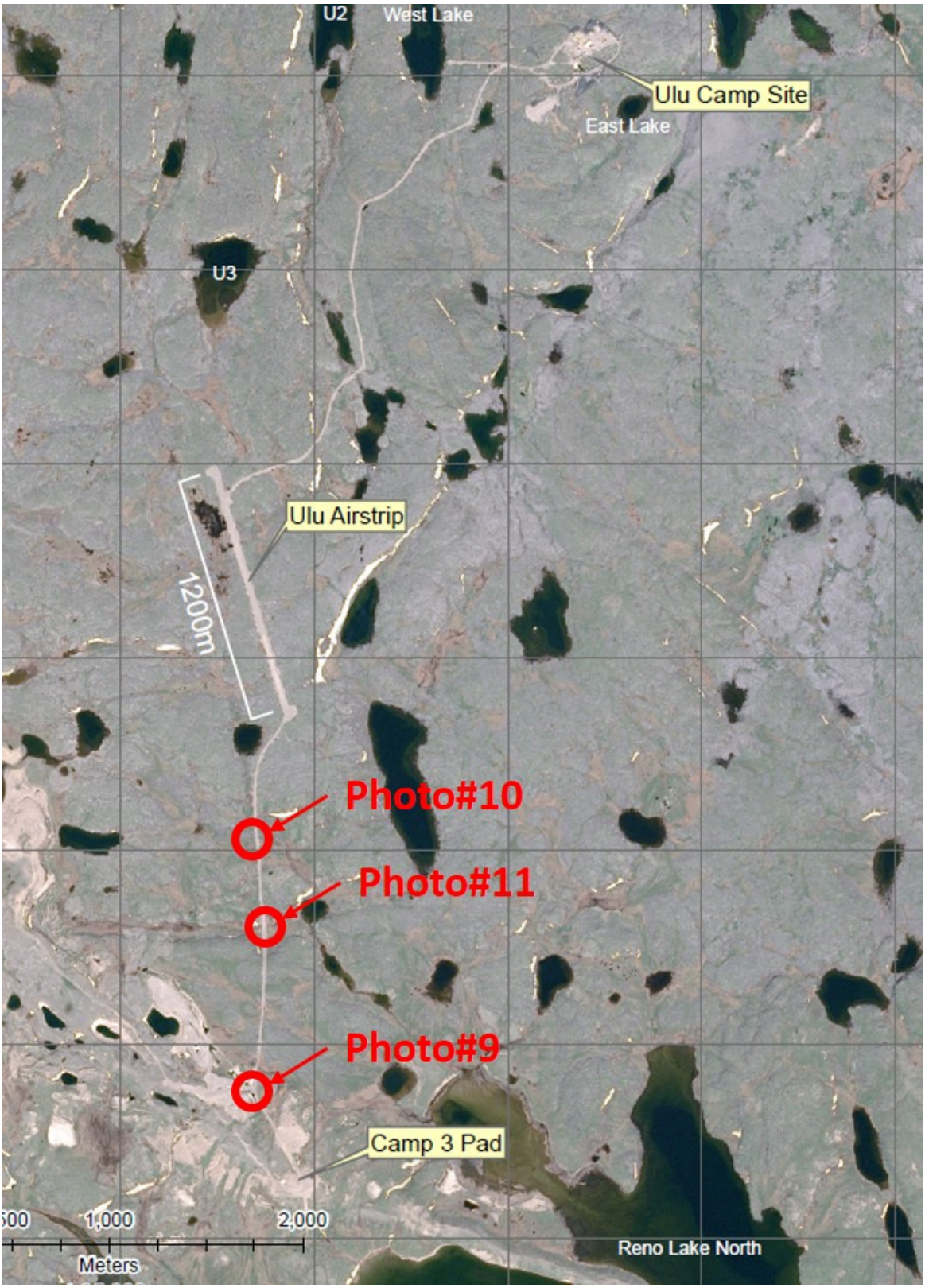
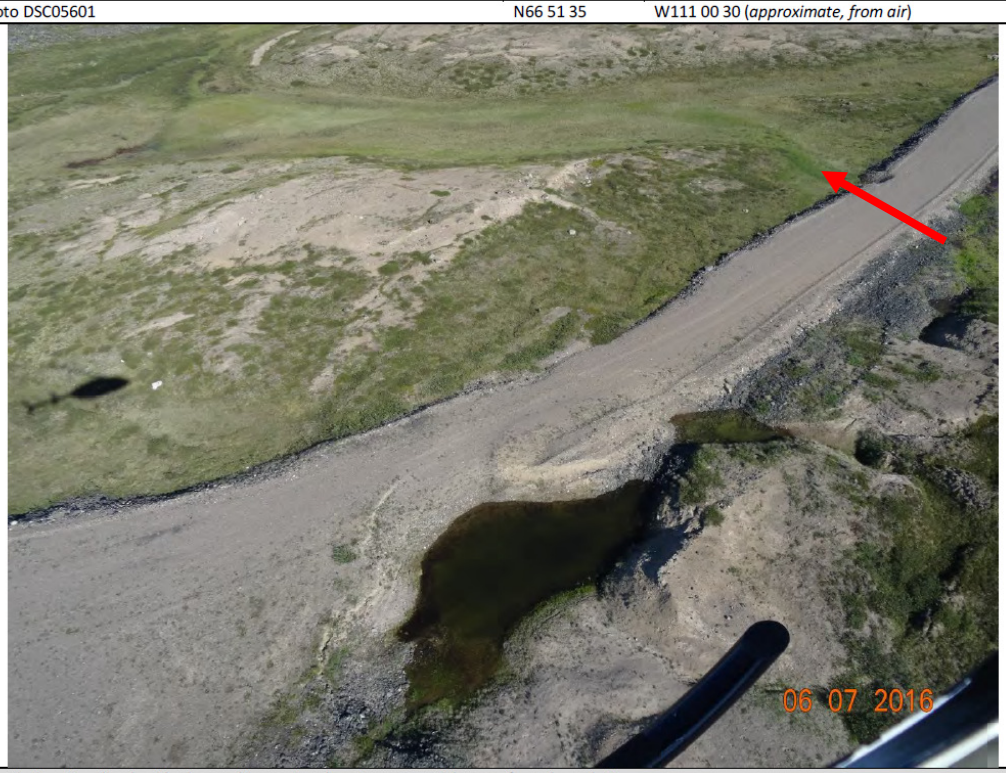


Figure 1: Inspection Photograph Locations

Photo Log # 9	Location (NAD 83 DD MM SS.SS)	
Photo DSC05601	N66 51 35	W111 00 30 (*approximate, from air*)



Description: Ponding beside the road is causing slumping; potential permafrost degradation.

Photo 9 shows the ponding on the upstream side of the road near Camp 3 and near the branch off to the borrow area. Norwest field observation indicate that there is a culvert located nearby downstream (red arrow).

Photo Log # 10	Location (NAD 83 DD MM SS.SS)	
Photo DSC05598	N66 54 17	W111 00 30 (*approximate, from air*)

Description: Washed out sections of road as discussed in 2015. No silt fencing or mitigation has been put in place.

Photo Log # 11	Location (NAD 83 DD MM SS.SS)	
Photo DSC05600	N66 52 04	W111 00 28 (*approximate, from air*)

Description: As photo 10. No mitigation measures are in place, and no repairs were conducted in 2015 as was proposed in the annual report.

Photo 10 and 11 show braided erosion gullies across the road in various locations and origins. A culvert is not confirmed within the section of the road shown in Photo 10. There is a culvert along the section of the road shown in Photo 11 (red arrow).

3. 2017 Observations and Repair Work

All of the culverts along the road have been scouted by Bonito with a handheld GPS and inspected in July 2017 (INAC 2017a), with their locations are shown in Figure 2. Table 1 shows the coordinates and status of the culverts. The culverts were found to be intact and functional such that that water could flow through them. The road sections with erosion have been repaired in 2017 and the road was trafficable during the engineer's August 30th, 2017 site visit. New coarse road fill, with a more resistance to erosion than the in-place esker sand, was placed to stabilize the eroded areas and reduce the potential for further erosion. The road stabilization and repairs and silt fences installations are shown in the Photo 1 and 2 below, which taken by the INAC inspector in August 2017 (INAC 2017b). Bonito has additionally installed silt fences downstream of the erosion areas to further protect downstream waterbodies, and as requested by the INAC inspector following the August inspection (Photo 3).

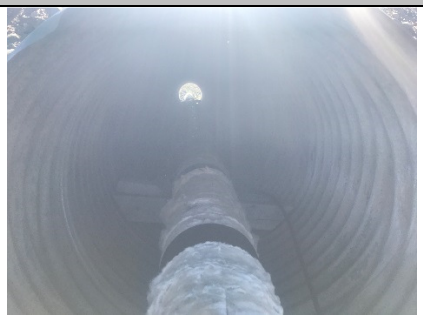
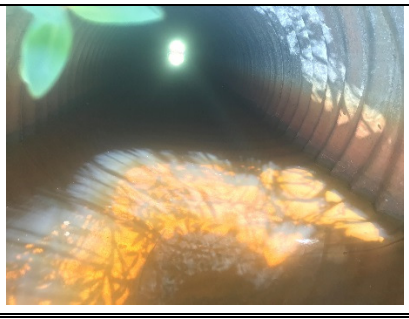
Figure 2: Culvert Locations (coordinates provided by Bonito, Photograph courtesy of Google Earth®)

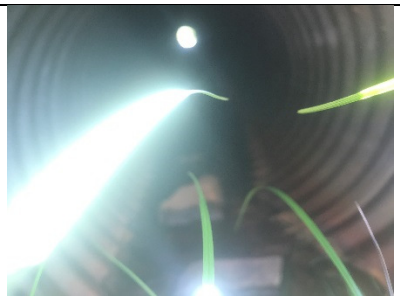
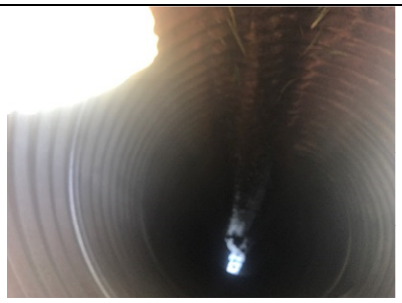
Photo 1: Silt Fences installed downstream of repaired road at the location shown in Culvert 6

Photo 2: Silt Fences installed downstream of repaired road at the location shown in Culvert 7

Photo 3: Additional silt fence installed further downstream at Culvert 6 as requested by the INAC inspector

Table 1: Culvert Location and Status

Culvert ID	Latitude D/M/S	Longitude D/M/S	Culvert Status
1	66°54.27"	110°57.54"	
2	66°54.14"	110°59.08"	
3	66°53.35"	110°59.40"	
4	66°54.27"	110°59.53"	
5	66°53.19"	111°00.15"	

Culvert ID	Latitude D/M/S	Longitude D/M/S	Culvert Status
6	66°52.14"	111°00.24"	
7	66°52.02"	111°00.22"	
8	66°51.50"	111°00.21"	
9	66°51.40"	111°00.24"	
10	66°51.32"	111°00.24"	

Note: Coordinates and photographs are provided by Bonito.

4. Recommendations

A general recommendation is to continue with the monitoring of road conditions and all of the culverts by care and maintenance site personnel. Specific recommendations to mitigate potential impacts identified in the INAC inspector photos are listed below.

Photo#9: The water ponded upstream of the road should be drained to limit the presence of standing water. Channels should be excavated within the road fill to allow water to drain toward the nearby culvert and minimize the potential for future ponding. Until the drainage is established, the water should be pumped and discharged to the culvert.

Photo#10 and 11: The erosion on the road was observed during the geotechnical engineer's visit, and based on experience at similar sites and anecdotal evidence from the care and maintenance personnel, is assumed to be caused by snowmelt over heavy snow drifts that formed up against the road. The braided erosion gullies were likely caused by snowmelt sheet flow over snow drifts on the upstream side of the road. The nature and location of the gullies is not evidence of concentrated flow from the backup and spillover of water (e.g. from a blocked culvert). The capacity and functionality of the existing culverts would not mitigate these erosional features as massive snow drifts or heavy snow pack generally render the culverts ineffective since they impede flows through during early freshet. It is impracticable to remove the snow drift during care and maintenance as active snow management cannot be done during the winter.

The placement of coarse fill material is most effective solution available under care and maintenance to minimize erosion to the existing road caused by overflow over irregular heavy snow drifts. Monitoring should be done when possible to determine the snow drift locations and snowmelt flow direction during freshet to better evaluate the issue and associated silt fencing required.

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Sara Wilkins, P.Geol.
Manager – Water Resources

5. Reference

Indigenous and Norther Affairs Canada 2016. Water Licence Inspection Form, 2BM-ULU1520, Date of inspection July 6-7, 2016, issued to Bonito Capital Corp.

Indigenous and Norther Affairs Canada 2017a. Water Licence Inspection Form, 2BM-ULU1520, Date of inspection July 11, 2017, issued to Bonito Capital Corp

Indigenous and Norther Affairs Canada 2017b. Water Licence Inspection Form, 2BM-ULU1520, Date of inspection August 20, 2017, issued to Bonito Capital Corp