APPENDIX L4

Fresh Water Supply, Sewage, and Wastewater Management Plan

(Pages L4-1 to L4-384)

Baffinland Iron Mines Corporation

BIM-5200-PLA-0022 FRESH WATER SUPPLY, SEWAGE, AND WASTEWATER MANAGEMENT PLAN

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Rev #	Prepared By	Reviewed By	Approved By	Description of change and purpose of issue
01/31/14	2	JM	JM	EM	Approved for Use
03/19/15	3	JM	JM	EM	Approved for Use
03/29/16	4	AV	AV	JM	Approved for Use
03/29/18	5	CD	CD	GR	Approved for Use
03/31/19	6	CD/WB	CD/WB	FG	Approved for Use
03/31/20	7	CD	CD	BM	Approved for Use
03/31/21	8	AP	AP	FG	Approved for use
03/31/22	9	CD	CD	FG	Approved for use
03/30/23	10	TS	TS	FG	Approved for use

TRACK CHANGES TABLE

Index of Major Changes/Modifications in Revision 10

Item No.	Description of Change	Relevant Section
1	General formatting change to new document template	All
2	Inclusion of KM 105 treatment system	7.2.5
3	Inclusion of ability to transfer water between MDMER facilities, if required	10
4	Concordance tables to Type B WL and Project Certificate	Appendix B

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1. PURPOSE

The purpose of this Plan is to describe the plan to manage the fresh water supply and wastewater for the various camp sites for the Mary River Project during the Project's construction and operation phases.

This Plan will continue to support the Membrane Biological Reactor (MBR) sewage treatment plants (STPs) installed in 2014 which service the Mine Site Complex (MSC) and Port Site Complex (PSC) camps, the MBR sewage treatment plant installed in 2018 to service the Sailiivik Camp, the MBR sewage treatment plant installed in 2019 to service the 380 Person Camp, and the potable water supply and oily water treatment activities under the Type A Water Licence 2AM-MRY1325 – Amendment No. 1 (Type A Water Licence). This Plan will also support future upgrades and additions to the MBR STPs necessary to service future MSC, PSC and Sailiivik camp expansions at the Mary River Mine Site and Milne Port.

2. APPLICATION

The Plan applies to all departments and to all Baffinland employees, contractors and visitors when involved in controlled activities.

Specifically, this document focuses on freshwater supply and wastewater treatment and disposal at Milne Port, the Mine Site, Steensby Port, and various temporary camps.

2.1 REGULATORY REQUIREMENTS

This Plan has been developed under the requirements of Baffinland's Type A Water Licence (refer to the concordance table for the Type A Water Licence presented in Appendix B). Furthermore, all actions undertaken under this Plan will be compliant with the appropriate sections of both Federal and Territorial legislation as indicated in Table 1.

TABLE 1 APPLICABLE REGULATIONS, STANDARDS, AND CODES

Title	Number/ Acronym
American Water Works Association	-
International Building Codes	-
National Sanitation Foundation	-
Health Canada Guidelines for Canadian Drinking Water Quality	-
Northwest Territories Water Supply System Regulations	NWT Regulation 108-2009
Safe Drinking Water Act, 2002	Ontario Regulation 170/03
Nunavut Waters and Nunavut Surface Rights Tribunal Act, SC2 002, c. 10	--
Northwest Territories Water Act	NWTWA
Northwest Territories Water Regulations (SOR/93-303)	--
Ontario Drinking Water Quality Standards	--

Federal *Fisheries Act*	--
Canadian Environmental Protection Act (1999)	CEPA
CCME Water Quality Guidelines for the Protection of Aquatic Life	--
Ontario Guidelines for Sewage Works, 2008	--
Drinking Water System Components	NSF/ANSI Standard 61
Filtering Material	AWWA Standard B100
Granular Activated Carbon	AWWA Standard B604
Canada Occupational Health and Safety Regulations	-
Metal and Diamond Mining Effluent Regulations	-
End-of-pipe Fish Protection Screens for Small Water Intakes in Freshwater	DFO Canada Interim Code of Practice (2020)
Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada	Canadian Science Advisory Secretariat Science Advisory Report 2013/17
DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut	DFO (2010)

3. DEFINITIONS AND ABBREVIATIONS

3.1 ABBREVIATIONS

Statement	Definition
API	American Petroleum Institute
BTE	4,4',4"-(Benzene-1,3,5-triyltri-2,1-ethynediyl)tribenzoic acid
COD	Chemical Oxygen Demand
CF	Crusher Facility
ECCC	Environment and Climate Change Canada
FDP	Final Discharge Point
GEVP	Group Executive Vice President
GCDWQ	Guidelines for Canadian Drinking Water Quality
HDPE	High Density Polyethylene
MBR	Membrane Biological Reactor
MDMER	Metal and Diamond Mine Effluent Regulation
MHR	Mine Haul Road
MSC	Mine Site Complex
MWH	Mine Site Weatherhaven
NH_4	Ammonia
NO_2	Nitrite
NO_3	Nitrate
NWB	Nunavut Water Board
OHWM	Ordinary High Water Mark
OMS	Operation, Maintenance and Surveillance
OWS	Oily Water Separator
PSC	Port Site Complex
PWSP	Polishing Water Stabilization Pond
PWTP	Potable Water Treatment Plant
ROM	Run of Mine
SCP	Spill Contingency Plan
SO_4	Sulphate
STP	Sewage Treatment Plant
SWAEMP	Surface Water and Aquatic Ecosystem Management Plan
TDS	Total Dissolved Solids
TOG	Total Oil and Grease
TSS	Total Suspended Solids
WRF	Waste Rock Facility
WTP	Water Treatment Plant

3.2 DEFINITIONS

Statement	Definition
FDP	Final Discharge Point

4. FRESH WATER

4.1 GENERAL MITIGATION MEASURES FOR WATER USE

4.1.1 Water Intakes

4.1.1.1 Engineering Intake Structures

Engineered intake structures are designed to minimize erosion, avoid sediment issues, and provide protection from ice and peak water flows. Care is taken to ensure that disturbance to aquatic environments is minimized during installation and maintenance of infrastructure. Riprap used in construction is clean, free of fine sediment, non-acid leaching, and non-metal generating.

4.1.1.2 Screens on Intake Pipes

All water intake hoses shall be equipped with a screen of an appropriate mesh size, in accordance with the Fisheries and Oceans (DFO) Canada Interim Code of Practice: End-of-pipe fish protection screens for small water intakes in freshwater (2020) to ensure no entrainment of fish. The guideline also requires a water withdraw rate such that fish do not become impinged on the screen.

4.1.1.3 Selection of New Water Take Locations

New water intake locations maybe required for a variety of needs including concrete production, drilling, and dust suppression, etc. A screening process is used to confirm whether water sources are considered adequate as water take locations. Source selection begins by looking for the largest possible water body that is feasible for use. Lakes are considered first, followed by ponds and then large rivers. Streams and creeks will not be considered for short-term water withdrawal unless larger sources are not available. Baffinland will notify the Inspector and the Board at least 10 days in advance of using any new water sources not identified in the Type A Water Licence. If the required volume of water is likely to result in drawdown of the source water body, an assessment of the proposed water withdrawal will accompany the notification to the Inspector and the Board. For water takes from fish-bearing streams during open water, DFO (2013) recommends water withdrawals not exceed 10% of the instantaneous flow without further study. During winter, water withdrawals from lakes should not exceed 10% of the under-ice volume without further study (DFO, 2010). During winter under ice conditions, water must be drawn from below two metres (2 m) of non-frozen water (as the top two metres (2 m) of water provides higher oxygenation for resident fish).

4.1.1.4 Water Truck Water Withdrawals

Water trucks withdraw water from Km 32 Lake to supply Milne Port, and from Camp Lake to supply the Mine Site for domestic and industrial (i.e. production drills, emulsion plant, maintenance facilities, etc.) water needs. A number of water sources are relied upon for use in dust control. Intakes on the extraction hoses are screened in accordance with the DFO

guideline. Water withdrawals are short-term (approximately 20 minutes to fill a water truck) and the approved and proposed water withdrawals are based on guidance established by Knight Piésold (2014).

4.1.1.5 Water Usage and Conservation Measures

Water meters are installed at strategic locations to monitor water consumption and enable the development of management strategies to reduce water usage/consumption. These strategies include the installation of low flow water taps. If water meters are not available, water use will be estimated using flow rates.

Water withdrawn from approved water intake locations within the Project is recorded and reported to the Environment Department. All personnel involved with water use activities are to follow the Type A Water Licence to ensure that daily withdrawal limits are not exceeded. Controls that may be implemented to ensure daily limits are not exceeded include:

- Totalizer flow meters
- Source location and limit signage
- Ongoing training of involved personnel in water taking
- Detailed water truck logs that indicate when the maximum daily volume of water has been collected from each source based on the number of water truck loads filled
- Waterproof housing to store water truck lugs in a singular location at the source, enabling the used of a common log sheet for all operators and improved tracking between different trucks using the same source on the same day; and,
- Effective communication between day shift and night shift operators.

4.2 FRESH WATER SOURCES

All fresh water for domestic camp use and industrial purposes, during Construction and Operation Phases of the Project shall be obtained in amount and from sources listed in Table 2. Domestic water use is for camp operations, and industrial uses are primarily for firewater and other industrial uses (e.g. concrete production, ice road construction).

TABLE 2 WATER USE AUTHORIZED FOR DOMESTIC AND INDUSTRIAL PURPOSES DURING PROJECT CONSTRUCTION AND OPERATIONS PHASES*

Site	Source	Construction Phase	Operations Phase		
			Domestic	Industrial	Combined
		Volume (m^3/day)	Volume (m^3/day)		
Milne Port (Milne Inlet)	Phillips Creek (summer) / Km 32 Lake (Winter)	367.5	300	67.5	367.5
Mine Site (Mary River)	Camp Lake	657.5	203.8	151.6	355.4
Steensby Port (Steensby Inlet)	ST 347 Km Lake / 3 Km Lake	435.8	101	142.6	243.6
Raven River	Camp Lake	145.2	N/A	N/A	N/A
Mid-Rail	Nivek Lake (Summer)	79.5	N/A	N/A	N/A
	Ravn Camp Lake (Winter)		N/A	N/A	N/A
Cockburn North (Tunnels Camp)	Cockburn Lake	101.4	N/A	N/A	N/A
Cockburn South Camp	Cockburn Lake	111.1	N/A	N/A	N/A
Total		**1,898**	**604.8**	**361.7**	**966.5**

* Source: Type 'A' Water Licence (2AM-MRY1325 – Amendment No. 1)

Table 2 outlines approved water sources under the Type A Water Licence for dust suppression. Table 3 includes approved water sources that are smaller streams. Water can be extracted from these streams during June and July in any year, with the exception of dry years where water withdrawals are prohibited during August and September. The Environment Department will be consulted before withdrawing water from these streams listed in Table 3 to verify if it is a wet or dry year and if water withdrawals are authorized.

TABLE 3 WATER USE AUTHORIZED FOR DUST SUPPRESSION ALONG THE TOTE ROAD*

Source	Proposed Maximum Volume (m^3/day)	Restriction
Phillip's Creek	212	None
Km 32 Lake	364	None
CV128	579.5	None
CV099	110	June – July only during low flow (less than mean flow) years
CV087	90	June – July only during low flow (less than mean flow) years
CV078	75	June – July only during low flow (less than mean flow) years
Katiktok Lake	318	None
BG50	150	None
BG32	120	June – July only during low flow (less than mean flow) years
CV217	130	None
Muriel Lake	212	None
David Lake	132	June – July only during low flow (less than mean flow) years
BG17	75	June – July only during low flow (less than mean flow) years
CV233 (Tom River)	135	None
Camp Lake	86	None

* Source: Type 'A' Water Licence (2AM-MRY1325 – Amendment No. 1)

The above water sources have been approved by the NWB as freshwater sources for dust suppression. Authorization by the NWB in writing must be obtained prior to withdrawing water at the sources listed above for any purpose other than dust suppression.

Waterproof storage systems are installed at each water source to house daily water use logs, which enabled the use of a common log sheet for all operators and improved tracking between different trucks using the same source on the same day. The water truck operator log indicates when the maximum daily volume of water has been collected from each source based on the number of water truck loads filled.

Streams will not be used as a water source unless authorized and approved by the NWB in writing. Additionally, no material shall be removed from below the OHWM of any water body unless authorized. For remote fresh water requirements such as dust suppression, tunnelling, and geotechnical and exploration drilling, some water may be drawn by truck from nearby lakes and ponds and used directly for these purposes if the source is pre-approved by Baffinland's Type A Water Licence or by application to the NWB.

Sources that are restricted by low flow years will have a visual inspection completed by environmental personnel to determine if restrictions need to be put in place on a regular basis.

Environment personnel will then perform instantaneous flow measurement by staff gauge monitoring if deemed necessary. The instantaneous flow estimate will be done by measuring the height of water on a staff gauge and applying it to rating curves of representative streams around the Project. This data will be compared to low flow indices from current monitoring locations for a representative stream in consultation with a hydrologist to determine if it is a low flow year. The Environment Department will inform operators of any restrictions.

Water used for the purposes of exploration drilling and domestic camp use at supporting satellite exploration camps will be withdrawn under the authorization of Baffinland's Exploration Type B Water Licence (Type B Water Licence; 2BE-MRY2131). Water withdrawn for domestic camp use at satellite exploration camps will be withdrawn from sources proximal to each camp. Total water use for all satellite exploration camps will not exceed 49 m^3 per day. Likewise, drill water will be withdrawn from water source(s) proximal to drilling targets and shall not exceed 250 m^3 per day. Therefore, the volume of water withdrawn for all purposes under the Type B Water Licence will not exceed 299 m^3 per day.

4.3 FRESH WATER SYSTEM PROCESS DESCRIPTION

The following sections describe the fresh water systems at the Project sites. Each site also includes a potable water treatment system that produces drinking water for the personnel at the site during construction and operation phases. These systems treat water to meet the Guidelines for Canadian Drinking Water Quality (Health Canada, 2017) as well as the Ontario Drinking Water Quality Standards (Government of Ontario, 2018a). Minimum process equipment requirements are based upon the Northwest Territories Water Supply System Regulations, NWT Regulation 108-2009, Ontario Design Guidelines for Drinking Water Systems 2008, Ontario Regulation 170/03 – Drinking Water Systems, the Procedure for Disinfection of Drinking Water in Ontario, as well as best management practices.

4.3.1 Milne Port

Currently on site at Milne Port, two (2) camps support operations and construction activities. These camps include the PSC Camp and the 380-Person Camp. Each camp contains a PWTP within or near the camp as well as freshwater tanks to store raw water being delivered. The freshwater demand for construction and operation are shown on drawing 'Milne Inlet – Water Supply Balance Block Flow Diagram' in Appendix D of this Plan.

A raw water truck draws water from either Km 32 Lake (in winter/summer) or Phillips Creek (in summer) and delivers the water to a water storage tank near the camp. Water from this tank is used to provide fire water as well as meet the fresh water requirements of the site. A standpipe within the tank ensures that fire water is always available in the tank. The Milne Port camp layout, including the locations of potable water related infrastructure, is presented in Appendix C. The potable water treatment scheme consists of coagulation followed by media filtration and disinfection by ultraviolet radiation. The water then undergoes a secondary

disinfection by sodium hypochlorite injection to ensure residual chlorine content at the point of use.

4.3.2 Mine Site

Currently on site at the Mine Site, three (3) camps support construction, operations and site wide exploration activities. These camps include the MWH Camp, the Sailiivik Camp Complex, and the MSC Camp. Each camp contains a PWTP within or near the camp as well as freshwater tanks to store raw water being delivered. The freshwater demand for construction and operation are shown on the drawing 'Mine Site – Water Supply Balance Block Flow Diagram' in Appendix D of this Plan.

Fresh water supply for the Mine Site is obtained using an electric pump positioned inside a heated and insulated pump house on a raw water jetty on Camp Lake. Water is pumped directly from the lake source to water storage tanks located at both camps. Storage tanks that are not connected to this water line are filled from water trucks that draft water directly from the pump house. Water from these tanks will be used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within each tank ensures that fire water is always available in the tank. The Mine Site camp layout, including locations of potable water related infrastructure, is presented in Appendix C of this Plan.

The potable water treatment scheme consists of coagulation followed by media filtration and disinfection by ultraviolet radiation. The water will then undergo a secondary disinfection by sodium hypochlorite injection to ensure residual chlorine content at the point of use.

Some fresh water requirements such as road dust suppression, exploration drilling, quarry dust suppression, and concrete and explosives manufacturing will be provided directly from Camp Lake and other nearby lakes using water trucks. Exploration drilling will continue throughout the construction and operation phases of the Project.

5. SEWAGE TREATMENT

5.1 SEWAGE GENERATION RATE

The estimated generation of sewage is based upon a per capita generation as shown in Table 4.

TABLE 4 STP AVERAGE SEWAGE FLOW DESIGN BASIS

Sewage Generation per Capita	300 L/person/day	Design Basis – Sewage Treatment Plant, Doc. No. H337697-4000-10-109-0002 (FEIS, Appendix 3B).
Sewage Generation per Capita	300 L/person/day	Design Basis – Sewage Treatment Plant, Doc. No. H337697-4000-10-109-0002 (FEIS, Appendix 3B).

5.2 SEWAGE DISCHARGE CRITERIA

All sewage generated from relevant Project sites is directed to the Sewage Treatment Plants (STP's) or as otherwise approved by the NWB. As per the Type A Water Licence, Baffinland constructs and operates infrastructure and facilities designed to contain, withhold, divert, or retain Water and/or Waste in accordance with applicable legislation and industry standards. Effluent is discharged such that surface erosion is minimized and no additional impacts are created. Effluent discharge locations are regularly monitored for erosion and control measures are implemented as required. The quality of the sewage treatment plant effluent discharging to freshwater or directly into the ocean shall be in accordance with the applicable site discharge limits and the approved Type A Water Licence as listed in Table 5.

TABLE 5 EFFLUENT QUALITY DISCHARGE LIMITS FOR SEWAGE TREATMENT FACILITIES TO FRESHWATER AND TO THE OCEAN*

Parameter	Unit	Maximum Concentration of Any Grab Sample discharging into Freshwater (mg/L) Monitoring Locations: MS-01, MS-01B, MS-01A, MS-MRY-04, MS-MRY-04A, MS-MRY-04B, MS-MRY-04C	Maximum Concentration of Any Grab Sample discharging into the Ocean (mg/L) Monitoring Locations: MP-01, MP-01A, MP-0!B
BOD_5	mg/L	30	100
TSS	mg/L	35	120
Faecal Coliform	CFU/100 mL	1,000 CFU /100 ml	10,000 CFU /100 ml
Oil and Grease*	mg/L	No visible sheen	No visible sheen
pH	---	Between 6.0 and 9.5	Between 6.0 and 9.5
Ammonia (NH3-N)	mg/L	4.0	-
Total Phosphorus (MS-01, MS-01B, MS-MRY-04A)	mg/L	4.0	-
Total Phosphorus (MS-01A)	mg/L	1.0	-
Toxicity	---	Final effluent not acutely toxic	Final effluent not acutely toxic

*Source: Type A Water Licence (2AM-MRY1325 - Amendment No. 1) Table 4 and 5

Locations MP-01 and MP-01A discharge directly into the ocean, therefore ocean discharge criteria apply.

Recycled water and use of reclaimed water from the various Treatment Facilities (STPs, OWSs, etc.), surface water management ponds, and embankment dams and approved discharge locations may be used if waters meet appropriate discharge criteria for those facilities. Sludge generated from Sewage Treatment Facilities or any other facilities shall be incinerated using the Milne Port and Mine Site on-site incinerators, disposed of in the landfill with the appropriate approvals from authorities, or backhauled for disposal off site in Southern Canada.

5.3 TREATED WASTEWATER GENERATION AND DISCHARGE/ OUTFALL LOCATIONS

Treated sewage and wastewater for the Project is discharged to the locations listed in Table 6:

TABLE 6 TREATED EFFLUENT GENERATION AND DISCHARGE/ OUTFALL LOCATIONS*

Camp/ Site	Discharge/ Outfall Location		Coordinates (UTM)	
	Summer	Winter	Easting	Northing
Milne Port	Ocean at Milne Inlet		503636	7976338
Mine Site	Sheardown Lake for Exploration Camp	Storage Ponds (PWSPs)	559733	7913630
Mine Site	Effluent Line to Mary River		562321	7911946
Tote Road Work Sites	Conveyed to Mine Site or Milne Port Sewage Treatment Facilities		N/A	N/A
Steensby (Port)**	Ocean at Steensby Inlet		593378	7801412
Ravn River Area**	Conveyed to Mine Site Sewage Treatment Facilities		N/A	N/A
Mid-Rail Area**	Conveyed to Mine Site Sewage Treatment Facilities		N/A	N/A
Cockburn Tunnels Area**	Conveyed to Steensby Sewage Treatment Facilities		N/A	N/A
Cockburn South Camp**	Conveyed to Steensby Sewage Treatment Facilities		N/A	N/A

*Refer to Site Block Flow Diagrams in Appendix D for Milne Port and Mine Site anticipated annual effluent discharge.
** These sites are part of the Southern Railway Corridor

Treated wastewater effluent will be discharged at a distance of least thirty-one metres (31 m) above the OHWM of any water body or watercourse, or where direct flow into the adjacent water body or watercourse is possible, so that surface erosion is minimized and additional impacts are avoided.

The sewage treatment facilities are sampled at the locations listed in Table 7.

TABLE 7 SEWAGE TREATMENT FACILITY MONITORING LOCATIONS

Camp/ Site	Treatment Facility	Description	Coordinates (UTM) Easting	Northing
Mine Site	MS-01	MSC Wastewater Treatment Plant	561322	7913257
Mine Site	MS-01A	Polishing Waste Stabilizing Ponds	Not Constructed	Not Constructed
Mine Site	MS-01B	Sailiivik Camp Wastewater Treatment Plant	560798	7913291
Mine Site	MS-MRY-04	Exploration Camp Wastewater Treatment Plant	558141	7914427
Mine Site	MS-MRY-04A	Polishing Waste Stabilizing Ponds	558528	7914112
Mine Site	MS-MRY-04B	Polishing Waste Stabilizing Ponds	558447	7914275
Mine Site	MS-MRY-04C	Polishing Waste Stabilizing Ponds	558496	7914244
Milne Port	MP-01	PSC Wastewater Treatment Plant	503209	7976485
Milne Port	MP-01A	Polishing Water Stabilizing Ponds	503625	7976015
Milne Port	MP-01B	380 Man Camp Wastewater Treatment Plant	503808	7975985
Steensby Port	SP-01	N/A	Not Constructed	Not Constructed
Steensby Port	SP-01A	N/A	Not Constructed	Not Constructed

5.4 SEWAGE TREATMENT PROCESS DESCRIPTION

The process description for the sewage treatment systems at each site are described in the sections that follow. Note that for design purposes a per capita sewage generation rate of 344 L/person/day had been considered originally, which is higher than the per capita potable water consumption rate of 300 L/person/day. This was to ensure that the sewage treatment systems would have a higher design allowance. For consistency, 300 L/person/day will now be used for both potable water consumption and sewage generation. On average sewage generated per person ranges from approximately 100 to 300 litres per day. In addition, actual camp occupancy can be optimized based on potable water conservation measures that can be implemented to reduce per capita water consumption and reduce overall sewage generation from current rates.

5.4.1 Milne Port

The original on-site STP for Milne Port is a MBR facility that was installed in 2014. Raw sewage generated at the PSC camp is pumped directly via lift stations and sewage lines to the MBR facility at Milne Port. A second STP is adjacent to the 380-Person Camp.

Treated effluent from the MBR sewage treatment plant servicing the PSC accommodations is stored in a series of treated effluent tanks. It is designed such that the effluent tank will be at a low-level during operation. This design allows for delay of discharge should sampling indicate that the effluent quality does not meet the applicable criteria. Such delay allows the effluent to be mixed, re-treated, and retested before discharge. Once sampling indicates that effluent meets discharge criteria the treated effluent stream is directed to discharge via truck or pipeline to the ocean outfall discharge location (see Table 7 for coordinates). The discharge location at Milne Inlet is shown on the Milne Port Site Layout (Appendix C).

Should discharge of off-spec effluent be necessary from the treated effluent tanks due to volume, the off-spec effluent will be stored in the Milne Port PWSP. The off-spec effluent will be removed by vacuum truck and fed into the sewage plant feed tank for re-processing or treated by means of a pond treatment system (i.e. DAF system). Should there be high volumes of off-spec effluent greater than the capacity of the existing PWSP, the Type A Water Licence allows for the construction of a second PWSP to be built at Milne Port. This second PWSP (No. 2) would work in parallel with the existing PWSP and be treated in the same manner.

In the event that there is an electrical power outage that causes the STP(s) to be completely inoperable, raw sewage will be diverted temporarily and trucked to the PWSP, until the STP(s) is operational. At that time, partially or untreated sewage from the PWSP(s) will be trucked back to the treatment plant(s) for treatment or treated using an in situ pond treatment system and discharged to the ocean outfall (refer to Appendix G - PWSP Effluent Discharge Plan). The PWSP Effluent Discharge Plan is used as a reference guideline by the onsite environmental team. Discharges from Project PWSPs will be monitored and treated as outlined in the PWSP Effluent Discharge Plan to ensure effluent discharged meets the applicable water quality criteria outlined in the Type A Water Licence. In the event that water treatment methods differ significantly from the PWSP Effluent Discharge Plan, Baffinland will seek third party consultation and approvals to determine the appropriate water treatment methods.

The sludge generated by the MBR is de-watered using a mechanical de-watering device, a filter press, and then incinerated or backhauled for disposal off site. Sludge is stored in an animal proof secure area. Odour generation is limited as a result of the sludge being aerobically digested, de-watered and double bagged. Sewage sludge also accumulates in the bottom of the lift stations that service the accommodations camps at Project sites. Regular maintenance of the lift stations includes the periodic removal of the accumulated sewage sludge.

The sewage treatment system basis as described above will be applicable for current and future construction and operations requirements. The site layout showing the location of camp, sewage treatment and ancillary facilities is presented in Appendix C.

5.4.2 Mine Site

The Mine Site has two (2) MBR STP facilities to service the MSC and the Sailiivik Camp Complex. Effluent is discharged via a direct effluent discharge line from the STP servicing the Sailiivik Camp Complex and Mine Site Complex to the approved discharge locations near the Mary River. The Rotating Biological Contactor (RBC) STP (Seprotech manufactured), previously used to treat sewage from the MWH, is currently being used as a temporary holding facility/surge tank for the MWH. Raw sewage is transported from the RBC by vacuum truck to the MBR STPs for treatment.

Treated effluent from the MBR STPs is stored in a series of treated effluent tanks. It is designed such that the effluent tanks will be at a low level during operation. This design allows for delay of discharge should sampling indicate that the effluent quality does not meet the applicable criteria. Such delay allows the effluent to be mixed, retreated, and retested before discharge. Once sampling indicates that effluent meets discharge criteria the treated effluent stream is directed to discharge via pipelines to the Mary River discharge locations; one pipeline from the MSC MBR and one pipeline for the Sailiivik Camp MBR (refer to Table 7 for discharge co-ordinates). The discharge locations at the Mine Site are shown on the Mine Site Layout presented in Appendix C.

To reduce potential sedimentation and/or erosion, riprap (i.e. coarse aggregate) has been used at the approved Mary River discharge locations. Mary River discharge locations are presented in the Mine Site Layout found in Appendix C.

In the event that there is an electrical power outage that causes the STP(s) to become inoperable, raw sewage will be temporarily trucked to local existing PWSPs until the STP(s) come on line again. Partially or untreated sewage from the PWSPs from this event will either be trucked back to the treatment plant(s) for treatment/reprocessing or treated in situ at the pond location (refer to Appendix G - PWSP Effluent Discharge Plan). The PWSP Effluent Discharge Plan is used as a reference guideline by the onsite environmental team. Water quality parameters will be monitored in the spring and a discharge plan will be developed based on the determined water quality conditions. Discharges from Project PWSPs will be monitored and treated as outlined in the PWSP Effluent Discharge Plan to ensure effluent discharged meets the applicable water quality criteria outlined in the Type A Water Licence. In the event that water treatment methods differ significantly from the PWSP Effluent Discharge Plan, Baffinland will seek third party consultation to determine the appropriate water treatment methods.

The sludge generated at the MBR is dewatered using a mechanical dewatering device, a filter press, and then incinerated or backhauled for disposal off site. Sludge cake is stored in an animal proof secure area. Odour generation is limited as a result of the sludge being aerobically digested, de-watered and double bagged. Sewage sludge also accumulates in the bottom of

the lift stations that service the accommodations camps at Project sites. Regular maintenance of the lift stations includes the periodic removal of the accumulated sewage sludge.

The MBR STPs are also designed to process raw or partially treated sewage from the Raven and Mid-Rail camps in the event these facilities are operational.

The sewage treatment system basis as described above is adequate for current construction and operations requirements. The modular nature of the plants makes it very simple to add containerized plants for increased sewage treatment capacity. The site layout showing the location of camps, sewage treatment plants and ancillary facilities is presented in Appendix C.

6. WASTEWATER MANAGEMENT – OILY WATER

Two sources of potentially oily water have been identified at Milne Port and the Mine Site. There is the wash-water generated at the vehicle maintenance facilities, waste management building, emergency response garage, and truck wash, as well as the surface water that collects within the bulk fuel storage berms, hazardous waste storage berms, and Landfarm facilities at Project sites. Based on the different nature of these two wastewater sources, distinct discharge criteria (and treatment plans) have been developed for each.

6.1 OILY WATER TREATMENT DISCHARGE CRITERIA

All discharge from the Oily Water/Wastewater Treatment Facilities for monitoring stations MP-02, MS-02, and SP-02 will not exceed the following effluent quality limits provided in Table 8.

TABLE 8 EFFLUENT QUALITY DISCHARGE LIMITS FOR OILY WATER TREATMENT FACILITIES*

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
pH	Between 6.0 and 9.5
TSS	35
Ammonia	4.0
Phosphorous	4.0
Benzene	0.370
Ethylbenzene	0.090
Toluene	0.002
Oil and Grease	15 and no visible sheen
Arsenic	0.50
Copper	0.30
Lead	0.20
Nickel	0.50
Zinc	0.50

*Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1) Table 6.

All discharge from Bulk Fuel Storage Facilities will not exceed the following effluent quality limits outlined in Table 9. Applicable monitoring stations include MP-03, MP-MRY-7, MS-03, MS-03B, MS-04, MS-MRY-6, SP-04 and SP-05.

TABLE 9 EFFLUENT QUALITY DISCHARGE LIMITS FOR BULK FUEL STORAGE FACILITIES*

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
Benzene	0.370
Ethylbenzene	0.090
Toluene	0.002
Oil and Grease	15 and no visible sheen
Lead	0.01

*Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1) Table 8.

All discharge from Landfarm Facilities, including the Contaminated Snow Containment Berms, will not exceed the following effluent quality limits outlined in Table 10. Applicable monitoring stations include MP-04, and MS-05.

TABLE 10 EFFLUENT QUALITY DISCHARGE LIMITS FOR LANDFARM FACILITIES*

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
pH range	Between 6.0 and 9.0
TSS	15
Oil and Grease	15 and no sheen
Total Lead	0.001
Benzene	0.370
Toluene	0.002
Ethylbenzene	0.090

*Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1) Table 9.

6.2 OILY WATER/ WASTEWATER POTENTIAL SOURCE LOCATIONS

The locations of potential sources of oily water on the Project are listed in Table 11.

TABLE 11 OILY WATER/ WASTEWATER POTENTIAL SOURCE LOCATIONS

Camp/ Site	Facility	Description	Coordinates (UTM)	
			Easting	Northing
Mine Site	MS-02	Mobile Maintenance Shop Sump	561638	7913222
Mine Site	MS-03	Bulk Fuel Storage Facility	561258	7913304
Mine Site	MS-03B	Bulk Fuel Storage Facility	561070	7913449
Mine Site	MS-04	Fuel Unloading Station	Not Constructed	Not Constructed
Mine Site	MS-05	Landfarm Facility	560800	7912700
Mine Site	MS-MRY-6	Exploration Camp Bulk Fuel Storage Facility	558309	7914487
Milne Port	MP-02	Mobile Maintenance Shop Sump	503785	7976209
Milne Port	MP-03	Bulk Fuel Storage Facility	503638	7976272
Milne Port	MP-04	Landfarm Facility	503710	7975574
Milne Port	MP-04A	Contaminated Snow Facility	503862	7975482

6.3 OILY WATER/ WASTEWATER TREATMENT PROCESS DESCRIPTION

Oily water and wastewater generated by the Project shall be treated at the Oily Water/Wastewater Treatment Facilities allowed under the scope of the Type A Water Licence. The process description for both oily water/wastewater treatment systems at each site are described in the sections that follow.

6.3.1 Milne Port

Sources of oily water that may be generated at Milne Port (excluding minor oily water generated from accidental spills, which is addressed under the SCP) are:

- Vehicle maintenance and wash facilities (i.e. truck wash, snow/ice melt, equipment and floor wash down water);
- Bulk fuel storage facility (water in the tank farm containment areas);
- Concrete sumps in buildings such as Maintenance Shops, Waste Management Building, Emergency Response Building, etc.;
- Lined containment facilities (i.e. hazardous waste and product storage berms); and,
- Landfarm Facility including the Contaminated Snow Containment Facility.

All possible sources listed above are shown in the Milne Port layout presented in Appendix C.

Any oily water generated from the Milne Port Bulk Fuel Storage Facility or other lined containment facilities is collected in sump(s) within each facility. The water is then treated directly by the prefabricated mobile OWS contained within a 40' seacan or an on-site constructed OWS. The prefabricated mobile OWS uses a series of skimmers, filters, clay, and activated carbon to capture and remove hydrocarbons from oily water.

Wash and melt water generated at the vehicle maintenance facilities, waste management building, and emergency response garage collects in each building's designated sump(s) by gravity flow. Suspended material in the wastewater settles out in the sump. All sump water collected in these buildings is collected and stored at engineered lined containment facilities until the water can be treated during the open water season using the mobile OWS system. Following treatment by the OWS, the treated effluent is pH adjusted, if required, and resampled to ensure effluent water quality meets the applicable discharge criteria before the effluent is finally discharged to the receiving environment.

All effluent discharges of treated oily water/wastewater to the receiving environment will be discharged to meet effluent discharge criteria outlined in Section 7.1.

6.3.2 Mine Site

Sources of oily water that may be generated at the Mine Site (excluding minor oily water generated from accidental spills, which is addressed under the SCP) are:

- Vehicle maintenance and wash facilities (i.e. truck wash, snow/ice melt, equipment and floor wash down water);
- Bulk fuel storage facilities (water in the tank farm containment areas);
- Concrete sumps in buildings such as Maintenance Shops, Waste Management Building, Emergency Response Building, etc.; and,
- Lined containment facilities (i.e. hazardous waste and product storage berms).

All possible sources listed above are shown in the Mine Site layout presented in Appendix C.

Wash and melt water generated at the vehicle maintenance facilities, truck wash, waste management building, and emergency response garage collects in each building's designated sump(s) by gravity flow. Suspended material in the wastewater settles out in the sump. All sump water collected in these buildings will be transferred to totes that will be stored in hazardous containment lined facilities. The water in these totes will be discharged and treated in lined berms (i.e. hazardous berm, landfarm) utilizing the mobile OWS system or shipped off site for disposal at an accredited treatment facility.

The Truck Wash Facility is equipped with an oily water treatment plant as well as trays and a sump to capture all wash water generated at the facility, allowing it to recycle up to 90% of the water used. Wash water produced in the truck wash facility (truck washing, equipment and

floor wash down) will flow by gravity and be collected in the trays and a local sump. Suspended material in the wastewater is removed using a series of sumps, settling tanks (de-muck tank) and filters. Free and emulsified oil in the wastewater is removed by the facility's oily water treatment plant, which utilizes a series of skimmers, activated carbon, and filters to substantially reduce oil levels in the recycled wastewater. The water is then reused by the facility to wash down equipment and vehicles. Should there need to be a discharge from the facility to the receiving environment, the wastewater is further treated with the facility's reverse osmosis unit and pH controller to ensure the final effluent meets all discharge criteria outlined in the Type A Water Licence.

Treated effluent from the truck wash's oily water treatment plant will be pumped to the discharge outfall at the Mary River or other on land location as agreed to by the Water Licence Inspector. Most water is recycled and reused within the facility. The separated waste oil will be stored in a local tank. Periodically, the oil from the tank will be drained and shipped off site or incinerated. Accumulated suspended solids will be periodically removed by bucket loader vehicle and sent to the Landfarm Facility for treatment if contaminated with hydrocarbons or the landfill if demonstrated to be non-hazardous.

Collected stormwater run-off from the Mine Site Bulk Fuel Storage Facility and/or other lined containment facilities (i.e. hazardous waste berms, etc.) will be treated using the mobile OWS system and discharged directly to the adjacent land surface. As mentioned prior, the mobile OWS system is a prefabricated mobile oily water separator contained within a 40' seacan. The mobile OWS system uses a series of skimmers, filters, clay and activated carbon to capture and remove oils and hydrocarbons from wastewater. Effluent from the mobile OWS will be sampled regularly to ensure effluent quality meets the applicable discharge criteria outlined in the Type A Water Licence.

6.3.3 Steensby

The construction of Steensby Port and associated railway has not commenced to date. As a result, oily water treatment has not been initiated at the Steensby Port Location. This plan will be updated prior to the commencement of construction of Steensby Port and the associated railway to reflect planned water management and monitoring.

7. WASTEWATER MANAGEMENT – CONTACT WATER

Contact water for the purposes of this Plan is defined as water that has come in contact with ore or waste rock; it is considered equivalent to mine effluent as defined under the MDMER. The water management ponds described in the sections below retain runoff water from the Milne Port ore stockpile pad and the Mine Site crushing pad, ROM Stockpile (ROM), MHR and the waste rock stockpile. In the event of abnormal conditions at an existing surface water management pond, Baffinland will consult an engineer for recommendations on required improvements or upgrades.

7.1 DISCHARGE CRITERIA

All discharge from the water management ponds (MS-06, MS-07, MS-08, MS-09, MS-11, and SP-07) associated with the Project's mining operations (crushing, ore, and waste rock stockpiles) will not exceed the effluent quality limits outlined in the Type A Water Licence and provided in Table 12.

In addition, effluent discharged from water management ponds at the Mine Site (MS-06, MS-07, MS-08, MS-09, and MS-11) will not exceed the effluent quality limits within the MDMER provided in Table 13. When the maximum limit for a parameter differs between the MDMER and the Type A Water Licence discharge criteria, the more conservative (lower) limit for the parameter will be adopted.

TABLE 12 EFFLUENT QUALITY DISCHARGE LIMITS FOR OPEN PIT, STOCKPILES, AND SURFACE WATER MANAGEMENT PONDS (NWB)*

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
Total Arsenic	0.50
Total Copper	0.30
Total Lead	0.20
Total Nickel	0.50
Total Zinc	0.50
Total Suspended Solids	15
Oil and Grease	No visible sheen
Toxicity	Not acutely toxic
pH	6.0 – 9.5

*Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1) Table 10.

TABLE 13 EFFLUENT QUALITY DISCHARGE LIMITS FOR OPEN PIT, STOCKPILES, AND SURFACE WATER MANAGEMENT PONDS (ECCC)*

Parameter	Maximum Authorized Monthly Mean Concentration (mg/L)[1]	Maximum Concentration of Any Grab Sample (mg/L)
Total Arsenic	0.30	0.60
Total Copper	0.30	0.60
Total Cyanide[2]	0.50	1.00
Total Lead	0.10	0.20
Total Nickel	0.50	1.00
Total Zinc	0.50	1.00
Total Suspended Solids	15	30
Radium-226	0.37 Bq/L	1.11
pH	6 – 9.5	6 – 9.5
Toxicity	Not acutely toxic	Not acutely toxic
Un-ionized Ammonia	0.50	1.00

*Source: Metal and Diamond Mining Effluent Regulations, Schedule 4

[1] Parameters listed above are sampled weekly during discharge.

[2] Cyanide included in Table 13 for informational purposes only; it is not a required parameter for Baffinland's sampling programs

Additional parameters including sub-lethal toxicity, aluminum, cadmium, iron, mercury, molybdenum, selenium, nitrate, ammonia, chloride, chromium, cobalt, sulphate, thallium, uranium, phosphorus, manganese, hardness, alkalinity and specific conductance are also required under MDMER, however these parameters do not have a maximum water quality discharge limit but instead are used to provide additional information to assist in interpreting toxicity results and identifying potential effects on the receiving environment. For additional information on the MDMER requirements pertaining to the Project refer to Appendix K.

7.2 CONTACT WATER FACILITY AND DISCHARGE LOCATIONS

The locations of the contact water management facilities and their respective discharge points are listed in Table 14.

TABLE 14 LOCATION OF WATER MANAGEMENT FACILITIES

Site	Facility	Description	Facility Coordinates (UTM)		FDP Coordinates (UTM)	
			Easting	Easting	Northing	Northing
Mine Site	MS-06	Crusher Pad Stormwater Facility	561475	7913000	561474	7913000
Mine Site	MS-07	Run Of Mine Stockpile Stormwater Facility	563475	7913058	563583	7913074
Mine Site	MS-08	Waste Rock Stormwater Facility	562901	7916776	563217	7916789
Mine Site	MS-09	Waste Rock Stormwater Facility	Not Constructed	Not Constructed	N/A	N/A
Mine Site	MS-11	KM105 Pond Stormwater	562250	7913150	562101	7913465
Milne Port	MP-05	Ore Stockpile Stormwater Facility	503469	7976383	N/A	N/A
Milne Port	MP-06	Ore Stockpile Stormwater Facility	503097	7976363	N/A	N/A

7.2.1 Milne Port Stockpile Surface Water Management Ponds

The three (3) Milne Port stockpile surface water management ponds were constructed to retain the runoff water from the Milne Port ore stockpile area and to contain the sediment load. Ore stockpile contact water includes water that has come in contact with DusTreat, a specialized crusting agent produced by SUEZ Water & Solutions Canada (SUEZ). DusTreat is a rain resistant and non-toxic substance that coats the outside of the ore stockpiles acting as a sealant to prevent lift-off of dust from the stockpiles. The application of DusTreat to the ore stockpiles, initiated in 2020, continues on an ongoing basis as sections of the stockpiles are built to permanent locations.

During normal operation, runoff from the stockpile area drains to the stockpile surface water management ponds. The ponds were designed with sufficient retention time to ensure the sediment will gravity-settle to the bottom of the pond and allow the runoff to be tested before the water reaches the overflow weirs. The ponds are equipped with overflow weirs designed to allow the unloaded surface water to drain through a controlled discharge to Milne Inlet. Alternatively, the pond can be pumped out using a portable pump arrangement.

In the case that the surface water management pond effluent quality does not meet the discharge criteria outlined in the Type A Water Licence by means of sediment gravity settling alone, additional treatment methods (i.e. flocculants, GAC, clay, filters, etc.) will be employed to ensure effluent compliance.

7.2.2 Mine Site Ore Crusher Pad Surface Water Management Pond

The Mine Site ore crusher pad surface water management pond is designed to retain the runoff water from the Mine Site CF and contain the sediment load, particularly during seasonal freshet activities. During normal operation, runoff from the crusher area drains to the surface water management pond (west of the crusher pad). The pond is equipped with an overflow weir designed for extreme weather periods (e.g. greater than a 1 in 10 year, 24 hour design storm), allowing the unloaded surface water to drain through a controlled discharge to Sheardown Lake. The pond was designed with sufficient retention time to ensure the sediment would gravity-settle to the bottom of the pond before the water reaches the overflow weir.

The pond is also equipped with a pump pad on the northwest side. The normal operation of the pond is to test the water quality for MDMER and applicable Type A Water Licence requirements and when on spec, control discharge using a portable pump arrangement. The pump arrangement connects into the treated effluent discharge pipeline originating at the MSC STP for discharge to Mary River.

In the case that the surface water management pond effluent quality does not meet the applicable discharge criteria by means of sediment gravity settling alone, additional treatment methods (i.e. flocculants, GAC, clay, filters, etc.) will be employed to ensure effluent compliance. Treatment with lime may be applicable to control pH as required prior to discharge. Additional contingency exists to transfer non-compliant water from this facility to the KM105 Surface Water Management Pond for additional settling/treatment.

7.2.3 Mine Site ROM Stockpile Surface Water Management Pond

The Mine Site ROM stockpile infrastructure supports Deposit No. 1 mining operations and is located off the MHR at approximately kilometer 106. Stormwater runoff originating in the ROM stockpile is intercepted by the Facility's perimeter collection ditches and directed to the ROM pond. The ROM pond is designed to retain the runoff and contain the sediment load, particularly during freshet activities. During normal operation, runoff from the ROM stockpile drains to the surface water management pond. The pond is equipped with an overflow weir designed for extreme weather periods (e.g. greater than a 1 in 200 year, 24 hour design storm), allowing the unloaded surface water to drain through a controlled discharge to Mary River.

In the case that the surface water management pond effluent quality does not meet the applicable discharge criteria by means of sediment gravity settling alone, additional treatment methods (i.e. flocculants, GAC, clay, filters, etc.) will be employed to ensure effluent compliance.

7.2.4 Mine Site Waste Rock Stockpile Surface Water Management Pond

The WRF Surface Water Management Pond (WRF Pond) was constructed to support Deposit No. 1 mining operations and is located northeast of the Deposit No. 1 open pit. Seepage and stormwater runoff originating from the Waste Rock Stockpile is intercepted by the Facility's

perimeter collection ditches and directed to the WRF Pond. The WRF Pond for the Mine Site was constructed in 2016 and is designed to retain surface water runoff. The capacity of the pond was upgraded in 2019 to account for an expansion of the Waste Rock Facility. Controlled transfers of in pit mine water to the WRF Pond for treatment through the WTP may also occur in accordance with Baffinland's SWAEMP.

Water from the WRF Pond is pumped into the WTP for pH adjustment, and subsequently discharged into a geotube adjacent to the WTP for solids removal via filtering and settling. The WTP has a design treatment rate of 280 m3/hr capacity, consisting of two 140 m^3/hr treatment trains. For each train, the water flow rate and pH in Reactor Tanks 1 and 2 is continuously monitored. Ferric sulfate and polymer is added based on flow rate, while the lime dosage is based on the pH in Reactor Tank 1. The chemical dose rate is adjusted by the plant operator using the PLC to achieve water quality requirements. Monitoring of the treated effluent at various stages of the treatment system is conducted to monitor the treatment system's performance. The Waste Pond Water Treatment Plant Operations SOP, which includes plant operating procedures as well as an overview of the treatment process, and General Arrangement Drawings is provided in Appendix J. Additional contingency water treatment measures are described in Section 9.2 of the Phase 1 Waste Rock Management Plan.

The effluent from the geotube is tested to ensure it meets MDMER and applicable Type A Water Licence criteria and then controlled discharged intermittently using a portable pump arrangement. Sludge generated from the operation of the WRF WTP is assessed for suitability of disposal within the WRF, or disposed of off-site at an appropriate waste receiving facility. Following the FDP, effluent passes through approximately 475 metres (m) of layflat hose and is discharged to the tundra of the approved receiving environment, the Mary River watershed.

In high rainfall periods (e.g. greater than a 1 in 10 year, 24 hour design storm), the WRF Pond is also equipped with an overflow weir on the north side designed to allow the unloaded surface water to drain through a controlled discharge diversion channel. The WRF Pond was designed with sufficient retention time to ensure the sediment would gravity-settle to the bottom of the pond before the water reaches the overflow weir. However, controlled discharges from the pond via active pumping are implemented.

7.2.5 KM105 Surface Water Management Pond

The KM105 Surface Water Management Pond (KM105 Pond) has been constructed north of the KM104 laydown to collect storm water and snow melt runoff originating from the MHR. Storm water and snowmelt runoff originating from the MHR will be collected in a ditch that runs along the MHR and directed to the KM105 surface water management pond during the open-water season. The KM105 Pond was designed to temporarily store sediment up to 1 metre in depth and has a collection capacity of 178, 000 m^3 with a freeboard depth of 0.5m.

Effluent collected in the KM105 surface water management pond is treated for solids removal via pond-based settling prior to discharge. Effluent is pumped from the surface water management pond through the FDP using two submersible pumps. Following the FDP, the effluent is pumped through 10" HDPE pipe down the slope of the spill way. The discharge location will have additional armoring to prevent erosion. The effluent will then travel overland into Sheardown Lake Tributary-1 (SDLT-1) and into Sheardown Lake. The estimated length of the flow path from MS-11 FDP to Sheardown Lake is 3.05 km via SDLT-1. An emergency spillway is present and designed to safely convey flood runoff if required.

Monitoring of water quality in the KM105 Pond will be conducted as required to ensure it meets the requirements prescribed in the water licence and MDMER. The KM105 pond will be discharged in a timely manner following runoff events and freshet such that the pond will remain empty during normal operating conditions. A set of pumping guidelines have been developed to ensure minimal impacts on hydrology and fish bearing habitant in downstream SDLT-1. Regular inspections will be occurring along with the inspections of waste and water retention structures on site. Regular geotechnical inspections will also be conducted, along with the removal of accumulated sediment in the pond as required. This information will be captured in the Facility's OMS Manual.

The KM105 Pond Surface Water Treatment System consists of a chemical dosing system at the inlet to the pond for the addition of flocculant, coagulant, as well as lime for pH control. At the effluent discharge location, a two-stage polishing system consisting of a clarification stage and a multimedia filtration stage, which may be used if required, prior to release through the existing final discharge point.

7.2.6 Steensby Port Contact Water Management

The construction of Steensby Port and associated railway has not commenced to date. As a result, contact water management has not been initiated. This plan will be updated prior to the commencement of construction of Steensby Port and the associated railway to reflect planned water management and monitoring.

8. LANDFILL

8.1 DISCHARGE CRITERIA

All runoff and seepage from the Landfill Facilities at monitoring stations MS-MRY-13A and MS-MRY-13B will not exceed the following effluent quality limits presented in the table below:

TABLE 15 EFFLUENT QUALITY DISCHARGE LIMITS FOR LANDFILL FACILITIES*

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
pH range	Between 6.0 and 9.5
Total As	0.5
Total Cu	0.3
Total Pb	0.2
Total Ni	0.5
Total Zn	0.5
TSS	15
Oil and Grease	No visible sheen

*Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1) Table 7.

8.2 MINE SITE LANDFILL

The Mine Site Landfill Facility is located just south of the NE Basin of Sheardown Lake. Both Facility's monitoring stations, MS-MRY-13A and MS-MRY-13B, are sampled monthly during the open water season and are situated on a small stream down gradient of the Landfill Facility. The small stream drains into the NE Basin of Sheardown Lake on its southern shoreline. Refer to the Mine Site Layout presented in Appendix C for the exact location of the monitoring stations and Landfill Facility.

9. OPERATIONS AND MAINTENANCE (O&M)

The project specific O&M Manual for Sewage Treatment Systems is provided by Newterra Ltd in Appendix E. Sample plans for operation and maintenance of the potable water and oily water systems are given below. These plans were provided by the vendors of the potable and oily water treatment systems.

9.1 POTABLE WATER TREATMENT SYSTEM O&M PLAN

9.1.1 Regular Maintenance Schedule

The potable water system is fully automatic, and only requires limited supervision and regular maintenance. The following maintenance schedule provided in Table 16 is subject to regulations from local government, and instructions from original equipment manufacturers. The following maintenance schedule is common for all potable treatment plants.

TABLE 16 RECOMMENDED MAINTENANCE SCHEDULE – POTABLE TREATMENT PLANTS

Items	Description
Daily	• Alarm check. • Chemical storage level check. • Controller time check. • Pressure gauge check. • Total and free chlorine testing. Turbidity check.
Monthly	• Turbidity analyzer check/calibration. • Residual chlorine/pH analyzer check/calibration.
Annual	• Filter media level check, and refill if required. • UV lamp replacement.

9.1.2 Monitoring Plan

Untreated freshwater will be sampled at active take locations and/or from the raw water tank at the potable treatment plants. Treated potable water will be sampled as well as several locations throughout the distribution system.

The monitoring plan is subject to local regulations of drinking water and other related codes. The following instruments are used to monitor the operation and performance of the potable water system.

- Inlet flow meter: to monitor feed flow, backwash flow, rinse flow and filtered flow;
- Effluent turbidity analyzer: to monitor turbidity in produced water; and,
- Effluent pH/residual chlorine analyzer: to monitor pH and residual chlorine of produced water.

The PLC system in the control panel will totalize raw water, produced water, backwash water, chemical injection, pump-running time etc.

Periodically sampling and lab tests for raw water and treated water will be applied to ensure the treated water meets drinking water standards. The frequency of the sampling and testing will be determined by the ministry and outlined in the certificate of approval.

Currently samples are collected at active water take locations for select analyses at frequencies specified in applicable regulations/guidelines. A typical list of parameters which are tested includes the following:

Calcium, Magnesium, Sodium, Potassium, Aluminum, Arsenic, Boron, Barium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Vanadium, Zinc, Tin, pH, Conductivity, Alkalinity as CaCO3, TDS, TSS,

Turbidity, Phenols, NH_3, SO_4, Cl, Br, NO_2, NO_3, Mercury, Hardness as $CaCO_3$, COD and Oil and Grease.

Sampling results are compared to the Guidelines for Canadian Drinking Water Quality (GCDWQ).

9.2 MOBILE OWS SYSTEM

9.2.1 System Overview

The mobile OWS is a prefabricated system (Newterra Ltd.) housed in a 40' seacan and is designed to remove oil, grease, and BTE compounds from hydrocarbon-contaminated water. The unit includes an API type separator to remove free product, a bag filter for solids removal and three adsorption units (one clay, two granular activated carbon) for oil/grease and BTE removal. In the event that the contaminated water has lead concentrations that exceed the discharge limits outlined in Baffinland's Type A Water Licence, additional treatment barrels containing lead removal media are added to the end of the mobile OWS unit. Figure 1 shows the Process Flow Diagram for the OWS. The OWS (Newterra Ltd. model OWS-24) is sized for a water temperature of 7°C, specific gravity of 0.88 (diesel/furnace oil), TOG concentration of 50mg/L and flow rate of 50 gpm.

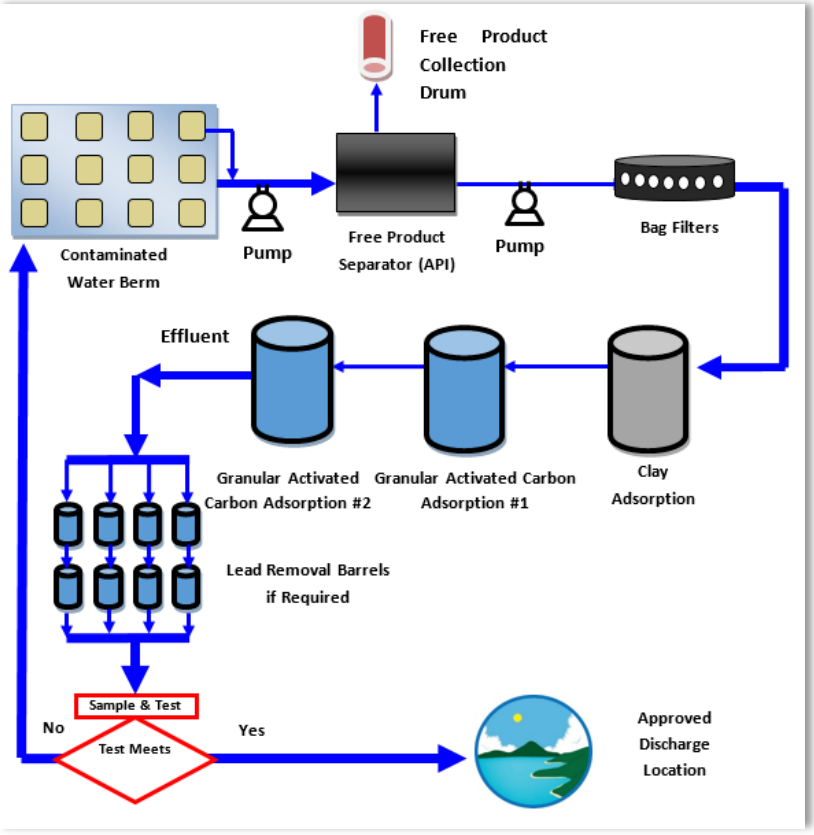


FIGURE 1 MOBILE OWS FLOW PROCESS DIAGRAM

9.2.2 Operation and Maintenance Plan

For the O&M procedures and schedule relating to the mobile OWS unit, refer to the Baffinland Mobile OWS Manual provided in Appendix H.

9.3 OILY WATER TREATMENT PLANT (FOR VEHICLE WASHWATER) O&M PLAN

9.3.1 Regular Maintenance and Monitoring Schedule

Regular system maintenance entails routine inspection of mechanical and electrical components. It is recommended that the system be inspected weekly to ensure that components are in good working order. Spare parts lists are included with the O&M Manuals, with critical spare parts and system expendables highlighted. Recommended stock quantities are be given.

Operational maintenance is mainly comprised of waste removal and expendable replacement in addition to some preventative maintenance on mechanical components. Maintenance activities, locations and their recommended frequencies are given in Table 17.

TABLE 17 MAINTENANCE ACTIVITIES, LOCATIONS AND THEIR RECOMMENDED FREQUENCIES

Maintenance Task	Location	Frequency
Sludge/sediment removal	De-muck tank	Twice/week
Oil Removal	Waste oil storage	Weekly
Media change out	CMAFU-2	TBD
Media change out	DPL30	TBD
Filter change out	Reverse Osmosis Unit	TBD
Membrane cleaning	Reverse Osmosis Unit	TBD
Media change out (plates)	Oil Coalescing System	TBD
Pump seals	Various	Annually

Additional, non-routine maintenance will be required throughout the life of the equipment. The recommended spare parts list and appropriate site stock levels are designed to keep the system running continuously with only scheduled downtime.

In addition to maintenance, monitoring the system performance and effluent quality are also necessary. A flow totalizer will be used at the effluent discharge to accurately summate the volume of treated water being released. This in conjunction with the quality data from the various system flows will allow forecasting for media and consumable change-out as well as waste oil and sludge/sediment generation. Residual contaminants below the regulatory limits can also be used in conjunction with treated volumes to determine area loadings over certain periods of time.

Monitoring tasks, locations and frequencies are listed in Table 18. The prefix, GI, in the task column denotes “General Inspection”. The Truck Wash Facility layout and component O & M manuals are presented in Appendix I.

TABLE 18 MONITORING TASKS, LOCATIONS AND FREQUENCIES

Monitoring Task	Location	Frequency
GI – solids/liquid separators (levels, appearance, pump operation)	De-muck system, CMAFU-2	Daily
Sample – solids/liquid separator effluent	CMAFU-2 effluent	TBD
GI – OWS (levels, appearance, dosing pump)	OWS room	Daily
Sample – OWS Inlet	CMAFU-2 effluent	TBD
GI – Chemical Treatment (tanks, totes, levels, appearance, mixers, dosing pumps, effluent pump, pressures)	Chemical room	Daily
GI – Filtration (units, pressures)	Reverse Osmosis Unit	Daily
GI – Media Vessels (units, pressures, backwash pump, treated water storage)	OCS Tank, DPL30	Daily
Sample – OWS outlet	DPL30 effluent	Quarterly/Monthly
Sample – Reverse osmosis effluent	Reverse Osmosis Unit effluent	Quarterly/Monthly
GI – Miscellaneous (vertical heaters, air compressors, air dryers, controls)	Various	Daily

A joint maintenance/monitoring log is kept to ensure that operational data and changes/responses are properly documented.

The monitoring guidelines are recommended as a minimum to ensure proper operation, health, safety and the protection of the surrounding environment. If corporate or regional policies in effect or enacted require more stringent monitoring, the scope and schedule will be adjusted to meet these requirements.

10. CONTINGENCY MEASURES

Design criteria for the potable, sewage and oily water treatment systems and discharge criteria for surface water management ponds have been reviewed and revised to provide additional safety factors.

To effectively manage emergency responses, Baffinland has adopted a tiered emergency classification scheme (Figure 2). Each level of emergency, based on its severity, requires varying degrees of response, effort, and support. Each level has distinct effects on normal business operations, as well as requirements for investigation and reporting. Levels of classification specific to spill response are as follows:

Level 1 (Low) – Minor accidental release of a deleterious substance with:

- No threat to public safety; and/or

- Negligible environmental impact to receiving environment.

Level 2 (Medium) – Major accidental release of a deleterious substance with:

- Some threat to public safety; and/or
- Potential Moderate environmental impact to receiving environment

Level 3 (High) – Uncontrolled hazard which:

- Jeopardizes project personnel safety: and/or
- Potential significant environmental impacts to receiving environment.

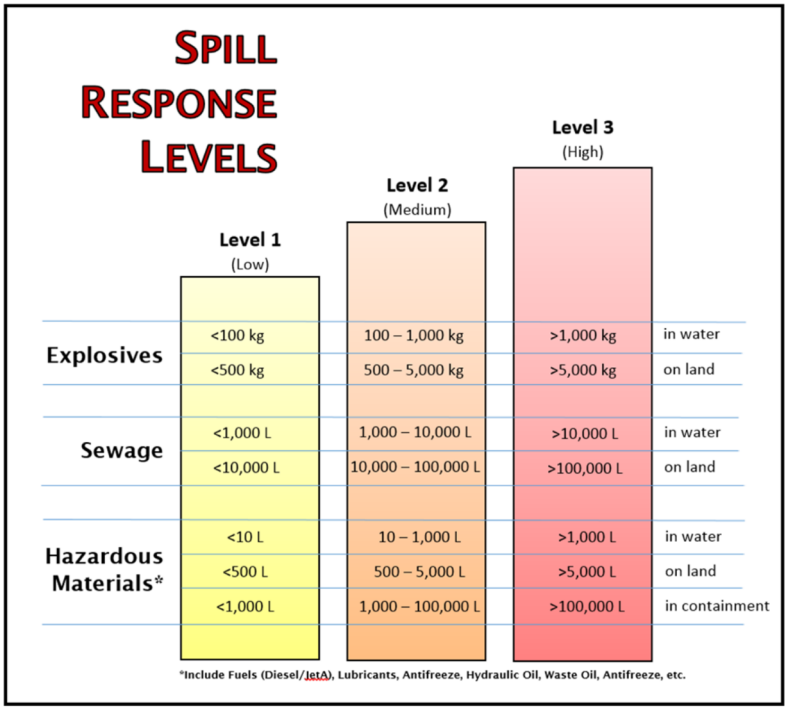


FIGURE 2 EMERGENCY SPILL RESPONSE LEVELS

The sewage treatment systems are set back sufficiently from surface water bodies and are fully enclosed units. In the event of a spill of untreated or partially treated sewage from these facilities, Baffinland will follow the procedures in its SCP and Emergency Response Plans. In the event that sewage discharge does not meet applicable discharge criteria, raw sewage will be temporarily trucked to the existing PWSPs or to another on-site STP for treatment. Partially or untreated sewage from the PWSPs from this event will either be trucked back to the treatment plant(s) for treatment/reprocessing or treated in situ at the pond location (refer to Appendix G - PWSP Effluent Discharge Plan). The PWSP Effluent Discharge Plan is used as a reference guideline by the on-site environmental team. Water quality parameters will be

monitored in the spring and a discharge plan will be developed based on the determined water quality conditions. Discharges from Project PWSPs will be monitored and treated as outlined in the PWSP Effluent Discharge Plan to ensure effluent discharged meets the applicable water quality criteria outlined in the Type A Water Licence. In the event that water treatment methods differ significantly from the PWSP Effluent Discharge Plan, Baffinland will seek third party consultation to determine the appropriate water treatment methods.

Effluent from the mobile OWS is sampled regularly to ensure effluent quality meets the applicable discharge criteria outlined in the Type A Water Licence. In the case of an accidental spill of oily water, Baffinland will follow the procedures in its SCP and Emergency Response Plans. In the event of a release of oily water in exceedance of applicable discharge criteria, discharge will be ceased immediately and treatment options will be evaluated. Prior to resuming discharge, resampling will occur to ensure effluent water quality meets the applicable discharge criteria before the effluent is finally discharged to the receiving environment.

Surface water management ponds are discharged in adherence to the MDMER and Type A Water Licence discharge criteria. Workers involved in the pumping operations exercise caution when setting up and operating pumps on the pond liners. While installing the pump's intake hose on an inner tube in a pond, workers will be in particularly close proximity to the water. The workers should ensure they have dry, secure footing while performing this task. When compliant results are received from pre-discharge water samples, surface water management ponds can be discharged.

Discharge is discontinued if internal or external results are approaching or exceed applicable water quality criteria. In the event of a spill of non-compliant water, Baffinland will follow the procedures in its SCP and Emergency Response Plans. In cases where water retained in water management infrastructure is determined to be non-compliant with applicable discharge limits, retained water (effluent) will be treated as per this Plan, the Phase 1 Waste Rock Management Plan, Waste Pond Water Treatment Plant Operations and MDMER ERP (Appendix I) to ensure compliance with the applicable discharge limits. Potential treatment options include use of temporary treatment systems to alter water chemistry with various mixing and dosing components, arranging equipment on the discharge end of the pump/discharge to provide final polishing before the water enters the receiving environment, or incorporation of additional treatment steps to ensure effluent water quality is compliant.

In the event that a containment facility is at risk of over-topping, pond to pond transfer will occur in order to safely lover the levels of a facility. Only containment facilities under MDMER regulations will be used to accept other MDMER regulated facilities. As a result, all effluent under MDMER regulations will still report to regulated FDPs for monitoring and treatment.

11. MONITORING

Generally, monitoring of the potable and wastewater treatment systems include the following:

- Regular sampling of sewage and wastewater discharge in accordance with the Type A Water Licence requirements;
- More frequent internal process sampling and monitoring to identify potential upset conditions early that could potentially lead to non-compliance;
- Recording of volumes of sewage and wastewater effluent discharged and sludge generated in accordance with the Type A Water Licence requirements;
- Completion of daily checklists related to O&M requirements for the facilities and reporting of any upset conditions that require action; and,
- Implementation of the Aquatic Effects Monitoring Program to confirm/validate environmental predictions.

11.1 COMMUNICATION

The types of communications for which members of the team will participate include the following:

- Formal written correspondence and meetings with stakeholders;
- Site visits by community representatives;
- Design, construction and planning meetings;
- Field inspections and monitoring reports disseminated by the Environmental Superintendent;
- Electronic communications;
- Toolbox meetings;
- Formal written correspondence and meetings with government regulatory bodies; and,
- Formal environmental awareness training.

Communications are appropriately recorded and filed for future reference. Where appropriate, copies of communications will be forwarded to Senior Management and the Environmental Superintendent.

11.2 EXTERNAL COMMUNICATIONS

Effective forms of communication include the proactive notification to external stakeholders of Project activity. Project activity updates will be provided to the communities of North Baffin through various means including regular meetings, public notices and radio announcements as appropriate. Baffinland employs Community Liaison Offices to assist in this regard.

12. RESPONSIBILITIES

Role	Responsibility
GEVP/ General Manager	• Reports to the Chief Executive Officer • Responsible for providing oversight for all Project operations and allocating the necessary resources for the operation, maintenance and management of Project infrastructure.
Mine Operations Superintendent/ Manager	• Reports to the General Manager • Provides oversight for all Deposit No. 1 mining operations, including the operation, construction and maintenance of water and waste management infrastructure at Deposit No. 1 mining areas, ROM stockpile, KM105 Pond, Waste Rock Facility and along the Mine Haul Road, including culverts, ditches, surface water management ponds and associated water treatment systems.
Crusher Superintendent/ Manager	• Reports to the General Manager • Provides oversight for all ore crushing operations, including the operation, construction and maintenance of surface water management infrastructure at the Mine Site Crusher Facility, including culverts, ditches, surface water management ponds and any associated water treatment systems.
Site Services Superintendent/ Manager	• Reports to the General Manager • Provides oversight for all Site Services operations, including the operation, construction and maintenance of water and waste management infrastructure and treatment systems at the Mine Site and Milne Port. • Responsible for managing water retained in containment areas associated with Project bulk fuel facilities and hazardous materials/waste storage areas, including landfarm facilities.
Road Maintenance Superintendent/ Manager	• Reports to the General Manager • Provides oversight for all Road Maintenance operations, including the operation, construction and maintenance of surface water management infrastructure for the Tote Road that runs between Milne Port and the Mine Site, including culverts, bridges, ditches and swales.
Environment (Sustainable Development) Department	• Support the management of the Project's surface water management infrastructure by advising operational departments and obtaining the appropriate regulatory approvals for necessary changes and modifications. • Advise operational departments on the implementation of the appropriate controls to manage surface water flows and effluents at

	the Project, including the implementation of sedimentation and erosion controls. • Report incidents to senior management and the appropriate regulatory agencies and stakeholders. • Conduct inspections and monitoring to ensure compliance with applicable regulations and commitments. • Provide training sessions to operational departments on the appropriate mitigation measures and strategies for managing surface water flows and effluents at the Project.
All Departmental Supervisors	• Reports to the Departmental Manager/Superintendent • Responsible for reading and understanding applicable sections of this Plan and directing departmental personnel on the appropriate mitigation measures and strategies for managing surface water flows and effluents in their Project area.
All Project Personnel	• All personnel Project personnel are responsible for complying with the requirements of this Plan in the management of surface water flows and effluents at the Project.

13. PRE-REQUISITE COMPETENCY SKILLS

Baffinland staff and contractors working on site receive environmental training as part of the site orientation to achieve a basic understanding of their obligations regarding environmental compliance with regulatory requirements, commitments and best practices.

Operations superintendents and contractor supervisors are provided this Plan, and receive additional training with respect to the requirements outlined in this Plan. In addition, supervising level staff and sub-contractors are provided the Operational Environmental Standards (found in the Project's Environmental Protection Plan) as a written guidance for their work.

Targeted environmental awareness training will be provided to both individuals and groups of workers assuming a specific authority or responsibility for environmental management or those undertaking an activity with an elevated high risk of environmental impact. These will be delivered in the form of toolbox meetings or other means as appropriate.

The content of the environmental component of the site orientation will include at a minimum:

- Location of environmental sensitivities;
- Location of additional information on environmental matters;
- Due diligence responsibilities;
- Responsibilities related to waste management, minimizing noise as necessary, road traffic rules, etc.; and,

- Principles and necessary steps to avoid encounters with bears or other wildlife and what to do if one such encounter occurs.

14. RELATED DOCUMENTS

This Plan should be used in conjunction with the Surface Water and Aquatic Ecosystem Management Plan (SWAEMP) (BIM-5200-PLA-0009), Aquatic Effects Monitoring Plan (AEMP) (BIM-5200-PLA-0023), Metal and Diamond Mining Effluent Regulations Emergency Response Plan (BIM-5200-PLA-003) and the Sampling Program – Quality Assurance and Quality Control (QA/QC) Plan (BIM-5200-PLA-0004).

Baffinland's Sustainable Development Policy identifies Baffinland's commitment internally and to the public to operate in a manner that is environmentally responsible, safe, fiscally responsible and respectful of the cultural values and legal rights of Inuit. The policy is available on the Baffinland Document Portal: https://baffinland.com/media-centre/document-portal/, and also referenced in Appendix A.

Baffinland's Health, Safety and Environment Policy is the company's commitment to achieve a safe, health and environmentally responsible workplace. The policy is available on the Baffinland Document Portal: https://baffinland.com/media-centre/document-portal/, and also referenced in Appendix A.

All employees and contractors are expected to comply with the contents of both above-mentioned policies.

APPENDIX A SUSTAINABLE DEVELOPMENT POLICY & HEALTH, SAFETY AND ENVIRONMENT POLICY

Available at https://baffinland.com/media-centre/document-portal/.

APPENDIX B CONCORDANCE TABLES

Tables 19, 20 and 21 show the terms and conditions of the Project's Type 'A' Water Licence (2AM MRY1325 – Amendment No. 1), Type 'B' Water Licence (2BE-MRY2131), and the Project Certificate (No. 005 – Amend. No 1) and the location within this Plan.

TABLE 19 CONCORDANCE TABLE WITH TYPE 'A' WATER LICENCE TERMS AND CONDITIONS

Part	Number	Condition	Section
B	11	The Licensee shall post signs in the appropriate areas to inform the public of the location of infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste. All signs must be in English, Inuktitut, and French.	Signage, written in English, Inuktitut, and French, will be posted inform the public of the location of infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste.
D	2	The Licensee shall submit to the Board for review and acceptance, at least sixty (60) days prior to construction or in a timeframe otherwise approved by the Board in writing, final design and for-construction drawings, stamped and signed by a Professional Engineer, for all infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste, as authorized under the Licence.	60 days prior to construction. If more immediate timeline required, Baffinland will issue letter to NWB with early drawings.
D	17	The Licensee shall submit a Construction Summary Report to the Board, within ninety (90) days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes, as authorized by the Board. The construction summary report shall be prepared by an Engineer(s) in accordance with Schedule D, Item 1.	90 days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes, as authorized by the Board.
D	23	The Licensee shall construct and operate all infrastructure and Facilities authorized by the Board that are designed to contain, withhold, divert or retain Water and/or Waste, in accordance with all applicable legislation and industry standards.	Demonstrated and outlined by this Plan.
E	3	The Licensee shall obtain all fresh Water for domestic camp use and industrial purposes, during the Construction Phase of the Project, in amounts and from the sources described in Table 2, or from sources otherwise approved by the Board in writing. In addition to the source-specific limits prescribed in Table 2, the Licensee is authorized to use up to one thousand eight hundred and eighty-eight (1,888) cubic metres of Water per day, to a maximum of six hundred and eighty-nine thousand (689,000) cubic metres of Water annually, during the Construction Phase of the Project.	Table 2

		Table 2: Water Use Authorized for Domestic and Industrial Purposes during Project Construction Phase **Site** / **Source** / **Volume (m^3/day)** / **Combined Volume (m^3/year)** Milne Port (Milne Inlet) / Phillips Creek (summer) / 367.5 / ~ 134,000 Km 32 Lake (winter) Mine Site (Mary River) / Camp Lake / 657.5 / 240,000 SteensbyPort (Steensby Inlet) / ST 347 Km Lake / 435.8 / 155,400 3 km Lake Ravn River / Camp Lake / 145.2 Mid-Rail / Nivek Lake (summer) / 79.5 Ravn Camp Lake (winter) Cockburn North (Tunnels Camp) / Cockburn Lake / 101.4 Cockburn South Camp / Cockburn Lake / 111.1 **Annual Total** / **~ 689,000 m^3/Annually**	
E	5	The Licensee may recycle water and use reclaimed water from the various Treatment Facilities, surface water management ponds and embankment dams and approved discharge locations under the licence if such waters meet appropriate discharge criteria for those facilities.	5.2
E	6	The Licensee shall equip all Water intake hoses with screens of an appropriate mesh size, consistent with the requirements of Fisheries and Ocean Canada's (DFO) Freshwater Intake End-of-Pipe Fish Screen Guidelines (1995), to prevent the entrainment of fish are and shall withdraw Water at a rate such that fish do not become impinged on the screen.	4.1.1.2
E	8	Streams cannot be used as a water source unless authorized and approved by the Board in writing.	4.2
E	9	The Licensee shall notify the Inspector and the Board at least ten (10) days in advance of using Water from any sources not identified in the Application or requiring approval as per Part E, Item 8.	10 days in advance of using Water from any sources not identified in the Application or requiring approval.
E	10	The Licensee shall update or revise annually following the commencement of the Operations Phase and/or the Early Revenue Phase, the Project Blockflow Diagram Water Supply Balance information for the various Project sites, provided with the Application and submit for review of the Board. The submission shall be included with the Annual Report under Part B, Item 4.	The Plan is updated to include the planned construction numbers as well as the current Work Plan. Updates will be provided as required to include the Operations Phase.
E	11	The Licensee shall carry out weekly inspections of all structures designed to contain, withhold, divert or retain Waters or Wastes during periods of flow and maintain records of the inspections and findings, for review upon the request by the Board or an Inspector.	11
E	12	The Licensee shall not remove any material from below the ordinary High Water Mark of any water body unless authorized.	4.2
E	25	The Licensee is authorized to withdraw up to 1,500 m3 / day to a maximum of 547,500 m3 annually of Water specifically for use in dust suppression or control along the Tote Road during the Early Revenue Phase (ERP) of the Project.	Table 3

<table>
<tr><td></td><td></td><td>Water for dust suppression or control shall be obtained from the sources in accordance with thresholds established in Table 2-3.
Table 2-3: Water use Authorized for Dust Suppression
<table>
<tr><th>Site</th><th>Source</th><th>Prosed Maximum Volume (m^3/day)</th><th>Restriction</th></tr>
<tr><td rowspan="13">Tote Road</td><td>Phillip's Creek</td><td>212</td><td rowspan="3">None</td></tr>
<tr><td>Km 32 Lake</td><td>364</td></tr>
<tr><td>CV128</td><td>579.5</td></tr>
<tr><td>CV099</td><td>110</td><td rowspan="3">June –July only during low flow(less than mean flow) years</td></tr>
<tr><td>CV087</td><td>90</td></tr>
<tr><td>CV078</td><td>75</td></tr>
<tr><td>Katiktok Lake</td><td>318</td><td rowspan="2">None</td></tr>
<tr><td>BG50</td><td>150</td></tr>
<tr><td>BG32</td><td>120</td><td>June –July only during low flow(less than mean flow) years</td></tr>
<tr><td>CV217</td><td>130</td><td rowspan="2">None</td></tr>
<tr><td>Muriel Lake</td><td>212</td></tr>
<tr><td>David Lake</td><td>132</td><td>June –July only during low flow(less than mean flow) years</td></tr>
<tr><td>BG17</td><td>75</td><td></td></tr>
<tr><td>CV233 (Tom River)</td><td>135</td><td>None</td></tr>
<tr><td>Camp Lake</td><td>86</td><td></td></tr>
</table></td><td></td></tr>
<tr><td>E</td><td>26</td><td>The Licensee shall obtain authorization from the Board in writing prior to using Water authorized under Part E, Item 25, for purposes other than that authorized in Part E, Item 25.</td><td>4.2</td></tr>
<tr><td>F</td><td>9</td><td>The Licensee shall treat oily water and wastewater generated by the Project at the Oily Water/Wastewater Treatment Facilities authorized under the scope of the Licence.</td><td>6.3</td></tr>
<tr><td>F</td><td>11</td><td>The Licensee shall provide at least ten (10) days' notice to the Inspector prior to planned Discharges from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project. The notice shall include the estimated volume proposed for Discharge and the location and description of the receiving environment.</td><td>10 days prior to the commencement of any treated effluent discharge.</td></tr>
<tr><td>F</td><td>12</td><td>The Licensee shall, unless otherwise approved by the Board in writing, discharge effluent at a distance of least thirty-one (31) metres above the Ordinary High Water Mark of any Water body, where direct flow into the Water body is not possible, such that surface erosion is minimized and no additional impacts are created.</td><td>Section 5.3</td></tr>
<tr><td>F</td><td>14</td><td>The Licensee shall direct all Sewage generated from the relevant Project sites to the Sewage Treatment Facilities or as otherwise approved by the Board in writing.</td><td>5.2</td></tr>
<tr><td>F</td><td>15</td><td>The Licensee shall treat all Sewage waste generated at the Ravn River and Mid-Rail camps and Sewage generated at the Cockburn North and Cockburn South camps at either the Mine Site Sewage Treatment Facility or the Steensby Port Sewage Treatment Facility, unless otherwise approved by the Board in writing.</td><td>Appendix E</td></tr>
<tr><td>F</td><td>16</td><td>The Licensee shall provide to the Board for review, at least sixty (60) days prior to installation, detailed specifications and operational requirements for the Sewage storage tanks proposed for the Railway camps.</td><td>60 days prior to installation</td></tr>
</table>

<table>
<tr>
<td>F</td>
<td>17</td>
<td>All discharge from the Sewage Treatment Facilities including the Polishing Waste Stabilization Ponds directly into fresh Water bodies at Monitoring Stations MP-01, MP-01a, MP-MRY-04, MP-MRY-04a, MS-01, MS-01a, MS-MRY-04, MS-MRY-04a, and/or from monitoring stations as otherwise approved by the Board in writing, must not exceed the following Effluent quality limits:
Table 4: Effluent Quality Discharge Limits for Sewage Treatment Facilities to Freshwater Receiving Environment
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr>
<tr><td>BOD_5</td><td>30</td></tr>
<tr><td>Total Suspended Solids</td><td>35</td></tr>
<tr><td>Faecal Coliform</td><td>1000 CFU/100 mL</td></tr>
<tr><td>Oil and Grease</td><td>No visible sheen</td></tr>
<tr><td>pH</td><td>Between 6.0 and 9.5</td></tr>
<tr><td>Ammonia (NH3-N)</td><td>4.0</td></tr>
<tr><td>Total Phosphorous (MS-01)</td><td>4.0</td></tr>
<tr><td>Total Phosphorous (MS-01a)</td><td>1.0</td></tr>
<tr><td>Toxicity</td><td>Not acutely toxic</td></tr>
</table>
(Note that treated effluent discharge from MP-01 and MP-01a is directed to the ocean, therefore ocean discharge criteria (F18) would therefore apply)</td>
<td>A.1 Table 5</td>
</tr>
<tr>
<td>F</td>
<td>18</td>
<td>All discharge from the Sewage Treatment Facilities including the Polishing Waste Stabilization Ponds at Monitoring Stations SP-01, SP-01a, and/or from monitoring stations as otherwise approved by the Board in writing, directly into the ocean or to ditches flowing into the ocean shall not exceed the following Effluent quality limits:
Table 5: Effluent Quality Discharge Limits for Sewage Treatment Facilities to the Ocean
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr>
<tr><td>BOD_5</td><td>100</td></tr>
<tr><td>Total Suspended Solids</td><td>120</td></tr>
<tr><td>Faecal Coliform</td><td>10,000 CFU/100 mL</td></tr>
<tr><td>Oil and Grease</td><td>No visible sheen</td></tr>
<tr><td>pH</td><td>Between 6.0 and 9.5</td></tr>
<tr><td>Toxicity</td><td>Not acutely toxic</td></tr>
</table>
(Note that treated effluent discharge from MP-01 and MP-01a is directed to the ocean, therefore the above ocean discharge criteria are applied for these locations)</td>
<td>Table 5</td>
</tr>
<tr>
<td>F</td>
<td>19</td>
<td>Sludge generated from the Sewage Treatment Facilities or any other facilities shall be confirmed to be non-hazardous and the results provided to the Board for review prior to disposal at any Landfill Facility or as otherwise approved by the Board in writing.</td>
<td>5.2</td>
</tr>
<tr>
<td>F</td>
<td>20</td>
<td>All discharge from the Oily Water/Wastewater Treatment Facilities at Monitoring Stations MP-02, MS-02, SP-02 must not exceed the following Effluent quality limits:</td>
<td>Table 8</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>
Table 6: Effluent Quality Discharge Limits for Oily Water Treatment Facilities
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr>
<tr><td>pH</td><td>Between 6.0 and 9.5</td></tr>
<tr><td>TSS</td><td>35</td></tr>
<tr><td>Ammonia</td><td>4.0</td></tr>
<tr><td>Phosphorous</td><td>4.0</td></tr>
<tr><td>Benzene</td><td>0.370</td></tr>
<tr><td>Ethylbenzene</td><td>0.090</td></tr>
<tr><td>Toluene</td><td>0.002</td></tr>
<tr><td>Oil and Grease</td><td>15 and no visible sheen</td></tr>
<tr><td>Arsenic</td><td>0.50</td></tr>
<tr><td>Copper</td><td>0.30</td></tr>
<tr><td>Lead</td><td>0.20</td></tr>
<tr><td>Nickel</td><td>0.50</td></tr>
<tr><td>Zinc</td><td>0.50</td></tr>
</table>
</td><td></td></tr>
<tr><td>F</td><td>21</td><td>
All discharge from the Landfill Facilities at Monitoring Stations MS-MRY-13a, MS-MRY-13b and SP-08 must not exceed the following Effluent quality limits:
Table 7: Effluent Quality Discharge Limits for the Landfill Facilities
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr>
<tr><td>pH</td><td>Between 6.0 and 9.5</td></tr>
<tr><td>Total As</td><td>0.5</td></tr>
<tr><td>Total Cu</td><td>0.3</td></tr>
<tr><td>Total Pb</td><td>0.2</td></tr>
<tr><td>Total Ni</td><td>0.5</td></tr>
<tr><td>Total Zn</td><td>0.5</td></tr>
<tr><td>Total Suspended Solids</td><td>15</td></tr>
<tr><td>Oil and Grease</td><td>No visible sheen</td></tr>
</table>
</td><td>Table 15</td></tr>
<tr><td>F</td><td>22</td><td>
All discharge from the Bulk Fuel Storage Facilities at Monitoring Stations MP-03, MP-MRY-7, MS-03, MS-04, MS-MRY-6, SP-04 and SP-05 must not exceed the following Effluent quality limits:
Table 8: Effluent Quality Discharge Limits for the Bulk Fuel Storage Facilities
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (ug/L)</th></tr>
<tr><td>Benzene</td><td>370</td></tr>
<tr><td>Toluene</td><td>2</td></tr>
<tr><td>Ethylbenzene</td><td>90</td></tr>
<tr><td>Lead</td><td>1</td></tr>
<tr><td>Oil and Grease</td><td>15,000 and no visible sheen</td></tr>
</table>
</td><td>Table 9</td></tr>
<tr><td>F</td><td>23</td><td>
All discharge from the Landfarm Facilities at Monitoring Stations MP-04, MS-05 and SP-06 must not exceed the following Effluent quality limits:
Table 9: Effluent Quality Discharge Limits for the Landfarm Facilities
<table>
<tr><th>Parameters</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr>
<tr><td>pH</td><td>Between 6.0 and 9.0</td></tr>
<tr><td>Total Suspended Solids</td><td>15</td></tr>
<tr><td>Oil and Grease</td><td>15 and no sheen</td></tr>
<tr><td>Total Lead</td><td>0.001</td></tr>
<tr><td>Benzene</td><td>0.370</td></tr>
<tr><td>Toluene</td><td>0.002</td></tr>
<tr><td>Ethylebenzene</td><td>0.090</td></tr>
</table>
</td><td>Table 10</td></tr>
<tr><td>F</td><td>24</td><td>All Discharge from the Bulk Sample Open Pit, Bulk Sample Weathered Ore Stockpile, Bulk Sample Processing Stockpile Area and Bulk Sample Stockpile Area Seepage and runoff from the at Milne Inlet at Monitoring Stations MS-MRY-</td><td>Table 13</td></tr>
</table>

<table>
<tr><td></td><td></td><td>09, MS-MRY-10, MS-MRY-11, MP-MRY-12 and/or monitoring stations as otherwise approved by the Board shall not exceed the following Effluent quality limits:
Table 10: Effluent Quality Discharge Limits for Open Pit, Stockpiles, and Sedimentation Ponds
<table><tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr><tr><td>Total Arsenic</td><td>0.50</td></tr><tr><td>Total Copper</td><td>0.30</td></tr><tr><td>Total Lead</td><td>0.20</td></tr><tr><td>Total Nickel</td><td>0.50</td></tr><tr><td>Total Zinc</td><td>0.50</td></tr><tr><td>Total Suspended Solids</td><td>15.0</td></tr><tr><td>Oil and Grease</td><td>No visible sheen</td></tr><tr><td>Toxicity</td><td>Not acutely toxic</td></tr><tr><td colspan="2">The waste discharge shall have a pH of between 6.0 and 9.5</td></tr></table></td><td></td></tr>
<tr><td>F</td><td>26</td><td>All discharge from the Ponds associated with the Run of Mine Ore Stockpile, Ore Stockpile, West and East Sediment Ponds at Monitoring stations MS-06, MS-07, MS-08 MS-09 and SP-07 shall not exceed the Effluent quality limits of Part F, Item 25</td><td>7.1 and Table 12</td></tr>
</table>

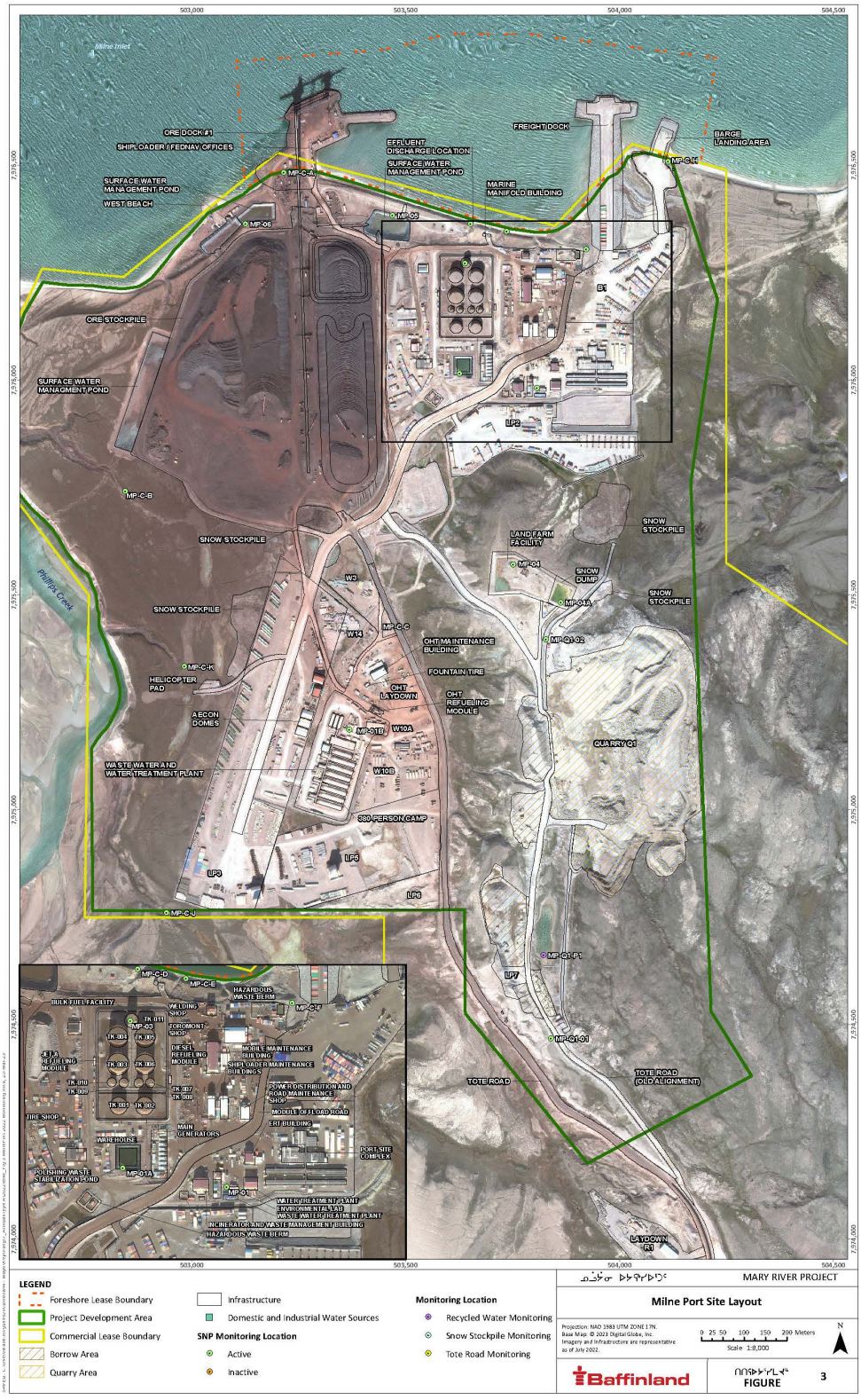
TABLE 20 CONCORDANCE TABLE WITH TYPE 'B' WATER LICENCE TERMS AND CONDITIONS

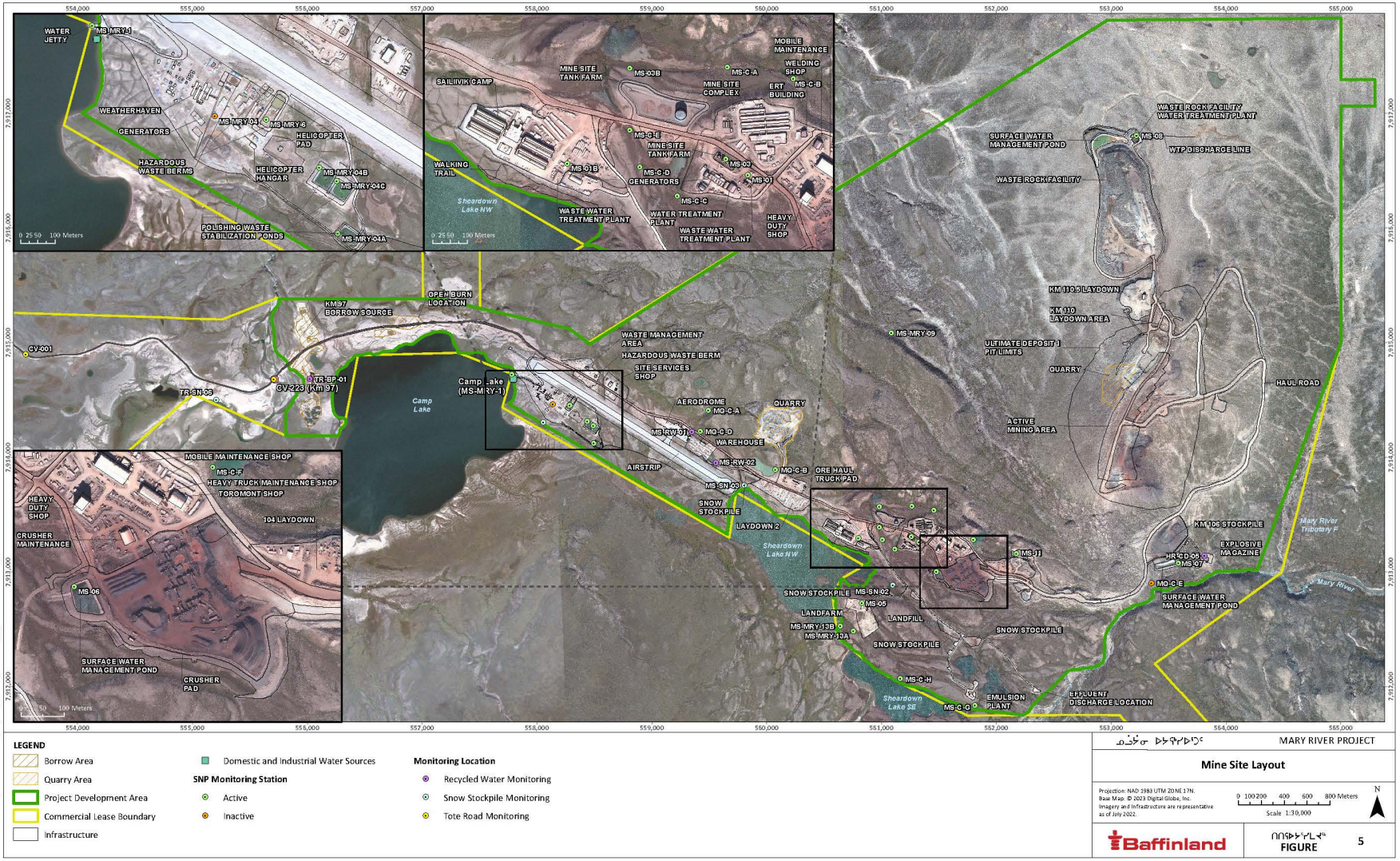
Part	Number	Condition	Section
C	1	The Licensee shall obtain all Water for domestic camp use from sources proximal to each camp. Total camp Water use shall not exceed forty-nine (49) cubic metres per day. Drill Water shall be obtained from local Water source(s), proximal to the drilling targets as outlined in the Application and shall not exceed two hundred and fifty (250) cubic metres per day. The volume of Water for all purposes under this Licence shall not exceed two hundred and ninety-nine (299) cubic metres per day.	4.2
C	4	The Licensee shall equip all water intake hoses with a screen of an appropriate mesh size to ensure that fish are not entrained and shall withdraw Water at a rate such that fish do not become impinged on the screen.	4.1.1.2
C	6	The Licensee shall not cause erosion to the banks of any body of Water and shall provide necessary controls to prevent such erosion.	4.1.1, 5.2, 5.3, 5.4.2, 7.2.5
C	7	Sediment and erosion control measures shall be implemented prior to and maintained during the undertaking to prevent entry of sediment into Water.	4.1.1, 5.2, 5.3, 5.4.2, 7.2.5
E	10	Sediment and erosion control measures shall be implemented prior to and maintained during the undertaking to prevent entry of sediment into Water.	4.1.1, 5.2, 5.3, 5.4.2, 7.2.5

TABLE 21 CONCORDANCE TABLE WITH PROJECT CERTIFICATE TERMS AND CONDITIONS

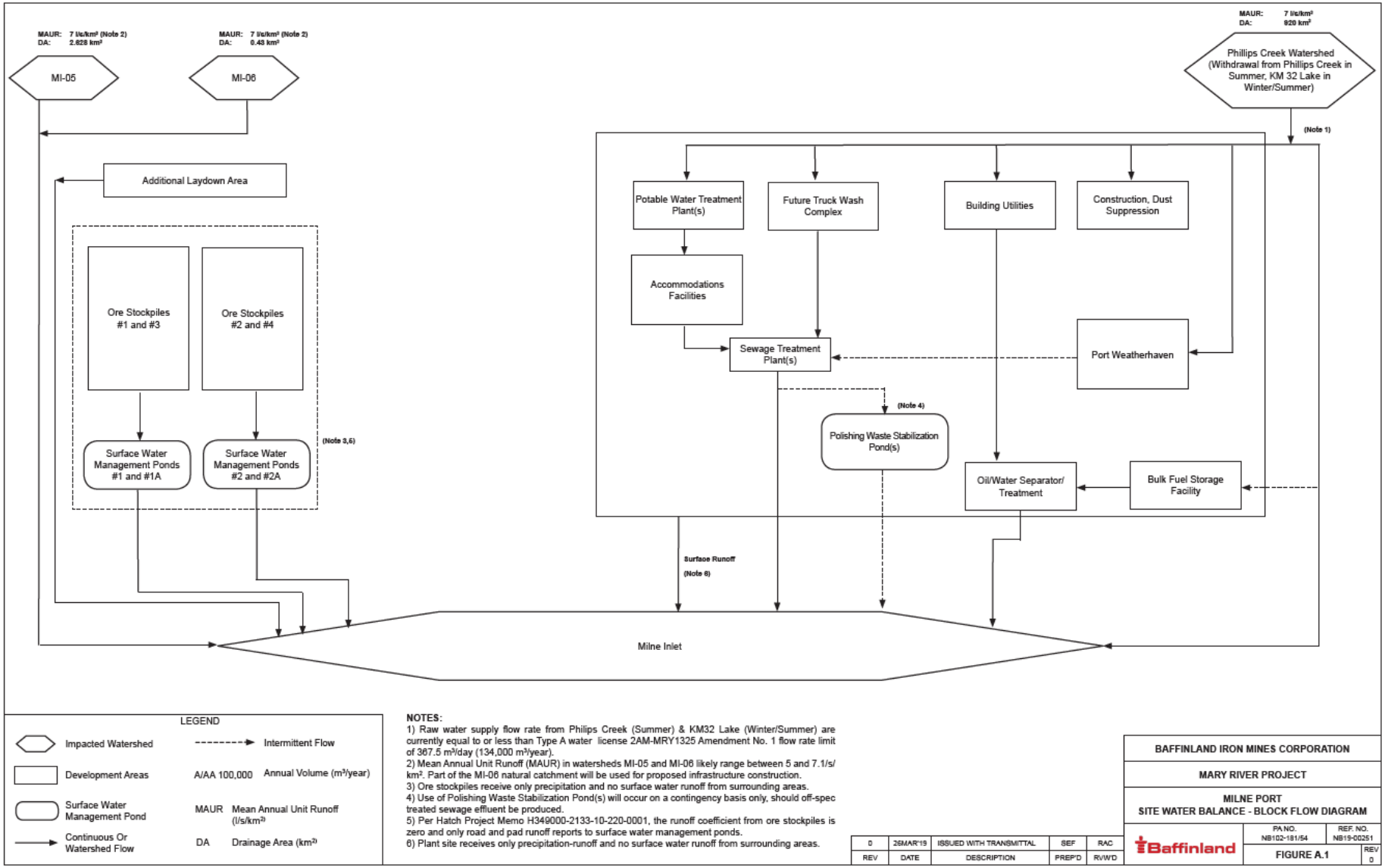
Number	Condition	Section
17	The Proponent shall develop and implement effectives measures to ensure that effluent from project-related facilities and/or activities, including sewage treatment plants, ore stockpiles, and mine pit, satisfies all discharge criteria requirement established by the relevant regulatory agencies prior to being discharged into the receiving environment.	7.1
24	The Proponent shall monitor as required the relevant parameters of the effluent generated from Project activities and facilities and shall carry out treatment if necessary to ensure that discharge conditions are met at all times.	11
46	The Proponent shall ensure that runoff from fuel storage and maintenance facility areas, sewage and wastewater other facilities responsible for generating liquid effluent and runoff meet discharge requirements.	7.1

APPENDIX C SITE LAYOUT – MILNE PORT AND MINE SITE

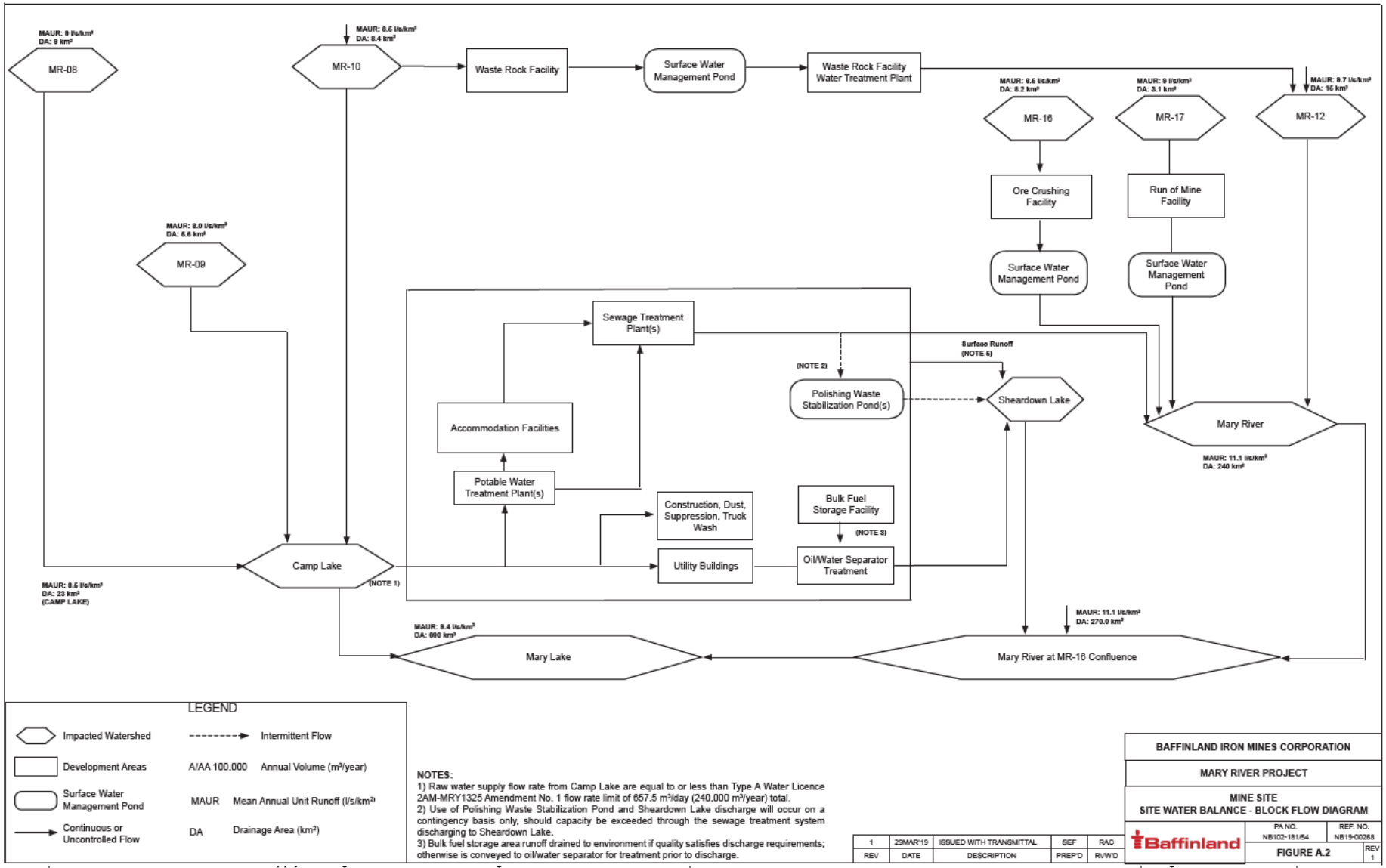




APPENDIX D BLOCK FLOW DIAGRAMS – MILNE PORT AND MINE SITE



Site Wide	Next Review date: 2025-03-31	Revision: 10
Document Owner: Environmental Superintendent	Document Approver: General Manager	



Site Wide	Next Review date: 2025-03-31	Revision: 10
Document Owner: Environmental Superintendent	Document Approver: General Manager	

APPENDIX E SEWAGE TREATMENT PLANT O&M MANUAL

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Doc Number	E349000-PM009-00-118-0001	Sub	01
Date Received			

Review Grade	Next Submittal Status
☐ C1 – Proceed to next submission & status	☐ Internal Review ☐ Certified Final ☐ Final ☐ As-Built
☐ C2 – Proceed with exceptions as noted to next submission & status	Next Submittal Date:
☐ C3 – Do not proceed, revise as noted & resubmit	
No further submission required - Complete ☐	
☐ C4 – No further submission required - Cancelled ☐	
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Sewage Treatment Plant

Operations & Maintenance Manual

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newterra MicroClear™ Membrane Bioreactor (MBR) Wastewater Treatment Plant

OPERATION AND MAINTENANCE MANUAL

System:	**Milne Port & Mine Site Wastewater Treatment Plants**
Location:	**Baffin Island, Nunavut**
Client:	**Baffinland Iron Mines Corporation (via Hatch)**
Project:	**300106**
Rev.:	**0**
Date:	**June, 2013**

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MANUAL OVERVEW

Section	Section Title	Section Description
1	**Introduction**	Introduction to **newterra** MBR WWTP O&M Manual
2	**Safety**	General personal and environmental safety information for operators serving newterra MBR WWTP.
3	**Wastewater Treatment Plant Design Basis**	**newterra** MBR WWTP Specification, Influent / Effluent Characteristics, and Prohibited Items.
4	**Plant Installation, Inspection, and Testing**	Overview of general procedures and actions followed during the plant installation, inspection and initial testing.
5	**Process Control Narrative**	Description of wastewater treatment process and equipment functionality. Control narrative & Control system touchscreen operation.
6	**System Start-Up, Operating Guidelines and Monitoring**	Overview of the plant start-up procedure & operational conditions; monitoring and testing requirements.
7	**System Maintenance**	Schedule for Routine Operation and Maintenance Checkups; membrane cleaning.
8	**Membrane Filtration Unit Shut Down**	Overview of the procedure followed during membrane filtration unit temporary and permanent shut downs; winterization procedure.
9	**Service & Support**	Information regarding the support services offered by **newterra** ltd. including start-up and emergency services; training sessions during plant commissioning.
10	**Warranty and Performance Guarantee**	General warranty statements and conditions for the membrane warranty.

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APPPENDICES:

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1.0 INTRODUCTION

The purpose of this manual is to provide necessary information for the Installation, Operation and Maintenance of the Waste Water Treatment Plant equipment.

	**The newterra MicroClear™ MBR wastewater treatment plant (WWTP) functions optimally if the operating procedures described in this manual are followed. If you have any questions after reading through this manual, please contact newterra ltd.**

- This O&M Manual must be kept on-site and available to employees at all time.
- It is IMPERATIVE that employees read the manual BEFORE working in the plant.
- Employees' must read ***Section 2*** – Health and Safety.
- Technical Support Department contacts are provided in ***Section 9***.

CAUTION: ***Once wetted, the membrane should remain wet, and not be allowed to dry out, to prevent irreversible damage to the membrane.***

WARNING: ***Failure to comply with the instructions provided in this manual can cause equipment & property damage or severe personal injury, and will render the warranty null and void.***

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2.0 SAFETY

2.1 Introduction

This section provides general personal and environmental safety information for newterra MBR WWTP operators.

Always refer to local codes and regulations.

Specific equipment and parts safety information can be found in Appendix E. Material Safety Data Sheets (MSDSs) include detailed information regarding health & safety of chemicals used in wastewater treatment process and are presented in Appendix F.

Information and guidelines outlined in this manual **must** be followed at all times prior to system installation and during operation and maintenance.

ESSENTIAL FOR SAFE OPERATION:

1. Installation and operation of the newterra MBR WWTP **must** only be carried out by **trained and qualified** personnel.
2. All necessary **safety precautions must** be carefully exercised, including but not limited to proper use of personal protective equipment considering given working environment and conditions.
3. All **electrical installations and troubleshooting must** only be carried out by licensed electricians.
4. All **plumbing work must** only be carried out by licensed plumbers or qualified personnel.
5. Please keep in mind that trees and shrubs taller than two meters located in close proximity to the plant buildings may become a safety concern at the time of installation or service.

DEFINITION OF SAFETY AND WARNING SIGNS USED IN THE MANUAL

ATTENTION SYMBOL

Special attention is required to ensure compliance with instructions concerning correct operating sequences to prevent damage to the plant or its function.

GENERAL WARNING SIGN

This symbol accompanies all important instructions or warnings associated with risks of injury as well as possible equipment damage.

WARNING

CRITICAL WARNING SIGN

Warns against an unsafe situation or practice associated with severe injury as well as major equipment damage.

2.1 Personal Protective Equipment (PPE)

Personal protective equipment refers to protective clothing, helmets, goggles, or other garments used to prevent injury.

The following list includes the minimum scope of PPE that should be available to newterra MBR WWTP operators:

Eye and Face Protection:

Protective glasses, goggles and face shields prevent wastewater and chemical splashes, tiny dust particles and vapors from getting in eyes and face.

Foot Protection:

Each operator should wear safety boots with steel toe and shank inserts at all times in wastewater plant operating area to protect feet from falling /rolling objects, wastewater and chemicals splashes, and electrical hazards.

Hand Protection:

Wear protective gloves at all times working in wastewater plant operating area; chemical-resistant gloves must be worn when handling chemicals

Clothing

Wear protective clothing to minimize risk of biohazards. Chemical splash apron must be worn when operator handles chemicals.

2.2 Bacterial Safety

The wastewater contains a mixture of viable bacteria and other biological organisms. A wastewater treatment plant poses a number of bacterial hazards and consequently potential health risk. Immunization protects operator against infection. The use of proper hygiene measures, protective equipment, good housekeeping and common sense prevent contact with pathogens.

These measures prevent infection!

Ensure that hands are washed with an antibacterial soap and warm water and dried by disposable towels on a regular basis, especially prior eating!

Do not expose cuts or open sores to wastewater!

Use personal protective equipment (PPE) at all times in wastewater treatment facility!

Any concern about possible infection should be brought to the attention of medical physician immediately!

2.3 Chemical Safety

The following chemicals are used in operation of newterra MBR WWTP:

- **Sodium hydroxide (NaOH)** is used for pH adjustment, in case there is a deficiency in alkalinity in influent sewage and pH drops. It is very corrosive and hazardous in case of skin/ eye contact, and ingestion.

- **Sodium hypochlorite (NaOCl)** and **Citric Acid ($C_6H_8O_7$)** are used for cleaning the membranes.

  √ **Sodium hypochlorite (NaOCl)** is a common disinfectant, which can be an irritant or corrosive, depending on its concentration. It cannot be mixed with organics, ammonia compounds or acids. ***Contact with acids produces highly toxic chlorine gas. It has to be mixed only with pure water.***

  √ **Citric Acid ($C_6H_8O_7$)** is hazardous in case of skin contact (irritant, sensitizer), or ingestion, eye contact (irritant) and inhalation (lung irritant).

When handling chemicals, it is important to wear proper personal protective equipment such as chemical goggles with combination full face shield, protective clothing with chemical splash apron and chemical-resistant rubber gloves.

The detailed information regarding health & safety of chemicals used in wastewater treatment process can be found in MSDSs presented in Appendix F of the O&M Manual Material.

2.4 Locking out Equipment

Lockout procedures must be followed prior to performing mechanical or electrical maintenance to ensure that equipment has been de-energized.

- All relevant local guidelines and procedures must be applied

2.5 Entering Confined Spaces

Confined space is defined as an area which is enclosed with limited access. The confined space:

- is large enough and so configured that an employee's body can enter and perform assigned work;
- has limited or restricted means for entry or exit; and
- is not designed for continuous employee occupancy;
- the accumulation of hazardous or toxic gases, vapor, dust, fumes, or the creation of an oxygen-deficient atmosphere may occur in confined space.

Follow local laws and regulations with respect to entering a confined space.

2.6 Vision Hazard

An Ultraviolet light (UV) unit is used in the wastewater treatment plant for final disinfection of treated effluent. Do not look directly at the blue UV lamps. Immediate or prolonged exposure to UV light can result in painful eye injury and skin burn.

2.7 Responsibility for Safety

Management:

Management is responsible for providing a safe working environment. This is accomplished partly by:

- Ensuring that all facilities and equipment are built and maintained in accordance with the appropriate safety standards
- Providing adequate funds for equipment and plant maintenance
- Establishing, promoting, and enforcing a ***safety policy***
- Establishing a safety training program
- Supplying easy accessible eyewash and first-aid stations and proper personal protective equipment (PPE) for personnel servicing wastewater treatment facility.

Worker:

- To develop a positive and professional attitude towards safety.
- To avoid mistakes caused by indifference to safety, poor work habits, lack of attentiveness, rushing the job, failure to observe established safety procedures and poor physical condition.

***Remember the "ABC" of accident prevention*:**

ALWAYS BE CAREFUL!!!

In addition to ***"being careful"*,** it is the responsibility of all workers to:

- Work in accordance with established safety procedures
- Follow the established safety rules
- Wear appropriate personal protective equipment (PPE)
- Report all accidents, no matter how minor
- Report potential safety hazards
- Participate in safety programs

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Plant Safety – Simple Rules to Follow

Common sense plays a very important part in the safe operation of any type of plant!

- Wear the appropriate personal protective equipment at all times.
- Keep walkways clear of snow and ice, and loose objects such as pails, shovels, tools, etc.
- Clean up spills of oil, grease, chemicals, or other substances immediately.
- Keep all tools and similar equipment clean, in good condition, and properly stored when not in use.
- Replace all manhole covers, access trap doors, etc. as soon as possible. Erect a safety barrier if it is necessary to leave the opening uncovered.
- Use the proper tools when removing or replacing a manhole cover.
- Wear a safety belt whenever there is the possibility of falling even a short distance, or when working over water.
- Lock out and tag electrical equipment before working on it or the associated equipment.
- Ensure that moving machinery is properly guarded. Wear ear protection in noisy environments.
- Ensure that fire-fighting equipment is in good working condition.

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Hazard Warning Signs/Symbols

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3.0 WASTEWATER TREATMENT PLANT DESIGN BASIS

The **newterra** MBR Wastewater Treatment Plants (WWTPs) are designed for treatment of domestic wastewater from 200-m Mine Site camp with an average design flow of 72 m^3/d and 175-m Milne Port camp with an average design flow of 63 m^3/d. The wastewater treatment plants have been designed to meet the required effluent quality.

newterra MicroClear™ MBR Process Specification

Parameters	Unit	Value	
		Mine Site WWTP	Milne Port WWTP
Design Hydraulic Load			
Average Daily Flow (ADF)	m^3/d	72	63
Selected Design Flow (Q_h)	m^3/h	3	2.63
Organic Load			
COD Load	[kgCOD/d]	76.32	66.78
BOD Load	[kgBOD/d]	38.16	33.39
TKN Load	[kgTKN/d]	5.4	4.73
TAN Load	[kgTAN/d]	3.24	2.84
TP Load	[kgTP/d]	0.86	0.76
TSS Load	[kgTSS/d]	41	35.9
Process Tanks			
One (1) Equalization Tank			
Effective volume	m^3	43.5	43.5
Hydraulic Retention Time (HRT_{EQ})	h	14.5	16.5
One (1) Aeration Tank			
Effective volume	m^3	48	48
$HRT_{AEROBIC}$	h	16	18.3
Two (2) Membrane Tanks			
Total Effective Volume	m^3	5.0	5.0
$HRT_{MEMBRANE}$	h	1.7	1.9

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Parameters	Unit	Value	
		Mine Site WWTP	Milne Port WWTP
MBR System (including aeration tank and membrane tanks)			
Overall Effective Volume	m^3	53	
Overall HRT	h	17.7	20.2
Overall SRT	d	15	16
Internal recirculation rate: Membrane tanks →Aeration tank		4 – 5x influent flow	
Average Design Flux	LMH	18	
Sludge wasting rate (at 1%, 10 g/L)	m^3/d	3.8	2.93
Minimum / maximum design operating temperature	°C	10 / 35	

MicroClear™ MB3-1 membrane module		
MCXL cassettes in each MB3-1 module	nr	15
Individual MB3-1 module filtration area	m^2	105
MB3-1 modules in each membrane tank	nr	1
Total Membrane Filtration Area in two (2) membrane tanks	m^2	210
MB3-1 Module Dimensions (L x W x H)	m	1.30 x 0.70 x 1.85
Housing materials	-	Stainless steel 1.4571 (316 Ti)

Sludge Treatment System	**Unit**	**Value**
One (1) Mixing Tank		
Effective Volume	m^3 (gal)	0.9 (240)
One (1) 6 ft^3 (expandable to 10 ft^3) 630 mm filter press		
Feed from aeration tank		
Sludge volume	m^3	2.93
Sludge concentration	%	1
Dewatered sludge dryness	%	25
Filter press daily run time		
Cycles	c/day	4
Cycle duration	h	4
Overall daily run time	h	16
Construction materials	-	Heavy duty steel skeleton, panted with two part epoxy
Polymer consumption (40 mg/L addition ratio of polymer at 0.25%)	L/d	150

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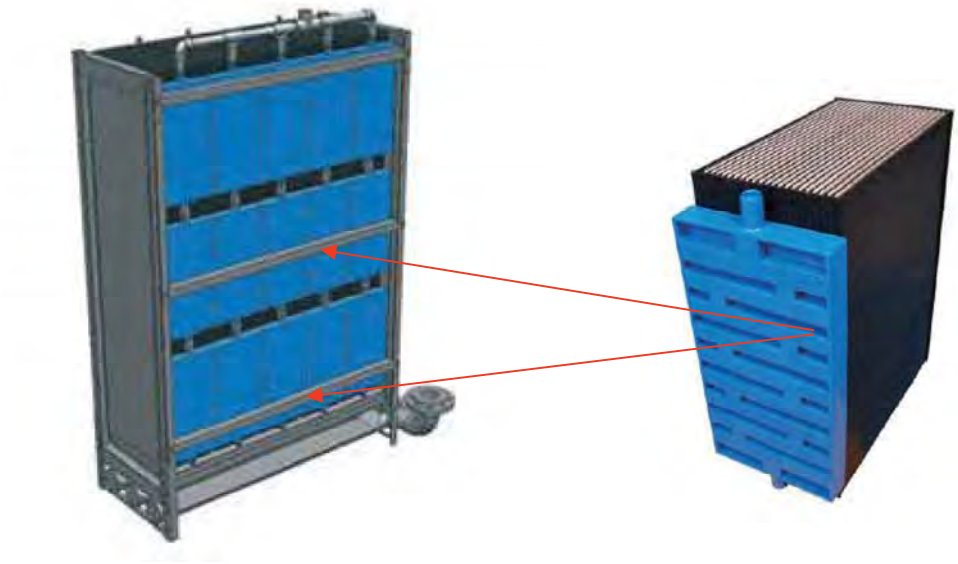

MicroClear™ MB3-1 membrane module

MicroClear™ MCXL membrane cassette

Influent Wastewater/Treated Effluent Characteristics:

Parameters	Unit	Influent Quality	Effluent Quality	
			Mine Site WWTP	Milne Port WWTP
pH	s.u.	6.0 – 9.0	6.0 – 9.5	6.0 – 9.5
Turbidity	NTU		<5	< 5
Fat, Oil, Grease (FOG)	mg/L	< 30	No visible seen	No visible seen
Chemical Oxygen Demand (COD)	mg/L	1060	-	-
Biological Oxygen Demand (BOD_5)	mg/L	530	< 10	< 20
Total Suspended Solids (TSS)	mg/L	570	< 10	< 20
Total Kjeldahl Nitrogen (TKN)	mg/L	75		-
Ammonia Nitrogen (NH_3-N)	mg/L	45	< 2	< 2
Total Phosphorus (TP)	mg/L	12	< 0.1	-
E-Coli / Fecal Coliform	CFU/100 mL		< 200*	< 200*
Alkalinity (assumed)	mg/L as $CaCO_3$	10 – 14	-	-

**After UV disinfection*

Prohibited Items

The raw wastewater should not contain any of the following substances:

- Hydrocarbons – lubricants, gasoline, diesel, etc.;
- Paints, solvents, silica, silicones and polymers;
- Antibacterial solutions, and products with quaternary ammonia;
- Large quantities of chemicals such as water softener, disinfectants, strong acids & alkalis, pesticides or photographic chemicals;
- Silicone based defoamers;
- Non-biodegradable solid waste (plastic, rubber products, disposable diapers, etc.);
- High amount of metals, such as iron, magnesium, calcium, barium and strontium.

TOXIC MATERIALS SHOULD NOT BE THROWN INTO THE DRAIN!

The raw wastewater should also comply with the following compatibility chart. The lipophilic substances concentration must be lower than **50 mg/L.**

MicroClear™ Membrane Compatibility Chart

Group	Substances	SP-Type Membrane
Chlorinated solvents	Methylene Chloride, Chloroform, Carbon Tetrachloride, Chlorobezene, Trichloroethane (<1%)	--
Esters	Ethyl Acetate, Butyl Acetate, Butyl Acrylate (<1%)	--
Ethers	Ethyl Ether, Polyethylene Oxide (<1%)	--
H_2O_2	<2000 ppm	++
Inorganic acids	HF, HCl, H_2SO_4	pH 0 - 14
Ketones	Acetone, Methyl Ethyl Ketone	--
NaOCl	100,000 ppmxh	++

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Organic acids	Sulfamic Acid, Formic Acid, Oleic Acid, Sulfonic Acid, Acetic Acid, Acrylic Acid, Latic Acid	pH 0 - 14
Phenols		--
Silicones		--
Alcohols	Ethanol, Butanol, Isopropranol (<50%)	+
Aldehydes	Formaldehyde (<1%)	++
Alkali		pH 0 - 14
	Dimethyl Formamide, Dimethyl, Acetamid Dioxane, N-Methyl, Pyrrolidone, Tetramethyl Acetamide	--
Aprotic Solvents	Benzene, Toluene, Xylene, Anthracene, Naphatalene, Gasoline	--
Aromatic hydrocarbon	Methoxyethanol, Ethoxyethanol, Buthoxyethanol	?

(++ = Very good, + = good, - = fair, -- = not recommended)

Removal of Oily Materials

The wastewater must pass through a grease trap (or similar facility for grease/fat removal), if there is kitchen usage onsite. The large amount of oil and fat can harm treatment facility (e.g., clogging pumps and piping and cause foaming in the aeration tank). To avoid premature membrane fouling, maximum FOG concentrations should not exceed 30 mg/L.

Fats, oils and grease (FOG) must be removed prior to MBR. Removing of FOG significantly reduces membrane fouling, foaming potential and increases aeration efficiency.

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4.0 PLANT INSTALLATION, INSPECTION, AND TESTING

The **newterra** MicroClear™ MBR WWTP is a packaged plant which comes complete with containerized inlet screen, equalization tank, post EQ screen, aeration tank, membrane tanks, UV disinfection systems and a sludge dewatering unit. The plant is housed inside multiple 40-ft modified high-cube shipping containers - completely pre-assembled, pre-piped, pre-wired and pre-tested, ready for a quick site installation and start-up. The standard containerized design also allows for modular expandability, portability and quick deployment, particularly beneficial features for work camp applications.

4.1 Site Conditions Requirements

- Installation site for the **newterra** MicroClear™ MBR WWTP should be close to the sewer drain and have a sufficient power source (refer to Electrical Drawings in **Appendix A** of this manual).

- Location must permit easy access for equipment capable of transporting, offloading, and handling of the designed loads.

- There should be adequate space around the containers for safe operation and maintenance.

- The firm base (foundation) must be built to support the full operating weight of the plant to prevent buildings from shifting and pipe/electrical conduit connection failure – pilings or rig mats are recommended (based on site conditions).

The firm base for the container must be level and must be capable of supporting the operating weight.

WARNING: ***Always check with the local utility companies for the location of water lines, electrical and telephone cables, or any additional hazards below grade, prior to excavation. Failure to do so could result in severe bodily injury or death.***

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4.2 Inspection upon Delivery

The **newterra** MicroClear™ MBR WWTP is carefully manufactured, checked, and tested at the manufacturing plant. All equipment is pre-wired, pre-piped, mounted inside the enclosure and factory tested. Upon receiving the system, please perform the following:

- Place the containers onto the prepared firm base to avoid sagging, equipment vibration, and shifting. When lifting the container, ensure that lifting equipment is clear of overhead obstructions such as power lines, trees or rooftops. Be careful during this procedure!
- Be careful when offloading the containers to prevent damage to the internal pipe work.
- Check the containers for any signs of shipping damages.
- Inspect the containers to ensure that no components or parts are missing (refer to the **Packing Slip** presented in **Appendix B** of this manual). Also, inspect for visual damage of the tanks, pumps, blowers, piping, and control panel.
- If the containers, equipment inside and any parts shipped loose are free of damage, proceed with the installation.

For any damages or loss of equipment, **please notify newterra ltd. at (800) 420-4056 immediately.**

4.3 Plant Initial Set up

WARNING: ***The installer must ensure that the installation site is safe from hazards. These could include excavations left open overnight, debris left lying around, and tanks & equipment not properly blocked. Provisions must be made to eliminate the potential hazards by roping off and proper shoring around the excavations, cleaning up at the end of each workday, and proper storage of equipment. Failure to do so could result in severe injury or death.***

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Enclosures Specifications

WWTP Enclosures	newterra MicroClear™ MBR WWTP consists of six (6) cMET certified, built to NEC standard enclosures
Enclosure #1 (SCREEN BLD-7903)	Room #1 - Class 1 Div 2, contains Screen Modules with Screw Screen Compactors (SCR-201/SCR-401), Screen Discharge Tanks (TNK-202/TNK-401), and pumps
	Room #2 - General Purpose (GP), contains Control Panel
Enclosure #2 (EQUALIZATION BLD-7901)	General Purpose (GP), contains Equalization Tank (TNK-301)
Enclosure #3 (AERATION BLD-7902)	General Purpose (GP), contains Aeration Tank (TNK-501)
Enclosure #4 (MBR FILTRATION BLD-7900)	General Purpose (GP), contains Membrane Tanks (TNK-601/TNK-602), scouring blowers, pumps, permeate withdrawal systems, UV system, and chemical units
Enclosure #5 (EFFLUENT BLD-7905)	General Purpose (GP), contains Effluent Tanks (TNK-811/TNK-812/TNK-813/TNK-814), pumps, and chemical units
Enclosure #6 (SLUDGE BLD-7904)	Room #1 - Class 1 Div 2, contains sludge dewatering module including Filter Press (FP=901), mixing tank (TNK-901), air , and pumps
	Room #2 - General Purpose (GP), contains pumps and blowers for aeration tank, and office space
Estimated Dry shipping weight for each enclosure	SCREEN BLD-7903 – 20 000 lb (9072 kg) EQUALIZATION BLD-7901 – 26 000 lb (11 793 kg) AERATION BLD-7902 – 28 000 lb (12 700 kg) MBR FILTRATION BLD-7900 - 23 000 lb (10 432 kg) EFFLUENT BLD-7905 - 15 000 lb (6804 kg) SLUDGE BLD-7904 – 20 000 lb (9072 kg)
Enclosures Dimensions	All enclosures are 40-ft high-cube modified shipping containers: 12.2 m L x 2.44 m W x 2.89 m H (40' L x 8' W x 9'6" H)
Influent supplied head	3.0 m (10')
Treated effluent discharged head pressure	1.5 m (5')
Inlet pipes	3" steel FNPT for wastewater from lift station; 3" steel with female camlock from sewage truck
Discharge pipe	2" steel pipe with 2" flange

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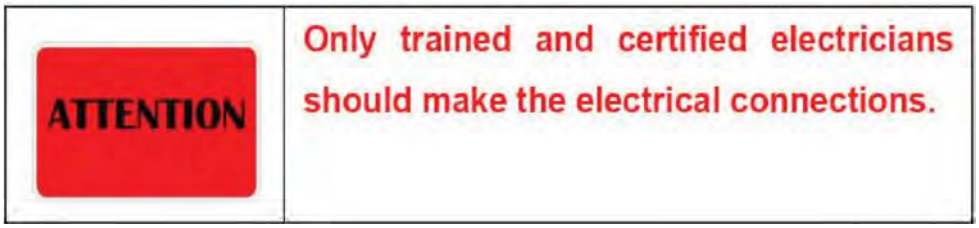
Verify site power per system design criteria.

System Electrical Specifications:

System Power	600-V, 3-Phase, 3-Wire, 60 Hz
Main Disconnect	200 A
Panel Approval and Classification	cMET, Classified
System Approval and Classification	cMET, Classified GP & C1 Div 2
Telemetry Setup	-

Please refer to the as-built electrical drawings in Appendix A of this manual.



Installation Instructions:

1. Remove hatch covers from the interconnecting ports.
2. Place containers tight against each other with the interconnecting ports lining up.
3. Connect electrical power to the **Main Switch Panel** located inside the enclosure **(BLD-CONTROL)** 3 phase, 380 V from available source ensuring correct phase rotation.
4. Ensure that proper electrical grounding and lightning protection is available.
5. Switch **Main Switch Panel's isolator** to the **ON** position.
6. Check all internal lighting, heating, and ventilation for correct operation.
7. Install packed external lighting into brackets above the doorway (double man doors), route the cables to the inside of the container through the ports provided and plug into sockets provided (check for correct operation).

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8. Ensure that a potable water supply is available (used for hydraulic testing during start-up, membrane cleaning, washing hands and for performing onsite testing).

9. **Ensure availability of an emergency eyewash station and personal protection equipment onsite.**

10. Verify membrane modules are secured within the membrane tanks – i.e. verify wheel chocks (if applicable) are in the correct location and that there is no lateral movement (less than an inch) of the membrane modules on the wheel tracks in the tanks.

4.4 Plant Initial Testing

The **newterra** MBR WWTP (except the membrane modules) undergoes electrical and leakage tests in our manufacturing facility prior to shipment; however, fittings could shift during shipment, so it is our standard practice to perform plant initial testing including **dry and hydraulic tests.**

4.4.1 Dry Test

The following tasks have to be performed **before potable water** is introduced into the system:

- Ensure that all tanks are clean and free of any dirt or debris (this is to prevent obstruction or damage to the piping, pumps, and membranes).
- Ensure that all connections have been provided and joints have been tightened.
- Check the placement of the air diffusers in the equalization tank **(TNK-301)** and aeration tank **(TNK-501)** if incorrectly positioned, proper adjustment has to be performed.
- Ensure that a functional check of the electrical and control system has been performed (please refer to the **newterra Pre-commissioning Test Checklist** presented in **Appendix C**).

4.4.2 Hydraulic Test

The hydraulic test is performed using potable water to:

- Check for and fix any leakage;
- Check the setting of level switches/transmitters;
- Check the hydraulic flow through the plant;