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March 31, 2006

Government of Nunavut
Community and Government Services
P.O. Box 379
Pond Inlet, Nunavut
X0A 0S0

Attention: Mr. Brian Duguay, P.Eng.
Project Officer
Community and Government Services – Baffin Region

Re: Assessment and Recommendations for Disposal of Tannery Waste
Hamlet of Qikiqtarjuaq, Nunavut
File No. N-O 09439.0

Dear Mr. Duguay,

1.0 Introduction

A tannery business owned by the Minguuq Sewing Group, operated for a period of time in the 1990's in a small building in the Hamlet of Qikiqtarjuaq, Nunavut. Locally acquired sealskins were tanned for commercial sale. The business closed several years ago, and it may or may not be revived depending on economic opportunities. Approximately 20 205 L plastic, food style drums containing liquid tannery wastes are currently stored on site. At the request of the Hamlet of Qikiqtarjuaq and the Government of Nunavut (GN), Nuna Burnside Engineering and Environmental Ltd. (Nuna Burnside) examined and sampled the drums on September 15, 2005.

2.0 Background

Available documents from Hamlet files regarding the Minguuq Sewing Group tannery indicates that it operated sporadically in the 1990's and has ceased operation. Pilot

testing of the operation resulted in the accumulation of wastewater in drums. Through the mid 1990's and up to 2000 documentation indicates:

- The business started in the late 1980's, early 1990's, without regulatory agency approvals for the storage or disposal of wastes
- Liquid wastes were stored outside the building in drums
- Drums were not labeled, manifested, or specifically identified as to their content
- Changing tanning processes resulted in changing effluent quality
- GN staff and several consultants provided input on how to handle the wastes
- Sampling of the wastes and disposal recommendations were made in the mid 1990's, but it is unclear if any of the liquid waste that had accumulated was disposed of or if the current stockpile includes all of the original wastes
- Sampling by GeoViro Engineering Ltd. of unidentified locations (drums?) of the wastewater in 1993 and 1994 indicated similar chemistry to the samples collected by Nuna Burnside
- Letters from GeoViro Engineering Ltd. to the GN in October and November 1994 indicated that they did not anticipate a significant environmental impact if the tannery wastewater was dumped into the sewage lagoon due to the large dilution effect
- Letters from the Water Board and other correspondence suggests efforts were started to obtain a water license for a wastewater treatment system (lagoon)
- Engineering proposals indicated the cost of a lagoon system for the tannery to be in excess of $200,000.
- Correspondence from the GN indicates that appropriate studies and licensing would be required prior to operating the tannery as the liquid effluent was considered industrial wastewater.

Currently the tannery is closed and no wastewater is being generated. It is not clear who is currently the responsible party for this waste now that the business has closed.

3.0 Results

During the site visit, the drums were examined and it was determined that they varied from half to one third full. The total volume of liquid waste is estimated at approximately 1,600 L.

The drums were found to contain a heterogeneous mixture of liquid with a floating layer of fat or grease. The colour of the liquid varied from a light to dark brown to a light green. The liquid had a strong odour of decaying organic materials.

Three representative drums were selected and sampled for chemical oxygen demand (COD) and metals. The results are attached in Table 1. The results were compared to:

- Guideline for the Discharge of Domestic Wastewater in Nunavut, September 2000, Table 4.1 – Raw Sewage Quality Guideline for Commercial or Industrial Wastewater Discharged to a Municipal Treatment Facility

- Environmental Guideline for Industrial Waste Discharges, Department of Sustainable Development, Government of Nunavut, January 2002. Schedule 1 – Standards for Process Effluent Discharged to Municipal Sewage Systems.

All of the results were below the above noted guideline criteria for the parameters tested.

To evaluate disposal options, the results were also compared to the sewage lagoon effluent sample analysis completed by Nuna Burnside in July 2005. Refer to the attached table for this comparison.

4.0 Disposal Options

Three options have been determined as acceptable to handle the tannery waste. The first two options involve disposal of the tannery waste in the sewage lagoon and the empty drums in the landfill. However, this waste is considered industrial waste, since it was generated from an industrial process. The sewage lagoon and landfill in

the community are not licensed to accept industrial waste. Therefore, if an option is selected for disposal at Hamlet facilities, a request must be made to the NWB for an amendment to the current NWB License to accept the waste or obtain special permission for a one-time disposal event.

4.1 Option 1 – Disposal in Sewage Lagoon

The analytical results of the sampling (Table 1) shows the wastewater meets the applicable guideline criteria for the parameters tested. There were no exceedances noted. Since there are no exceedances, it suggests the liquid waste is suitable for disposal in the sewage disposal facility (lagoon). The existing lagoon has a volume of approximately 10,558 m^3. The total volume of tannery waste is less than 2 m^3. This provides a huge amount of dilution.

Disposal of the tannery waste into the lagoon would unlikely have a negative impact when discharging the lagoon to the natural environment. The metals would be rapidly diluted to well below the NWB wastewater discharge guidelines, the organic components (fat and skin) of the waste would break down in the lagoon in the same fashion as sewage. The drums and any solid sediment could be disposed of at the solid waste landfill.

After some residence time in the lagoon, the quality of the lagoon discharge to the wetland treatment area should not be charged by the addition of the small quantity of tannery wastes.

4.2 Option 2 – Pretreatment and Disposal in the Sewage Lagoon

Should there be a concern with adding the wastewater to the sewage lagoon, the liquid can be pretreated to reduce the levels of aluminum, chromium, iron, copper, lead, and selenium prior to disposal.

Pretreatment would consist of:

- Adding sodium hydroxide to raise the pH
- Monitoring the pH with a pH meter
- Adding ferrous sulphate as a flocculent
- Confirmatory testing of the wastewater for specific metals with a field test kit.

The liquid would be decanted into the lagoon, and the drums with sediment and flocculated metals disposed of at the landfill as solid waste.

4.3 Option 3 – Ship Out of Community

The drums could be bulked, placed in over pack drums, manifested, and shipped out of the community to a licensed liquid waste disposal site in the south.

5.0 Costs

5.1 Option 1 – Disposal in the Sewage Lagoon

The liquid and the drums could be disposed of at the Hamlet sewage lagoon and solid waste sites, respectively. The drums could be moved one at a time when it was convenient. This would require the permission of the Hamlet and the NWB. It is recommended that $4,000. (i.e. $200/drum) be budgeted for this task. This option assumes that sufficient documentation is available for the Hamlet and NWB to approve a one-time disposal of this industrial waste into the Hamlet's facilities.

5.2 Option 2 – Pretreatment and Disposal in the Sewage Lagoon

The costs of pre-treatment and disposal, based on a Nuna Burnside engineering inspector conducting the pretreatment while on site inspecting infrastructure construction in 2006, are estimated as follows:

• Pretreatment chemicals and shipment to site	$1,000.
• Field technician (2 days)	$2,600.
• Confirmatory testing (20 drums @ $250/drum)	$5,000.
• Drum handling by Hamlet staff (20 drums @ $200/drum)	$4,000.
Total Cost	**$12,600.**

The budget assumes Hamlet staff will be responsible for the decanting of the drums in the lagoon, and disposing of the drums in the landfill. These costs assume that all first round sampling analysis will be deemed acceptable, based on the results from a CEAEL certified laboratory. It also assumes that the Hamlet and NWB will approve the option. Any drum, which has a sampling result returned as an exceedance, will

require an additional round of treatment and confirmatory sampling, which will be in addition to these costs.

5.3 Option 3 – Offsite Disposal

The cost for off site disposal by barge to Montreal and trucked to a local licensed liquid waste disposal depot is roughly estimated as follows:

• Technician to supervise packaging, manifesting, and coordinating transport and disposal	$6,500.
• Backhaul shipping to Montreal on barge based on 8 full drums @ $1,500/drum	$12,000.
• Trucking from Montreal to a local waste water disposal facility @ $500/drum	$4,000.
• Liquid waste disposal 1,600 L @ $2/L	$3,200.
• Drum disposal (8 drums @ $50/drum)	$400.
Total Cost	**$26,100.**

The cost assumes a Nuna Burnside engineering inspector will be on site to assist with the preparation of drums for shipping and preparing manifests.

6.0 Conclusions

The tannery liquid waste has been examined and analyzed. Based on the analytical results, and comparison to existing guidelines, the waste can be disposed of in the Hamlet's sewage lagoon and landfill site. Due to the huge dilution capacity of the sewage lagoon, untreated disposal in the lagoon should have no significant impact on the lagoon or the subsequent discharge to the wetland treatment area. However, since the material is an industrial waste, one time disposal approval of the Hamlet and the NWB is required.

If there are any concerns with this disposal option, the wastewater can be pretreated to lower the levels of metals prior to disposal, or the waste can be shipped to a licensed receiver outside the community.

7.0 Recommendations

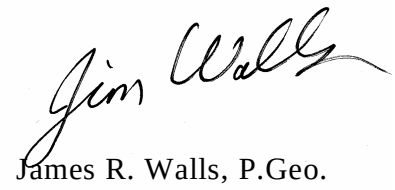
1. Obtain permission from the Hamlet and NWB, and if approved dispose of as outlined in Option 1.

2. Should the tannery business start up again, we recommend developing a system for treating the wastewater on site so it can be directly discharged or it can go to the lagoon for disposal immediately. This will require NWB approval as the wastewater is from an industrial source.

If you have any questions or comments please contact the undersigned.

Yours truly,

Nuna Burnside Engineering and Environmental Ltd.



James R. Walls, P.Geo.

Attachments

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Table 1
Metals in Tannery Wastewater Drums

METALS	Units	DL	NWB - DDW and EG-IWD	DRUM-1	DRUM-2	DRUM-3	Lagoon 7/11/2005
				2005-09-15	2005-09-15	2005-09-15	
Total Aluminum (Al)	ug/L	50	50,000	3,400	60	510	540
Total Antimony (Sb)	ug/L	10		ND	ND	ND	
Total Arsenic (As)	ug/L	10	1,000	ND	ND	ND	3
Total Barium (Ba)	ug/L	50	5,000	ND	ND	ND	
Total Beryllium (Be)	ug/L	5		ND	ND	ND	
Total Bismuth (Bi)	ug/L	10		ND	ND	ND	
Total Boron (B)	ug/L	100		180	ND	ND	
Total Cadmium (Cd)	ug/L	1	2,000	ND	ND	ND	0.2
Total Calcium (Ca)	ug/L	2,000		14,000	2,100	2,800	4,200
Total Chromium (Cr)	ug/L	50	5,000	380	58	150	ND
Total Cobalt (Co)	ug/L	5		ND	ND	ND	ND
Total Copper (Cu)	ug/L	10	5,000	2,000	81	150	82
Total Iron (Fe)	ug/L	500	50,000	3,600	640	630	530
Total Lead (Pb)	ug/L	5	5,000	40	ND	ND	2.7
Total Lithium (Li)	ug/L	50		ND	ND	ND	
Total Magnesium (Mg)	ug/L	500		14,000	1,500	2,300	2,700
Total Manganese (Mn)	ug/L	20		39	ND	ND	240
Total Molybdenum (Mo)	ug/L	10		ND	ND	ND	
Total Nickel (Ni)	ug/L	10	5,000	56	ND	ND	3
Total Potassium (K)	ug/L	2,000		170,000	25,000	28,000	20,000
Total Selenium (Se)	ug/L	20		67	ND	ND	
Total Silicon (Si)	ug/L	500		2,900	1,600	1,900	
Total Silver (Ag)	ug/L	5	5,000	ND	ND	ND	
Total Sodium (Na)	ug/L	1,000		5,600,000	970,000	910,000	7,700
Total Strontium (Sr)	ug/L	10		110	10	15	
Total Tellurium	ug/L	10		ND	ND	ND	
Total Thallium (Tl)	ug/L	1		ND	ND	ND	
Total Thorium (Th)	ug/L	10		ND	ND	ND	
Total Tin (Sn)	ug/L	10	5,000	59	ND	ND	
Total Titanium (Ti)	ug/L	50		64	ND	ND	
Total Tungsten (W)	ug/L	10		ND	ND	ND	
Total Uranium (U)	ug/L	1		ND	ND	ND	
Total Vanadium (V)	ug/L	10		ND	ND	ND	
Total Zinc (Zn)	ug/L	50	5,000	400	240	110	78
Total Zirconium (Zr)	ug/L	10		ND	ND	ND	
Total Chemical Oxygen Demand (CO	mg/L	4		2,400	1,800	3,600	360

Notes:
ND - Not detected
DL - Detection Limit
MAC - Maximum acceptable concentration
AO - Aesthetic objective
NWB-DDW - Guidelines for the Discharge of Domestic Wastewater in Nunavut, September 2000. Table 4.1 Raw Sewage Quality Guidelines for Commercial or Industrial Wastewater Discharged to a Municipal Treatment Facility
EG-IWD - Environmental Guideline for Industrial Waste Discharge, Department of Sustainable Development, Government of Nunavut, January 2002. Schedule 1 - Standards for Process Effluent Discharged to Municipal Sewage Systems
Samples collected by Nuna Burnside from the drums on September 15, 2005 and from the lagoon on July 11, 2005
Laboratory analysis by Maxxam Analytics Inc.
Drums were labeled for future reference.