Environmental Assessment
Registration Document (Class 1 Undertaking)

Expansion of Waste Management Services
Atlantic Industrial Services, Debert Facility

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Appendix G
Water 9 Model Input and Assumptions

Emissions to the atmosphere at the wastewater treatment system of the AIS Debert Facility were modeled using the U.S. Environmental Protection Agency approved Water9 Version 2 model (AMEC 2008a).

The modeling included 13 volatile organic compounds (VOCs), 7 of which are referred to separately herein as 3 alcohols and 4 glycol compounds, that were all found in the waste streams based on a sampling program conducted in August 2008. → Kennetcook frac waste ponds

The wastewater characteristics chosen are found in Table H-1, and represent the waste stream as it is being pumped to the holding ponds and/or the biological treatment (aeration) pond. The existing wastewater characteristics are based on samples taken from pond number 4, and as such do not represent the influent exactly, but allow for the use of the model to determine off-gas emissions.

Table G-1: Partial Wastewater Characteristics

Parameter	Units	Existing Waste[2]	New "Frac. Fluid" Waste[3]	New "Produced Water" Waste	
				Normal Operation	Simulated Upset Conditions
Flow (average)	m^3/d	50	21[1]	5	5
COD	mg/L	47,000	17,000	1,200	61,000
BOD^5	mg/L	20,000	11,000	280	30,000
TSS	mg/L	370	1,000	190	190
Dissolved Solids	mg/L	12,000	6,200	2,200	3,800
Oil & Grease (THC)	mg/L	380	750	88	91
Benzene	mg/L	0.13	ND	ND	2.7
Ethyl Benzene	mg/L	0.17	ND	0.009	6.1
Methylene Chloride	mg/L	0.054	ND	ND	ND
Tetrachloroethylene	mg/L	0.013	ND	ND	ND
Toluene	mg/L	1.2	ND	0.011	4.7
Xylene (total)	mg/L	1.05	ND	0.016	25.4
Ethanol	mg/L	4,400	ND	ND	170
Isopropanol	mg/L	6	100	ND	110
Methanol	mg/L	120	10,000	120	40,000
Ethylene Glycol	mg/L	6,000	480	27	62
Diethlyene Glycol	mg/L	100	ND	11	ND
Triethylene Glycol	mg/L	4,000	ND	ND	ND
Tetraethylene Glycol	mg/L	180	ND	ND	ND

1. Flow for 6 months each year only.
2. Parameters are taken from the manual composite sample collected from Lagoon 4 . This is not a proper "influent" sample but it is representative of the types and relative concentrations of compounds present.
3. Based on assumption that the still bottoms at Debert will contain 1 percent residual methanol (about 95 % removal), about 82 percent removal of the isopropanol and no removal of ethylene glycol from the waste stream.

SPECS include references → equipment in drawings (proposed)

The parameters of interest for the air quality impacts are the volatile compounds which include volatile organic compounds (VOC's), alcohols and glycols. The Water9 model was able to predict the fate and air emission rates for all of these compounds. While it is recognised that there is some production of reduced sulphur compounds through the action of anaerobic bacteria in the holding basin, the model could not be used to determine their production rates nor their fate.

The process configuration for wastewater treatment at the Debert Facility is shown schematically in Figure 4.2-1 (Scenario 1) and Figure 4.2-2 (Scenario 2), as well as in more detail in Figure 2.1-3. The Water9 model assumes that each pond is a completely mixed system (constant composition characteristics), and for this plant, the following assumptions were made:

- The model contains three separate waste input streams; one for the existing flow, a second for the future "Produced Water" waste stream, and a third for the future "high concentration Frac. Fluid" waste stream.
- For purposes of the Water9 model, holding ponds L-3, L-4 and L-5 are considered to be a single pond, which is wind agitated and completely mixed.
- The biological treatment pond (L-2) is entered as a separate activated sludge basin in the model.
- The ultrafiltration unit is simulated by a small covered clarifier that has 99.9% suspended solids capture efficiency. This reduces the potential for air emissions from this unit to trivial levels when compared to the ponds.

The actual basin dimensions, as well as the model basin dimensions are shown in Table H-2. The aeration basin contains six induced draft lance type floating aerators having 15 HP motors capable of inducing an air flow of about 300 ft^3/minute. In addition, there is a diffuser system using a 75 HP blower that provides an additional 650 ft^3/minute.

Table G-2: Pond Sizes

Identifier	Length	Width	Area		Depth		Volume
	(feet)	(feet)	(ft^2)	(m^2)	(feet)	(metres)	(m^3)
Holding Pond							
L-3 West Pond L-4 East Pond L-5 Northeast Pond	169 294 110	114 149 102	19,266 43,806 11,220		14 9 14		
Model Basin	30	248	74,292	6,904	8.8[1]	2.69[1]	18,600
Aeration Pond							
L-2 Main Aeration	144	104	14,976	1,392	6.6[1]	2.0[1]	2,800

1. Depths back calculated based on given volumes and surface area.

In order to establish the appropriate meteorological parameters for developing the Water9 model's application, a mix of climate information was used. The climate normals for Debert, N.S. (Latitude 45° 25.200 N, Longitude 63° 25.200' W) were used to the extent possible; however, wind speed information from Halifax International Airport station (Latitude 44° 52.800' N, Longitude 63° 31.200' W) was used, although the speeds were scaled back by a factor of 30%, based on limited information from the closer station at Truro, N.S. The overall suite of parameters are indicated in Table H-3.

Part I - Treatment of Aqueous-Organic Wastes;

- Establish a new Stormwater Management Pond ;
- Fill in the existing Stormwater Management Pond;
- Erect new multi-purpose processing building;
- Install new distillation unit;
- Construct new tank farm;
- Install organics waste and product storage tanks;
- Construct new biological oxidation treatment system; and
- Install fugitive emission controls.

The new diffused air biological treatment tank will be located south of the multi-purpose building. The dimensions of this concrete tank are anticipated to be about 80 ft long x 40 ft wide x 12 ft deep (about 27 m x 13 m x 4 m) (Note: The tank is proposed to be placed no more than 9 ft (3m) below grade level). The outside of the concrete walls will be coated with a spray applied polymer enhanced waterproofing membrane before the outside perimeter of the tank is backfilled. A network of tube-type diffusers will be installed in the tank to deliver the required air supply. A fabric building or a low profile cover will be installed to enclose the biological treatment system. (see Appendix B for conceptual detailed drawing).

2.2.3 Schedule

It is anticipated that the construction activities associated with the expansion will begin early in 2009 and be completed by the end of 2010.

Part I, the work required to establish the new Stormwater Management Pond and fill in the decommissioned Stormwater Pond will require about 2 weeks. During the next 6 months; the new building will be erected, the biological treatment system will be installed and the tank farm will be constructed. The distillation unit will also be installed during this period.

Part II, the upgrades proposed for the existing chemical treatment system are scheduled to begin in 2010. New tank capacity for metal-bearing wastewater storage and chemical pretreatment and associated air emission controls (if required) are scheduled for the same year.

The proposed Facility modifications and additions outlined above are scheduled to be implemented in 2009 and 2010 subject to the necessary approvals. In order for AIS to respond to current market needs, Part I of the proposed expansion needs to be completed and fully operational early in the third quarter of 2009.

Triangle's 2nd year exploration plans – several wells

2.3.2 Waste Types and Volumes

Feedstock (waste types) currently managed and proposed to be processed at this Facility in the future are listed in Table 2.3-1 together with approximate quantities. The estimated volume for Part I is expected to be generated from onshore oil & gas exploration activities in the Maritimes. The estimated volume for Part II is expected to be generated by Nova Scotia based industries.

amec

low ball figure

Table 2.3-1: Waste Types and Volumes

Waste Type	Approximate Quantities (per year)			
	Existing Debert Operation	Proposed: Part I Aqueous-Organic Wastes	Proposed: Part II Metal-Bearing Wastewaters	Proposed: Part III Containerized Waste Dangerous Goods
Bulk Wastewater (L)	18,000,000	7,000,000	1,000,000	
Used Oils (L)	7,000,000			
Containerized Waste Liquids (Drums)	2,000	*	only 2 exploratio, wells	
Containerized Waste Solids (Drums)	5,000		Many more planned anually.	
Containerized Waste Dangerous Goods (Drums)				3,200

A detailed list of materials (and their TDG classifications) currently accepted, and those proposed to be accepted in the future are shown in Table C-1, Appendix C.

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Table C-1:
Description of Waste Goods and Applicable TDG Classifications for Existing and Proposed Facility Operations

Debert Facility	Waste Goods	TDG Classification
Existing Operations: Oil Re-refining and Wastewater Treatment	Used Oil	Non – Regulated
	Waste Fuels	3(6.1) Flammable Liquid(Poisonous)
	Waste Glycols	Non – Regulated
	Oil Filters	Non – Regulated
	Oily Rags	Non – Regulated
	Oily Sludge	Non – Regulated
	Wastewater[1]	Non – Regulated See Footnote Below
Expansion Part I: Aqueous-Organic Wastes	Organic-Rich Fluids; e.g., 20 to 40% Methanol in Water	3(6.1) Flammable Liquid(Poisonous)
	Organic-Lean Fluids; e.g., < 3% Methanol in Water	9 Environmentally Hazardous
Expansion Part II: Metal-Bearing Wastewaters	Chromic Acid Rinse Waters	9 Environmentally Hazardous
	Metal Plating and Finishing Wastes	8 Corrosive
	Aircraft Paint Hangar Wastewaters	9(6.1) Environmentally Hazardous (Poisonous)
Expansion Part III Containerized Wastes	Waste Solvents	3 Flammable Liquids
	Readily Combustible Solids	4.1 Flammable Solids
	Sulphur Compounds, matches, etc	4.2 Spontaneously Combustible
	Water Reactive Chemicals	4.3 Dangerous When Wet
	Batteries; Wet/ Dry/Sealed	8 Corrosive
	Oil Base Paint Waste	3 Flammable Liquids
	Acids and Bases	8 Corrosive
	Pesticides/Herbicides	6.1 Poisonous
	Pharmaceuticals; Liquids/Solids	6.1 Poisonous
	Aerosol Cans	2.1 Compressed Gas
	Small Propane Cylinders	2.1 Compressed Gas
	Oxidizers; Liquids/Solids	5.1 Oxidizer

Frac Fluids

[1] Wastewater which meets criteria as listed for a dangerous good under Transport Canada's Transportation of Dangerous Goods Regulations or under Schedule B of the Dangerous Goods Management Regulations shall be considered a waste dangerous goods and shall not be accepted for treatment at this facility. This definition does not apply to wastewater containing waste fuels which may be classified as a waste dangerous good due to the flash point.