8BW-PIM1821 WATER CROSSING MONITORING – 2020 SUMMARY

The water crossings authorized under the license 8BW-PIM1821 from the Nunavut Water Board (NWB) have been monitored by Tower Arctic Ltd. (TA) from June 8 to October 22, 2020. The monitoring of the circular culverts identified in **Table 1** has been conducted before and during the using of the Haul Road for the construction activities of the Pond Inlet Marine Infrastructure Project. The usage of the Haul Road was during the freshet, summer, and freeze-up periods. The Runoff Monitoring and the Stability Monitoring have been conducted as per the Water Crossing Monitoring Plan presented by TA to the NWB on March 31, 2020. Results of the monitoring are summarized in the next sections. The detailed results are provided in **Appendix 1** of this document.

TABLE 1 – CULVERT GPS COORDINATES AND DIAMETER

Culvert identification	X	Y	Diameter (mm)
CS01	72°41'25.26"N	77°52'52.44"W	900
CS02	72°41'22.52"N	77°53'8.12"W	900
CS03	72°41'4.32"N	77°55'18.96"W	600
CS04	72°40'55.74"N	77°55'43.05"W	1200
CS05	72°40'49.61"N	77°56'13.95"W	600
CS06	72°40'37.00"N	77°58'40.61"W	600
CS07	72°41'38.15"N	77°58'57.96"W	1200

RUNOFF MONITORING

- Twenty (20) Runoff Monitoring campaigns have been conducted from June to October 2020.
- Three (3) events of runoff have been observed and the durations of the events were less than 24 hours. Two (2) observations were at CS-03 and one (1) observation was at CS-04.
- The turbidity and pH levels have been monitored during the surface runoff events that have impacted a watercourse. The turbidity level has been converted to Total Suspended Solid (TSS) using the TSS:Turbidity relationship outlined on the CCME Guideline for Total Particulate Matter[1]. Also, the presence of oil or grease sheen over the impacted water has been monitored. Results of the monitoring are provided in **Table 2**. Samplings have been collected as per Section 3 of the Water Crossing Monitoring Plan of TA.
- Following the runoff observations, three (3) corrective actions were requested and immediately implemented. Those corrective actions included improvement of the already present silt fences and installation of a new silt fences. The corrective actions have been immediately efficient to decrease the turbidity level of the impacted watercourse.

TABLE 2 - WATER QUALITY DURING SURFACE RUNOFF EVENTS

Date	Turbidity (NTU)	TSS (mg/L)	pH	Oil or Grease Sheen
July 16, 2020	22.1	7.4	8.2	No observation
August 31, 2020	346	115.3	7.7	No observation
September 2, 2020	8.6	2.9	7.4	No observation

[1] Canadian Council of Ministers of the Environment. 2002. Canadian water quality guidelines for the protection of aquatic life: Total particulate matter. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg p. 7.

STABILITY MONITORING

- Thirteen (13) Stability Monitoring campaigns have been conducted from June to October 2020.
- For all the water crossings and during the entire season, one (1) erosion concern has been raised. The concern was at CS-04. Riprap and a silt fence have been installed to improve the stability condition of the water crossing.

APPENDIX 1

DETAILED RESULTS OF THE 2020 WATER CROSSING MONITORING

Date	Monitoring	Comment	Corrective action
June 8, 2020	Runoff Stability	• The inspection was during the freshet period. • CS-03 to CS-07 were inspected. CS-01 and CS-02 were not observed because of the snow. • The watercourse flow of the culverts CS-03 and CS-04 was blocked (It seems there was ice in the culverts). • There was no construction crew on site during the inspection.	No action required.
Beginning of the use of the Haul Road for the construction activities			
June 16, 2020	Runoff Stability	• The inspection was during the freshet period. • CS-03 to CS-07 were inspected. CS-01 and CS-02 were not observed because they were covered by snow. • The watercourse flow of the culverts CS-03 and CS-04 was not blocked as observed during the inspection of June 8, 2020.	No action required.
June 21, 2020	Runoff Stability	• The inspection was during the freshet period. • CS-01 to CS-07 were inspected. • Erosion concerns have been raised at CS-04.	On June 21, additional silt fence and riprap were installed at CS-04.
June 25, 2020	Runoff	• The inspection was during the freshet period. • CS-01 to CS-07 were inspected. • No runoff observed.	No action required.
July 2, 2020	Runoff Stability	• The inspection was during the freshet period. • CS-01 to CS-07 were inspected.	No action required.
July 11, 2020	Runoff	• The inspection was during the freshet period. • CS-01 to CS-07 were inspected.	No action required.
July 16, 2020	Runoff	• The inspection was during the freshet period. • CS-01 to CS-07 were inspected. • Runoff from the road has been observed at CS-03. Water quality values are provided in Table 2 of the Water Crossing Monitoring – 2020 Summary.	On July 16, the already installed silt fence has been moved and a trench has been dug to allow the silt fence to trap the runoff. The action has been immediately efficient, and the runoff has been controlled.
July 22, 2020	Runoff	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
July 29 and 31, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
August 2, 2020	Runoff	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.

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Date	Monitoring	Comment	Corrective action
August 8, 2020	Runoff	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
August 14, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
August 18, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
August 23, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
August 30, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
August 31, 2020	Runoff	• The inspection was during the summer period. • CS-01 to CS-07 were inspected. • Runoff from the road has been observed at CS-04. Water quality values are provided in Table 2 of the Water Crossing Monitoring – 2020 Summary. Note that the water flow was limited which has significantly increased the turbidity level.	On September 1, the already installed silt fence has been more buried in the ground to trap the runoff. The action has been immediately efficient, and the runoff has been controlled.
September 2, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected. • Runoff from the road has been observed at CS-03. Water quality values are provided in Table 2 of the Water Crossing Monitoring – 2020 Summary.	On September 2, a silt fence has been added to trap the runoff. The action has been immediately efficient, and the runoff has been controlled.
September 9, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
September 20, 2020	Runoff Stability	• The inspection was during the summer period. • CS-01 to CS-07 were inspected.	No action required.
Freeze-up period			
October 22, 2020	Runoff Stability	• The inspection was during the freeze-up period. • CS-01 to CS-07 were inspected.	No action required.
End of the use of the Haul Road for the construction activities			