APPENDIX 4-C
HAZID LIST OF ATTENDEES & OUTCOMES

APPENDIX B
HAZID Report

Navigation

#	Segment	Hazardous event	Cause	Mitigation	Comments	Other Notes
1	Trestle to past the exclusion zone	**Grounding**	Sailing too far west of the approach channel - environmental conditions (tides, wind etc.)	25 kts limit on operations	Operation window not defined. No draft limitation on tide	
2				4 Tugs available (3x70 and 1x50 tons)	2 tethered, 2 in position. Might be possible to manage with 3 tugs	
3			Sailing too far west of the approach channel - human error	4 Tugs available (70 and 50 tons)	2 tethered, 2 in position. Might be possible to manage with 3 tugs	
				Training and procedure sign off		
4				Pilot aboard	1 pilot No PPU	
5		**Collision**	Other Canaport traffic	Organization of traffic, Only one vessel moving in the area		
6			Other traffic, passing vessel without pilot	Advisory from MCTS	All foreign vessel >500 tons and Canadian >1500 tons requires pilot, 5000 tons offshore vessel excluded.	Bulk vessels with captain that has sailed the route many times are excluded from pilot requirement.
7			Other traffic, out of control	Standby tug	Escort tug can intervene	Last 25 years, the closest vessel have been 1 mile away from the SBM Most of the traffic that passes the terminal does not have tug escort until further shore side the harbor.

#	Segment	Hazardous event	Cause	Mitigation	Comments	Other Notes
8	Past Exclusion to harbor limits	**Collision - Ferries, other cargo vessel to the harbor area**	Low visibility	MCTS, Radar, AIS		
				Pilot aboard	1 pilot No PPU	
9			Human error	Operation of LNG vessels is limited to 1 mi visibility		
10			Mechanical error	Visibility limits will be defined for own traffic		Energy of ferries have to be evaluated
11				Organization/Coordination with ferry traffic to keep separation at or above 1 nm		Traffic study will be performed (current baseline and future)
12		**Collision - fishing vessel**	Human error	Advisory from MCTS		
13		**Loss of tugs**	Disabling of tugs due to fishing gear/mechanical failure	Tugs not affected by fishing gear and no nets being used in the area[1]		
14		**Loss of tugs**	mechanical failure	redundancy in number of tugs		
15		**Diverting from set course**	Avoiding other vessels (disabled or out of control)	Tugs can be used to clear the area	1 tug is fast when pilot board, the two next when getting closer to trestle	Tugs can be dismissed after passing the ferry track, escort dismissed after pilot station.
16		**Grounding**	Diverting from course to emergency	Deep water		

[1] Comment from Transport Canada on 5/5/2016 (Commenter was not present at HAZID workshop): "The main fishery in that area is lobster, where there are numerous surface buoys and lines. If appropriate actions are not taken by the tug, the probabil ty of the tug becoming mechanically disabled by this gear is relatively high. However, the mitigating factor would be the redundancy in number of tugs, as per #14. My comment obviously does not produce any material change to the document, but the proponent should be aware of this inaccurate statement by DNV". Comment communicated to DNV GL via email on 05/05/2016.

#	Segment	Hazardous event	Cause	Mitigation	Comments	Other Notes
			Human error	Pilot aboard	1 pilot No PPU	
17		**Collision**	Loss of anchoring	1 mile separation between anchoring vessels	Separation provides more time to react	When previous event occurred there were no separation limits
18			Congested anchoring area			
19			Bad weather/currents	Move vessel further out in the Bay of Fundy		Vessel with mechanical failures is advised to have stand by tug
20			Passing vessels	Speed limitation - set by pilot depending on conditions	E.g. container ship 10 kts	At severe weather conditions, vessel are directed to open sea holding area.
21				Traffic separation: 1 nm CPA		
22	Harbor limit to 5A/5B	**Collision**	Vessel inbound to anchoring B	Traffic advisory from manual Traffic monitoring	No automated collision warning systems in place	
23		**Collision**	Loss of control (drifting) due to black out		Current general in one direction	
24		**Grounding**	Loss of control (drifting) due to black out	6 tugs in harbor	Wind	
25			Mechanical failures			
26		**Collision**	Traffic congestions	MCTS monitors traffic and assists		
27				AIS		
28				Masters proactively communicating with other ships	No overtaking rules	
29				Harbor Master decide if conflicts		
30	5B to 4D	**Collision**	Crossing traffic into Passamaquoddy	MCTS, Radar, AIS		

#	Segment	Hazardous event	Cause	Mitigation	Comments	Other Notes
31				4E turnout established	Turnout established to avoid interaction with whale population	General guidelines, notice to mariners. NOTSHIP (Notice to shipping) issued when whales are observed
32				MCTS monitors separation zones and will advise vessels		
33	Beyond 4A, 4B	**Drift Grounding**	Low clearance south of Grand Manan Island (6 to 10 nm from channel) and east of channel outside Northwest Ledge (from channel)	Well established traffic patterns	RACON and new technology have limited the events	

Terminal

Node	Hazardous event	Cause	Mitigation	Comments
Node 1. Berthing operations	Vessel striking the jetty during berthing	Propulsion failure	Training of pilot (simulation) and system for knowledge transfer between trained pilot.	Simulations have demonstrated that berthing can be completed with 3oo4 tugs
		Heavy swell, Strong wind/currents	Operation limits combined with weather forecast	Local weather and meteocean observation equipment
			Operation can be aborted at any time	
	Striking the jetty with a tug	Tugs maneuvering during berthing	Tied tugs outside range of the trestle	Tug to tug collisions more likely
		Drifting tug	Remaining tugs can intervene	
Node 2. Loading operations	Release of product	Pipeline leaks	Welded pipe, no valve or flanges	Foam skids and fire water pumps
		Break in flange or valve at jetty	Concrete floor, open drain with capacity to handle heavy rain	
		Error in loading arm - overloading of loading hose	Arm dimensioned for the tidal variation	
		Break in connection between vessel		

Node	Hazardous event	Cause	Mitigation	Comments
		and loading arm		
		Leakage in swivel joint at the loading arm		
		Overfilling or loading wrong tank	Level indicators in each tank. HL will close valve and divert to another tank	
			Potential ESD shutdown button on pendent for the loading crew	
			Overpressure shutdown valve	
	Fire and explosion from HC release	Error in LFL equipment	Loading arms are drained, in a closed system.	
		Vapor return system leak	All electrical equipment is rated explosion proof	
			Fire suppression on the berth	Foam skids and fire water pumps
			Fire suppression on the vessel and tugs	
	Loss of mooring - breakaway from berth	Overloaded mooring lines	Mooring line monitoring system	
			Vetting of arriving vessels, decision on activation of ESD	Aligning the mooring procedures

Node	Hazardous event	Cause	Mitigation	Comments
			Weather limits on loading operations	
	Collision with other vessel	Passing vessel without tug escort, human error	Established route, established crew	Passing ferry traffic 1.3 nm
			Nav lights, normal light during operation	
			Standby tug when tanker is moored	Exclusion zone to be determined
Node 3. Un-berthing operations	Grounding	Loss of tug capacity	3 out of 4 tugs enough to execute normal un-berthing	Simulation have demonstrated successful un-berthing with one tug in all tidal scenario
Node 4. The jetty including pipes	Impact damage to Jetty	Collision from passing vessel on trestle	Lighted trestle	Lights might also be used when not loading.
			Fire detection and suppression	
			Sector lines moved to increase facilitate navigation	All vessels >300 tons requires radar
			Isolation valves isolate the trestle, limiting the release	