



to: John Woods, Minas Basin Pulp and Power Co. Ltd
from: Joseph Kozak
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re: FINAL Technical Memorandum – Marine Transportation Study – Phase 1

FINAL Technical Memorandum – May 9, 2008

Marine Transportation Study – Phase 1 for the Proposed Fundy Tidal Power Demonstration Facility Project

1. Objective

The objective of this study is to investigate and describe commercial shipping activities in the Minas Channel area to assist the preliminary site selection survey by identifying “no go” areas for potential Demonstration Facility sites.

2. Description of the Minas Channel

The Minas Channel is a 50 kilometre passage that links the Minas Basin with the Bay of Fundy proper. The Channel is 24 kilometres wide and narrows to approximately 5 kilometres at its eastern end between Partridge Island (near Parrsboro) and Cape Blomidon. It is characterized by heavy rip tides, reduced wave action and surf, and a 13- 14 m extreme tidal range. Tidal currents reach 5.5 m/s and result in scouring of the bottoms at depths of > 110 metres. The area from Cape Split to Cape Blomidon is referred to locally as the Minas Passage (this name is not identified on the Charts), and is approximately 13 kilometres in length.

3. Vessel Traffic Management

The management of marine traffic for the Minas Channel area is a responsibility of the Canadian Coast Guard’s Fundy Marine Communication and Traffic Services Centre (Fundy MCTS) based in Saint John, New Brunswick.

Based on direct communications (via telephone discussions and e-mails), with the Officer in Charge (OIC) at Fundy MCTS, the following was confirmed:



- ♦ There are no shipping lanes for the approaches to the Minas Channel.
- ♦ The vast majority of large vessels moving through the Minas Channel are the gypsum bulk carriers (almost 100%).
- ♦ Infrequent large recreational vessels visit the area (those > 30 metres in length). The last one of this size was a couple of years ago visiting the Parrsboro area.
- ♦ There are no mandatory pilotage requirements for the Minas Channel area. This was discussed and confirmed with the Atlantic Pilotage Authority and their pilots are not used in this area, due to the familiarity of the gypsum bulk vessel operators with the Minas Channel and Basin.

The only shipping lane is in the outer part of the Bay, called the Bay of Fundy Traffic Separation Scheme (shipping lanes). It was established in 1982 to organize vessel traffic through an area used extensively for fishing, and is mandatory for all vessels of 20 metres in length. In 2003, changes to this shipping lane came into effect to protect the endangered North Atlantic right whale. But this shipping lane is far removed from the Minas Channel area.

However, all large vessel traffic movement in the Bay of Fundy must (mandatory) report to the Fundy MCTS at specified points in the Bay, based on following criteria (see Hydrographic Chart 4010 for locations);

- ♦ All merchant/commercial vessels >20 metres in length;
- ♦ All fishing vessels > 20 metres in length; and,
- ♦ All recreational vessels >30 metres in length.

The Aids to Navigation Branch of DFO indicated that there are no large floating buoys located in the Minas Channel or Basin areas, and therefore, no CCG vessels operate in the Minas Channel area on a routine basis. CCG or other DFO vessels may sail in the area, but this would only be for special surveys; even these larger vessels would not have drafts of > 4-5 metres.

As well, the Conservation and Protection Branch of DFO indicated that Fishery Patrol Vessels operate on an infrequent basis, with the number of patrols varying from year to year. DFO's largest patrol vessel used in the Minas Channel /Basin has a draft of <2 metres and is <15 metres in length. DFO also noted that the largest fishing boats operating in the Minas Channel/Basin area have similar dimensions, but with a slightly larger draft when fully loaded (i.e., 2.5 metres).



4. Vessel type, Frequency, and Tracking of Commercial Marine Traffic

Generally, commercial shipping activities are minimal in the Bay of Fundy. As noted above, the gypsum bulk carriers are the only large vessels operating through the Minas Channel and Minas Basin area.

These vessels service the Fundy Gypsum Company, which loads its product via the Hantsport loading facility. The gypsum rock is transported via rail to Hantsport and stockpiled in a covered storage area. The unique aspect of the Hantsport facility is that the bulk carriers dock on the rising ebb tide (mid) and sail on the high tide (3 hour window), with an average loading time of less than 3 hours for 40,000 tons of rock. It is one of the fastest ship loading facilities in the world.

In discussions with the Fundy Gypsum Company, the following summary of the number of gypsum bulk carriers loading at Hantsport was provided:

- During the months of May to December there is an average of 4 to 6 ships per month, and during the winter months December to May, anywhere from 6 to 12 ships per months on average. The higher number of ships loading in the winter months is due to the closure of a gypsum loading facility in Cape Breton because of ice conditions. The Hantsport facility ships an average of approximately 2 million tons of raw gypsum annually.

The largest gypsum bulk carrier that loads at the Hantsport facility is the Gypsum Centennial (42,000 ton cargo capacity) with has drafts of approximately 6.5 metres unloaded to **10 metres (32'06") fully loaded**. The Fundy Gypsum Company confirmed that there are no plans for larger bulk gypsum carriers, since the Gypsum Centennial is the largest vessel that can be accommodated by their market ports. The sister ship to the Gypsum Centennial, the Gypsum Integrity will be put into service in the fall of 2008. Another other smaller gypsum vessel is owned by the company is the A.V. Kastner, and has 21,000 ton cargo capacity. The Spanish Mist, a tug which assists bulk vessel movements and positioning in Hantsport, has a draft of 4.5 metres. Additional detail is provided in Attachment 1.

The following number of gypsum bulk vessels movements were recorded for 2006 and 2007, based on information provided from INNAV system (Canadian Coast Guard), was as follows:

2006 – 251 Bulk carrier movements

2007 – (On Request from Fundy MCTS – due to data management problems not available at this time)



In terms of tracking, vessels going to Hantsport generally follow a coastal route in the Bay of Fundy proper closer to the Nova Scotia side, and a more northern route during bad weather conditions. The Minas Channel has steep sides, with a large portion having depths > 25 metres, while depths at the centre range from 55 to 70 metres at low tide level. There are deep holes in the Minas Channel at depths >110 metres. The Passage (i.e. Cape Split to Cape Blomidon) varies between 5-7 kilometres wide.

Actual course coordinates for the Gypsum Centennial for sailing through the Minas Channel/Passage, including anchorages sites, are provided in Attachment 2. The Captain of the Spanish Mist tug indicated that other gypsum vessels would use a similar course as the Gypsum Centennial. Generally, the loaded gypsum vessels sail through the deepest part of the Minas Channel/Passage (near the centre of the Passage), more to the Cape Split side, which is steeper, and during falling high tide. And as noted in Attachment 2, under specific weather conditions the gypsum vessel would wait out the rough seas at sites near the Cape Blomidon and Scots Bay sides.

5. Water Depth to the Top of the Turbine/Facility (Clearance)

One of the critical considerations for the siting of the Demonstration Facility is the clearance between low tide level and the highest point of the device/facility. It has been suggested that this clearance is 15 metres, but the source of this number is not clear. We understand this number may have originated from one of the device suppliers.

However, in discussions with Transport Canada (TC), they have not identified this clearance or any other specified clearance range and are not aware of its origin. The Navigable Waters Protection group of TC indicated that this determination is made on a case-by-case basis (when the proponent makes application for a NWPA Permit), based on the dimension of the devices placed on the seabed and the approximate location in relation to fishing and vessel traffic patterns.

TC noted that once a permit application is received, they would undertake a similar exercise to determine the largest vessels (maximum drafts) moving through the Minas Channel area, and also evaluate the potential for future larger vessels, as part of determining whether to issue a permit or not. Regardless of the final clearance above the device and an approved NWPA permit, TC will still require marking of the device location and a notice to mariners.

Based on available information, the largest and most frequent vessels moving through the Minas Channel/Passage are exclusively the gypsum bulk carriers with a maximum draft of 10 metres when fully loaded, sailing at high tide or falling high tide. If the site selected for the Demonstration Facility is nearer to the centre of the Minas Channel/Passage, then a clearance of 15 metres from low tide level and the highest point of the device would appear to be a prudent approach that



provides a built in safety factor to accommodate rough seas. However, if the Demonstration Facility is closer to the Cape Sharp side away from the gypsum vessel traffic pattern, this clearance could possibly be reduced, since other vessels in area have drafts of only 2-3 metres.

6. Summary

The following points provide guidance to the preliminary site selection survey and consider large vessel movements in the Minas Channel/Passage area;

1. The largest vessels sailing the Minas Channel on a regular basis are gypsum bulk carriers. The maximum (fully loaded) draft of the largest gypsum bulk carrier, the Gypsum Centennial, is 10 metres.
2. The number of gypsum vessel movements via the Minas Channel is probably >200 per year.
3. The gypsum vessels sail through the passage following the deepest portion near the centre, closer to the Cape Split side of the Minas Channel. Plotted coordinates for gypsum vessels will be available the latter part of the week of April 28, 2008.
4. A maximum clearance of 15 metres from low tide level to the highest point of the device/facility would be adequate, with a comfortable safety factor, if the Demonstration Facility site is in or close to the gypsum vessel traffic patterns.
5. If the Demonstration Facility is closer to the Cape Sharp side away from the gypsum vessel traffic pattern, this clearance could possibly be reduced, since other vessels operating in the area have drafts in the 2-3 metres range.



References

Chart 4010, Bay of Fundy – Inner Portion, Published by the Canadian Hydrographic Service. Fisheries and Oceans Canada, 2003. (Copies provided to Oceans Ltd and Minas Basin Pulp & Power)

Marine Communications and Traffic Services, Canadian Coast Guard, Fisheries and Oceans Canada. <http://www.ccg-gcc.gc.ca>

News Release – Bay of Fundy Shipping Lanes Moved to Protect Right Whale. December 19, 2002. Transport Canada. http://www.tc.gc.ca/mediaroom/releases/atl/2002/02_A017e.htm

Offshore Energy Environmental Research Association (January 2008) background Report for the Fundy Tidal Energy Strategic Environmental Assessment on the Bay of Fundy Tidal Power Development. Project No. 1028476, Prepared by Jacques Whitford, Dartmouth, NS

Tides, Currents and Water Levels. Canadian, Hydrographic Service, Fisheries and Oceans Canada. <http://www.waterlevels.gc.ca>

Personal Communication (via telephone, E-mail and Meeting) with Harold Bulger, Hantsport Production Supervisor, Fundy Gypsum Company, Hantsport, NS

Personal Communication with the following (by telephone and E-mails):

Atlantic Pilotage Authority, Main Office, Halifax, NS

Mihai Balaban, A/Regional Director, Marine-Atlantic, Dartmouth District Office, Transport Canada, Dartmouth, NS.

Captain Mark Langdon, Fundy Gypsum Company, Hantsport, NS.

Paul LeBlanc, Officer In Charge, Fundy Marine Communications and Traffic Services (MCTS), Canadian Coast Guard Base, Fisheries and Oceans Canada, Saint John, NB

Barry Nisbet, Navigation Review Officer, Aids to Navigation-Saint John, Fisheries and Oceans Canada, Saint John, NB.

John Prentiss, Navigable Waters Protection Officer, Marine Safety, Transport Canada, Dartmouth, NS.

Vincent Smith Fishery Officer, Parrsboro, Conservation and Protection Branch, Fisheries and Oceans Canada, Truro, NS.



ATTACHMENT 1

Fundy Gypsum (C.G.C.) Shipping Facility Hantsport

The shipping facility is totally tide dependent. The ships arrive at the dock on ebb tide, one-half way to the full tide height. There are two company owned ships, the A.V. Kastner, which is a 21000-ton cargo vessel, and the Gypsum Centennial, which is a 42000-ton cargo vessel. There are chartered vessels that dock at Hantsport, but they are very limited. These charters are of the 35,000-ton range. In September 2008, another company owned vessel is due to go into service as well. This is the sister ship to the Gypsum Centennial and will be named the Gypsum Integrity.

The tug boat Spanish Mist sails on the high tide previous to the ship docking and remains anchored at the bar buoy until the ship arrives. The ship arrives at the bar buoy one hour before docking time. At this point, the tug board will tie up to the starboard side of the vessel and remain tied to the vessel until sailing time. The pilot goes to the ship's bridge at this time to navigate the ship up the river to the Hantsport dock.

The ship arrival draft at the dock will vary depending on fuel store and fresh water aboard. The normal arrival draft for the A.V. Kastner is 4'06" to 7'00" forward and 16'00" to 19'06" on the stern. The Gypsum Centennial's arrival draft is 6'06" to 8'06" forward and 16'06" to 19'10" on the stern.

There is a window of three hours to load each ship for they have to sail on high water from the dock. This is accomplished with two new ship loaders with a constant loading rate of 10,000 tons an hour each. The sailing drafts will differ depending on the cargo and port that it is scheduled to unload. The A.V. Kastner will sail with a draft of between 25'06" to 30'03" forward and a draft of 26'06" to 31'06" on the stern. The Gypsum Centennial's sailing draft will be between 29'10" to 31'06" forward and between 29'06" and 32'06" on the stern.

During the months of May to December, there is an average of four to six ships monthly and during the winter months, December to May, anywhere from six to twelve ships on average. The facility ships an average of about 2,000,000 tons of raw gypsum on a yearly basis. After helping the vessels pull off the wharf, the Spanish Mist will untie and return to her berthing dock next to the docking facility at Hantsport.

Average times between trips:

Boston	8 to 9 Tides (4 days)
Stoney Point (New York)	10 to 12 Tides (5 to 6 days)
Norfolk	12 to 14 Tides (6 to 7 days)
Baltimore	12 to 14 Tides (6 to 7 days)
Jacksonville	18 to 22 Tides (9 to 11 days)
Savannah	24 to 28 Tides (12 to 14 days)

Provided by: Harold Bulger
Hantsport Production Supervisor
Fundy Gypsum Company, Hantsport, Nova Scotia



ATTACHMENT 2

Gypsum Centennial WP from CIP 8U to Bar-Buoy Position

Geographical Location	Lat	Long	Course
Passing '8U'	45 01 N	065 18.5 W	057 deg
Off Cape D'Or	45 16 N	064 45.2 W	056 deg
Off Cape Split	45 22.1 N	064 32.2 W	104 deg
Off Partridge Island	45 20 N	064 20 W	137 deg
Off Cape Blomidon	45 17.27 N	064 15.07 W	169 deg
Bar-Buoy' Posn	45 13.15 N	064 15.26 W	

Anchor Posn for Normal Weather and Strong W'lies and SW'lies

Normal Wx	45 15.0 N	064 17.0 W
Normal Wx	45 15.5 N	064 17.5 W

Expecting Winter Storm Passage over Minas Basin / Fundy Waters

Center Of Minas Basin	45 19 N	064 15 W
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If Strong Nwly Forecasted

Advocate Bay	45 20 N	064 51 W
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If Strong E'lies Forecasted

Scotts Bay	45 17.25 N	064 29.5 W
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Provided by: Captain Mark Langdon
Fundy Gypsum Company
Hantsport, N.S.