

# MEMO



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**DATE:** September 8<sup>th</sup>, 2014

**SUBJECT:** Gjoa Haven, NU Old Lagoon Final Effluent Analysis

**OUR FILE:** 11-5029

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## OLD LAGOON SAMPLING

The results of the final supernatant sampling campaign executed on August 20<sup>th</sup>, 2014 for the old lagoon in Gjoa Haven, NU are summarized herein. Three supernatant grab samples were taken (one near the inlet, one near the middle and one near the outlet of the lagoon) and are reported as a composite to represent the effluent quality in the lagoon just prior to its scheduled final discharge. Sampling methodology was executed as per the water licence, Part D-2.

The analysis results for the old lagoon supernatant are shown in **Table 1** below, along with the relevant water licence criteria as recommended by the Nunavut Water Board (NWB).

**TABLE 1: OLD LAGOON SUPERNATANT ANALYSIS RESULTS AND NWB CRITERIA**

Parameter	Units	MDL	Measured Value (composite)	NWB Water Licence Criteria
Biochemical Oxygen Demand	mg/L	2	27.0 *	80 mg/L
Total Suspended Solids	mg/L	3	72.7	100 mg/L
Fecal Coliforms	CFU/100mL	1	< 10	1 x 10 <sup>4</sup> CFU/dl
Oil and Grease	-	visual	Non-visible	No visible sheen
pH	pH units	-	9.0	Between 6 and 9

\* The composite result for BOD<sub>5</sub> <21.73 mg/L, however, the lab reported BOD<sub>5</sub> results for samples Gjoa-02 and Gjoa-03 were deemed inconclusive due to insufficient depletion of sample during analysis. To be conservative, the above result is the value reported for sample Gjoa-1 only.

The results confirm that the lagoon supernatant sampled just prior to the scheduled berm breach of the old lagoon is well within the water licence criteria for all parameters of concern.

The lagoon supernatant was also analyzed for the parameters listed in Part H, item 4 of the water licence before breach. The results of this analysis are shown in **Table 2** below, and are

compared to CCME water quality guidelines (Protection of Aquatic Life, Protection of Agricultural Water Uses), the Health Canada Guidelines for Canadian Drinking Water Quality as well as Guidelines for the discharge of Treated Municipal Wastewater in the Northwest Territories (1992).

**TABLE 2: OLD LAGOON SUPERNATANT ANALYSIS RESULTS FOR PARAMETERS IN PART H, ITEM 4 OF THE WATER LICENCE**

Parameter	Units	MDL	Measured Value	Water Licence Criteria	CCME/HC Water Quality Guideline	NWT Water Quality Guidelines
<b>Inorganics, major ions and organics</b>						
Ammonia as N	mg/L	0.1	8.6	-	19	19
Calcium	mg/L	0.1	21.8	-	1000 <sup>1</sup>	-
Magnesium	mg/L	0.01	19.0	-	200 <sup>2</sup>	-
Nitrate + Nitrite as N	mg/L	0.1	0.11	-	60	60
Potassium	mg/L	0.1	28.5	-	-	-
Sodium	mg/L	1	109	-	200 <sup>2</sup>	-
Sulphate	mg/L	0.1	16	-	-	500 000
Total Phenols	mg/L	0.001	0.0182	-	4	-
<b>Trace Metals</b>						
Arsenic	µg/L	0.2	1.2	-	12.5	50
Cadmium	µg/L	0.1	0.10	-	0.12	5
Chromium	µg/L	0.1	1.3	-	1.5	100
Copper	µg/L	0.2	11.9	-	200	200
Iron	µg/L	5	221	-	300	300
Lead	µg/L	0.1	0.4	-	1-7	50
Mercury	µg/L	0.01	0.01	-	0.026	.6
Nickel	µg/L	0.1	3.0	-	25-150	300
Zinc	µg/L	5	16.5	-	30	500

Guideline values are from Canadian Environmental Quality Guidelines for the Protection of Aquatic Life, CCME 2003, (Freshwater) unless indicated, as below:

<sup>1</sup> Canadian Environmental Quality Guidelines for the Protection of Agricultural Water (CCME 2003)

<sup>2</sup> Guidelines for Canadian Drinking Water Quality (Health Canada 1996)

The results for all parameters analyzed for the old lagoon supernatant were well within CCME recommended values for water quality, the Health Canada Guidelines for Canadian Drinking Water Quality as well as Guidelines for the discharge of Treated Municipal Wastewater in the Northwest Territories (1992).

It can be concluded that the effluent discharged from the old lagoon at this time is normal and within expected values, and is in compliance with water licence requirements and all applicable guidelines.

## WETLAND SAMPLING

An additional effluent sample was taken at NWB monitoring station GJO-04, “Effluent Final Discharge Point from Sewage Disposal Facility” after breaching the lagoon berm to determine the quality of discharge at this point. This sample was analysed for all parameters as indicated in Part D, item 2 and Part H, item 4 of the water licence. Values were compared with CCME water quality guidelines (Protection of Aquatic Life, Protection of Agricultural Water Uses), the Health Canada Guidelines for Canadian Drinking Water Quality as well as Guidelines for the discharge of Treated Municipal Wastewater in the Northwest Territories (1992). **Table 3** below shows the results of the wetland effluent analysis along with the most sensitive or relevant guidelines.

**TABLE 3: WETLAND EFFLUENT ANALYSIS RESULTS AFTER LAGOON BREACH**

Parameter	Units	MDL	Measured Value	Water Licence Criteria	CCME/HC Water Quality Guideline	NWT Water Quality Guidelines
<b>Nutrients and Physical characteristics</b>						
BOD <sub>5</sub>	mg/L	2	86	80 mg/L	80	80
TSS	mg/L	3	494	100 mg/L	100	100
Fecal Coliforms	CFU/100mL	1	4700	1 x 10 <sup>4</sup> CFU/dl	10 000	10 000
Oil and Grease	-	visual	Non-visible	Non-visible	Non-visible	Non-visible
pH	pH units	-	8.16	6 – 9	6 – 9	6 – 9
Sp Conductivity	µS/cm	0.4	956	-	-	-
<b>Inorganics, major ions and organics</b>						
Ammonia as N	mg/L	0.1	10.4	-	19	19
Calcium	mg/L	0.1	22.7	-	1000 <sup>1</sup>	-
Magnesium	mg/L	0.01	19.6	-	200 <sup>2</sup>	-
Nitrate + Nitrite as N	mg/L	0.1	1.90	-	60	60
Potassium	mg/L	0.1	32.5	-	-	-
Sodium	mg/L	1	113	-	200 <sup>2</sup>	-
Sulphate	mg/L	0.1	19	-	-	50 000
Total Phenols	mg/L	0.001	0.0298	-	4	-
<b>Trace Metals</b>						
Arsenic	µg/L	0.2	20.2	-	12.5	50
Cadmium	µg/L	0.1	< 0.10	-	0.12	5
Chromium	µg/L	0.1	12.0	-	1.5	100
Copper	µg/L	0.2	35.1	-	200	200
Iron	µg/L	5	15000	-	300	300
Lead	µg/L	0.1	17.2	-	1-7	50

Mercury	µg/L	0.01	0.02	-	0.026	.6
Nickel	µg/L	0.1	10.4	-	25-150	300
Zinc	µg/L	5	65.6	-	30	500

Guideline values are from Canadian Environmental Quality Guidelines for the Protection of Aquatic Life, CCME 2003, (Freshwater) unless indicated, as below:

<sup>1</sup> Canadian Environmental Quality Guidelines for the Protection of Agricultural Water (CCME 2003)

<sup>2</sup> Guidelines for Canadian Drinking Water Quality (Health Canada 1996)

All parameters tested at NWB monitoring station GJO-04 were below the recommended Guidelines for the Discharge of Treated Municipal Waste Water in the Northwest Territories and Water Licence limits, with the exception of BOD<sub>5</sub> (exceeded by 7%) and TSS. It should be noted that at the time of sampling, the flow rate at the sampling site was higher than normal due to the recent breach of the lagoon berm, and would account for the high observed value for TSS.

Concentrations for arsenic, chromium, lead exceeded the CCME Guidelines for the Protection of Aquatic Life (2003), but were within the Guidelines for the Discharge of Treated Municipal Waste Water in the Northwest Territories. The reported iron concentration in the effluent at GJO-4 exceeded both the CCME and NWT water quality guidelines.

Yours sincerely,

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