



Via Email

Ms. AlecSandra Macdonald
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Gwich'in Land and Water Board
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Dear Ms. Mcdonald:

Government of the Northwest Territories, Department of Transportation – Water Licence(s) G15L8-001 and G15L8-002 – Sedimentation Report

The Department of Transportation is submitting the attached Sedimentation Report as required by Water Licence(s) G15L8-001 and G15L8-002 *Part B, Section 8*.

Should you have any questions regarding the report please do not hesitate to contact me at Herbert.Blake@gov.nt.ca or at (867) 777-7345.



Herbert Blake
Marine Manager, Inuvik Region
Department of Transportation

c. Jon Posynick, Environmental Analyst, DOT



Sedimentation Report
Mackenzie River and Peel River Ferry Landings
G15L8-001 and G15L8-002

October 2016



Background

The below report was written by the Department of Transportation (DOT) as required by the Gwich'in Land and Water Board (GLWB) for Water Licences G15L8-001 and G15L8-002, the operation of ferry landings on the Peel River and Mackenzie River, respectively. This report is written in response to questions surrounding the placement of granular material on the landings for DOT operation and maintenance purposes and its potential effect on the river environment. The report references information gathered between 2010-2015 for the now expired Water Licences G99L8-001 and G99L8-002; this is also the time period the questions reference.

Discussion

DOT maintains that the amount of granular material placed on the ferry landings is insignificant compared to the natural sediment load of both rivers and the natural processes enacting upon the river system. The following report supports this assertion.

The Licensee shall submit to the Board for approval, by October 31st, 2016, a report pertaining to sedimentation and sediment control methods. This report shall address, but not be limited to:

- a) *The types of sediment control measures that were employed over the course of the 2010-2015 Licence period and a discussion of their effectiveness;*

Sediment control measures employed by the Department over the course of the 2010-2015 Licence period include:

- The use of clean, local material taken from Frog Creek, located about halfway between the Mackenzie and Peel Ferry Landings.

Following advice from the Federal Government's Department of Fisheries and Oceans (DFO), the Government of the Northwest Territories, Department of Transportation, has consistently used material that does not have a high fraction of fine particles such as clay and sand, which would be more subject to erosion and sedimentation.

- The use of sediment curtains.

Sediment curtains were employed at various times throughout the last five years in an effort to respond to concerns raised by community members, however, their effectiveness was limited by a couple of factors:

1. The massive amount of natural sediment contained within both river systems;



Massive amounts of naturally occurring sediment, suspended within the water column, would get trapped by the installed sediment curtains and create a buildup until the curtains could no longer hold the sediment and were rendered ineffective.

2. Fluctuating water levels.

Seasonal water level increases and decreases within both river systems are common, however within those seasonal changes there are also daily fluctuations which occur, sometimes to an extreme level, such as covering the ferry landings. These same occurrences can completely obliterate stationary objects such as silt curtains which are not made to withstand that magnitude of water, sediment, and flotsam.

- Removal of Granular Material from the Landings.

The Water Licence in effect from 2010-2015, G99L8-001 and G99L8-002, allowed for *the maximum allowable difference between the total volume of granular material placed and total volume of granular material recovered [to] be 500m³*. The table below summarizes the amount of material placed each year of each licence and includes material placed in the first year (2016) of each current Water Licence (G15L8-001 and G15L8-002).

Table 1 – Summary of annual granular material placed on each landing during 2010-2015 Licence period and in 2016 under the current Licences.

Year	2011	2012	2013	2014	2015	2016
Total Amount Placed - Peel (m³)	520.0	-955.0	350.7	-300.0	-2220.0	-2800
Total Amount Placed – Mackenzie (m³)	506.0	320.0	236.29	70.0	92.0	-4200

*Note: Negative numbers denote more material recovered than placed.

As shown by the numbers above DOT has been using less material on a year-to-year basis and as shown in 2012, 2013, and 2014 on the Peel River, recovering accumulated material. Minimizing the amount of new material used, and working with material that is already on the landings continues to be the most cost efficient and most effective sediment control available to the Department, a method which DOT had continued in the 2016 operating season.

During the 2016 operational season, under the current licences (G15L8-001 and G15L8-002), DOT recovered a combined 2800m³ from the two Peel River ferry landings and a combined 4,200m³ from the three Mackenzie River ferry landings, while placing none.



Including the 2016 operational season, since 2011, DOT has placed a combined 870.70m³ on the Peel River ferry landings and has recovered 6,275.0m³. During that same time span DOT has placed a combined 1,224.29 m³ on the Mackenzie River ferry landing and has recovered 4,200 m³.

- Other Sediment Control Methods

DOT uses shaping of the Ferry Landings to reduce slope and eliminate as many of the mechanisms of erosion as possible from working on the ferry landings. Each landing is shaped to be as flat as possible and well compacted to reduce the amount of sediment which can be lost to the environment through weathering and erosion. It's worth noting that granular materials have a monetary value, and so it is in DOT's best interests and the interests of the Public, to use operational practices such that the material used on the landings stays in place.

In 2013, publication of the DOT Erosion and Sediment Control Manual was completed by DOT's Environmental Affairs Division (available on the DOT website). This manual has become the Department's go-to source for determining Erosion and Sediment Controls on work sites around the NWT. However, the issue of deploying sediment control methods on the edge of large, sediment-rich river systems with highly fluctuating water levels such as the Mackenzie and Peel Rivers, is a larger one, and not easily solved by even the most expansive of ESC Manuals. The amount of naturally occurring sedimentation in the river(s) far outweighs the amount of sediment which might be contributed by activities such as the ferry landings. The Department of Fisheries and Oceans has indicated that the best method for minimizing the effect of the Landings is to use material that is clean and local. Both of these methods are being employed by the Department of Transportation on the Ferry Landings.

b) Plans to address sediment control in the upcoming renewal period;

During the current water licence (G15L8-001 and G15L8-002) period (2015-2020) DOT will continue to use existing material available on the landings before adding further granular and will continue to remove excess material from landings when and where applicable. This will reduce the amount of material which will be placed on the landings and therefore reduce the amount of material which can be lost due to sedimentation.

DOT will continue to look into other sediment control options however, DOT stresses that the volume of water and sediment flowing through both river systems makes standard sediment controls, such as sediment curtains, unviable. Further, any controls that could be identified for use must make sense from not only an environmental perspective but also from an operational and cost point of view.

c) Background information on natural sedimentation in the Peel and Mackenzie Rivers;



There are a number of scholarly articles which are available on the web pertaining directly to the topic of sedimentation, sediment loads, and origins of sediment in the Mackenzie and Peel River systems. One article in particular titled, *Magnitude and Sources of Sediment Input to the Mackenzie Delta, Northwest Territories, 1974-94* (M.A. Carson, et al.) (1997) covers a breadth of the available material. The main points within the report are:

- The mean annual sediment supply to the Mackenzie Delta is determined as 128 million tonnes (Mt);
- 4 Mt of the mean annual amount is sandy bed material moved by the Mackenzie itself;
- 99% of that material is moved during the months of May-October;
- 17% of the fine-sediment load is contributed by the Peel River;
- 41 Mt of the Mackenzie sediment load (103Mt) is contributed by the Liard River;
- Other contributing sources make up approximately 36 Mt.

Another report, *Mackenzie River Input to the Beaufort Sea* (K.F. Davies) (1975) reports that “Mean daily suspended sediment loads of over one million tons per day are common during June to September. Peak loads of over 20 million tons per day of suspended sediment have been recorded.”

A comparison of the amount of material DOT places on the landings with the numbers reported above is difficult since the above are reported as a mass (eg. Mt) and DOT’s numbers are recorded in volume (eg. m³). However, taking the Board’s allowance of 500m³/landing into consideration, the amount of material DOT has placed on the landings in the past is miniscule compared with the amount of sediment that flows through the river system on an annual, monthly, or even daily basis. Or stated another way, the amount of naturally-occurring suspended material that passes by the ferry landings is many orders of magnitude higher than the sum total of everything that DOT has deposited into the river landings during the period of the licence, without taking into account what we remove each year (this comparison is even greater when it is taken into account as shown in part a).

d) *A discussion on the cumulative effects of sediment deposition into the river systems by various sources, including ferry landing operations.*

While it is difficult to compare in exact terms the amount of material supplied by the river systems to that placed by DOT, it is even more difficult to discuss the cumulative effects of sediment deposition by natural processes vs. the material from the ferry landings. This is because the amounts are not equivalent, as shown previously, the amount supplied by natural processes far exceeds what has been placed by DOT on an annual basis.

What has not yet been discussed are other materials which are washed or eroded into the river system via natural processes such as sand, gravel, large rocks and boulders, trees, brush, etc. Or the fact that ice formations on the river can scour the river banks and walls as it moves and



deposit rock, gravel, and organic flotsam far downstream. One look along the walls of the river around the three Mackenzie River ferry landings (for example) shows the size and magnitude of material which can enter from outside the system which, once in the river, can act as a block or collector for other material until it builds up and forms a larger feature (eg. sandbar).

Occurrences like these are subject to other river processes such as flow, thalweg, scour, etc. but the point here is that these are all ongoing processes which create a dynamic and constantly changing river environment, however fast or slow the changes may be.

“No man ever steps in the same river twice, for it’s not the same river and he’s not the same man.” – Heraclitus of Ephesus.

Conclusion

DOT has written this report at the request of the Gwich'in Land and Water Board under the Terms and Conditions of Water Licences G15L8-001 and G15L8-002. It is the opinion of the Department of Transportation that the amount of granular material placed on the ferry landings during operations and maintenance activities is not affecting the river(s). It is insignificant compared to the natural sediment load of both rivers and the natural processes enacting upon them.