Baffinland Iron Mines Corporation

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

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TRACK CHANGES TABLE

Index of Major Changes/Modifications in Revision 11

Item No.	Description of Change	Relevant Section
1	Addition of Operational Wastewater to process description	6
2	Addition of winter operations of OWS	6.3.1, 6.3.2
3	Change to station descriptions to add new OWS discharge at MS and MP	Table 11
4	Update of truck wash and OWS system description	6.3.2
5	Addition of Adaptive Management Section	12
6	Addition of review of Plan Effectiveness Section	13

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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	--

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Title	Number/ Acronym
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)

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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

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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

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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 (calculated) 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 use 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).

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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)	367.5	300	67.5	367.5
	Km 32 Lake (Winter)				
Mine Site (Mary River)	Camp Lake	657.5	203.8	151.6	355.4
Steensby Port (Steensby Inlet)	ST 347 Km Lake	435.8	101	142.6	243.6
	3 Km Lake				
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.

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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

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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. Currently the Phillips Creek intake location is not in use. 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

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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

Parameter	Design Value	Source
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.

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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-01B
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

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. Refer to Site Block Flow Diagrams in Appendix D for Milne Port and Mine Site anticipated annual effluent discharge. The project specific O&M Manual for Sewage Treatment Systems is provided by Newterra Ltd in Appendix E

TABLE 6 TREATED EFFLUENT GENERATION AND DISCHARGE/ OUTFALL LOCATIONS

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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

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.

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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

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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 potential

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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.

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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 AND OPERATIONAL WASTEWATER

The Mine Site and the Milne Port site both generate (or have the potential to generate) oily water or operational wastewater. The sources of oily water or operational wastewater generated from these locations is predominately collected from floor drains and collection sumps located within the vehicle maintenance facilities, waste management buildings, emergency response garages, and the vehicle washbay facility, as well as the surface water (i.e. precipitation) that accumulates within the bulk fuel storage berms, hazardous waste storage berms, and soil landfarm facilities.

6.1 OILY WATER AND OPERATIONAL WASTEWATER TREATMENT DISCHARGE CRITERIA

All discharge from the Oily Water/Wastewater Treatment Facilities (OWS) for monitoring stations MP-02, MP-02B, MS-02, MS-02B 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. Associated discharge and environmental monitoring stations include MP-03, MP-MRY-7, MS-03, MS-03B, MS-04, MS-MRY-6, SP-04 and SP-05.

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TABLE 9 EFFLUENT QUALITY DISCHARGE LIMITS FOR BULK FUEL STORAGE FACILITIES

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
Benzene	0.37
Ethylbenzene	0.09
Toluene	0.002
Oil and Grease	15 and no visible sheen
Lead	0.001

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

All discharge from the soil Landfarm Facilities, including the Contaminated Snow Containment Berm, will not exceed the following effluent quality limits outlined in Table 10. Applicable discharge and monitoring stations include MP-04, MP-04A, 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	0.37
Toluene	0.002
Ethylbenzene	0.09

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

6.2 OILY WATER AND OPERATIONAL WASTEWATER POTENTIAL SOURCE LOCATIONS

The oily water and operational wastewater effluent discharge locations and environmental monitoring stations associated with the Oil Water Treatment Systems (OWS) on the Project are listed in Table 11.

The Discharge and associated Environmental Monitoring locations identified in Table 11 represent the location where the effluent verification sample is collected from a sampling port prior to discharge and release into the environment.

Note: OWS effluent is only released into the environment once confirmation the laboratory analysis demonstrates that the effluent meets the established discharge criteria as part of the commissioning process for the Mobile OWS.

TABLE 11 OILY WATER/ WASTEWATER POTENTIAL SOURCE LOCATIONS

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Camp/ Site	Discharge/ Monitoring Locations	Facility	Coordinates (UTM)	
			Easting	Northing
Mine Site	MS-02	Mobile Maintenance Shop Sump	561638	7913222
Mine Site	MS-02B	Waste Management Facility	n/a	n/a
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-02B	Milne Port LP-2 Pad	n/a	n/a
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/ OPERATIONAL WASTEWATER TREATMENT PROCESS DESCRIPTION

Oily water and operational wastewater generated by the Project sites shall be treated using the Oily Water/Wastewater Treatment Facilities as per conditions in Part F of the Type A Water Licence. The process description for the oily water/wastewater treatment systems located at each site are described in the sections that follow.

6.3.1 System Overview

The mobile OWS is a prefabricated system (Newterra Ltd.) housed in a 40’ seacan and is designed to remove oil, grease, and dissolved volatiles compounds such as Benzene, Toluene, Ethylbenzene and Xylene (BTE) as well as Petroleum Hydrocarbon compounds from hydrocarbon-contaminated water. The unit includes an API type separator to remove free product, a bag filter for solids and sediment removal and three adsorption units (one clay, two granular activated carbon) for oil/grease and BTE removal., Additional treatment using media filter drums are added to the end of the mobile OWS unit to remove any metals that may be associated with the contaminated water.

Figure 1 shows the Process Flow Diagram for the OWS when it is set-up for treating from surface water containment berms throughout the Project site. Figure 2 shows the Process Flow Diagram for the OWS when it is set up as a stationary treatment system during the frozen water season to maintain year round treatment capacity. 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. For the O&M procedures and schedule relating to the mobile OWS unit, refer to the Baffinland Mobile OWS Manual provided in Appendix H.

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The mobile OWS systems at both MP and the MS can be reconfigured for temporary stationary operations as shown in Figure 2, using storage tanks to contain the Raw oily/operational waste water (i.e. influent) and the treated water within a heated facility to permit the year round treatment capacity of oily and operational waste water. The treated water is tested prior to discharge to ensure the water quality meets the applicable discharge criteria prior to release to the environment.

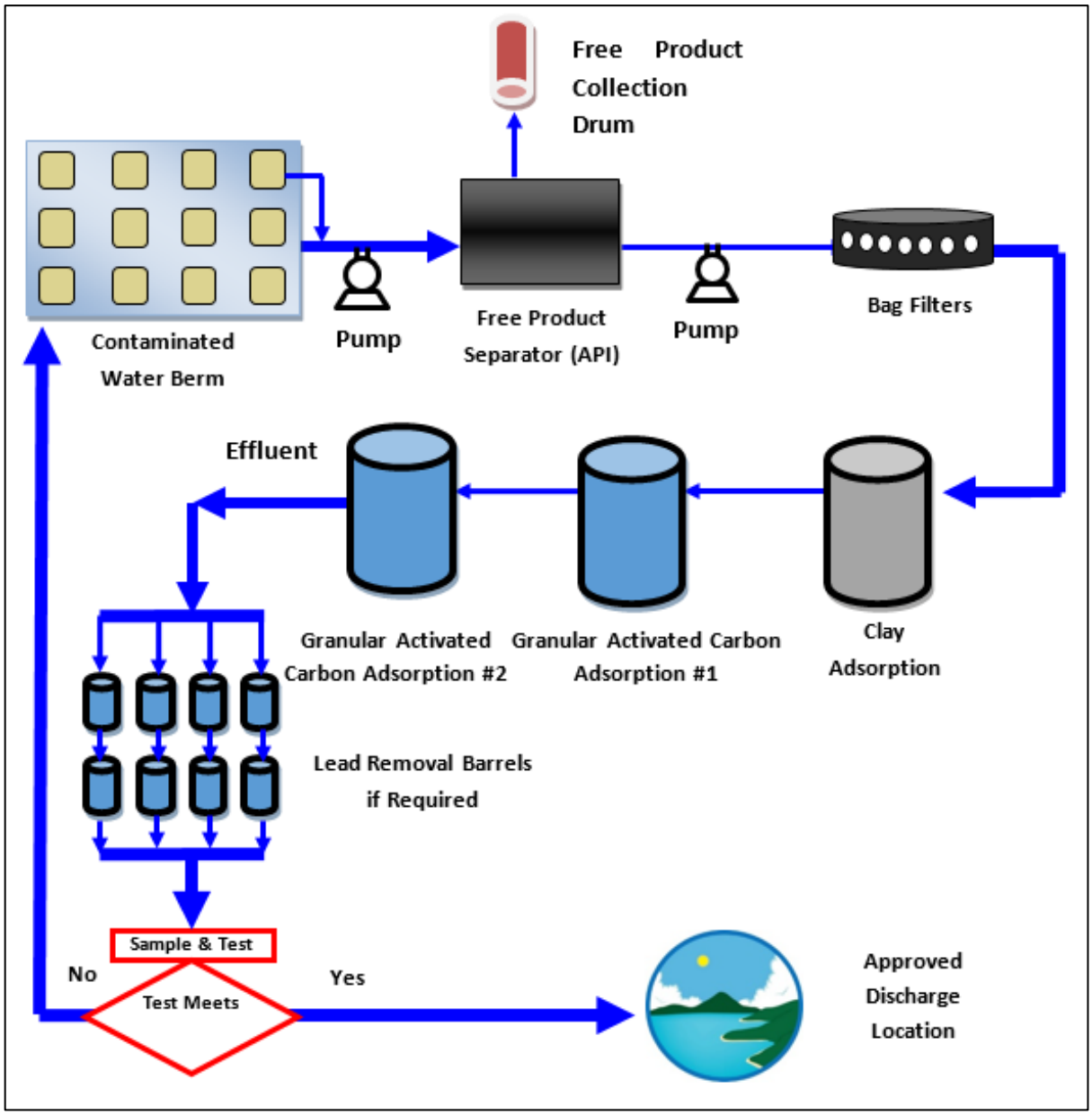


FIGURE 1 - MOBILE OWS FLOW PROCESS DIAGRAM

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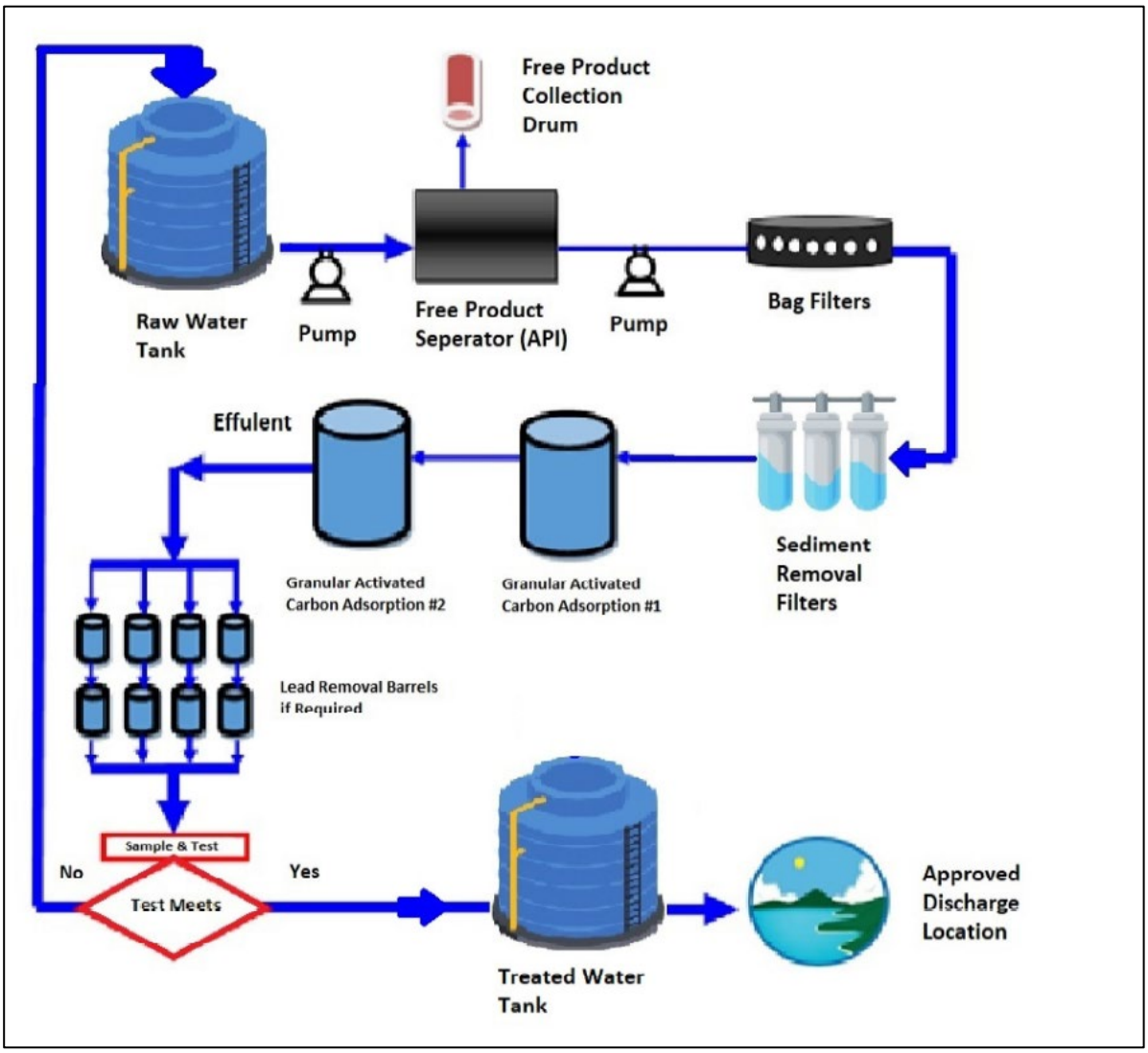


FIGURE 2 – MOBILE OWS FLOW PROCESS DIAGRAM FOR STATIONARY SET-UP

6.3.2 Milne Port

Sources of oily water and operational wastewater that may be generated at Milne Port site are:

- Vehicle maintenance and wash facilities (i.e. Floor drains and concrete sumps in the Mobile Maintenance Shops (North/South), Toromont Shop and Contractor Maintenance Shop);
- Bulk Fuel Facility (i.e. precipitation that accumulates in the sump of the lined containment berms);
- Concrete sumps in buildings such as the, Waste Management Building, Emergency Response Building, etc.;

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- Lined containment facilities (i.e. hazardous waste and bulk fuel storage facilities);
- and, Landfarm Facility including the Contaminated Snow Containment Facility

Any oily water generated at Milne Port is collected in surface water sump(s) within each facility. The water is then pumped from the sumps and treated directly by the prefabricated mobile OWS contained within a 40' seacan. The prefabricated mobile OWS uses a series of skimmers, sediment filters, activated carbon media and media filters to capture and remove hydrocarbons from oily water and/or wastewater generated from these containment areas. Effluent from the mobile OWS is sampled from a sampling port on the OWS system and prior to being released to the environment, the results are compared to the applicable discharge criteria prior to being released to the environment.

Oily water is removed from each facility as needed and is then transferred to an the engineered lined containment facility or during the winter is transferred to the mobile OWS Raw Water tank. The MP Mobile OWS stationary configuration is shown in Figure 2 in Section 9.2.1 of the plan.

During winter the mobile OWS system may be temporarily installed and operated at one of the Waste Management buildings to permit year round treatment capacity.

Following treatment by the mobile OWS, the effluent is sampled to ensure the water quality meets the applicable discharge criteria before the being discharged to the receiving environment.

Any water that does not meet the discharge criteria will be reprocessed or transferred to the Milne Port PWSP for further treatment via the MP Waste Water treatment plants or further in-situ treatment prior to discharge.

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

6.3.3 Mine Site

Sources of oily water and operational wastewater that may be generated at the Mine Site are:

- Vehicle maintenance and wash facilities (i.e. floor drain and concrete sumps located in the Heavy Duty Shop, Heavy Truck Maintenance Shop and Washbay, Toromont Shop);
- MS Bulk fuel storage facilities (i.e. precipitation collected in the lined tank farm containment areas);
- Waste Management Building, Emergency Response Building (i.e. floor drains and concrete sumps)
- Lined containment facilities (i.e. precipitation collected in the various hazardous waste and product storage berms).

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- Landfarm Facility (i.e. precipitation collected in surface water sumps)

Collected oily storm water run-off from the Mine Site Bulk Fuel Storage Facility and/or other lined containment facilities will be treated using the mobile OWS system and discharged directly to the adjacent land surface.

Oily water generated at the Mine Site is collected and then transferred to either one of the designated lined hazardous waste containment facilities or is transferred to the MS OWS system (raw water tank). The MS OWS configuration as shown in Figure 2 in Section 9.2.1 of the plan. During winter OWS system shall be temporarily installed and operated at one of the MS Waste Management buildings to permit year round treatment capacity.

Following treatment by the MS OWS, the effluent is sampled to ensure the effluent water quality meets the applicable discharge criteria before discharged to the receiving environment.

Any effluent that does not meet the discharge criteria will be transferred to the one of the MS PWSP's for further treatment via the MS waste water treatment plants (i.e Sailiviik or MSC) or further in-situ treatment prior to discharge.

The wastewater generated that cannot feasibly be treated by the OWS systems will be shipped off site for disposal at an accredited treatment facility in southern Canada.

6.3.3.1 Truck Wash Bays

The Truck Wash Facility (OHT Wash Bay) is equipped with a sediment treatment plant that removes sediment and solids and recycles the wash water within the system. The system also has trays and a sump to capture all wash wastewater generated at the facility, allowing it to allowing it to recycle and thereby reduce the amount of fresh water used. Waste wash water produced in the truck wash facility (i.e. vehicle 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. The water is then reused by the facility to wash down equipment and vehicles.

Most water is recycled and reused within the facility. 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.

The Heavy Duty shop 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 and thereby reduce the amount of fresh 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

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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 to ensure the final effluent meets all discharge criteria outlined in the Type A Water Licence.

Treated compliant effluent from the truck wash bays / oily water treatment plants will be sampled and flows recorded as per the water license. The separated waste oil will be stored in a local tank. Periodically, the oil from the tank will be drained and shipped off site. Accumulated suspended solids will be periodically removed and sent to the Landfarm Facility for treatment if contaminated with hydrocarbons or the landfill if demonstrated to be non-hazardous.

6.3.4 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.

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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 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

Additional parameters 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.

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TABLE 14 LOCATION OF WATER MANAGEMENT FACILITIES

Site	Facility	Description	Facility Coordinates (UTM)		FDP Coordinates (UTM)	
			Easting	Northing	Easting	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.

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 spill way 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 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

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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 spill way.

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 will be employed to ensure effluent compliance. Chemical addition to control pH as required prior to discharge may be required. 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 kilometre 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 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.

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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 sulphate 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 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

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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 is 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 flocculent, 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

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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. POTABLE WATER

The Sample plans for operation and maintenance of the potable water systems are outlined below.

9.1 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.

9.2 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.

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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, Aluminium, 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).

10. CONTINGENCY MEASURES

Design criteria for the, 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

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- 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.

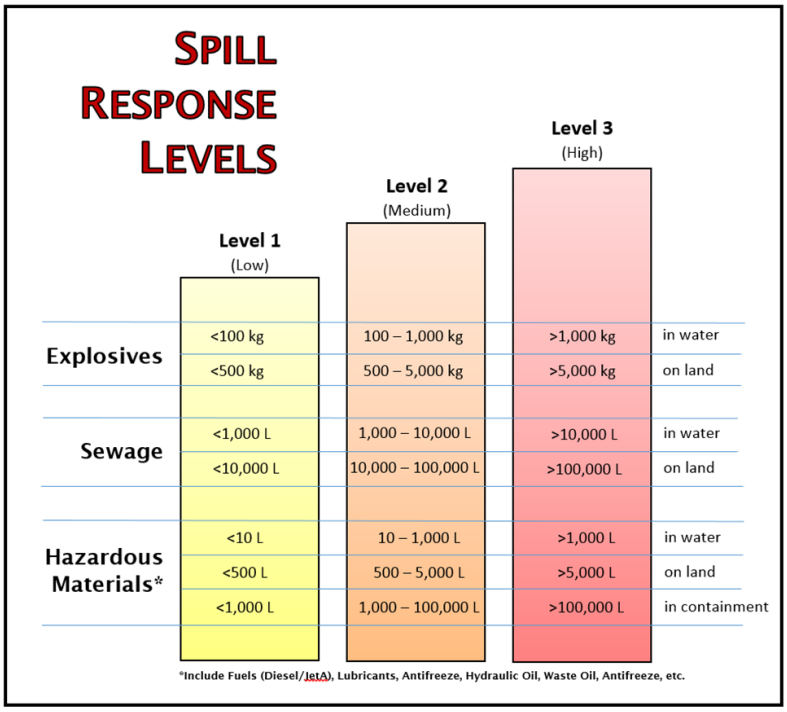


FIGURE 2 EMERGENCY SPILL RESPONSE LEVELS

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

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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.

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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.

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12. ADAPTIVE MANAGEMENT

Adaptive management is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes (Canadian Environmental Assessment Agency, 2016). Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project.

Baffinland has developed a draft Adaptive Management Plan (AMP) that provides the framework by which adaptive management is to be incorporated into Project operations (Baffinland, 2020). The Project-wide adaptive management process begins with a planning phase, followed by iterative phases of implementing and monitoring the actions included in the plan(s), evaluating the effectiveness of actions included in the plans based on results of monitoring and other feedback mechanisms, and adjusting management strategies and actions and responses based on monitoring. The cycle begins anew with implementation and monitoring of a revised plan, which integrates the outcomes of the previous cycle. This cycle can occur in real-time or over an extended period according to the nature of the situation or area of focus. In this way, a properly designed and well-implemented adaptive management process progressively diminishes uncertainty, as management strategies and processes are refined throughout a project's operational lifecycle.

Monitoring and responding to effects in the short-term is addressed in a Trigger Action Response Plan (TARP) described in Table 19. The TARP identifies the pre-defined actions to be taken should threshold levels be exceeded. Longer term review of and response to monitoring data is addressed in an annual review of plan effectiveness in Section 13.

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TABLE 17 FRESH WATER SUPPLY, SEWAGE, AND WASTEWATER TRIGGER ACTION RESPONSE PLAN

Project Activity	Objectives	Performance Indicators	Monitoring Program / Plan	Condition Status / Threshold			Pre-defined Response(s)		
				Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk
Domestic and industrial water withdrawals	Protect fish and fish habitat during water withdrawal activities	Volume of water withdrawn (m^3/day)	SNP; monitoring requirements of Public Water Supply Regulations	Water withdrawals below the withdrawal limits prescribed in the Type A Water Licence (Table 3.7).	Water withdrawals exceed the limits prescribed in the Type A Water Licence (Table 3.7). The weekly average remains within the authorized limit.	Water withdrawals exceed the thresholds presented in Table 3.1 (>10% of the lake outflow and/or the winter withdrawal is >10% of the under-ice lake volume.	No action required.	Env't Dept: Notify Site Services and determine reason for exceedance. Notify the NWB in the monthly report. Work with Site Services to determine the need for a WL amendment. Site Services Dept: Report the exceedance to the Env't Dept. Determine root cause of exceedance and adjust activities to reduce water use to be within approved limits.	Env't Dept: Direct stoppage of all non-essential water use. Assess if the exceedance may have resulted in impacts to fish and fish habitat. Report exceedance of threshold in the following NWB monthly report, and the assessment of impacts in the annual report. Site Services Dept: Cease all non-essential water use to reduce water consumption to below thresholds. Determine root cause and take corrective action to avoid future overuse.
Dust suppression water		Volume of water withdrawn (m^3/day) from lakes. Rate of water withdrawal (m^3/s) from rivers.	SNP; Detailed Water Withdrawal Plan; Type A Water Licence	Below water withdrawal limits prescribed in the Type A Water Licence (Table 3.8).	Exceed water withdrawal limits prescribed in the Type A Water Licence (Table 3.8). The weekly average remains within the authorized limit.	Water withdrawals exceed the thresholds presented in Table 3.1 (>10% of the instantaneous flow).	No action required.	Env't Dept: Notify the Roads and/or Projects Depts of the exceedance. Review the pumping rates used by the water trucks and determine if a lower pumping rate is required. Include the exceedance in the monthly report to the NWB. Roads/Projects Dept: Report the exceedance to the Env't Dept (if the Env't Dept is not already aware). Cease water withdrawal from sites which have exceeded the authorized limits. Determine route cause of exceedance and adjust activities to reduce water use to within approved limits.	Env't Dept: Direct Roads/Projects Dept(s) to adjust daily withdrawals to within authorized limits, and/or flow rates to below 10% threshold. Notify the QIA, and report exceedance of threshold in the following monthly report. Roads/Projects Dept: Cease water withdrawal until a plan is developed to ensure water take is within authorized volumes and/or rates.
Geotechnical drilling and exploration		Volume of water withdrawn (m^3/day) from lakes. Rate of water withdrawal (m^3/sec) from rivers.	SNP (Type B Water Licence)	Below water withdrawal limits prescribed in the Type B Water Licence (Section 3.4).	Exceed water withdrawal limits prescribed in the Type B Water Licence (Section 3.4). The weekly average remains within the authorized limit.	Water withdrawals exceed the thresholds presented in Table 3.1 (>10% of the instantaneous flow).	No action required.	Env't Dept: Notify the Geology Dept of the exceedance. Include the exceedance in the monthly report to the NWB. Geology Dept: Report the exceedance to the Env't Dept (if the Env't Dept is not already aware). Cease water withdrawal from sites which have exceeded the authorized limits. Determine route cause of exceedance and adjust activities to reduce water use to within approved limits.	Env't Dept: Direct Geology Dept to adjust flow rates to below 10% threshold. Notify the QIA, and report exceedance of threshold in the following monthly report. Geology Dept: Cease water withdrawal (drilling) where exceedance occurred until a plan is developed to ensure water take is within authorized volumes.

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Project Activity	Objectives	Performance Indicators	Monitoring Program / Plan	Condition Status / Threshold			Pre-defined Response(s)		
				Low Risk	Moderate Risk	High Risk	Low Risk	Moderate Risk	High Risk
Treated sewage effluent	Maintain receiving environment water quality	BOD_5, COD, TSS, faecal coliform, oil and grease, pH, ammonia (NH3-N), total phosphorus and acute toxicity	SNP	Treated sewage effluent exceeds Baffinland's Internal Discharge Limits for any of the performance indicators (Table 3.2).	Treated sewage effluent exceeds the Water Licence Discharge Limits for any of the performance indicators (Table 3.2).	Sustained[2] non-compliance (exceedance of Water Licence Discharge Limits).	Env't Dept: Continue to monitor. Site Services Dept: Delay discharge (if possible) and divert off-spec sewage to the PWSP for additional management. Refer to the PWSP (Appendix E) for possible treatment methods.	Env't Dept: Conduct a risk evaluation as to proceed with discharge. Site Services Dept: Delay discharge (if possible) and divert off-spec sewage to the PWSP for additional management. Refer to the PWSP (Appendix E) for possible treatment methods.	Env't Dept: Implement the Spill Contingency Plan and notify the NWB and QIA. The Emergency Response Plan (ERP) will be implemented if the spill is Level 2 or 3 (Section 3.8).Notify the NWB and the QIA. Site Services Dept: Investigate the cause and identify additional contingencies and assess the need for modifications to the treatment system.
Contact water management		As, Cu, Pb, Ni, Zn, TSS, oil and grease, pH, radium-266, un-ionized ammonia aquatic toxicity.	SNP and MDMER	Contact water exceeds Baffinland Internal Discharge Limits for any of the performance indicators (Table 3.3).	Contact water exceeds Water Licence Discharge Limits and/or MDMER Schedule 4 and 5 limits for any of the performance indicators (Table 3.3).	Sustained[2] non-compliance (exceedance of Water Licence and/or MDMER Discharge Limits).	Env't Dept: Conduct risk evaluation on whether to proceed with discharge. Mine Operations Dept: Cease discharge unless directed otherwise by the Env't Dept.	Env't Dept: Determine if discharge can be delayed. Mine Operations Dept: Cease discharge unless directed otherwise by the Env't Dept.	Env't Dept: Implement the Spill Contingency Plan and notify the NWB and QIA. The Emergency Response Plan (ERP) will be implemented if the spill is Level 2 or 3 (Section 3.8). Notify the NWB and the QIA. Site Services Dept: Investigate the cause and identify additional contingencies and assess the need for an amendment to the Type A Water Licence.
Oily water management from oily water separators, bulk fuel storage facilities, and landfarms		pH, TSS, ammonia, phosphorous, benzene, ethylbenzene, toluene, oil and grease, As, Cu, Pb, Ni, and Zn	SNP	Oily water is below discharge limits for all performance indicators (Tables 3.4, 3.5 or 3.6).	Oily water exceeds discharge limits for one or more performance indicator (Tables 3.4, 3.5 or 3.6).	Oily water is discharged to the environment despite exceeding discharge limits for one or more performance indicator (Tables 3.4, 3.5 or 3.6).	Env't Dept: Communicate acceptable effluent quality for discharge to Site Services Dept. Site Services Dept: Discharge effluent.	Env't Dept: Communicate unacceptable effluent quality for discharge to Site Services Dept. Operations Dept: Delay discharge and treat effluent. Transfer to a PWSP as a temporary measure if required.	Env't Dept: Implement the Spill Contingency Plan and notify the NWB and QIA. The Emergency Response Plan (ERP) will be implemented if the spill is Level 2 or 3 (Section 3.8). Notify the NWB and the QIA. Site Services Dept: Investigate the cause and take corrective action to prevent another unauthorized discharge from occurring.

NOTES:

1. Immediately means without delay, understanding that there could be competing urgent work or emergencies that may affect this response time.
2. Sustained refers to exceedances that continue to occur despite application of mitigation measures and pre-defined response

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13. REVIEW OF PLAN EFFECTIVENESS

An important element of Baffinland's management system is reviewing the continued suitability, adequacy and effectiveness of each management plan. This will occur through an annual review process as well as scheduled updates.

14. 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

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	Milne Port and the Mine Site, including culverts, bridges, ditches and swales.
Environment 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.

15. 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.

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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.

16. 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).

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

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

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Sustainable Development Policy

At Baffinland Iron Mines Corporation (Baffinland), we are committed to conducting all aspects of our business in accordance with the principles of sustainable development & corporate responsibility and always with the needs of future generations in mind. Baffinland conducts its business in accordance with the Universal Declaration of Human Rights.

Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and with utmost respect for the cultural values and legal rights of Inuit. We expect each and every employee, contractor, and visitor to demonstrate courageous leadership in personally committing to this policy through their actions. The four pillars of our corporate responsibility strategy are:

1. Health and Safety
2. Environment
3. Upholding Human Rights of Stakeholders
4. Transparent Governance

Health and Safety

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness, where everyone goes home safe everyday of their working life. Why? Because our people are our greatest asset. Nothing is as important as their health and safety. Our motto is “Safety First, Always”
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour, awareness and promoting active courageous leadership. We allow our employees and contractors the right to stop any work if and when they see something that is not safe

Environment

- Baffinland employs a balance of the best scientific and traditional Inuit knowledge to safeguard the environment
- We apply the principles of pollution prevention, waste reduction and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop more sustainable practices. We strive to develop more sustainable practices
- Baffinland ensures that an effective closure strategy is in place at all stages of project development to ensure reclamation objectives are met

Upholding Human Rights of Stakeholders

- We respect human rights, the dignity of others and the diversity in our workforce. Baffinland honours and respects the unique cultural values and traditions of Inuit
- Baffinland does not tolerate discrimination against individuals on the basis of race, colour, gender, religion, political opinion, nationality or social origin, or harassment of individuals freely employed
- Baffinland contributes to the social, cultural and economic development of sustainable communities in the North Baffin Region

Sustainable Development Policy

- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions
- We expect our employees and contractors, as well as community members, to bring human rights concerns to our attention through our external grievance mechanism and internal human resources channels. Baffinland is committed to engaging with our communities of interest on our human rights impacts and to reporting on our performance

Transparent Governance

- Baffinland will take steps to understand, evaluate and manage risks on a continuing basis, including those that may impact the environment, employees, contractors, local communities, customers and shareholders.
- Baffinland endeavours to ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We measure and review performance with respect to our safety, health, environmental, socio-economic commitments and set annual targets and objectives.
- Baffinland conducts all activities in compliance with the highest applicable legal & regulatory requirements and internal standards.
- We strive to employ our shareholder's capital effectively and efficiently and demonstrate honesty and integrity by applying the highest standards of ethical conduct.



Brian Penney
Chief Executive Officer
March 2016

Baffinland Iron Mines Corporation

Health, Safety and Environment Policy

BAF-PH1-800-POL-0001

Rev 3

Approved by: Brian Penney

Title: Chief Executive Officer

Date: May 3rd, 2019

Signature: 

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DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
05/07/15	0	EM	TP	For Use
03/07/16	1	JS	BP	Minor edits
04/20/18	2	TS	SA/BP	Minor edits
05/03/19	3	TS	BP	Minor edits

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This Baffinland Iron Mines Corporation Policy on Health, Safety and Environment is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goals.

We implement this Policy through the following commitments:

- Continual improvement of safety, occupational health and environmental performance
- Meeting or exceeding the requirements of regulations and company policies
- Integrating sustainable development principles into our decision-making processes
- Maintaining an effective Health, Safety and Environmental Management System
- Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts
- Engaging stakeholders through open and transparent communication.
- Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
- Reclamation of lands to a condition acceptable to stakeholders.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- As evidenced by our motto “Safety First, Always” and our actions Health and Safety of personnel and protection of the environment are values not priorities.
- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution through courageous leadership is essential for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

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We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The health and safety of all people working at our operation and responsible management of the environment are core values to Baffinland. In ensuring our overall profitability and business success every Baffinland and business partner employee working at our work sites is required to adhere to this Policy.



Brian Penney
Chief Executive Officer
May 2019

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Baffinland Iron Mines Corporation

Health, Safety and Environment Policy

BAF-PH1-800-POL-0001

Rev 2

Approved By: **Brian Penney**

Title: **Chief Executive Officer**

Date: **April 20th, 2022**

Signature: 

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04/20/22	3	TS	BP	Minor edits

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Brian Penney
Chief Executive Officer
April 2022

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APPENDIX B CONCORDANCE TABLES

The information contained herein is proprietary to Baffinland Iron Mines Corporation (BIM) and used solely for the purpose for which it is supplied. It shall not be disclosed in whole or in part, to any other party, without the express permission in writing by BIM. CONTROLLED IN CDMS. UNCONTROLLED WHEN PRINTED OR SAVED.

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 18 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

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Part	Number	Condition	Section
		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) / Km 32 Lake (winter) — 367.5 — ~ 134,000 Mine Site (Mary River) — Camp Lake — 657.5 — 240,000 SteensbyPort (Steensby Inlet) — ST 347 Km Lake / 3 km Lake — 435.8 — 155,400 Ravn River — Camp Lake — 145.2 — Mid-Rail — Nivek Lake (summer) / Ravn Camp Lake (winter) — 79.5 — 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	Table 3

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<table>
<tr><th>Part</th><th>Number</th><th>Condition</th><th>Section</th></tr>
<tr><td></td><td></td><td>along the Tote Road during the Early Revenue Phase (ERP) of the Project. 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="14">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>

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<table>
<tr><th>Part</th><th>Number</th><th>Condition</th><th>Section</th></tr>
<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>

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<table>
<tr><th>Part</th><th>Number</th><th>Condition</th><th>Section</th></tr>
<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</td><td>Table 13</td></tr>
</table>

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<table>
<tr><th>Part</th><th>Number</th><th>Condition</th><th>Section</th></tr>
<tr><td></td><td></td><td>Area Seepage and runoff from the at Milne Inlet at Monitoring Stations MS-MRY-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 19 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

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TABLE 20 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

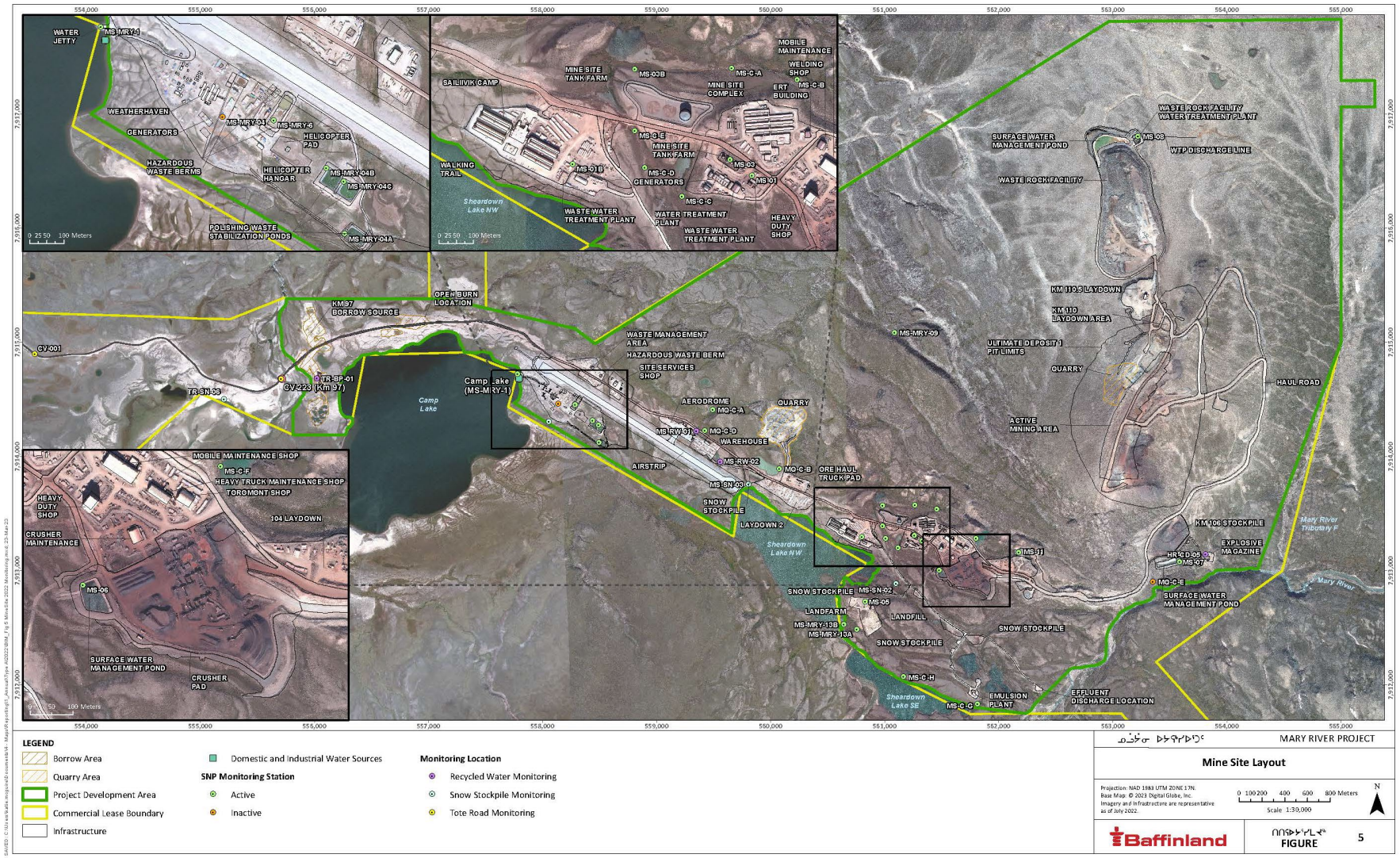
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APPENDIX C SITE LAYOUT – MILNE PORT AND MINE SITE

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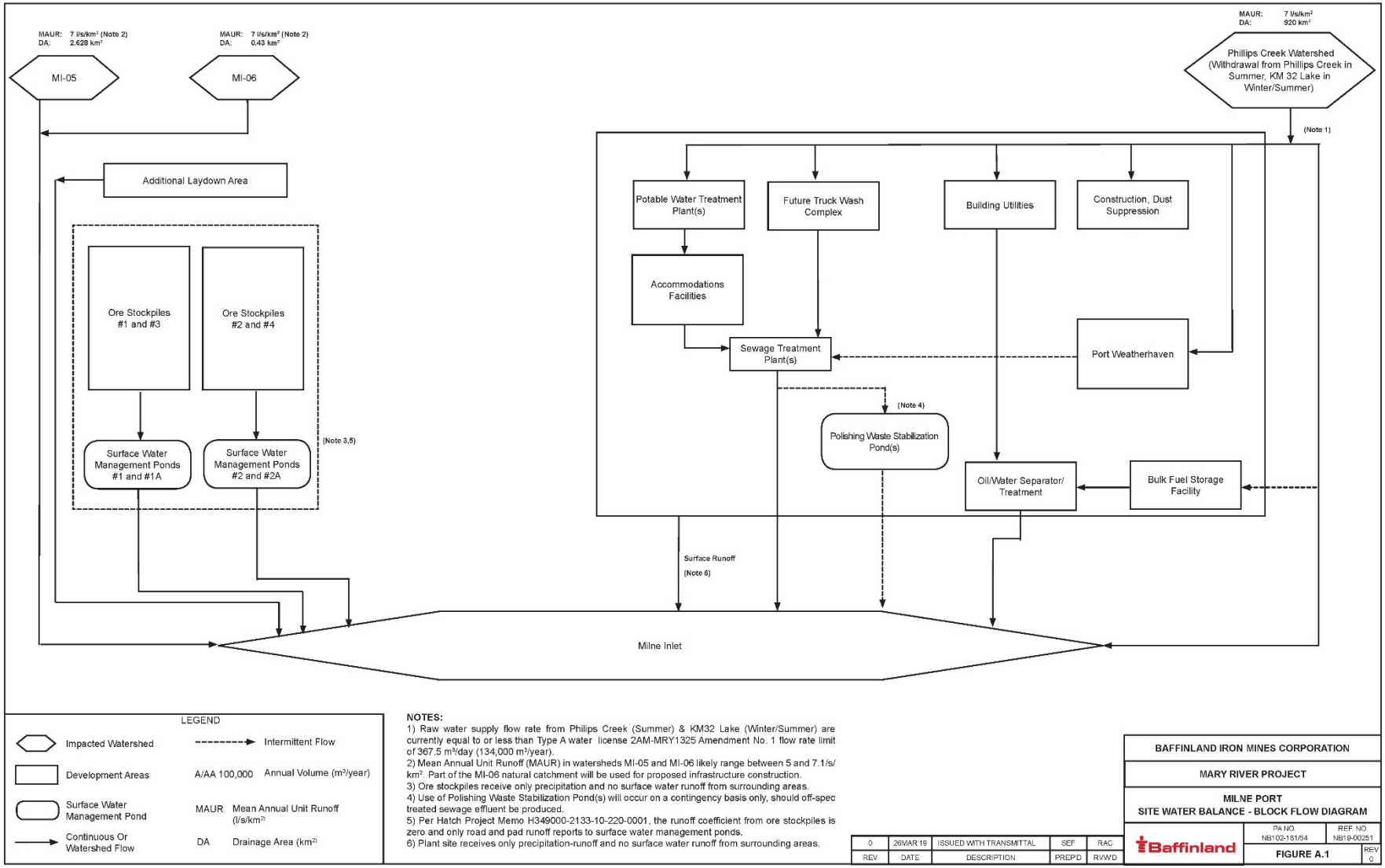
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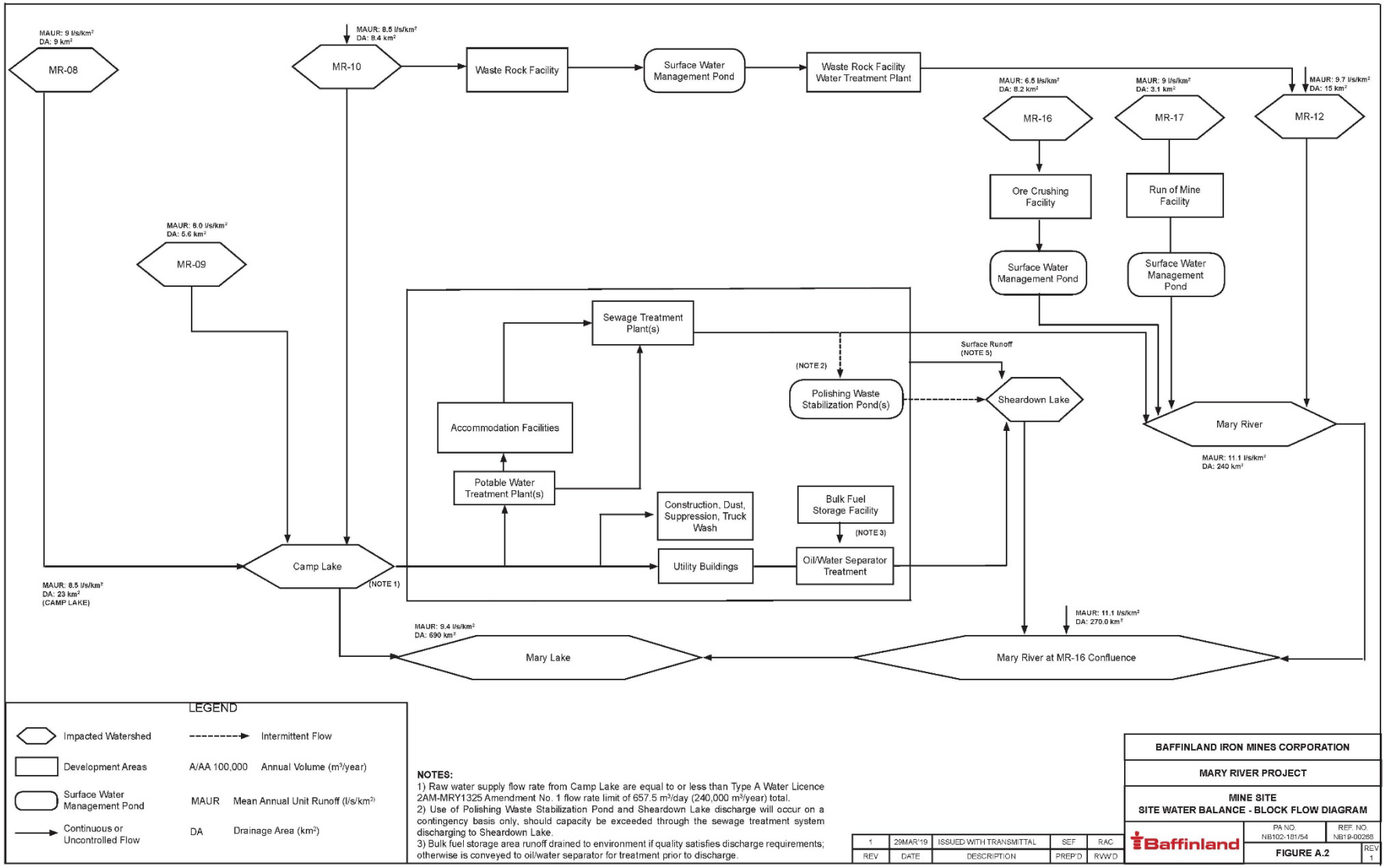
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APPENDIX D BLOCK FLOW DIAGRAMS – MILNE PORT AND MINE SITE

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APPENDIX E SEWAGE TREATMENT PLANT O&M MANUAL

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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 ☐	
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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:

Appendix A Drawings and Bill of Materials
Appendix B Packing Slip
Appendix C Testing Checklists / Pre-commissioning Test Checklist
Appendix D Spare Parts List
Appendix E Technical Specs and Brochures for Parts and Equipment
Appendix F Material Safety Data Sheets
Appendix G Glossary & Terms
Appendix H Biological Treatment & Monitoring Parameters
Appendix I Process and Chemicals Dosage Calculations
Appendix J Membrane Fouling
Appendix K newterra MicroClear™ Membrane Cleaning Log Sheet
Appendix L Alarms Troubleshooting Guide
Appendix M Process Troubleshooting Guide

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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.

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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

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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).

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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.

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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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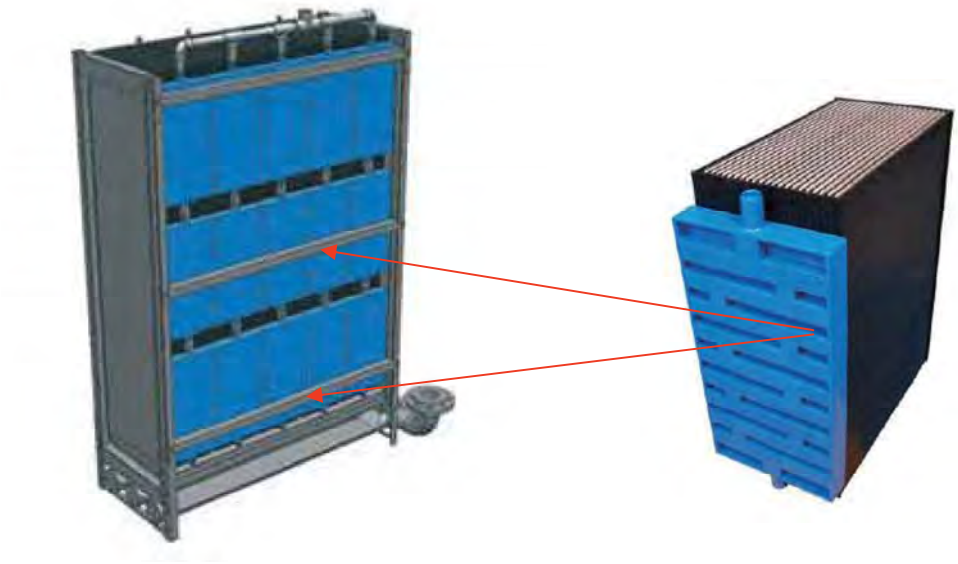
Parameters	Unit	Value	
		Mine Site WWTP	Milne Port WWTP
MBR System (including aeration tank and membrane tanks)			
Overall Effective Volume	m^3	53	
Overall HRT	h	17.7	20.2
Overall SRT	d	15	16
Internal recirculation rate: Membrane tanks →Aeration tank		4 – 5x influent flow	
Average Design Flux	LMH	18	
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*

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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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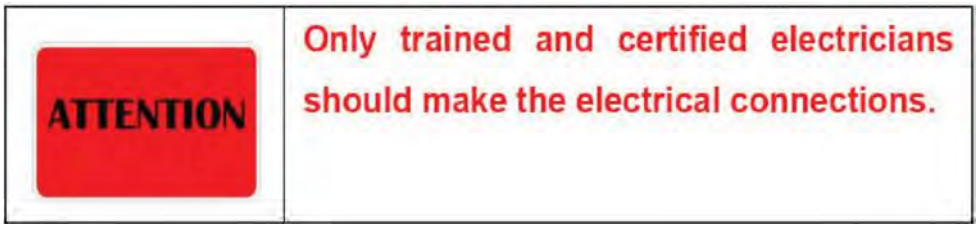
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Verify site power per system design criteria.

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;

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- Check if all the ancillary equipment and controls of the plant function as per design;
- Recalibrate instruments (if applicable);
- Perform clean water test on membranes.



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

Performing the Hydraulic Test

- Fill the system [equalization tank (TNK-301) and aeration tank (TNK-501)] with potable water, run the pumps and check for any signs of leakage.
- Perform electrical and instrumentation (E&I) functional checks and adjustment of level switches.
- Turn on the air blowers B-301/B-302/B-303/B-304/B-305/B-306 for the equalization tank (TNK-301) and blowers B-501/B-502 for the aeration tank (TNK-501), and check for:
    - Buoyancy of air diffusers and if this occurs, empty the tank and fix;
    - Air leakages: if this occurs, tighten up the fittings;
    - Manually check water temperature and DO (dissolved oxygen): with a hand-held DO meter and adjust air flow to keep it up to 0.5 – 1 mg/L for equalization tank (TNK-301) and 2- 3 mg/L for aeration tank (TNK-501); check the DO readings on the touch screen.
    - DO Control System: check automatic ON/OFF of aeration tank air blowers at low and high settings of DO without the return of aerated water from the membrane tanks to aeration tank, and record blower ON/OFF duration.

Membrane Tanks (TNK-601/TKN-602):

- Enable membrane operation.
- Start the pumps (P-501/P-502) for aeration tank and fill the membrane tank (TNK-601) with potable water.
- Start the air blowers (B-601/B-602/B-603/B-604/B-605) for membrane tank (TNK-601) and blowers (B-606/B-607/B-608/B-609/B-610)for membrane tank (TNK-602) and check for an even distribution of air across the membrane filter area and air bubble uniformity above the membrane modules/cassettes.

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- Check hydraulic flow pattern through the membranes and between membrane modules/ cassettes and tank wall.
- Make a clean copy of the **Clean Water Testing Sheet** presented in **Appendix K** of this O&M Manual.
- Start the permeate (vacuum) pumps P-701/P-702
- Record all checked parameters in the **Clean Water Testing Sheet:**
    - Record the vacuum (TMP) on gauges PI-701/PI-702 [for clean water could be 0.05 to 0.07 bar (20" to 29" WC)].
    - Record ambient temperature, and water temperature and DO with a hand-held DO meter.
    - Gradually increase the permeate flow while recording the vacuum (TMP) on the gauges up to the anticipated peak wastewater flow.
- Forward a complete **Clean Water Testing Sheet** to **newterra** for analysis.

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5.0 OPERATION of newterra MicroClear™ MBR

Membrane Bioreactor (MBR) treatment technology is an effective combination of an activated sludge biological treatment process with MicroClear™ MBR membrane filtration technology. The MBR operates at MLSS (mixed liquor suspended solids) concentrations between 8,000 to 12,000 mg/L.

This section provides a brief description of the treatment process and how it is controlled. Most of the equipment in the **newterra** WWTP can be operated in either manual or automatic mode. The system is designed to always run in auto mode. The manual option is provided mainly for maintenance purposes. Equipment and instrumentation identification numbers are referenced from the **Process & Instrumentation Diagram** and **System Layout** presented in **Appendix A** of this O&M Manual.

Automatic Operation

The PLC-based control system is the default operation mode for the **newterra** MicroClear™ MBR. The system operates as a programmable computer that:

- Receives analog and digital input signals from the switches and transmitters being controlled;
- Processes this information using the structure and rules entered into the program;
- Generates outputs that control the equipment - turn equipment **OFF** or **ON**.

Under normal operation, all switches are set in the **AUTO** position on the **HMI**.

All alarms are visually indicated on a beacon stack on the roof of the exterior of the container:

- Green – System OK
- Green Flashing – System Auto Restart
- Red Solid – Warning Alarm
- Red Flashing – Critical Alarm
- No Light – Loss of Power

The MBR will always remain in auto run mode, unless the kill switch is pressed or power is down. The MBR will automatically restart after power failure given that the system was running when the power failed.



All high high level alarms (identified as LSHH on P&ID) indicate a critical situation for imminent tank overflow and could result in pump(s) shutting off to avoid overflow situations and requires immediate operator attention.

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Manual Operation

The manual mode of operation is provided for maintenance purposes and for emergency operation of the plant in the unlikely event of a failure of the automatic control system (default operation mode). Operators **must be present when equipment is operated in the manual mode.**

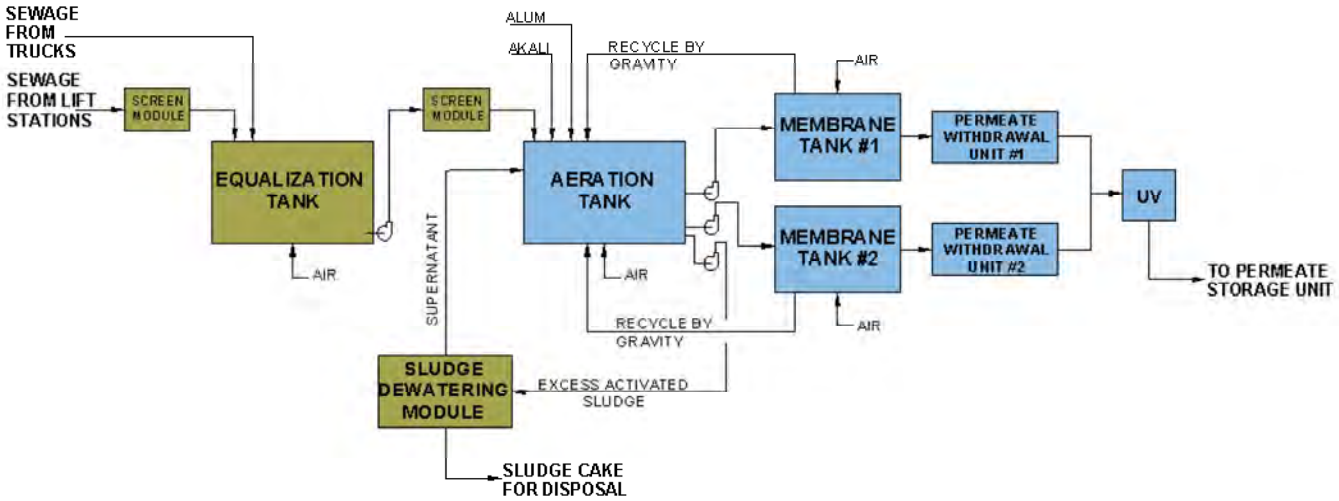
A HAND-OFF-AUTO (H-O-A) switch is provided on the touch screen of the control panel. The HAND position on the switch allows the equipment to be operated in the manual mode.



For safety reasons, a motor in the HAND position will only run for two minutes before it will be automatically stopped.

5.1 Wastewater Treatment Process Description / Control Narrative

The **newterra** MBR WWTP comprises screen modules, equalization tank, aeration tank, membrane filtration module, UV system, permeate storage tank, and sludge dewatering module.



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5.1.1 Buildings/ Utilities

The newterra MBR WWTP is housed inside six (6) enclosures (buildings):

- Screen building (BLD-7903) with two (2) rooms: Room #1 (Electrical Classification – Class 1, Div 2 area), and Room #2 (GP area)
- Equalization tank building (BLD-7901)
- Aeration building (BLD-7902), GP area
- Membrane Filtration building (BLD-7900), GP area
- Effluent building (BLD-7905), GP area
- Sludge building (BLD-7904) with two (2) rooms: Room #1 (Electrical Classification – Class 1 Div 2 area), and Office Room #2 (GP area)

The main control panel is located in the Screen building (BLD-7903), Room #2 (GP area)

5.1.1.1 Wastewater Treatment Plant Power Supply



Please refer to the as-built Electrical Block Diagram presented in Appendix A of this manual.

A power monitor has been installed in the main power distribution panel to ensure proper power and phase rotation is delivered to the system. The main power distribution panel is located in the Screen BLD-7903, Room #2 (GP area).

E-STOP

There are several emergency stop buttons wired to a common system kill circuit (KILL-7901) in the plant:

- Kill Switch Emergency Stop **MCP-01** (ESD-8201) located in the control room of the BLD-7903, Room #2, (GP area)
- Emergency Stop **MCP-02** (ESD-8202) located in BLD-7900
- Emergency Stop **MCP-03** (ESD-8203) located in BLD-7905
- Emergency Stop **MCP-04** (ESD-8204) located in BLD-7904, Room #2 (GP area)
- Emergency Stop Screen (ESD-7931) located in BLD 7903, Room #1 1 (Class 1 Div 2 area)
- Emergency Stop Membrane Filtration (ESD-7911) located in BLD-7900

The following emergency stop switches are used for local shut off:

- Emergency Stop Effluent (ESD-7905) located in BLD-7905
- Emergency Stop Sludge (ESD-7941) located in BLD-7904

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5.1.1.2 SCREEN BLD-7903

Ventilation

Two (2) exhaust blowers (B-7931 & B-7932) provide constant ventilation for the Screen Modules and Building BLD-7903 Room #1 (Electrical Classification – Class 1 Div 2 area). The air from the blowers is passed through a heat recovery system prior to discharging outside. The blowers run at all times at a rate of ~12 air changes per hour to ensure the requirements of the electrically classified location are met.

Alarms

If the blowers' motors stop running an alarm signal will be sent to the PLC from current switches (YI-7931/ YI-7932).

A single exhaust fan (F-7911) is locate in the Room #2 (GP) of the BLD-7903 where the main control panel is located. The purpose of the fan is to prevent the building temperature from climbing higher than desired room set point temperature. The desired room temperature must be set by the operator with the building high temperature switch TSH-7911. If this switch is tripped the exhaust fan will run until the temperature drops below the set point.

Note: The fan (F-7911) is to be used primarily during the summer months - freezing cold air in to the building can lead to condensation/potential freezing risks for critical pieces of equipment.

Hydrogen Sulphide Detection

A Hydrogen Sulphide (H_2S) Detector (AIT-7931) is installed in the screen building (BLD-7903) Room #1 (Electrical Classification – Class 1 Div 2 area). This sensor allows continuous monitoring for H_2S gas. In the event the H_2S alarm level set point is exceeded an alarm will be triggered and indicated on the HMI, an internal and external audible buzzer will sound, the alarm beacon light will illuminate. The water treatment process will continue to run.

Temperature control

For building (BLD-7903), temperature is controlled manually at the local thermostats of the heaters: H-7931/H-7932 for the Room #1 (Electrical Classification - Class 1 Div 2) and H-7933 for the Room #2 (GP area). They are not linked to the PLC.

The operator is required to set the desired building temperature set point in ^{o}F at the temperature switches (TSL-7931 and TSL-7932) located in the general purpose room of this building. If the building temperature falls below the temperature switch setting the electric heaters (H-7931/H-7932) will turn on. H-7933 is locally controlled only.

CAUTION: The temperature switch units are in ^{o}F.

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Alarms

If the temperature of the room #1 and room #2 in the BLD-7903 drops below the low low temperature set point, the alarm switches (TSLL-7931 & TSLL-7932) will trip and after 300 sec a low temperature alarm will register on the HMI and the red beacon light will illuminate. This may indicate that heaters (H-7931/H-7932) are faulty.

5.1.1.3 EQUALIZATION TANK BLD-7901

Ventilation

The Equalization Tank (TNK-301) is equipped with a ventilation exhaust blower (B-307) located in classified area of BLD-7903. The blower runs at all times providing constant ventilation of the equalization tank. The blower vents air at a rate of 12 air changes per hour and exhausts to the exterior of the building.

If the blower's motor stops running an alarm signal will be sent to the PLC from current indicator switch (YI-307).

5.1.1.4 AERATION TANK BLD-7902

Ventilation

The aeration tank head space is vented by a blower (B-503) to the aeration foam tank (see details in subsection 5.2.3).

5.1.1.5 MEMBRANE FILTRATION BLD-7900

Hydrogen Sulphide Detection

A Hydrogen Sulphide (H_2S) Detector (AIT-7911) is installed below the control panel in the permeate extraction system room of building 7900. This sensor allows continuous monitoring for H_2S gas. In the event the H_2S alarm level set point is exceeded an alarm will be triggered and indicated on the HMI, an internal and external audible buzzer will sound, the alarm beacon light will illuminate. The water treatment process will continue to run.

Temperature control

For building (BLD-7900), temperature is controlled manually at the local thermostats for the wall mounted heaters: H-7911/H-7912. They are not linked to the PLC.

The operator is required to set the desired building temperature set point in ^{o}F at the temperature switch (TSL-7912). If the building temperature falls below the temperature switch setting the wall mounted electric heaters (H-7911/H-7912) will turn on.

CAUTION: The temperature switch units are in ^{o}F.

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Alarms

If the temperature in the BLD-7900 drops below the low low temperature set point, the alarm switch (TSLL-7901/TSLL-7905) will trip and after 60 sec the room's temperature alarm will register on the HMI and the red beacon light will illuminate. This may indicate that heaters (H-7911/H-7912) are faulty.

5.1.1.6 EFFLUENT STORAGE BLD-7905

Temperature control

For BLD-7905, temperature is controlled manually at the local thermostat for the wall mounted heaters (H-7951/H-7952). They are not linked to the PLC.

The operator is required to set the desired building temperature set point in ^{o}F at the temperature switch (TSL-7952). If the building temperature falls below the temperature switch setting the wall mounted electric heaters (H-7951/H-7952) will turn on.

CAUTION: The temperature switch units are in ^{o}F.

Alarms

If the temperature in the BLD-7905 drops below the low low temperature set point, the alarm switch (TSLL-7951) will trip and after 60 sec a building temperature alarm will register on the HMI and the red beacon light will illuminate. This may indicate that heaters (H-7951/H-7952) are faulty.

5.1.1.6 SLUDGE BLD-7904

Ventilation

Building (BLD-7904), Room #1, Class 1 Div 2 is equipped with an exhaust blower (B-7941). The blower runs at all times providing constant ventilation of the room. The blower vents air at a rate of 12 air changes per hour. The air from the blower (B-7941) is passed through a heat recovery system prior to discharging outside the BLD-7904.

If the blower's motor stops running an alarm signal will be sent to the PLC from current (YI-7941).

Temperature control

For BLD-7904, temperature is controlled manually at the local thermostats for the wall mounted heaters: H-7941/H-7942 for the Room #1, Class 1 Div 2 and H-7943 for the Room #2 General Purpose. They are not linked to the PLC. There are temperature switches in the BLD-7904: TSL-7941/TSL-7942 for the Room #1 (Class 1 Div 2).

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Alarm

Alarm switch (TSLL-7941) is activated when the temperature falls below set point. This may indicate that heaters (H-7941/H-7942) are faulty.

Compressed air

Air compressor (C-901) supplies air to operate the filter press (FP-901). The air compressor has level switches:

- an oil level switch alarm (LSLL-901) is activated when the oil level is low
- if pressure switch (PSL-901) is activated an alarm will register on the HMI indicating the air compressor has malfunctioned.

5.1.1.7 FIRE AND EXPLOSION PROTECTION

There are some areas in the plant defined as Class 1 Div 2 according to the National Electrical Code Classification (NFPA 70). These areas are:

- Screen building (BLD-7903), Room #1
- Equalization tank zone, (BLD-7901)
- Sludge building (BLD-7904), Room #1

This classification refers to the areas with potential hazards as flammable gas which is not present under normal conditions.

Fire alarm system is implemented across the plant. The fire protection measures include fire alarm system (FAS), fire detection system (FDS), and portable fire extinguishers. Please refer to the Fire Alarm Layout Drawing presented in Appendix A of this manual.

5.1.2 Process Description

5.1.2.1 Screen Modules Building (SCREEN BLD-7903)

Function: a screening process is provided to remove hair, and fibrous materials from wastewater supplied from the lift stations and delivered by sewage trucks.

There are two (2) screen systems in the plant:

- screen module (SCR-201) for screening incoming raw sewage pumped from lift stations
- screen module (SCR-401) for screening effluent from equalization tank (TNK-301) taking into account addition of raw sewage delivered by sewage trucks and added into the equalization tank (TNK-301)

Both screen modules are located in the building (BLD-7903), Room #1 (Class 1 Div 2 area).

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Screw Screen Compactor (SCR-201)/Screen Tank

The screw screen compactor module consists of:

- screw screen compactor with 2-mm opening, equipped with solids bagging
- discharge tank (TNK-202) for collection of the screened wastewater
- external discharge pumps (P-201/P-202) to transfer screened wastewater to the equalization tank (TNK-301)
- self cleaning spray nozzles set on a timer through the HMI

Screw Screen Basin Level Control

The screw screen (SCR-201) will run when the permissive signal (YC-101) to receive from the lift station is ON, and the high level in the screen tank has been reached. If the high level in the screw screen basin has been reached this indicates the screen is clogged. The screw will continue to turn for 2 minutes after the high level condition has cleared.

Screened wastewater flows by gravity from screw screen basin to the screen discharge tank (TNK-202) through 6" discharge pipe.

Alarms

If the clogged screen cannot be cleared and the high high level in the screw screen basin is reached the LSHH-201 will trip. If the LSHH-201 level switch is tripped, an alarm will be generated and will remain visible on the HMI until the alarm condition has cleared. The permissive to receive wastewater from the lift station will be lost. **Operator intervention is required in the event of this alarm!**

In the event the SCR-201 motor trips off on overload an alarm will register on the HMI and the red beacon light will flash.

Screen Tank Level Control:

The screen discharge tank (TNK-202) is equipped with:

- (2) external discharge pumps (P-201 Duty and P-202 Standby)
- discharge pressure indicator (PI-201/ PI-202) to measure the discharge pressure
- motor current switch (YA-201 /YA-202)
- variable frequency drive (VFD-201/VFD-202)
- discharge tank (TNK-202) is equipped with level transmitter (LT-202) and high high level switch (LSHH-202)

After completion of 4 cycles the standby pump will run for 1 cycle. Each time a pump starts the cycle count goes up. As long as the wastewater level in TNK-202 is between the high and low set point, the PLC will allow the operation of the pumps (P-201/P-202) to transfer wastewater to the equalization tank (TNK-301).The VFD's regulate the flow of the pumps to keep the discharge flow rate at the desired set point flow.

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If current switches (YA-201/YA-202) are ON and level transmitter (LT-202) indicates the high set point, then the pumps turn on until the level transmitter (LT-202) gets to its low set point.

If the high level set point is on for more than 5 seconds, pumps (P-201/P-202) will increase speed to clear the high level condition.

Alarms

In the event the screen tank discharge pumps motor current switches (YA-201/YA-202) trip, an alarm will register on the HMI and the red beacon light will flash.

Screen Cleaning:

A potable water connection to the screw screen compactor unit (SCR-201) is used to clean the screw screen. A solenoid valve (SV-201) is controlled on a timer to open the solenoid valve for 2 seconds every 60 minutes, with the goal of removing solid build up on the screw screen. Frequency of cycle can be changed through the HMI.

5.1.2.2 Equalization Tank (TNK-301)

Function: Buffers influent variable flow to prevent concentration fluctuations in (i.e. BOD, TSS etc.) through the MBR treatment system.

The equalization tank (TNK-301) receives screened wastewater from the screen tank (TNK-202). The equalization tank (TNK-301) can also receive raw wastewater from the sewage trucks. There are two truck hook-ups from the screen building (BLD-7903) side equipped with 3" female camlocks, valves and 3" PVC pipes.

WARNING: NO CONTROLS ARE IN PLACE TO SHUT OFF TRUCK INFLUENT TO THE EQUALIZATION TANK IN THE EVENT OF A HIGH OR HIGH HIGH LEVEL CONDITION IN THE EQUALIZATION TANK. THE LEVEL OF THE EQ TANK MUST BE MANUALLY MONITORED AT ALL TIMES DURING THE OFFLOADING OF TRUCKS.

The effective volume of the EQ tank is 43.5 m^3, providing a hydraulic retention time of 14.5 hours. The equalization tank is equipped with:

- level monitoring/control equipment
- 2 electric immersion heaters with local temperature control
- blowers (B-301to B-306) supply air to the air diffusers
- 10 EDI fine-bubble air diffusers for mixing and assisting the elimination of potential odour
- 12 magnesium anodes which act as the tank ground and will be sacrificially eroded as a means of prolonging the tank life
- discharge pumps (P-301/ P-302) for transferring wastewater to the SCR-401

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Air Diffusers Control

Blowers (B-301- B-306) supply air to the air diffusers installed in the bottom of the equalization tank. A pressure indicator (PI-301) and switch (PLS-301) is installed on the discharge side of the blowers.

Alarms

If the blower air pressure drops below set point, the low pressure switch (PLS-301) will trip and a low pressure alarm will be activated through the PLC. The flashing red beacon light will illuminate.

Temperature Control

The equalization tank (TNK-301) is heated via 2 electric immersion heaters (H-301/H-302).Temperature in the tank is controlled via a local thermostat. Recommended temperature setting for TSL-301/TSL-302 is 10^{o}C to 15^{o}C.

Alarms

If the Temperature Switch Low Low (TSLL-301) is tripped an alarm signal will register on the HMI and the flashing red beacon light will illuminate.

Note: As a low water level in the tank can cause damage to the heaters, the Level Switch Low Low (LSLL-301) is installed in the equalization tank to protect the immersion heaters and if tripped will shut the tank heaters off and initiate an alarm signal from the PLC.

Transfer Pumps/Level Control

The equalization tank (TNK-301) has two (2) external pumps (P-301, P-302) with one of the pumps acting as a standby. Pump (P-301) operates for 4 cycles, pump (P-302) for 1. This pump transfers the wastewater from the equalization tank (TNK-301) to SCR-401 screw screen basin tank.

The equalization tank discharge pumps (P-301/P-302) have local pressure indicators (PI-302/PI-303) to measure discharge pressure and motor current switches (YI-301/YI-302). The discharge pressure can be used to determine an estimation of the flow rate based on the pump curve.

A level transmitter (LT-301) is used to indicate the liquor level in the equalization tank (TNK-301). As long as the level in the tank is above set point, the PLC will allow the operation of either EQ tank discharge pump (P-301 or P-302). If the high level in the EQ tank is met the screen tank supply pumps will be turned off.

Alarms

In the event the equalization tank discharge pumps motor current switches (YI-401/YI-402) trip, an alarm will register on the HMI and the red beacon light will flash.

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The Level Switch High High (LSHH-301) if tripped will send a signal to the PLC to warn of imminent overflow in the equalization tank (TNK-301).

Post EQ Screw Screen Compactor (SCR-401)

The screw screen compactor module consists of:

- screw screen compactor with 2-mm opening, equipped with solids bagging
- discharge tank (TNK-401) for collection of the screened wastewater
- external discharge pumps (P-401/P-402) to transfer screened wastewater to the aeration tank (TNK-501)
- self cleaning spray nozzles set on a timer through the HMI

Screw Screen Basin Level Control

The screw screen (SCR-401) will run when the high level in the screen tank has been reached. If the high level in the screw screen basin has been reached this indicates the screen is clogged. The screw will continue to turn for 2 minutes after the high level condition has cleared.

Screened wastewater flows by gravity from screw screen basin to the screen discharge tank (TNK-401) through 6" discharge pipe.

Alarms

If the clogged screen cannot be cleared after 5 minutes a high high level alarm (LSHH-402) will be triggered and will remain visible on the HMI until the alarm condition has cleared. The permissive to receive wastewater from the equalization tank (TNK-301) will be lost. **Operator intervention is required in the event of this alarm!**

In the event the SCR-401 motor trips off on overload an alarm will register on the HMI and the red beacon light will flash.

Screen Tank Level Control:

The screen discharge tank (TNK-401) is equipped with:

- (2) external discharge pumps (P-401 Duty and P-402 Standby)
- discharge pressure indicator (PI-401/ PI-402) to measure the discharge pressure
- motor current switch (YA-401 /YA-402)
- discharge tank (TNK-401) is equipped with a low level switch(LSL-402), high level switch (LSH-402) and a high high level switch (LSHH-202)

After completion of 4 cycles the standby pump will run for 1 cycle. Each time a pump starts the cycle count goes up. As long as the wastewater level in TNK-401 is above the low level switch level, the PLC will allow the operation of the discharge pumps (P-401/P-402) to transfer wastewater to the equalization tank (TNK-301).

Alarms

In the event the screen tank discharge pumps motor current switches (YA-201/YA-202) trip, an alarm will register on the HMI and the red beacon light will flash.

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Screen Cleaning:

A potable water connection to the screw screen compactor unit (SCR-401) is used to clean the screw screen. A solenoid valve (SV-401) is controlled on a timer to open the solenoid valve for 2 seconds every 60 minutes, with the goal of removing solid build up on the screw screen. Frequency of cycle can be changed through the HMI.

5.1.2.3 Aeration Tank (AERATION BLD-7902)

Function: Oxygen is added to the wastewater to ensure microorganism concentration is at optimum levels to metabolize contaminants. (i.e. oxidation of carbonaceous BOD; nitrification (conversion of TKN to NO_3-N).

One (1) aeration tank (TNK-501) located in BLD-7902 has an overall effective volume of 48 m^3, providing a hydraulic retention time of 16 hours. TNK-501 receives screened wastewater from the screen tank (TNK-401) of the post EQ screen module (SCR-401), return flow from the membrane tanks (TNK-601/ TNK-602), and supernatant from (TNK-901) of sludge dewatering module.

Blowers supply air to the submerged fine-bubble diffusers to ensure biological oxidation (aeration) and to keep solids in the water suspended. Mixed liquor is constantly re-circulated from the bottom of the tanks to the top through spray nozzles. This recirculation process is in place for foam suppression. Alum and soda ash chemical metering systems are in place to ensure regulation of aeration tank water pH and phosphorus levels.

The aeration tank (TNK-501) is equipped with:

- level, temperature, pH, and dissolved oxygen (DO) monitoring and control equipment.
- 2 electric immersion heaters (H-501/H-502) to keep the temperature of the biological process above 15-20° C.
- Blowers (B-501, B-502) equipped with VFD's to supply air to the fine-bubble air diffusers in (TNK-501)
- 30 EDI fine-bubble air diffusers
- Tank recirculation/sludge removal pump (P-503)
- Tank discharge pumps (P-501/P-502) transfer wastewater to the membrane tanks (TNK-601/TNK-602)
- Chemical Metering Systems – soda ash tank (TNK-6101) with dosing pump (P-6101) and alum tank (TNK-6102) with dosing pump (P-6102)

<u>Temperature Control</u>

The aeration tank (TNK-501) is heated via electric immersion heaters (H-501/H-502). Temperature in the tank is controlled via a local thermostat. Recommended temperature setting for TSL-301/TSL-302 is 15°C to 20°C.

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Alarms

If the Temperature Switch Low Low (TSLL-501) is tripped an alarm signal will register on the HMI and the flashing red beacon light will illuminate.

Note: As a low water level in the tank can cause damage to the heaters, the Level Switch Low Low (LSLL-501) is installed in the equalization tank to protect the immersion heaters and if tripped will shut the tank heaters off and initiate an alarm signal from the PLC.

Discharge Pump/Level Control

The aeration tank (TNK-501) has two (2) external transfer pumps (P-501, P-502). Pump (P-501) transfers wastewater to membrane tank (TNK-601) and pump (P-502) transfers wastewater to membrane tank (TNK-602).

Level transmitter (LT-501) indicates the liquor level in the aeration tank (TNK-501). As long as the level in the tank is above set point the PLC will allow the operation of both discharge pumps (P-501 or P-502).

Alarms

If the Level Switch High High (LSHH-501) is tripped an alarm will register on the HMI, the flashing red beacon light will illuminate and the equalization discharge pumps will be shut down or disabled from running for the duration of the high high level condition.

The aeration tank discharge pumps (P-501/P-502) have pressure indicators (PI-501/PI-502) to measure discharge pressure and motor current switches (YA-P501/YA-P502). The discharge pressure can be used to determine an estimation of the flow rate based on the pump curve.

Alarms

In the event the aeration tank discharge pumps motor current switches (YA-P501/YA-P502) trip, an alarm will register on the HMI and the red beacon light will flash.

Dissolved Oxygen Control

The aeration tank (TNK-501) is equipped with a dissolved oxygen (DO-501) sensor. The PLC is programmed to ensure the level of DO remains above 2 mg/L. If the level of DO falls below the set point value a 4-20 mA signal is sent to the VFD (VFD-501) that controls the speed of the blowers (B-501, B-502).The speed of the blowers is regulated to maintain the DO at set point level.

Alarms

In the event the Dissolved Oxygen level set point cannot be achieved within 15 minutes of the detection of the level being outside of the set point range a low DO alarm will register on the HMI and the red beacon warning light will illuminate. The duty blower will run at full speed for

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15 minutes to attempt to regain the oxygen level. If after 15 minutes the oxygen level has not returned to below set point the duty blower defaults to a manual speed setting until operator intervention is possible.

pH Control

A chemical dosing pump (P-6101) is provided to inject soda ash (Na_2CO_3) into the aeration tank (TNK-501) to maintain the pH at desired pH set point. If the pH measured by pH probe (PH-501) falls below set point, the PLC will turn the pump on for 30 seconds, turn the pump off for 30 seconds and repeat this cycle until tank pH has regained desired set point. The pump stroke must be set by the MBR system operator.

Alarms

In the event the pH level set point cannot be achieved a low or high pH alarm will register on the HMI and the red beacon warning light will illuminate. The system will continue to adjust to achieve set point pH throughout the duration of the alarm.

Phosphorus Concentration Control

A chemical dosing pump (P-6102) is provided to inject alum [$Al_2(SO_4)_3$]. The dosing pump will be stroked based on an influent volume set point entered on the HMI by the system user. Alum is used to remove phosphorus from the influent. The alum dosage volume is manually set locally at the metering pump by adjusting the pump stroke.

Foam Suppression

The aeration tank (TNK-501) is equipped with an external pump (P-503) and a spray nozzle system for foam suppression. The pump (P-503) has a pressure indicator (PI-503) measuring its discharge pressure. The flow is controlled by opening a manual gate valve installed in the foam suppression line. The foam suppression line is equipped with a de-ragger unit to prevent spray nozzles from plugging.

Sludge Dewatering Unit Supernatant Return

Supernatant can be returned to the aeration tank (TNK-501) if the MBR system is operating in conjunction with a sludge dewatering system. Supernatant will be returned as long as the aeration tank level is below the High Level set point. The PLC will shut down pump (P-503) for the duration of the return cycle.

Sludge Removal

A sludge removal pipeline is provided at a tee off of the aeration tank recirculation line, isolated by a manual ball valve. The manual isolation valve must remain closed at all times. To remove sludge the manual isolation valve is opened along with the manual isolation valve at the entrance of TNK-901, while P-503 is running.

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5.1.2.3 Membrane Filtration (TNK-601/602)

Function: Mixed liquor filtration and supplemental biological oxidation.

Membrane filtration is comprised of a membrane tank and permeate extraction unit

Membrane unit includes:

- Two (2) membrane tanks, each tank is equipped with submersible membrane filtration module, level controls, gravity recycling line, drain, access hatch, viewing window, and sample port
- Blower unit for membrane tanks; each unit contains five (5) blowers and it is equipped with pressure indicator, pressure switch low alarm, and motorized three-way valve
- Recirculation pumps transferring mixed-liquor from the membrane tanks (TNK-601/TNK-602) to the aeration tank (TNK-501)

Permeate extraction unit includes:

- Permeate pumps (P-701/P-702) with VFD, current switches, pressure and flow rate control equipment, solenoid valves, and motorized valves
- Backwash tank (T-801) equipped with level control switches, submersible pump (P-801), and solenoid valve
- UV disinfection unit with two (2) UV lights (UV-751/UV-752)

Membrane Unit Operation

External pumps (P-501/P-502) housed in (BLD-7900) transfer mixed liquor from the aeration tank (TNK-501) to the membrane tanks (TNK-601/TNK-602). Each membrane tank contains One (1) MicroClear™ MB3-1 submerged membrane module (membrane cassettes are complete with stainless steel housing and permeate piping with header).

Each membrane tank is equipped with air diffusers for the purpose of scouring the membranes to assist in the prevention of membrane fouling.

Mixed liquor from the membrane tanks (TNK-601/TNK-602) is constantly recycled back to the aeration tank (TNK-501) by external pumps (P-601/ P-602) to maintain even biomass inventory within the aeration tank and membrane tanks.

Each of the respective pumps (P-601/P-602) are equipped with pressure indicators (PI-603/PI-604) to measure the discharge pressure of the pumps, and current switches (YA-601/YA-602). The membrane tanks are also equipped with gravity overflow lines that recycle mixed liquor back to the aeration tank (TNK-501).

Membrane Tanks Level Control

The membrane tanks (TNK-601/TNK-602) contain high level switches (LSH-601/LSH-602) which activate the permeate pumps (P-701/P-702) to start pulling permeate out of the membrane tanks (TNK-601/TNK-602).

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Alarms

The level switches high high alarm (LSHH-601/LSHH-602) inform the operator of an imminent overflow. It also shuts off the aeration tank discharge pumps (P-501/P-502) to prevent more mixed liquor from entering the membrane tank (TNK-601/TNK-602).

Recycle Pump Control

Recycle (RAS) pumps (P-601/P-602) recycle mixed liquor from membrane tanks (TNK-601/TNK-602) back to the aeration tank (TNK-501) as long as the discharge pumps (P-501/P-502) are on, water level switches in the membrane tanks (LSH-601/LSH-602) are ON, and there is no High High Level in aeration tank.

Alarms

In the event the RAS pumps motor current switches (YA-601/YA-602) trip, an alarm will register on the HMI and the red beacon light will flash.

Blower Units Control

The membrane air scouring blowers (B-601 to B-605 for TNK-601 and B-606 to B-610 for TNK-602) are connected to the air diffusers in the membrane tanks (TNK-601/TNK-602) respectively. The common airlines to the membrane tanks are equipped with a discharge pressure indicators (PI-601/PI-602) and a pressure switches (PSL-601/ PSL-602).

Each blower unit is also equipped with an electrically actuated three-way valve (MV-601/ MV-602) to direct the flow of air through medium air diffusers or coarse air diffuser. The valves (MV-601/MV-602) are installed with closed position switches (ZSC-601/ZSC-602) that is monitored by the PLC.



The blowers scouring the membranes:

- Operates continuously **(24/7)**
- Turned off for one minute every hour to relax the membranes

Coarse Air Diffuser Cycle

Under normal operation, air is directed through the medium air diffusers at the base of the membrane housing. If the level switch high (LSH-601) has not been reached in 30 minutes, the air is diverted to the coarse air diffusers in the membrane tank. Changing where air enters into the membrane tank (TNK-601) changes the direction of scouring, helping remove debris on the membrane modules/cassettes.

The air will be directed to the coarse air diffusers for the time interval set point entered through the HMI. The duration of the coarse air diffuser cycle time is adjustable up to 15 minutes, by changing the set point on the HMI screen to meet the particular plant operating conditions.

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Blower for scouring air must be on 24/7, as failure of air supply can lead to clogging of the air diffusers and membranes.

Alarms

If the pressure switches low alarm (PSL-601/PSL-602) are tripped, a signal will be sent to the PLC which will generate an alarm indicating a potential blowers (B-601 to B-610) malfunction which will cause the corresponding membrane permeate tank discharge pumps (P-701/P-702) to stop. This interlock is in place to prevent damaging the membranes.

Please note: At no time shall the vacuum pumps P-701/P-702 operate when the pressure switches (PSL-601/PSL-602) are active; this is to ensure that air for membrane scouring is available at all times, and to protect the membranes from fouling.

Permeate Extraction Unit Operation

Vacuum pumps (P-701/ P-702) draw the water through the membranes under a preset flow rate of 31.5 Lpm (at a design flux of 18 LMH). Permeate is run through UV system for final disinfection before entering permeate storage tank (TNK-811).

Permeate Flow Control

There are two (2) operational modes for permeate flow control, flow mode (constant flux mode) or vacuum mode (constant TMP mode).The operator has the option of selecting the permeate flow control mode on the screen. Flow transmitters (FT-701/FT-702) are installed on the permeate discharge line to measure the effluent flow from each membrane tank.

Flow Mode (default for newterra MBR)

- Normal permeate flow rate is 31.5 Lpm (corresponds to a design flux rate of 18 LMH)
- This setpoint is used for vacuum pumps (P-701/P-702) VFDs control
- The maximum permeate flow setpoint is 52.5 Lpm (corresponds to a maximum flux rate of 30 LMH)
- The operator has the option of changing the permeate flow rate on the screen, but the set point should not be greater than 31.5 Lpm under normal operating condition and cannot exceed 52.5 Lpm, at any given time

Note: If the vacuum reaches -0.250 bar the system automatically switches to Vacuum Mode.

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Vacuum Mode

There are two vacuum set points for the permeate withdrawal system:

- Normal vacuum rate to pull the permeate out at a pre-set vacuum setpoint of -0.100 bar
- Higher vacuum rate (-0.120 bar) is used when the EQ tank's high level (LSH-301) is on, signalling the MBR to run at a higher vacuum to keep up with the incoming water
- The highest vacuum of the permeate extraction system is -0.300 bar

Permeate Discharge Pump Control

The permeate discharge pumps (P-701/P-702) will run continuously as long as the high level switches (LSH-601/P-602) in the membrane tanks (TNK-601/TNK-602) are activated. Permeate withdrawal is done based on the preset permeate normal flow rate or vacuum rate.

If the level switch (LSH-301) in the equalization tank (TNK-301) is active for more than 5 seconds, permeate pumps (P-701/P-702) start increasing the permeate flow rate using the variable frequency drives (VFD-701/VFD-702). The trans-membrane pressure (TMP) indicated by vacuum transmitters (VT-701/VT-702) and the calculated permeability are displayed on the touch screen. The permeability is a key indicator of membrane fouling state.

Membrane Relax Cycle

- After every 9 minutes of permeate flow the permeate discharge vacuum pumps (P-701, P-702) will stop and the electrically actuated valves SV-701/SV-702 will open to release vacuum through the membranes.

- The resulting removal of vacuum in the system allows the membranes to relax for 1 minute.

Membrane Backwash Cycle

- When necessary conditions have been met the backwash tank sump pump (P-801) will be activated, permeate pumps (P-701/P-702) shut off and the backwash supply valves (MV-701/MV-702) open, to allow the reversal of flow over the membrane surface.

- The duration of the relax and backwash time is adjustable by changing the set point on the **HMI** screen to meet the particular plant operating conditions. A combination of backwash and relaxation (no permeation) is carried out for the best performance of the membranes.



- Maximum head required for backwash is **one meter**.
- During the entire backwash cycle, the scouring of the membranes is continuous.

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At design flow when the membrane discharge vacuum exceeds 0.2 bar/80" WC (transmitted by VT-701, and indicated locally at PI-701), or permeability drops rapidly to 50 LMH/bar, it is necessary to take the membrane tanks (TNK-601/TNK-602) offline for chemically enhanced backwash **(CEB)** cleaning (please refer to Section 7 of this O&M manual)..



The permeability is a key indicator of membrane fouling state. A permeability of less than 50 LMH/bar (or transmembrane pressure exceeding 0.2 bar) indicates a membrane chemical clean is required.

A chemical addition unit is provided in the building (BLD-7900) for membrane in-situ chemically enhanced backwash (CEB) and recovery cleaning. The unit includes:

- Citric acid tank (TNK-802) with chemical dosing pump (P-802)
- Sodium hypochlorite tank (TNK-803) with chemical dosing pump (P-803)

Backwash Tank

The backwash tank (TNK-801) has 3 level switches (LSL-801, LSH-801, LSHH-801). When the low level switch LSL-801 is tripped this indicates a low water level in the backwash tank. Solenoid valve (SV-801) will open to fill the tank to the high level switch (LSH-801).

Alarms

LSHH-801 indicates imminent overflow. An alarm signal will register on the HMI and the flashing red beacon light will illuminate. **Operator intervention is required**.

Disinfection System

The MBR permeate is run through UV system for final effluent disinfection. The disinfection system consists of two high intensity UVmax Lights (UV751/ UV752) installed in series. The UVmax lights provide disinfection with a UV dosage of 40 mJ/cm^2 and a flow rate of 303 L/min. This system is installed for protection in the event of a membrane breakthrough. The UV-Lights are connected to a solenoid safety (UVL-751, UVL-752) to restrict the flow in case the UV-Light system have been compromised.

Turbidity Meter

Turbidity transmitter (AIT-801) connected after the UV systems indicates the turbidity (solids content) in the treated effluent. High turbidity will activate an alarm as this can indicate possible breakthrough of the membranes.

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5.1.2.4 Permeate /Treated Effluent Building (EFFLUENT BLD-7905)

Function: Treated effluent storage**,** ammonia oxidation with calcium hypochlorite followed by dechlorination.

Prior to final discharge to the receiving water body the treated effluent will be tested. In the event the biological process upset occurs, due to a toxic shock load or cold weather, it may result in a discharge of ammonia or total nitrogen into the receiving water body. Therefore, calcium hypochlorite addition system is supplied as a stand-by solution for ammonia removal in the wastewater. The sodium bisulfite dosing system is used for dechlorination.

The treated effluent from UV lights is stored in four (4) identical storage tanks (TNK-811, TNK-812, TNK-813, TNK-814). All tanks are connected with 3" PVC pipes.

Calcium Hypochlorite Concentration Control

Chemical dosing system including calcium hypochlorite tank and dosing pumps (P-813 Duty / P-814 Standby) is provided to inject calcium hypochlorite [$Ca(ClO)_2$] to the tank (TNK-811). The calcium hypochlorite dosage rate is manually set locally at the metering pump by adjusting the pump stroke. The operator must determine what the dosage rate needs to be and manually set the stroke at the pump and enter influent flow rate set point through the HMI.

The calcium hypochlorite tank is equipped with low level switch alarm (LSLL-815) indicating if tank is empty; this is to protect dry running of the pumps (P-813/P-814).

Effluent Storage System Discharge pumps / Level control

The storage tanks have two (2) external pumps (P-811 Duty / P-812 Standby) for sending treated effluent to final discharge. Each pump is equipped with discharge pressure indicator (PI-811/ PI-812) to measure the discharge pressure and motor current switch (YA-811 /YA-812).

Tank (TNK-814) is equipped with a high level switch (LSH-814) and low level switch. As long as the water level in the tank is above the low level height, pumps (P-811/P-812) will run.

Alarms

All effluent storage tanks (TNK-811/TNK-812/TNK-813/TNK-814) are equipped with level switches alarm (LSHH-801/LSHH-802 /LSHH-803/LSHH-804) for indicating imminent overflow; an alarm signal will register on the HMI and the flashing red beacon light will illuminate, operator intervention is required.

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Sodium Bisulfite Concentration Control

Chemical dosing system including sodium bisulfite tank and metering pumps (P-815 Duty / P-816 Standby) is provided to inject sodium bisulfite [$Na_2S_2O_5$] to the discharge line for effluent dechlorination. The sodium bisulfite dosage rate is manually set locally at the metering pump by adjusting the pump stroke. The operator must determine what the dosage rate needs to be and manually set the stroke at the pump and enter influent flow rate set point through the HMI.

The sodium bisulfite tank is equipped with low level switch alarm (LSLL-815/LSLL-816) indicating if tank is empty; this is to protect dry running of the pumps (P-815/P-816).

5.1.2.5 Sludge Treatment Module (SLUDGE BLD-7904)

Excess waste activated sludge (WAS) from the aeration tanks (TNK-501) is pumped to the sludge treatment module housed inside container (SLUDGE BLD-7904), Room#1 Cl1 Div 2.

Sludge treatment module includes:

- Polymer tank (TNK-902) with mixer (M-902), and polymer transferring pump (P-902)
- Sludge mixing tank (TNK-901) equipped with level control switch, mixer (M-901), and transferring pump (P-901)
- One (1) Filter Press unit equipped with air driven hydraulic pump, and sludge dumpster
- Supernatant tank (TNK-903) equipped with level control switches, and supernatant transferring pump (P-903)
- Air compressor (C-901) equipped with oil level switch and pressure switch; air compressor located in Room #2 GP of the building (SLUDGE BLD-7904)

Polymer preparation unit

The polymer unit is used for preparation and dosing polymer solution into the mixing tank (TNK-902) for sludge treatment. The batch-wise polymer preparation process includes:

- Hydration stage, when dry polymer is added to the tank for mixing with potable water
- Blending the polymer to a homogenous and activated solution, when the gentle agitation/mixing is provided
- Dosing the polymer activated solution into the sludge mixing tank (TNK-901) for sludge treatment using air diaphragm pump (P-902)

The mixer (M-902) and the pump (P-902) are driven by compressed air supplied by air compressor (C-901). Compressed air lines are equipped with pressure indicators (P-901/P902) to measure pressure in the air lines. The mixer (M-902) and the pump (P-902) are operated manually.

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Sludge mixing unit

The waste activated sludge is pumped from the aeration tank (TNK-501) into the mixing tank (TNK-901) where it is mixed with the polymer solution sent by pump (P-902) from the polymer tank (TNK-902). The sludge is mixed with polymer by submersible mixer (M-911). The mixer is driven by compressed air supplied by air compressor (C-901); compressed air line is equipped with pressure indicator (P-903) to measure pressure in the air line.

Alarm

The mixing tank (TNK-901) is equipped with level switches alarm (LSHH-901) indicating imminent overflow; an alarm signal will register on the HMI and the flashing red beacon light will illuminate, operator intervention is required. If the high high condition occurs an if the sludge transfer pump is running the PLC will shit P-503 off.

Treated (flocculated) sludge is transferred from mixing tank (TNK- 901) to the filer press (FP-901) by air diaphragm pump (P-901); compressed air line is equipped with pressure indicator (P-904) for measure pressure in the air line.

Filter press

The incoming treated sludge enters the filter press (FP-901) via the center feed pipe. The center feed plates contain a recess on either side of the plates. The cylinder will be shut closed (and hence compress the plates together) with the air driven hydraulic pump and then pressurized shut with approximately 4300 PSI of pressure. When the plates are closed, a cavity is created between the plates where the sludge will be captured.

The filtered water (supernatant) exits through the filter cloth (while the solids are captured within the clothed chambers) and goes to the supernatant tank (TNK-903) by gravity.

The feed pressure of the filter press (FP-901) may start at about 25 PSI, due to the low resistance of an empty filter press. As solids accumulate in the chambers of the filter press, the feed pressure will need to be increased to maintain a stroke count of about one stroke every 1-5 seconds or until a maximum feed pressure of 100 PSI is obtained.

Once the filter press (FP-901) is filled with sludge, the feed pump (P-901) and air driven hydraulic pump are shut off and the sludge blow down process will then commence for further water removal. The air enters via air valve into the sludge chamber via the upper left hand corner of the three button plates, and exits via the bottom right hand corner of the one button plates. This process will push excess water out through the outlet manifold.

Once the sludge blown down process is complete, the filter press is ready to be opened. To open the automatic filter press, reverse the air valve on the automatic pump to allow the pump to slowly pull open the pushing plate. For opening and closing the filter press the controls are right on the hydraulics for safety reasons. It is a forward, off, reverse lever.

Now that the plates are released, index the plates one by one, and most of the sludge will fall into the sludge dumpster below the press. A sludge spatula is provided to aid in the sludge removal.

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Once all plates are clean, the filter press (FP-901) is ready to be closed hydraulically. The three outlet manifold ball valves should be opened, the center feed pipe should be opened and the pump is ready to be turned on again.

Supernatant unit

The supernatant tank (TNK-903) receives spernatant from the filter press (FP-901). The tank is equipped with:

- Liquid level switches (LSL-902/LSH-902/LSHH-902)
- Pump (P-903) transferring supernatant from the supernatant tank (TNK-903) to the aeration tank (TNK-501) located in the building (AERATION BLD-7902); pump is equipped with current switch (YA-903) and pressure indicator (PI-903) for pressure control.

Level / Pump Operation and Control

The supernatant transferring pump (P-903) will run based on liquid level in the supernatant tank (TNK-903):

- Pump (P-903) run, when level switch LSL-902 is ON and YA- 903 is ON
- Pump (P-903) stops, when level switch (LSL-902) is OFF; this is to protect dry running of the pump

Alarms

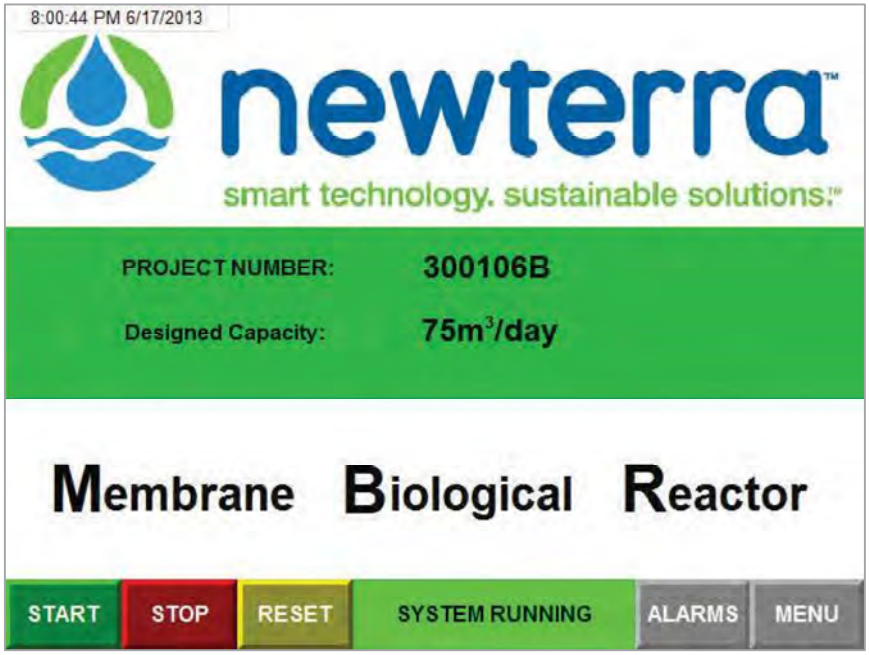
LSHH-902 indicates the imminent overflow. Operator intervention is required.

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5.2 Process Control System Touchscreen Operation

The MicroClear™ MBR system is designed to be fully automatic. Since the unit operates through a touchscreen, simply press the screen in an area where a button or text appears.

5.2.1 Main Control Screen



System Operation Commands

- **START** button puts the system in **RUN** mode
- **STOP** button stops the system operation. Some equipment continues to run even after this **STOP** button has been pressed, however the **E-STOP** button (located on the panel front) will stop all equipment
- **RESET** button is used to clear alarms after they have been addressed
- **SYSTEM ON (RUNNING) / SYSTEM OFF** indicates whether the system is currently in RUN mode or turned off
- **ALARM** button - when it is flashing red (it is on), it indicates an alarm is present in the system. Press **ALARMS** button to be routed to the alarm screen
- **MENU** button is used for screen navigation to show individual screens

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5.2.2 Process Screens

The main process screens are accessed from the main menu by pressing either the “BIOLOGY” button or the “MBR SYS” button.

On the main process screens, switches are displayed as **Grey** when **OFF, Green** when **ON** and **Red** when in alarm condition.

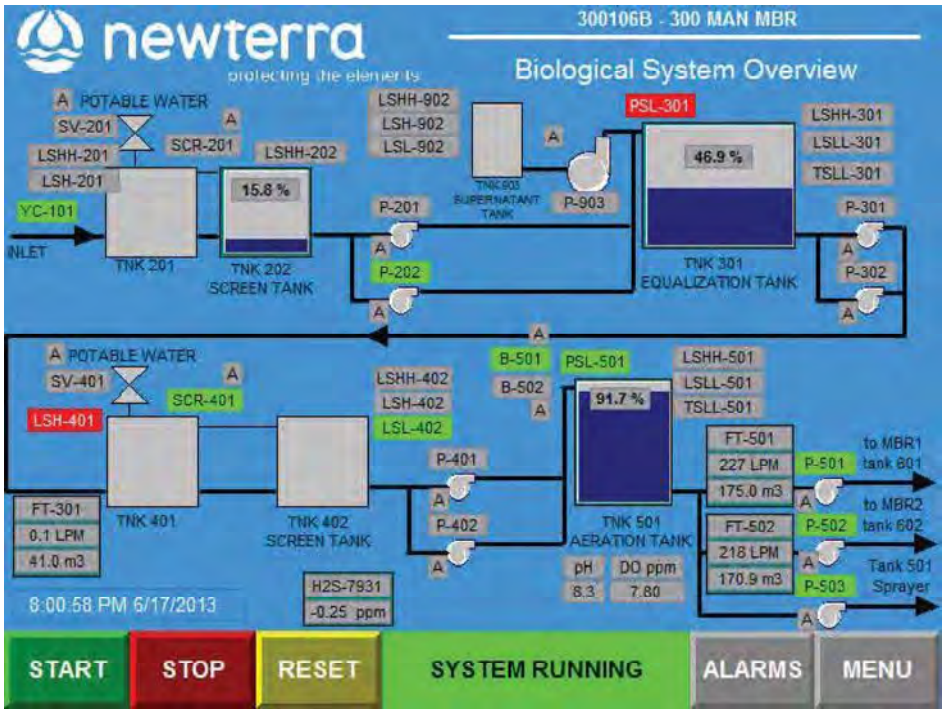
- LSHH – level switch high high
- LSH – level switch high
- LSLL – level switch low low
- TSHH – temperature switch high high
- LSL – level switch low
- PSL – pressure switch low

Individual devices can be monitored and controlled from the process screens.

- The letter indicated beside a device shows the current operational status of that device (**H** for hand, **O** for off, **A** for automatic)
- Touching a device on the process screen will open an **HOA** popup for that device.
- Devices are shown in green if they are currently running

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5.2.2.1 Biological System Overview Screen

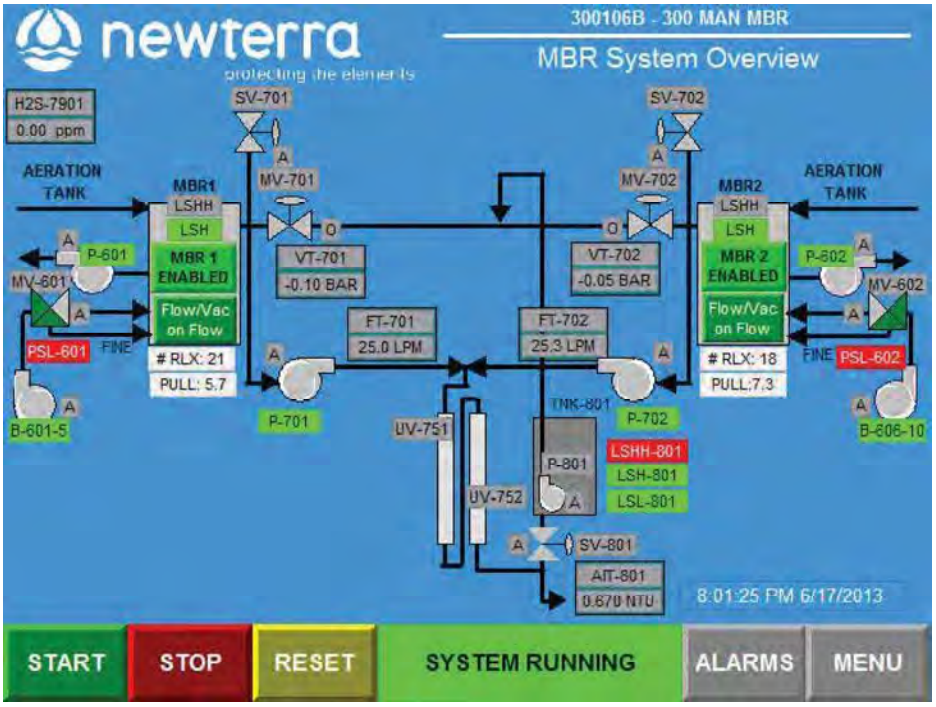


On the Biological System Overview Screen the following equipment and parameters are displayed:

- Inlet screen module (SCR-201) including screen basin (TNK-201) connected with screen tank (TNK-202), pumps and controls
- Equalization module including EQ tank (TNK-301) with controls, blowers; EQ tank level is displayed in %
- The second screen module (SCR-401) including screen basin (TNK-401) connected with screen tank (TNK-402), pumps and controls
- Aeration Tank (TNK-501) with all interconnecting piping, pumps and controls. Aeration tank level is displayed in % , dissolved oxygen (DO) and pH is displayed for the tank
- Status of blowers, pumps, level switches, flow transmitters and H_2S detector are displayed

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5.2.2.2 Membrane Filtration System (MBR) Overview Screen

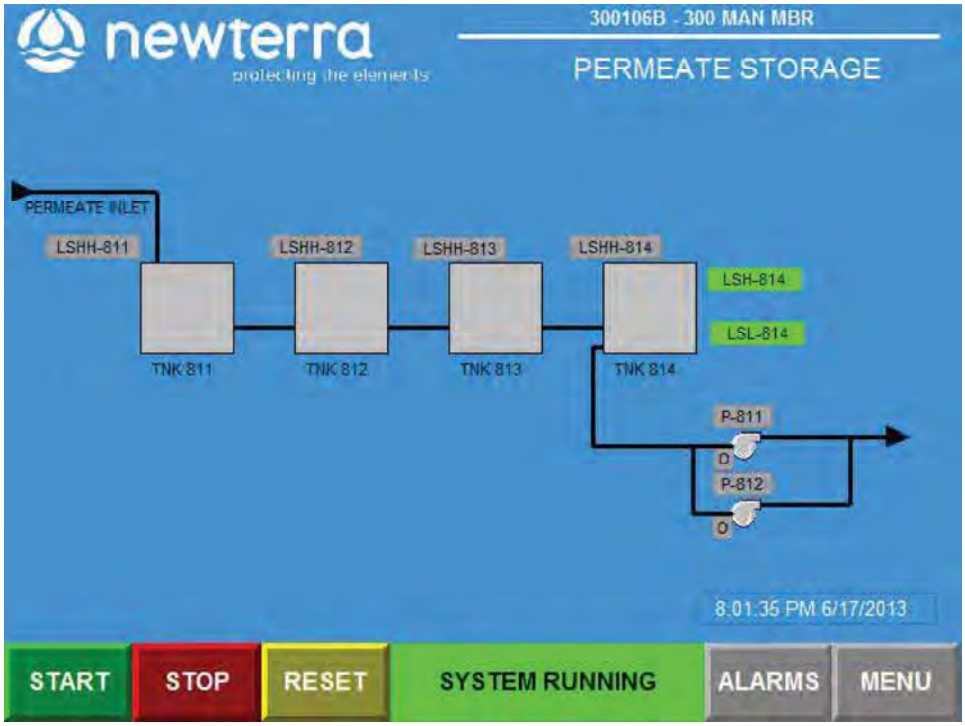


On this screen the following equipment and parameters are displayed:

- Membrane Tanks (TNK-601 and TNK-602), and Backwash Tank (TNK-801) with all interconnecting piping
- Permeate flow and vacuum are indicated for both membrane systems
- The number of relaxes performed in the current cycle is displayed
- The time on the current pull cycle is displayed
- Status of blowers, pumps, level switches, flow transmitters and H_2S detector are displayed
- The time on the current pull cycle

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5.2.2.3 Permeate Storage Module Overview Screen



On this screen the following equipment and parameters are displayed:

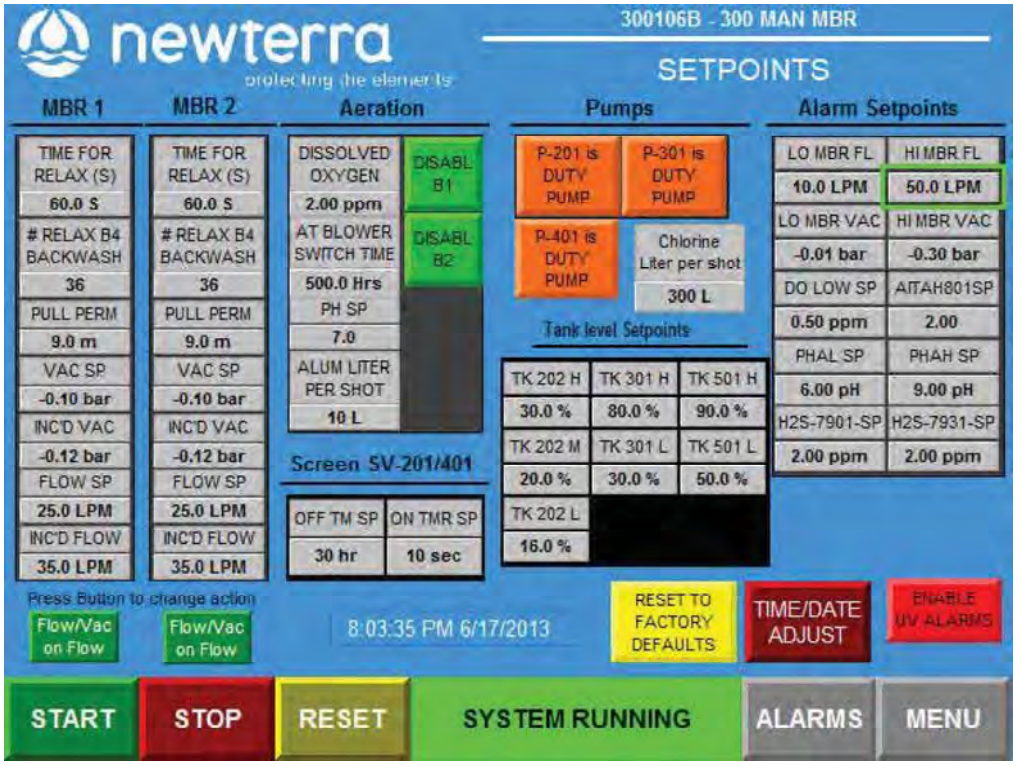
- Permeate Storage Tanks (TNK-811/TNK-812/TNK-813/TNK-814) with all interconnecting piping and pumps
- Status of level switches and pumps are displayed

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5.2.3 Process Setpoints Screen

The **Setpoints Screen** is accessed from the main menu by pressing the **"SETPOINTS"** button. This screen allows optimization of the system operation. Once the system is correctly set up, these values **should not be changed**.



See the table on the following page for the description of setpoints.

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newterra MBR Operational Setpoints Description

Process Location	Setpoint	Value	Description
Inlet Screen Module (SCR-201)	OFF TMR SP	30 hr	Setpoint for the amount of time when solenoid valve (SV-201) used for potable water delivery for screen cleaning is closed (OFF)
	ON TMR SP	10 sec	Setpoint for the amount of time when solenoid valve (SV-201) used for potable water delivery for screen cleaning is open (ON)
The second Screen Module (SCR-401)	OFF TMR SP	30 hr	Setpoint for the amount of time when solenoid valve (SV-401) used for potable water delivery for screen cleaning is close (OFF)
	ON TMR SP	10 sec	Setpoint for the amount of time when solenoid valve (SV-401) used for potable water delivery for screen cleaning is open (ON)
Membranes	TIME FOR RELAX (S)	60 sec	Setpoint for the amount of time the membrane relaxes between pulls, in seconds (shown for MBR 1 & MBR 2)
	# RELAX B4 BACKWASH	36	Setpoint for the number of relaxes before a backwash is triggered.
	PULL PERM MBR 1	9 min	Setpoint for the amount of time (in minutes) the system pulls permeate from TNK-601 before relaxing
	PULL PERM MBR 2	9 min	Setpoint for the amount of time (in minutes) the system pulls permeate from TNK-602 before relaxing
	VAC 1 SP	-0.10 bar	Setpoint for the vacuum in TNK-601 (in bar) the system will put on the membrane under normal operating conditions
	VAC 2 SP	-0.10 bar	Setpoint for the vacuum in TNK-602 (in BAR) the system will put on the membrane under normal operating conditions
	INC'D 1 VAC	-0.12 bar	Setpoint for the vacuum in TNK-601 (in bar) the system will put on the membrane when the system is experiencing a high flow (typically controlled by a high level in the EQ tank)
	INC'D 2 VAC	-0.12 bar	Setpoint for the vacuum in TNK-602 (in bar) the system will put on the membrane when the system is experiencing a high flow (typically controlled by a high level in the EQ tank)

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Process Location	Setpoint	Value	Description
Membranes	FLOW 1 SP	25.0 LPM	Normal flow setpoint for permeate flow rate (in LPM) in TNK-601. Under normal operation the system will default to this setpoint
	FLOW 2 SP	25.0 LPM	Normal flow setpoint for permeate flow rate (in LPM) in TNK-602. Under normal operation the system will default to this setpoint
	INC'D 1 FLOW	35.0 LPM	Increased Flow setpoint for permeate flow rate (in LPM) in TNK-601. If LSH-301 is activated the system will use the Increased Flow setpoint.
	INC'D 2 FLOW	35.0 LPM	Increased Flow setpoint for permeate flow rate (in LPM) in TNK-602. If LSH-301 is activated the system will use the Increased Flow setpoint.
Aeration Tank	DISSOLVED 0XYGEN	2.00 ppm	Setpoint for the amount of dissolved oxygen in ppm in the aeration tank
	AT BLOWER SWITCH TIME	500.0 Hrs	Setpoint for switching between aeration tank blowers under normal operation. The switch time is usually 500hrs.
	pH SP	7.0	Setpoint for the pH level in the aeration tank
	ALUM LITER PER SHOT	10 L	Setpoint for the amount of alum (L) added in the aeration tank
Tank Level Setpoint	TK 202 H	30.0 %	Setpoint for the high level (in %) for the screen tank (TNK-202)
	TK 202 M	20.0 %	Setpoint for the medium level (in %) for the screen tank (TNK-202)
	TK 202 L	16.0 %	Setpoint for the low level (in %) for the screen tank (TNK-202)
	TK 301 H	80.0 %	Setpoint for the high level (in %) for the equalization tank (TNK-301)
	TK 301 L	30.0 %	Setpoint for the low level (in %) for the equalization tank (TNK-301)
	TK 501 H	90.0 %	Setpoint for the high level (in %) for the aeration tank (TNK-501)
	TK 501 L	50.0 %	Setpoint for the low level (in %) for the aeration tank (TNK-501)

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newterra MBR Alarm Setpoints Description

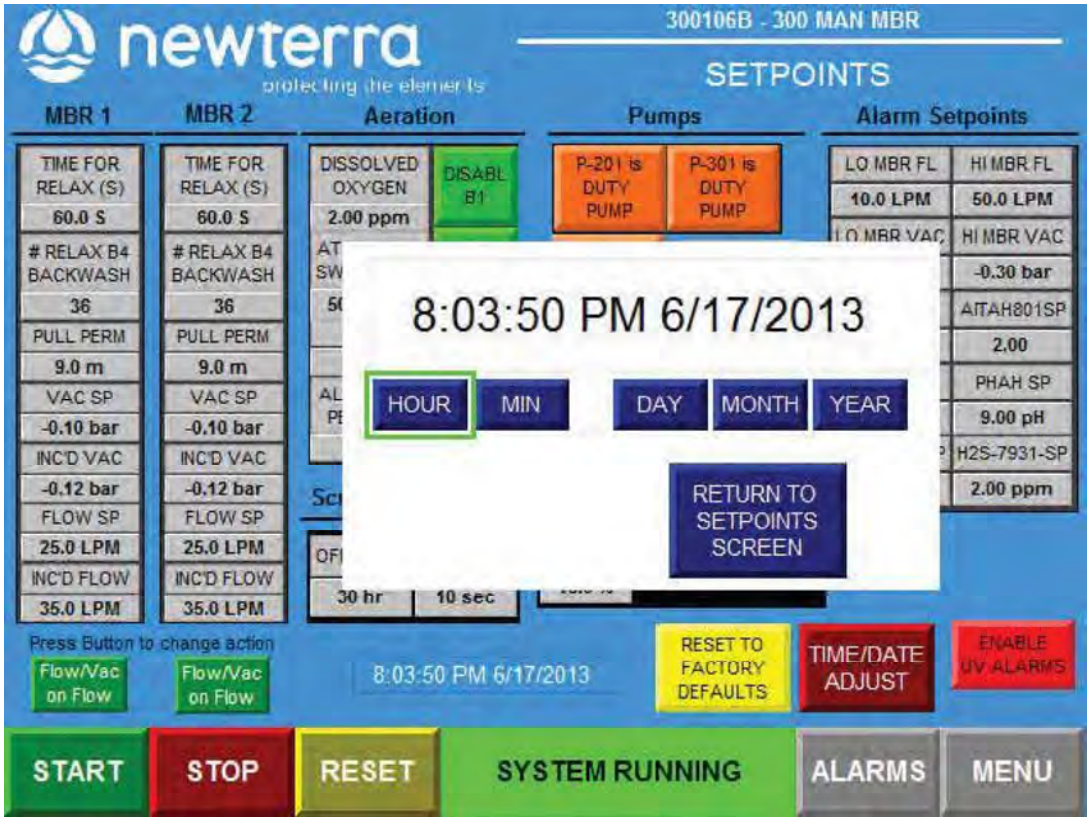
Alarm Setpoints	LO MBR FL	10.0 LPM	If the discharge flow is below this setpoint for more than 5 minutes, an alarm will be initiated.
	HI MBR FL	50.0 LPM	If the discharge flow is higher this setpoint for more than 5 minutes, an alarm will be initiated.
	LO MBR VAC	-0.01 bar	If the vacuum on the membrane is below this setpoint for more than 60 seconds, an alarm will be initiated.
	HI MBR VAC	-0.30 bar	If the vacuum on the membrane is higher this setpoint for more than 60 seconds, an alarm will be initiated.
	DO LOW SP	0.50 ppm	If the dissolved oxygen in the aeration tank is below this setpoint for more than 15 minutes, an alarm will be initiated.
	AITAH801SP	2.0 ppm	If the % solids in the aeration tank is above this setpoint an alarm will be initiated.
	PHAL SP	6.00 pH	If the pH in the aeration tank is below this setpoint for more than 15 minutes, an alarm will be initiated.
	PHAH SP	9.00 pH	If the pH in the aeration tank is higher this setpoint for more than 15 minutes, an alarm will be initiated.
	H_2S-7901-SP	2.00 ppm	If the concentration of detected H_2S reaches this setpoint for more than 5 minutes, an alarm will be initiated.
	H_2S-7931-SP	2.00 ppm	If the concentration of detected H_2S reaches this setpoint for more than 5 minutes, an alarm will be initiated.

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ATTENTION

The following screen shows **setpoints** modification procedure. **Setpoints** should only be modified under the direction of **newterra** engineers to prevent damaging the membranes.

RESET TO FACTORY DEFAULT (yellow button) - Pressing this button will reset all process and alarm setpoints to the default values at the factory.



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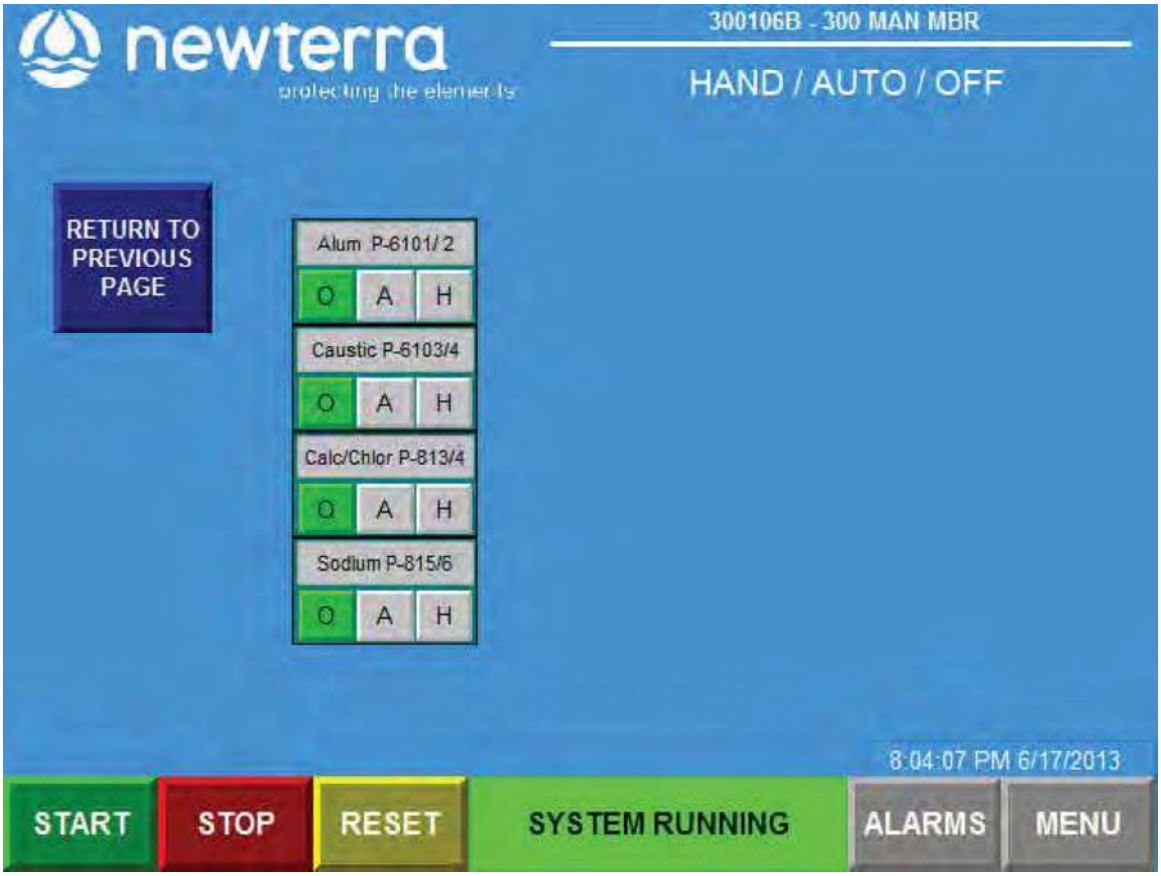
5.2.4 System HAO's (HAND /AUTOs/ OFF)

The **Hand / AUTO / OFF** screen is accessed from the main menu by pressing the "**HAO**" button.



- Each PLC controlled motor or valve in the system has **a Hand/Auto/Off (HAO)** Switch to control its operation. This screen displays all the system HAO's
- For normal operation, all switches should be in the **AUTO (A)** position
- The **HAND (H)** position of a switch is used for testing and troubleshooting of the system. As a safety precaution to prevent damage to equipment, the equipment will operate for two minutes in hand mode and will then return to the **OFF (O)** position

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5.2.5 Motor Info Control Screen

The following screen shows the status of the VFD's and their PID control values.



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5.2.6 Moto Hours Control Screen

Motor Hours screen is accessed from the main menu by pressing the “Motor Hours” This screen shows the total number of hours that each motor can run.

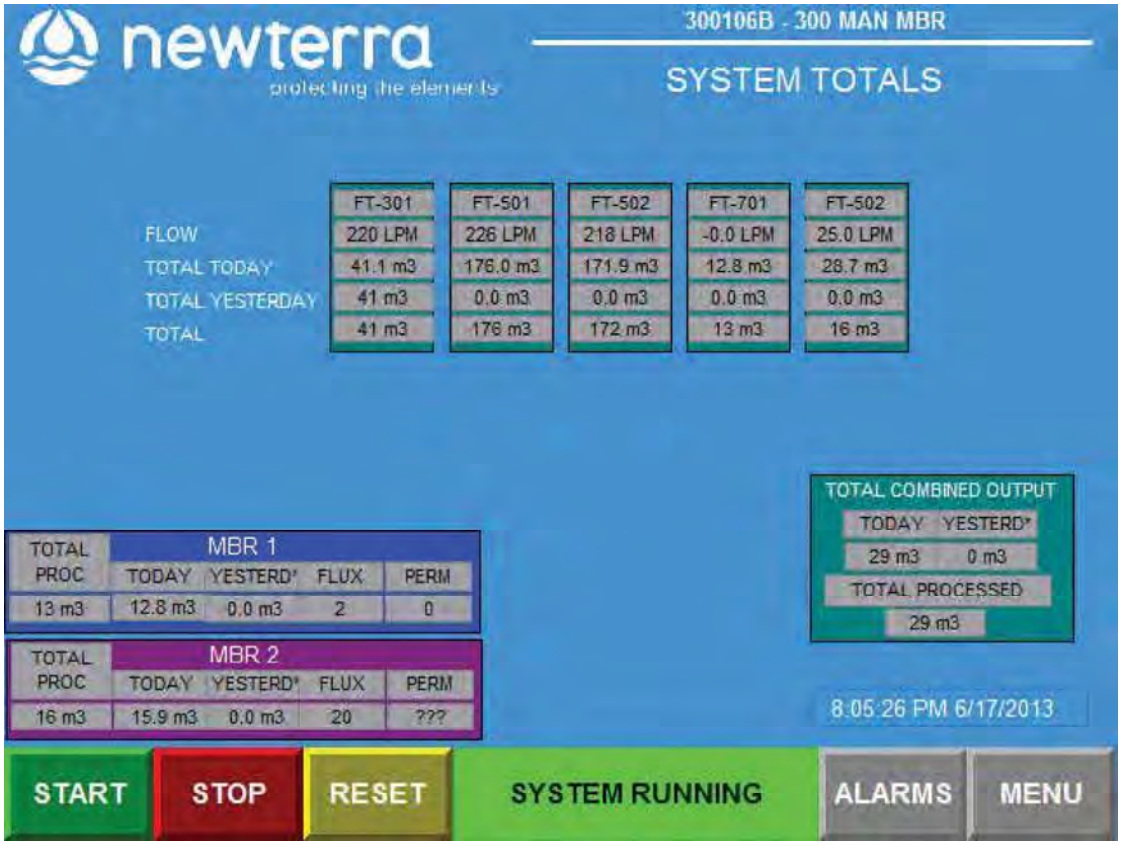
- When the SERVICED button is pressed, it resets the hours since service to zero (0)
- When the REPLACED button of a motor is pressed, it resets the total hours to zero (0).



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5.2.7 System Totals

The **System Totals** Screen is accessed from the main menu by pressing the **"TOTALS"** button



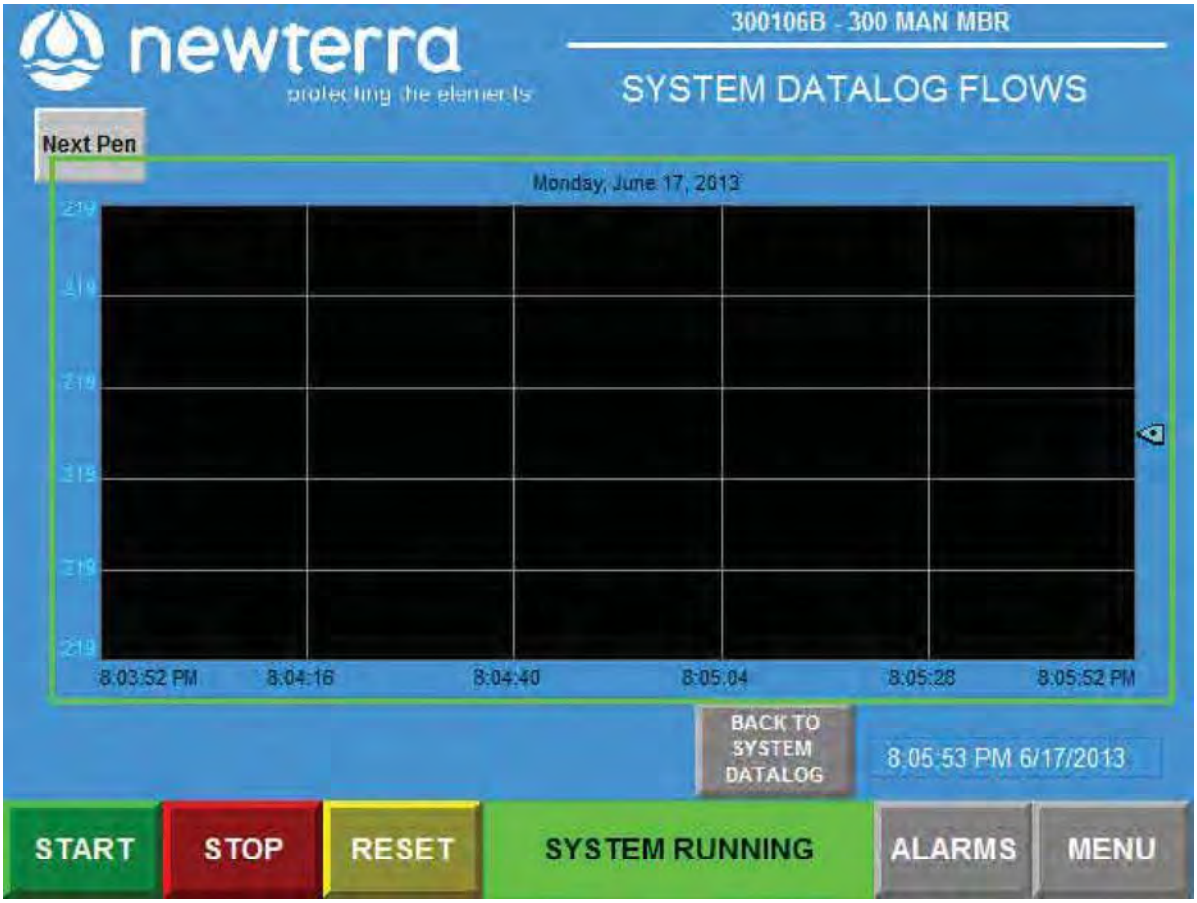
This screen is used to show:

- The total amount of water processed through the process train, and also current (today) amount and amount of water processed yesterday
- Flux (**J**) for membrane unit expressed in **LMH (L/m²·h)**
- Permeability **(K)** for membrane unit expressed in **LMH/bar**

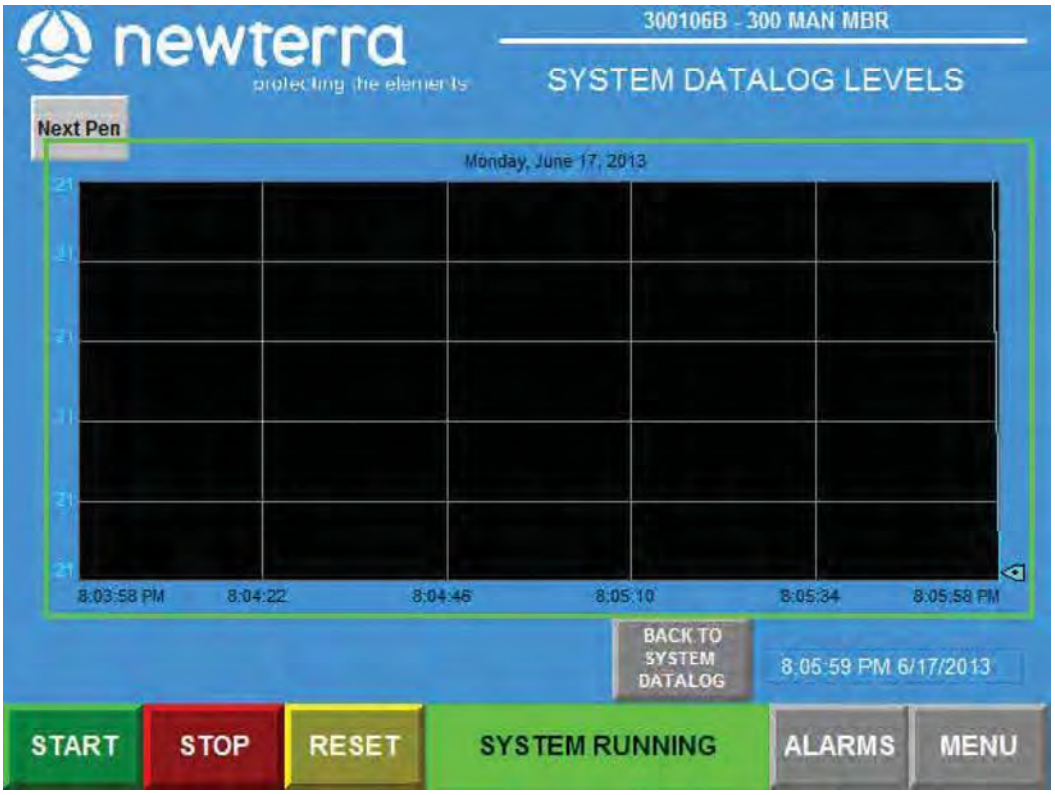
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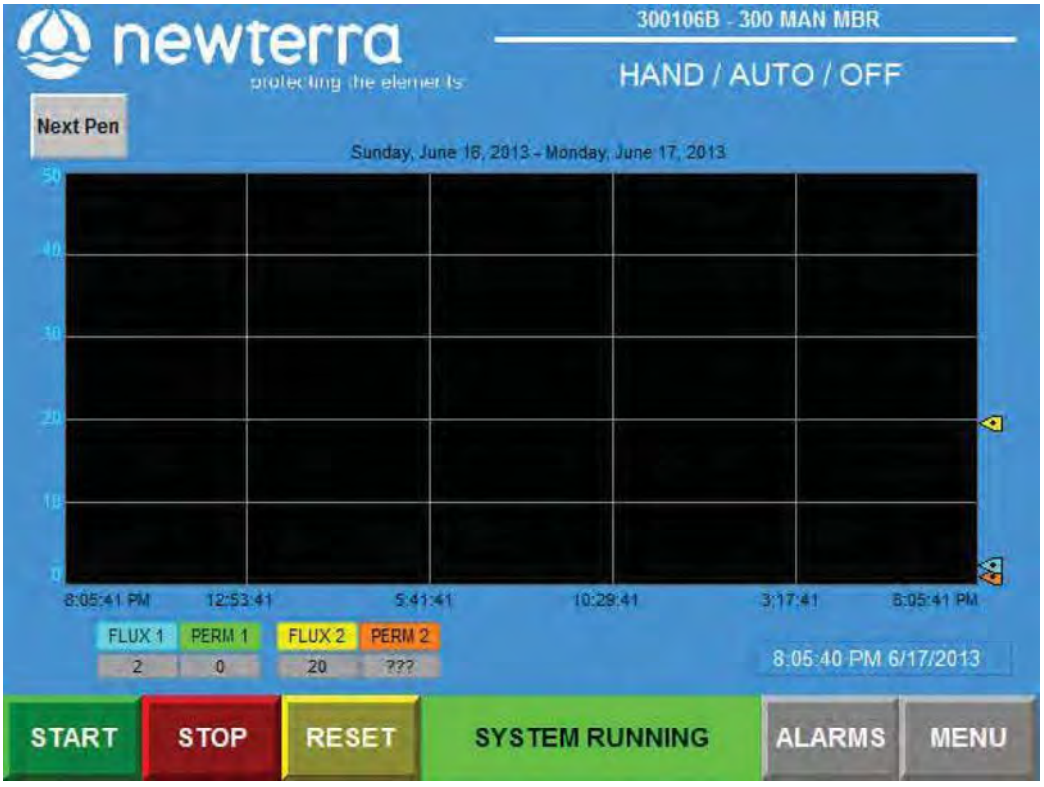
5.2.8 System Data Log Screens

- The following screens show how system is setup with extensive dada log to keep a history of the performance.
- It shows real time data log of critical process operating parameters
- This information is saved on a USB stick that is located on the front of the control panel
- The LOG INTERVAL setting determines how often data points are stored. The factory default setting is 600 seconds



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6.0 PLANT START-UP, OPERATING GUIDELINES AND MONITORING

6.1 Plant Start-Up

Mechanical & Electrical Start-up Procedure:

- If the system is being started for the first time, work your way through the **newterra Pre-Commissioning Test Checklist** presented in **Appendix C** of this O&M Manual.
- If the kill switch on the panel (red mushroom shaped button) is pulled out, then push it in to confirm that the MBR system is off.
- Push the reset button on the operator interface to reset all alarms.
- Make sure there are no obstructions over any moving parts, for example a jacket laying on a belt drive.
- Put all HAND/OFF/AUTO switches to AUTO **(A)** mode.
- Pull the kill Button (red button on panel) out to start the process.
- Push the start button on the Operator Interface.

Process Start-up:

Seeding

The procedure for determining the amount of seed sludge required for process start-up, and methods for seeding the system are as follows:

1. Calculate the volume of seed sludge required to ensure that there is a minimum of 3,000 mg/L MLSS in the membrane tank. The volume of seed sludge required can be calculated with the following formula.

$$V_s = \frac{3000 \times V_t}{MLSS_s}$$

V_s: Total volume of seed sludge for MBR system (m^3)
V_t: Total volume of process tanks in MBR system (m^3)
$MLSS_s$: MLSS concentration of seed sludge from a similar treatment system (mg/L)

2. Arrange for delivery of fresh seed sludge from an activated sludge system employing a suspended growth type process. If it is possible, obtain seed sludge from a facility treating a similar wastewater and operated with similar processes (nitrification etc).

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3. Drain the water used for clean water testing from the reactor, if the returned activated sludge (MLSS<10,000 mg/L) is used. Do not drain the water after clean water testing, if the dewatered sludge is used.

4. **Screen all seed sludge with the 2 mm basket screen** before the sludge is transferred to the aeration or membrane tanks **to remove gross solids and rags and hair**.

5. Remove grit from the screen if required.

6. Once the tanks are fully seeded in aeration tank and membrane tank is turned on, the system can start to work. Do not waste sludge, as membrane filtration continues, until the MLSS in the aerobic or membrane tank becomes concentrated to the targeted concentration. The system will be started at a reduced design flow/loading initially per **newterra** start-up schedule.

7. Foaming may occur during start-up, which is normal. However, after a period of time (1 week), the foam should disappear. Foaming can be addressed by water spraying, food based defoamer **(silicone based defoamer is strictly prohibited**) addition, or aeration minimization in the membrane tank.

8. If a defoamer is required, contact **newterra ltd**. for recommendation of an acceptable antifoaming agent and dosing quantities.

9. Process start-up and adaptation periods can last for two or three weeks.

10. If fresh activated seed sludge is not available, **newterra** can supply dry cultures bacteria (a consortia group of different kinds of bacteria) for start-up. Please consult newterra ltd; quantities of dry bacteria and procedure of seeding will be confirmed by newterra technical representative during commissioning / start-up period.

ATTENTION	No untreated wastewater should enter the membrane tank. Make sure wastewater is completely biologically treated before it gets to the membrane tank

ATTENTION	It is advisable to start the MBR system with a minimum MLSS concentration of 3,000 mg/L to minimize foaming. The seed sludge should come from a plant which has a screen of 2 mm. It is critical to screen the seed sludge with 2 mm perforated screen prior to seeding for membrane protection.

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6.2 System Operating Guidelines and Monitoring

6.2.1 Operating Guidelines

The operators are expected to run the MBR system at all times in accordance with the maintenance, operational procedures and details specified in this manual. The following two tables provide operating parameters that can be easily maintained, and define the range of operating values.

There may be situations where the system needs to operate outside of the conditions covered in this manual. If these conditions develop, please consult newterra ltd. to discuss operation and methods to optimize performance.

Generally, the following points can be used to operate the MBR system properly:

1. The MBR system is designed to treat wastewater with specified influent characteristics.
2. Never operate the MBR tank below the minimum membrane submerged level. It is necessary to maintain a minimum of 250 mm liquid level above the membrane modules to ensure they are wet at all times and to allow for proper filtration.
3. Always supply the required amount of air for scouring to the membrane module.
4. Always filter wastewater at or below design flow rate.
5. Periodically, relax the membranes by ending filtration while allowing the membrane aeration scour to operate continuously and initiate backwash operation during membrane relaxation (default relaxation mode preset in PLC - permeation continues for 9 min and stops for 45 sec, and backwash the membrane).
6. Always operate the MBR in accordance with the parameters listed in the following tables.
7. Clean the membranes in-place with a dilute chemical in accordance with **Section 7** of the O&M Manual.

Membrane Filtration Operational Conditions

Parameter	Recommended Value	Notes
Diffuser Relaxation	10 minutes/day	Effluent filtration must be turned off, blower shuts down for 10 mins/day
Relax Time	1 min/10 min	Filtration must be off and blower are operating continuously
Backwahing	48 cycles	Built-in backwash mode during relaxation mode
In-situ Chemically Enhanced Backwash (CEB)	200 ppm as NaOCl	Requires 3 L to fully backwash one MCXL cassette. Frequency of CEB may vary. Refer to Membrane Cleaning Section 7.3 for cleaning procedure.

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Avg Flux Rate	15 LMH (9 gpd)	Average flux rate with permeation 9 minutes out of 10 minutes
TMP	< 0.2 bar (2.9 psi)	Membranes to be cleaned once the TMP exceeds 0.2 bar (2.9 psi)

MBR – Recommended Biological Operational Conditions

Parameter	Recommended	Range	Notes
MLSS (mg/L)	10,000	8,000 – 15,000	Never operate the membranes if MLSS < 3,000 mg/l. Sludge wasting should be undertaken as required to maintain target MLSS
Temperature (°C)	15 - 35	10 – 35	Avoid sudden changes in temperature. Minimum operating temperature is 15 °C
pH (s.u.)	6.8 - 8.5	6.0 – 9.0	Membrane module can handle a change in pH, however it is recommended to keep pH between 6.8 - 8.5
Aeration Tank, DO (mg/L)	≥ 2.0	1.0 – 8.0	This can be maintained by adjusting the volume of air supplied to the aeration tank
Viscosity (mPa-s)	Not applicable	0 – 300	–
Membrane Tank to Aeration Tank Recirculation	400%	200 – 600%	–
F:M (kg BOD/kg MLSS/d)	0.1	0.03 – 0.2	F:M = [Flow (m^3/d) x BOD conc (mg/l)] / [Process volume (m^3) x MLSS conc (mg/l)]
F:M (kg COD/kg MLSS/d)	0.15	0.05 – 0.3	F:M = [Flow (m^3/d) x BOD conc (mg/l)] / [Process volume (m^3) x MLSS conc (mg/l)]
SRT	> 15	12 – 50	

Process Troubleshooting Guide is presented in **Appendix M** of this O&M Manual.

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6.2.2 Sampling

To ensure accurate system monitoring and the validity of laboratory test data, samples must be collected as outlined below. These are only recommended guidelines. It is imperative that scheduled testing protocols are performed in compliance with local regulatory agency requirements. Composite samples of the MBR systems may need to be sent out to a certified laboratory for testing, based on the local regulatory requirements

Monitoring and Testing Requirements

Parameter***	Influent	Aeration Tank	Membrane Tank	MBR Effluent
Flow rate	D (PLC)			D (PLC)
Fat, Oil and Grease (FOG)	AR			AR
Alkalinity	AR			
Biological Oxygen Demand (BOD)	W			W
Total Suspended Solids (TSS)	W			W
Total Kjeldahl Nitrogen / Total Nitrogen (TKN / TN)	M			AR
Ammonia Nitrogen(NH_4-N)				AR
Nitrate Nitrogen (NO_3-N)				AR
Total Phosphorus (TP)	W			W
Mixed Liquor Suspended Solids (MLSS)			W	
Mixed Liquor Volatile Suspended Solids (MLVSS)			AR*	
Temperature		D (PLC)		
pH	AR	D (PLC)		W
Dissolved Oxygen (DO)		D (PLC)		
Filterability			TW	
Turbidity				AR**
Fecal Coliform / *E-Coli*				W

Legend: D = daily; W = weekly; TW = three times weekly; M = monthly; AR = as required.

* If MLVSS /MLSS ratio of a minimum of 0.7 is detected, MLVSS testing can be done periodically, on an "as required" basis.

**The effluent should be routinely checked for any signs of problem. Normally, the effluent is reasonably clear, colourless, and odourless. If the effluent becomes turbid, testing should be carried out required.

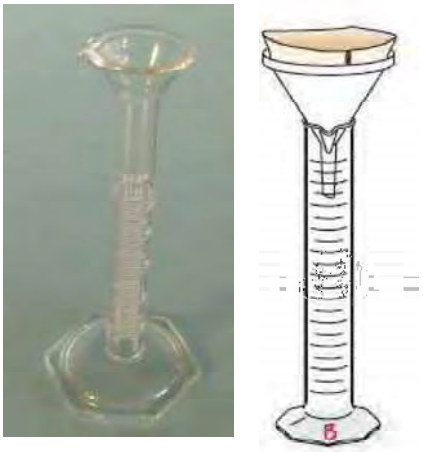
*** Explanation and definition of abbreviations, acronyms and terms used in the manual are presented in **Appendix G – Glossary & Terms and Appendix H – Biological Treatment & Monitoring Parameters.**

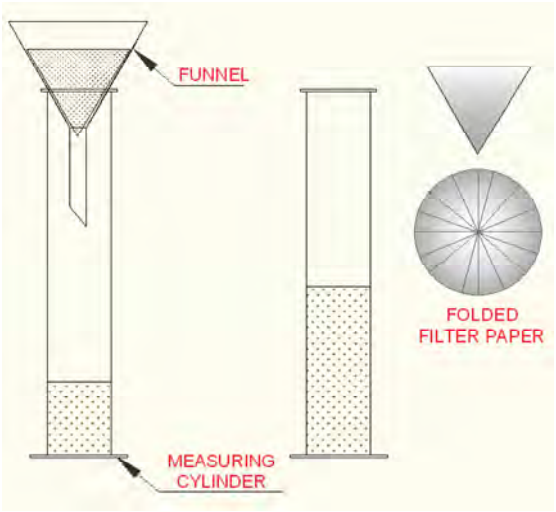
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Filterability Test

The objective of the filterability test is to evaluate the condition of the working biomass. This is assessed by measuring the volume of filtrate passing through the filter paper. If filtrate is greater than 10 mL/10 min, then biomass filterability is acceptable; however, if it is less than 10 mL/10 min, modifications to the plant operating condition are required to prevent premature membrane fouling.

Laboratory Glassware and Filter Paper





Apparatus:

Filterability Kit is distributed by **newterra ltd (Part # 24146).**

Filterability Kit includes:

- Filter paper distributed;
- Funnel (75 mm diameter recommended);
- 2 - 50 mL graduated cylinder;

Stop watch

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Measurement Procedure:

1. Pleat filter paper by folding in half, quarters etc.
2. Line the funnel with pleated filter paper and place the funnel in the graduated cylinder.
3. Collect 50 mL of activated sludge sample in a beaker and stir.
4. Pour the 50 mL sample into the funnel.
5. Start timer when the first drop of water filtered through the filter paper.
6. After 10 minutes of filtration, record the level of filtrate in the graduated cylinder.

Filterability (FT)	Action	State of urgency
> 10 ml	Excellent, no action req'	
5 - 10 ml	Tweak process operation	
< 5 ml	Process adjustment req	**Contact newterra ltd.**

6.2.3 Record Keeping

An essential component of quality control in any facility is sound record keeping. A log book covering the entire treatment system performance should be maintained, updated, and readily accessible to all operators. The log book should be used to record observations, set point alterations, and unusual conditions.

For each wet chemistry parameter analysis, a separate work-sheet has to be prepared. Work-sheet data for at least the previous year should be kept for possible consultation.

The second step in quality control is to train all operators to follow an established procedure for each test. Identical samples should be periodically tested for any parameter by different operators, and the variability among results should be compared. Consistent variability in results may lead to the technique improvement of operators.

Duplicate analysis of a sample should also regularly be done. And, split samples should regularly be sent to an outside accredited laboratory and analysis results should be compared with those done in-house.

In addition to summary sheets, it is highly recommended that data should be entered into prepared Excel spread-sheets. Spread-sheets greatly aid in the data presentation and manipulation, and would be of immeasurable value when report writing is required.

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6.2.4 Process Trending

Other than pre-planned process changes or major upsets, process modifications should be based on trends shown in the process data. A trend is nothing more than an indication of real change in a process parameter over time. A trend chart is simply a graph of data being trended.

As the graph changes, upward or downward trends are detectable. Smoothing trends by graphing the 3-, 7-, or 30-day average of the data allows the trend to be shown more clearly. Because the individual data point may be questionable, the actual value of data point are less important compared with the trend regarding the process monitoring.

Trend graphs are a part of the Excel data spread-sheet; the operator can trend and analyse many parameters in just a few minutes in order to assess process performance.
When a trend is identified, its indication to the process can be evaluated, and corrective action may be carried out, if needed. Statistically, the more data points there are in a trend chart, the more reliable the trend.

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7.0 SYSTEM MAINTENANCE



CAUTION: Shut off all electrical power before working on the mechanical or electrical equipment.

The system should be routinely checked for any signs of operational problems. Such problems could include, but are not necessarily limited to, abnormally high peak flows, unpleasant odour, and diffuser clogging, and so on.

7.1 Plant Visual Checks

Noise	During normal operation, there is a uniform humming sound at the plant. In case of an unusual noise, it could be an indication that the blower needs maintenance or repairs.
Smell	The MicroClear™ MBR is an aerobic system. During normal operation, the system has an earthy smell similar to that of a well-maintained compost pile. If other odours are noticed, the aeration process may not be operating or the system has been overloaded. Check the DO manually and the blower to verify proper operation.
Sight	Normally, the effluent is reasonably clear, colourless, and odourless. If the effluent becomes turbid, there is a pin hole in the membrane or a leakage in the piping. Take the unit out of operation and investigate. **Check uniformity of membrane air distribution periodically to ensure air scoring is effective across all membrane plates.**

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7.1.1 Air Scouring Patterns in Membrane Tanks

Membrane air scouring check is essential procedure for **newterra** MBR WWTP. Air scour has to be observed for uniformity of bubbling action all across the membrane module/cassette on regular basis.

A visual inspection of the aeration patterns should be performed with the liquid level 2-3" (5 – 7.5 cm) above the permeate pipe.



Proper air scouring in membrane tank



Uneven aeration in membrane tank

It is easy to observe aeration patterns through clear window in membrane tank. Operator should note any unusual patterns of air distribution. The visual inspection also should be performed before any membrane cassette removal from membrane tank. Operator has to check for:

- damage of air diffusers - if this occurs, empty the tank and fix the diffuser;
- air leakages - if this occurs, tighten up the fittings.

If there is insufficient air scouring, localized dewatering (**clogging, sludging, caking and plugging**) may occur and may in turn lead to membrane fouling.

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7.2 Schedule for Routine Operation and Maintenance Checkups (if Applicable)

Location	Item	Day	Week	Month	Quarter	Year	Comments
HEADWORKS	**Inspect and maintain grease trap in the kitchen of the work/mining camp**		X	X*			*Kitchen grease trap(s) should be checked weekly and cleaned monthly to ensure proper performance.
	Inspect lift station with sump pumps		X				
	Remove grease from lift stations and top of PC tank		X				
PROCESS	**Perform visual check**	X					Refer to Plant Visual Checks
	Check for proper wasting to sludge system		X				
	Record permeate flow rate	X					
	Record DO in the aeration tank	X					
	Record pH in the aeration tank	X					
	Record vacuum pressure at the membranes	X					Normal range: 0.07 – 0.15 bar (28" -61" WC)
Note: When the vacuum at the membranes reaches 0.2 bar/2.9 psig/80" WC), stop the permeation and perform recovery cleaning (please see procedure separately)							
MECHANICAL & PROCESS	**Inspect membranes and permeate withdrawal system**		X				1 hour
	Clean and calibrate the DO sensor			X			1 hour
	Inspect and maintain valves & fittings for leaks		X				
	Clean manually Fine Screen and direct solids to primary settling/sludge holding tank		X				may require daily cleaning during start-up (subject to PI502 reading)
	Membrane in-situ cleaning				X		2-4 hours
	Remove membrane module for mechanical cleaning and inspection					X	Drain membrane tank. Roll out membrane cassette. Remove membranes and inspect. (1 -2 days)
	Visual inspection of air bubbles in the equalization, aeration and membrane tanks		X				Replace diffusers if big uneven bubbles/high turbulence is found.

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Location	Item	Day	Week	Month	Quarter	Year	Comments
MECHANICAL & PROCESS	**Remove, inspect and maintain diffusers in equalization, aeration and membrane tanks**					X	This involves a complete draining of tanks (1-2 days)
	Pump out solids collected in the primary settling/sludge holding tank for offsite disposal				X		
	Check and record UV instrumentation: % Transmissivity vs required minimum; Remaining Lamp Life; Total Days of Operation		X				
	Inspect and maintain pump bearings			X			
	Check blower operation (if vibrating)		X				
	Check time clock setting		X				
	De-ragger (foam suppression unit)						may require daily cleaning during start-up
	Inspect functionality of baseboard heater				X		
	Check ventilation systems for container					X	
ELECTRICAL	**Check electrical leads**				X		
	Inspect and maintain breakers, fuses, resets and anodes			X			
	Check motor mounting bolts			X			
	Clean dust away from electric motor			X			
	Check PLC and control panel functionality		X				



All connections (hoses, hose clamps, camlocks) have to be checked periodically (on a monthly basis) to make sure all of them are in good conditions.

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7.2.1 De-ragger operation and maintenance cleaning

Please refer to the drawing presented in **Appendix A** of this O&M Manual.

De-ragger is part of the anti-foaming system which is provided in the system for foam suppression in the aeration tank. The main purpose of a de-ragger in this system is to avoid the spray nozzles clogging by catching fibres and other impurities found in the recirculation water pumped through the system.

De-ragger is simple equipment consisting of a PVC clear pipe, a nylon bristle brush installed in the pipe, and a fernco coupling for quick disconnection. During the water spraying process the brush (with a sliding fit in the pipe) catches fibres and other impurities
.
When the de-ragger is filled with impurities, perform maintenance as follows:

- Turn off P-503 operation.
- Close 2' PVC isolation valve and open 1' PVC drain valve and drain the content to a 20-L pail.
- Disconnect fernco coupling.
- Remove brush and rinse with clean water.
- Close the drain valve and reassemble the fernco coupling.
- Make sure all connections are tight.
- Open isolation valve.
- Turn on P-503 operation.

7.2.2 Polymer Make-up Instructions

Please refer to the P&I Diagram presented in **Appendix A** of this O&M Manual.

1. Fill polymer make up tank (conical bottom mixing tank) with 100L clean water
2. Open air mixer speed valve by turning valve one and a half revolutions (1 ½) to allow mixer to run at high speed
3. Slowly add 1 cup (~250ml) of Powdered CC4509 polymer into vortex beside mixer shaft (keep bag sealed when not in use)
4. Run mixer on high speed for 5 min
5. Reduce mixer speed to low by turning value back to half (1/2) a revolution open, continue mixing for 45 min
6. Polymer is now ready to use

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7.3 Membrane Cleaning

7.3.1 Membrane In-situ Chemically Enhanced Backflush (CEB)



Chemical cleaning is only to be carried out by qualified and trained personnel! Chemicals can lead to serious injuries. Always wear personal protective equipment (PPE) when handling chemicals! Obey the chemical safety handling procedure as listed in the Material Safety Data Sheets.

It is recommended that in-situ CEB be carried out before the TMP exceeds 0.2 bar (or permeability drops rapidly to 50 LMH/bar) This is typically done once every couple weeks/months depending on biomass characteristics and system operating condition.

On certain occasions, membrane module/cassette may need to be physically inspected for membrane integrity if membrane permeability performance is not recovered after the cleaning (i.e., suspect of membrane deterioration); please refer to subsection **7.3.3**.



The maximum backwash pressure of MicroClear™ MCXL filter is 0.1 bar or equivalent to a 100 cm water line. Only use gravity force to perform the backflush.

Note: Membrane have a maximum active chlorine tolerance of 100,000 ppm.h.

For better cleaning performance, it is recommended:

- Potable water (permeate is acceptable if potable water is unavailable)
- Water temperature is above 20 ^{0}C (better cleaning efficiency if water temperature ranges from 20 to 30 ^{0}C)

Procedure

Note: Only clean (backwash) one membrane tank at time.

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***Step 1: Cleaning with sodium hypochlorite (NaOCl)* - 3L cleaning solution required per MCXL cassette for in-situ CEB. The CEB is performed manually.**

1) Press the disable membrane button on the screen.

2) Open valve (SV-801) and allow water to fill up the backwash tank (T-801) to LSH-801 level.

3) Close valve (SV-801).

4) Add concentrated NaOCl into the backwash tank to a concentration of 500 mg/L (acceptable range of 200 to 1,000 mg/L).

Volume of concentrated NaOCl required can be calculated with the following formula,

$$V_x = \frac{V_m \times 0.05}{C_s}$$

V_m: Volume of the solution (Gallon, or Litre), equal to 3 L multiplying the number of MCXL cassettes;
C_s: Concentrated NaOCl concentration (%)
V_x: Volume of concentrated NaOCl required (Gallon, or Litre)

5) Open valve (MV-701 or MV-702) and inject chemical solution by pump (P-801) into membrane tank (TNK-601 or TNK-602) until reach LSL-801 level in backwash tank. (T-801).

6) Soak the membranes in NaOCl solution for 1-2 h. Adjust air scour in interval, if necessary, to control potential foaming.

7) Resume normal operation by turning off the disable membrane button. Check permeability. Normal permeability after cleaning: 150 to 300 LMH/bar.

8) Repeat the cleaning procedures if the normal permeability value is not attained.

Step 2: Cleaning with Citric Acid – only required in case of inorganic fouling caused by the high hardness.



Rinse membrane filter thoroughly with potable water to completely remove NaOCl solution before treatment with citric acid. Mixing NaOCl with citric acid releases toxic chlorine gas!

1) Repeat the above steps with 0.2% citric acid solution (a max of 2%)

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7.3.2 Membrane Recovery Cleaning

The membrane recovery cleaning is to be done once a year at a minimum. On certain occasions, membrane cassette may need to be inspected for membrane integrity (suspect of membrane deterioration, membrane permeability performance does not recover after the cleaning, etc.).



Disable operation of the dedicated membrane tank that needs to be cleaned by pressing the disable membrane button on the screen.

For better cleaning performance, it is recommended:

- Potable water is used
- Water temperature is above 20 ^{0}C (better cleaning efficiency if water temperature ranges from 20 to 30 ^{0}C)

Procedure

Step 1: Cleaning with Sodium Hypochlorite (NaOCl)

1. Drain all mixed liquor from the membrane tank to the sump/recycle back to the process tanks.

2. Clean (wash down) the membrane tank with potable water and drain the dirty liquid to the sump/recycle back to headwork.

3. Turn off air scour, fill the membrane tank with potable water until the membranes are completely covered, and add NaOCl into the membrane tank to a concentration of 500 mg/L as free chlorine (max. 1,000 mg/L). Turn on air scour for 5 min to mix the solution and turn it off during membrane soak.

   Volume of NaOCl required can be calculated with the following formula:

$$V_x = \frac{V_m \times 0.05}{C_s}$$

V_m: Volume of membrane tank (Gallon, or Litre)
C_s: NaOCl concentration (%)
V_x: Volume of NaOCl required (Gallon, or Litre)

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4. Keep the membranes soaked for a min 12 hours in the NaOCl solution (longer soak time required if severe fouling is evident). Air scour can be on intermittently during soak time (5 min every 4 hrs).

5. Drain spent NaOCl solution to the sump/recycle to headwork.

6. Rinse membrane filter thoroughly with potable water and drain the entire tank. Rinse waters are drained to the sump/recycle back to the headwork.

Step 2: Cleaning with Citric Acid – only required in case of inorganic fouling caused by the high hardness



Rinse membrane filter thoroughly with potable water to completely remove NaOCl solution before treatment with citric acid. Mixing NaOCl with citric acid releases toxic chlorine gas!

1. Fill the membrane tank with potable water, turn on scouring air, and add citric acid to pH 2.0. Turn off air scour when the pH of 2.0 is reached.
2. Keep the membranes soaked in the citric acid solution for 2 hours (longer soak time required if severe fouling is evident).
3. Drain spent citric acid solution, rinse membranes thoroughly with potable water and drain all the rinse waters. Spent citric acid solution and rinse waters are drained to the sump/recycle back to headwork.

Step 3: *Resume normal operation*

Step 4: Checking Permeability on Clean Water

Normal permeability after cleaning: 150 to 300 LMH/bar.

Repeat the cleaning procedures If normal permeability is not achieved.

Note: Membrane maintenance (CEB) and recovery cleaning has to be recorded according to Membrane Cleaning Log Sheet presented in Appendix K of the manual.

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7.3.3 Membrane Physical Check



WARNING*: A membrane cassette that has been in operation weighs more than dry membrane cassette before installation.*
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.

To remove membrane module from membrane tank

This procedure is required if the membranes are being inspected as part of routine maintenance for physical check or being replaced.



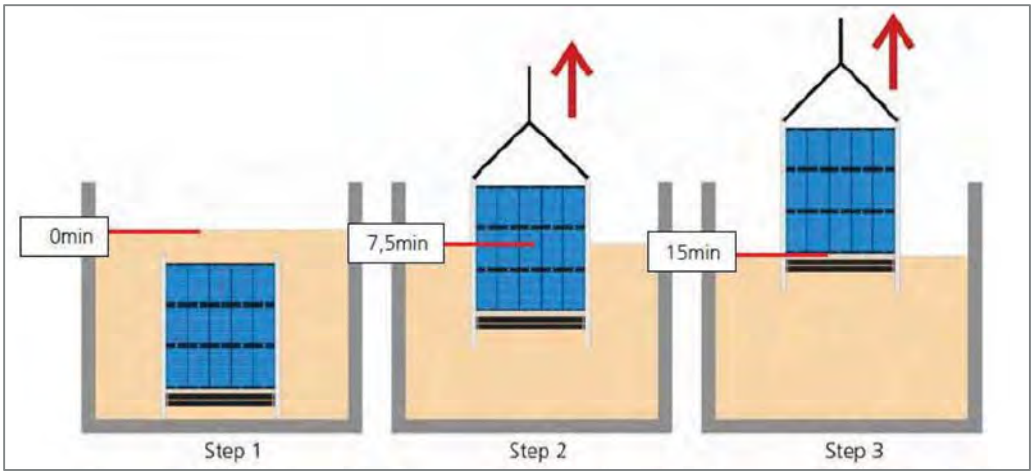
Once membrane inspection or replacement has begun, it must be completed promptly. It is important that the membrane DO NOT DRY OUT OR FREEZE during this procedure.

1. Lifting the membrane cassette out of a tank or emptying a tank should take at least 5 min. For each single filter layer.

MicroClear™ Membrane Module	Filter Layers	Acceptable time for membrane filter lifting out of the membrane tank or empting the tank
MB2- series	2	10 min
MB3- series	3	15 min
MB4- series	4	20 min (module must be separated in to 2 parts)
MB5- series	5	25 min (module must be separated in to 2 parts)

Note: Non observance will lead to damage of the filters because of exceeding the maximum backwash pressure.

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Schematic of MicroClear™ membrane module lifting / emptying of the membrane tank

Membrane module replacement

If membranes require changing *v*erify membrane modules are secure within the membrane tanks after re-installing the modules – i.e. verify wheel chocks 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 tank.

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8.0 SHUT DOWN

8.1 Temporary Shut Down

A temporary shutdown for a few days requires continuous aeration of the biomass to keep the DO level at least 2 mg/L and continues biomass recycle between the bioreactors.

8.2 Permanent Shut Down / Winterizing

Permanent shut-down is required if system operation stops at least for 2 weeks without inflow. Permanent Shut Down includes the following procedure:

- Perform membrane cleaning before permanent shut down / winterizing.
- Drain all tanks.
- Remove membranes and winterize
    - For short term storage (up to 6 months): soak membranes in 10 ppm NaOCl solution, and membranes are not allowed to dry out), never expose the membrane unit to frost, dust, rain, or direct sunlight.
    - For long term storage: soak membranes in preservation solution - 20 % glycerin solution (by weight).The glycerin will pass through the membrane via diffusion and provides pore protection from freezing and from drying out.
- Disassemble all PVC ball valves and drain any water inside (open and close to ensure trapped water escapes).
    - Leave all valves ½ open during reinstallation
- Open all drain valves and leave open.
- Clean and reinstall all sprayer nozzles.
- Find all check valves and make sure water is not being held by valve (Wet/Dry Vac works well here).
- Drain / remove all pumps from tanks, ensure no water is left inside the pump.
- Use RV biodegradable Antifreeze to
    - Refill any check valve
    - Dump in 2 (qty) 4-L bottles in each tank
- Remove pH and DO probes (if unit is equipped) and store with membranes in a heated area ensure probes are kept wet.
- Remove power from system.

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Double check and ensure that there is no water left in any pipes, fittings etc. If it is not possible to remove the water fill with antifreeze.

Glycerine Solution Solution Components and Solution Make-Up

1. Chemicals:
Technical Glycerin (86.5%)
Distilled water

2. Solution make-up procedure:

Dissolve technical glycerin (86.5%) in water and homogenize according the following table.

Preservation Solution 20 % Glycerin	Technical Glycerin [86,5%]	Distilled Water
[kg]	[kg]	[kg]
1	0.23	0.75
10	2.3	7.5
100	23	75
1000	230	750

The preservation solution has a density of 1,045 g/cm^3. The concentration of preservation solution can be tested and corrected with a density meter.

Membrane preservation procedure

- Allow the membrane unit to soak in preservation solution for a few hours.
- Remove the membrane unit and allow excess glycerin to drain.
- Shrink wrap the unit with a thick (1.5 mm) plastic bag and seal membrane unit using a hand sealer or tape.



For long term storage preserved unit should be stored in a cool (4^{0}C - 20^{0}C), dry area, away from direct sunlight and protected from accidental damage.

Re-commissioning the unit is straight forward. Once unit is lowered into MBR Tank, first start the aeration, then the permeate pump. In order to let all the traces of glycerin in the permeate to dissipate, make the arrangement for the permeate to recycle back to the aeration tank for the first half hour.

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9.0 SERVICE & SUPPORT

Commissioning and Start-up

newterra MicroClear™ MBR System's **commissioning & start-up** is the last step of the **newterra** project execution process. Experienced engineers and technicians are available to assist clients in these procedures including system initial set up and primary start-up and providing all performance tests according to the pre-commissioning checklist.

Initial on-site training program is an important part of the commissioning service as well. During on-site training, **newterra** technical representative will cover process monitoring, system operation, maintenance, and troubleshooting activities related to the **newterra** ™MBR System. Customized training packages are available. Contact **newterra** for more information.

Post commissioning Services

A comprehensive range of post commissioning services is available from within **newterra** beyond system design and installation. Specific services are included:

- Technical support (including after-hours emergency telephone support).
- Spare parts order and delivery.
- Training program.
- Plant optimization and upgrades.
- Telemetry control and monitoring.
- Assistance in preparing system performance reports (process data monitoring & analysis).
- Preventive maintenance cleaning (including membrane cleaning).
- System audits for reviewing the performance of all MBR subsystems and the efficiency.

1. **Technical support** is available to assist in troubleshooting of **newterra** MBR system during normal working hours 8:30 am to 5:00 pm (Eastern Time Zone for **newterra** ltd.). Telephone service is available via **1.800.420.4056.**

Emergency **24/7 telephone technical support –** This will be activated upon subscribing to **newterra's** 24/7 technical support service.

If problem cannot be resolved through telephone or e-mail supports, **newterra** engineers are available for site visit.

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APPENDIX F STEENSBY AND RAIL CAMPS FWSSWWMP – PLANS FOR FUTURE WORK

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There will be no construction and development of Steensby and the Rail camps in the near future. Updates to these sections of the Plan will be done when required and will be included in a future Annual Report to NWB as required by Part B, Item 4 of existing Type A Water Licence. Block Flow Diagrams for Steensby and Railway Camps will be updated when required.

A.1 Freshwater

A.1.1 Freshwater System Process Description

A.1.1.1 Steensby Port Site

Currently, there are no construction activities planned for Steensby Inlet. During the future construction phase the on-site population will be approximately 600 people. Half the camp personnel will be accommodated on a barge which will be equipped with potable water treatment systems. The potable system onboard the barge will be a reverse osmosis based system. The full configuration will include coagulation, filtration by media filter, reverse osmosis and chemical disinfection. The remaining personnel will be accommodated by a land based potable water treatment system. This system will continue to operate during the operation phase while the barge-based system will only be used during the construction phase.

The existing fresh water equipment will not be used and a new fresh water distribution system will be installed. The fresh water demand for construction and operation are shown on the drawing Steensby Site - Water Supply Balance Block Flow Diagram in Appendix C.

For the land-based system, a heated and insulated pump house will be built at Lake ST347 with duty/standby pumps to deliver fresh water to a fresh water tank (located in close proximity to the new potable water treatment plant). Water from this tank will be used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within the tank will ensure that fire water is always available in the tank. Some fresh water requirements such as road dust suppression, stockpile dust suppression, concrete and explosives manufacturing will be provided directly from nearby lakes using a vacuum truck.

The land based potable water treatment scheme will consist 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. The applicable guidelines specify minimum required levels of chlorine residual free chlorine. The barge-based potable water treatment scheme will include the same equipment as well as a membrane-based system to desalinate the seawater source.

A.1.1.2 Mid-Rail Site

Currently, there are no construction activities planned for the Mid-Rail Site. During the future construction phase, the on-site population will be approximately 200 people. A new potable water

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treatment system and fresh water distribution system will be put in place to support the construction phase operations. The fresh water demand for construction and operation are shown on the drawing Mid-Rail - Water Supply Balance Block Flow Diagram in Appendix C.

A heated and insulated pump house will be built at an adjacent Unnamed Lake with duty/standby pumps to deliver fresh water to a fresh water tank during summer. During the winter, water will be trucked from Ravn Camp Lake to the fresh water tank. This tank will be located in close proximity to the new potable water treatment plant. Water from this tank will be used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within the tank will ensure that fire water is always available in the tank. Some fresh water requirements such as road dust suppression and tunnel drilling will be provided directly from nearby lakes by vacuum truck.

The potable water treatment scheme will consist 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. The applicable guidelines specify minimum required levels of chlorine residual free chlorine.

A.1.1.3 Ravn River Site

Currently, there are no construction activities planned for the Mid-Rail Site. During the future construction phase, the on-site population will be approximately 400 people. A new potable water treatment system and fresh water distribution system will be put in place to support the construction phase operations. The fresh water demand for construction and operation are shown on the drawing Ravn River - Water Supply Balance Block Flow Diagram in Appendix C.

A heated and insulated pump house will be built at Ravn Camp Lake with duty/standby pumps to deliver fresh water to a fresh water tank (to be located in close proximity to the new potable water treatment plant). Water from this tank will be used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within the tank will ensure that fire water is always available in the tank. Some fresh water requirements such as road dust suppression and tunnel drilling will be provided directly from nearby lakes by vacuum truck.

The potable water treatment scheme will consist 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. The applicable guidelines specify minimum required levels of chlorine residual free chlorine.

A.1.1.4 Cockburn Tunnels Camp Site (Cockburn North Camp)

Currently, there are no construction activities planned for the Cockburn Tunnels Camp Site. During the future construction phase, the on-site population will be approximately 100 people. A new potable water treatment system and fresh water distribution system will be put in place to support the construction phase operations. The fresh water demand for construction and operation are shown on

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the drawing Cockburn Lake Tunnels Camp - Water Supply Balance Block Flow Diagram in Appendix C.

A heated and insulated pump house will be built at Cockburn Lake with duty/standby pumps to deliver fresh water to a fresh water tank (located in close proximity to the new potable water treatment plant). Water from this tank will be used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within the tank will ensure that fire water is always available in the tank. Some fresh water requirements such as road dust suppression and tunnel drilling will be provided directly from nearby lakes by vacuum truck.

The potable water treatment scheme will consist 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. The applicable guidelines specify minimum required levels of chlorine residual free chlorine.

A.1.1.5 Cockburn South Camp Site

Currently, there are no construction activities planned for the Cockburn South Camp Site. During the future construction phase, the on-site population will be approximately 400 people. A new potable water treatment system and fresh water distribution system will be put in place to support the construction phase operations. The fresh water demand for construction and operation are shown on the drawing Cockburn South - Water Supply Balance Block Flow Diagram in Appendix C.

A heated and insulated pump house will be built at Cockburn Lake with duty/standby pumps to deliver fresh water to a fresh water tank (located in close proximity to the new potable water treatment plant). Water from this tank will be used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within the tank will ensure that fire water is always available in the tank. Some fresh water requirements such as road dust suppression and tunnel drilling will be provided directly from nearby lakes by truck.

The potable water treatment scheme will consist 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. The applicable guidelines specify minimum required levels of chlorine residual free chlorine.

A.2 Sewage Treatment

A.2.1 Sewage Treatment Process Description

A.2.1.1 Steensby Site

During the construction and operation phase, the camp population will increase to approximately 600 people. There is no planned construction at Steensby Site in the immediate future.

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During construction start-up, sewage generated by the workforce will be treated in an existing sewage treatment plant that is on-site but not yet installed. During the construction phase, 300 people will be accommodated by a temporary sewage treatment system in place for the construction period. In addition, the temporary sewage treatment plant will be designed to process raw or partially treated sewage from the Cockburn Lake rail camps, which will be conveyed to the Steensby temporary sewage treatment facility by truck. The remaining workforce will be accommodated by a permanent sewage treatment system that will remain in service during the operation phase.

These sewage treatment plants will be housed in a temperature controlled areas and as such their performance will not be negatively impacted by arctic conditions.

Effluent from the sewage treatment plants will be stored in effluent tanks. The effluent tanks will have a hydraulic retention time of two days (at minimum) based upon nominal flows. It is intended that the effluent tank will be at a low level during operation such that if sampling indicates that the effluent quality does not meet the applicable criteria further discharge can be prevented for a period in excess of a day to allow this effluent to be mixed, retreated, and retested. In addition, this retention volume will allow for a minimal amount of recirculation through the STP using any spare STP capacity. This will improve the quality of the final effluent in the tank. The volume is sufficient to allow for periodic sampling and testing of the treated effluent before discharge or reuse. The new permanent sewage treatment facility will be RBC based technology or superior. Treated effluent will be discharged to the ocean.

The equalization tank that feeds the temporary sewage treatment plant will be sized to accommodate the sewage from the Cockburn Lake and Cockburn South rail camps. The rail camp sewage will be added during periods of low sewage generation at Steensby in order to reduce excessive surge volumes building up in the tank.

The sludge generated will be dewatered using a mechanical dewatering device such as belt filter or filter press and then incinerated. Sludge cake will be stored in an animal proof secure area. Odour generation will be limited because the sludge will be aerobically digested, dewatered and incinerated regularly such that the sewage cake is not stored for significant periods. Odour control carbon vents will be installed where deemed necessary. The incinerator design will consider the solids content of the sludge from the dewatering device.

The equalization tank that feeds the new sewage treatment plant will be sized to accommodate the sewage from the Cockburn Lake and Cockburn South rail camps. The rail camp sewage will be added during periods of low sewage generation at Steensby in order to reduce excessive surge volumes building up in the tank.

The sludge generated will be dewatered using a mechanical dewatering device such as belt filter or filter press and then incinerated. Sludge cake will be stored in an animal proof secure area. Odour generation will be limited because the sludge will be aerobically digested, dewatered and incinerated

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regularly such that the sewage cake is not stored for significant periods. Odour control carbon vents will be installed where deemed necessary.

A.2.1.2 Mid-Rail and Ravn River Sites

Sewage waste generated at the Ravn River and Mid-Rail camps and Sewage generated at the Cockburn North and Cockburn South camps can only be transported and treated at either the Mine Site Sewage Treatment Facility or the Steensby Port Sewage Treatment Facility, unless otherwise approved by the Board in writing.

Sewage generated at these sites will mainly be conveyed to the Mary River permanent sewage treatment facility by truck. During the first year when there will only be access to the camp via an ice road, sewage can only be trucked from January to April. During the remaining months the sewage will be stored. There would be an opportunity to partially or fully treat sewage prior to storage. Sewage storage facilities may be aerated to prevent the waste from becoming septic (generating odours and noxious gases). Sludge will form and settle in the facility depending on how long the sewage resides there. This sludge will be withdrawn and delivered separately to the dewatering system at the Mine Site. Given the quantity of waste to be moved or stored every effort will be made to reduce this volume by using low flow showers and toilets and potentially segregating gray water to be treated and reused as urinal flush water. Other potential waste minimization techniques will also be reviewed. These will be evaluated during the detailed design. In addition, the surrounding water bodies will be modelled and sampled to potentially support having sewage treatment and waste discharge near the camp sites. An additional amendment to the Type A Water Licence would be required to support this option.

The equalization tank at Mary River will be sized to provide sufficient residence time for freshly added sewage from the Mid-Rail or Ravn River to mix with sewage generated at the Mine Site. Given that sewage generation follows diurnal patterns, the sewage from the remote sites will be added during the low generation periods at the Mine Site.

A.2.1.3 Cockburn Tunnels (Cockburn North) and Cockburn South Sites

Sewage generated at these sites will be conveyed to the Steensby permanent sewage treatment facility by truck. Raw to partially treated sewage will be conveyed to Steensby Inlet by means of established roads along the rail alignment or by ice road. Depending on the volume of sewage to be stored at site, the sewage storage facilities will be sized accordingly. At the north camp there will only be access to the camp via an ice road and as such, sewage can only be trucked from January to April. During the remaining months the sewage will be stored. Sewage storage facilities will be aerated to prevent the waste from becoming septic (generating odours and noxious gases). There will be the opportunity to partially or fully treat sewage prior to storage. Sludge will form and settle in the facility depending on how long the sewage resides there. This sludge will be withdrawn and delivered separately to the dewatering system at the Steensby site. Given the quantity of waste to be moved every effort will be made to reduce this volume by using low flow showers and toilets and potentially

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segregating gray water to be treated and reused as urinal flush water. Other potential waste minimization techniques will also be reviewed. These will be evaluated during the detailed design. In addition, the surrounding water bodies will be modelled and sampled to potentially support having sewage treatment and waste discharge near the camp sites. An additional amendment to the Type A Water Licence would be required to support this option.

The equalization tank at Steensby will be sized to provide sufficient residence time for freshly added sewage from the Cockburn Tunnels (Cockburn North) and Cockburn South camps to mix with sewage generated at the Steensby site. Given that sewage generation follows diurnal patterns, the sewage from the remote sites will be added during the low generation periods at the Steensby site.

A.2.1.4 Design Considerations from 'Lessons Learned'

Previous studies have recommended the use of Polishing Waste Stabilization Ponds (i.e. Mary River Project Appendix 10D-3 Wastewater Management Plan SD-EMMP-003, March 31, 2010) followed by a secondary waste polishing system. The existing infrastructure at the Mine Site and Milne Port include these ponds in part to allow for secondary treatment of the sewage treatment plant (STP) effluent which was not meeting the phosphorus discharge limit. However, based upon practical experience at the site with the STP it was projected that a secondary polishing system will not be required in the future.

The new systems will be installed with temporary storage ponds for off-spec water but will not require secondary polishing for the following reasons:

- The proposed new STPs will be based on membrane technology. This technology produces better quality effluent, is less susceptible to the impact of varying loads and has shorter start-up periods.
- The STP trains will be better able to handle upsets by using the available spare capacity to operate the equipment at more conservative flow rates.
- The existing equipment (at the Mine Site) was designed to meet a phosphorus discharge criterion of 0.5 mg/L. The new STPs shall be designed to meet a much lower phosphorus discharge criteria of <0.1 mg/L.

Sewage Treatment equipment vendors will be assessed based upon their experience producing equipment for arctic environments.

A.2.2 Oily Water/Wastewater Treatment Process Description

The process descriptions for both oily water/wastewater treatment systems for Steensby are described in the section that follows.

A.2.2.1 Steensby Site

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Future Construction and Operation Phase

Oily water may be generated from the following sources (this neglects minor oily water generated from accidental spills, which will be handled by the Spill Response Plan):

- Vehicle maintenance and wash facilities (i.e. truck wash, equipment and floor wash down water).
- Fuel tank farm run-off.
- Emulsion plant wash water.
- Freight dock.
- Airstrip.

The vehicle maintenance and wash facility will have a sump located in close proximity to the maintenance facilities. Wash water produced in the maintenance facility (truck washing, equipment and floor wash-down) will flow by gravity and be collected in the local sump. Suspended material in the wastewater will settle in the sump. Free oil in the wastewater will be removed by an oil/water separator system in order to meet the required oil discharge limits. The waste will then be further treated in the oily water treatment plant by activated carbon and clay to meet other specific parameters. The effluent will then be pH adjusted, if required, to meet discharge criteria.

Treated effluent from the oily water treatment plant will be pumped to discharge, or recycled and reused as wash-down water at the maintenance shops. The separated waste oil will be stored in a local tank. Periodically, the oil will be drained and shipped off site or incinerated. Accumulated suspended solids will be periodically removed and sent to the landfarm for treatment, if necessary.

Run-off from the tank fuel storage areas will have to be treated by the mobile oily water separator system that will be used as needed. The resulting water will be discharged directly to the receiving body (Steensby – Ocean). The water will be periodically tested such that if any parameter is out of compliance the water will be removed by vacuum truck and treated in the vehicle maintenance shop wastewater treatment plant.

Run-off water from the freight dock will be collected and treated in a manner similar to the treatment scheme for the run-off from the tank fuel storage areas.

The emulsion plant shall be supplied with its own wastewater treatment plant, which utilizes an evaporation system to evaporate the water leaving solid residue and oil. This residue will be tested for toxicity and if necessary taken off-site for disposal at a licensed facility otherwise the waste will be land filled.

Run-off water from the airstrip run-off also has the potential for some oily water content. As such, this water will be collected through a drainage system and transported as needed by vacuum truck to the vehicle maintenance shop wastewater treatment plant.

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Small amounts of propylene glycol will be used for de-icing of aircraft. The spent propylene glycol will be collected, stored in containers and sent by ship off-site to a licensed treatment/disposal facility. Some interim treatment of the spent propylene glycol may occur to reduce the overall waste volume generated. This will be evaluated during the detailed design.

Some dust suppression solution will be applied to roads at the Steensby site. The suppressant will be DL-10. This is an asphalt-based emulsion and as such, some water will be consumed for the dilution of the solution. This is an approved dust suppressant as specified by the Nunavut Department of Sustainable Development Environmental Protection Service (Environmental Guideline for Dust Suppression).

In addition, some Calcium Chloride solution will be used for drilling activities. The spent brine will be applied to nearby roads as a dust suppressant. This is an approved dust suppressant as specified by the Nunavut Environmental Protection Service. Treated oily water will be blended with treated sewage and discharged or discharged directly based on sampling.

A.2.2.2 Rail Camps

Two tunnels are to be built along the railway and a small amount of water will be consumed in the tunnelling operation. Calcium Chloride brine solution is used for tunnelling. This waste brine generated during the tunnelling will be collected and disposed of as per the Waste Management Plan for Construction, Operation and Closure. In addition, some Calcium Chloride solution will be used for drilling activities.

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APPENDIX G PWSP EFFLUENT DISCHARGE PLAN

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Technical Memo

To: Connor Devereaux, Baffinland Iron Mines

From: Jack Hinds, P.Eng, Wood E&IS

Reviewer: Jered Munro, P.Eng, Wood E&IS

Project No.: TPC192071

Date: 29 April 2020

Re: PWSP Treatment and Discharge

1.0 Background

Baffinland Iron Mines Corporation (Baffinland) has retained Wood Environment and Infrastructure Solutions, a Division of Wood Canada Ltd (Wood E&IS) to prepare this technical memo, outlining treatment, and disposal options for the water stored in the polishing/ waste stabilization ponds (PWSPs) at the Milne Inlet and Mary River sites.

The PWSPs can receive wastewater, sludge, grey water, and non-compliant sanitary effluent from various locations across both sites. These sources include, but are not limited to:

- Non-compliant effluent from wastewater treatment plants
- Excess sludge generated at wastewater treatment plants
- Raw sewage from spills
- Raw sewage from lift stations as a result of malfunction or emergency
- Greywater from lift stations

This plan updates and amends the previous plan that was completed in March 2012. The intent of this memorandum is to outline options that could be employed to treat the PWSPs to a level that is compliant with the approved Type A Water Licence requirements and be discharged to the environment under those requirements. The proposed treatment options may be used individually or combined with other treatment options to form a treatment system that is capable of achieving compliant effluent quality. This approach has been selected to provide operators with the ability to address various water quality issues that can occur due to changing conditions in the PWSPs, caused by the various site sources noted above, and the natural environment.

The PWSPs can potentially require treatment for:

- Removal of BOD/COD
- Removal of total suspended solids (TSS)
- Removal of total ammonia
- Removal of total phosphorus
- Removal of oil and grease
- Destruction of faecal coliforms
- Acute Toxicity associated with inorganic or organic compounds
- Control of pH

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1.1 Onsite Water/Wastewater Treatment Equipment

There are a number of water and wastewater treatment equipment available at the Project site that are available for use in treating the PWSPs. The equipment is owned and maintained by Baffinland, and is typically operated by Baffinland, or is operated under contract with an engineering or operations firm. It is expected that Baffinland may be required to purchase additional equipment or replace existing equipment that is aging or no longer functional.

Baffinland maintains a supply of common treatment chemicals required by the treatment processes. Less common chemicals used for treatment are brought on site on an as-needed basis.

2.0 Treatment of PWSPs

PWSP treatment occurs during the spring and summer discharge seasons, when the water in these ponds is not frozen. Water quality in the PWSPs can be variable, and often changes over the course of the year. These variations in water quality are typically caused by:

- Contributions of impacted water to the PWSPs
- Spring melt, and ice retained within the PWSPs
- Fluctuations in temperature and pH
- Biological activity and consumption of nutrients
- Diurnal effects, exacerbated by long periods of daylight/twilight during the mid-summer months

The treatment methods presented below represent the treatment techniques that may be employed to achieve compliant water quality in the PWSPs, and allow for discharge to the environment. The options presented have been listed discretely but may be combined as required in order to address the influent water quality. As the water quality is variable over the course of a single season, multiple treatment methods or approaches may be required in a single season in order to maintain compliant effluent quality.

2.1 Winter Discharge

During the winter season, the PWSPs will stratify and eventually freeze the entire water column down to the lined bottom of the pond. If no additional non-compliant effluent is added to the ponds, it is possible that melted ice could be compliant for discharge. This offers Baffinland an opportunity to perform a discharge during winter months, if additional storage space is required before the spring melt.

To do so, Baffinland would use in-line heaters to recirculate hot water into the pond, to produce a layer of melt water. The melt water would then be heated, and returned to the pond, to further melt the surface ice. This process would be repeated, until there was sufficient free water on the surface to allow for sampling and discharge.

Samples will be collected for all criteria and analyzed prior to discharge. The discharge will be monitored for compliance following the guidelines given in Section 3.0, and will be shut down once water quality degrades below internally set limits.

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2.2 Spring Discharge

As noted in Section 2.1 above, during the winter months the PWSPs will typically freeze down to the lined bottom of the ponds. During spring freshet, warmer temperatures and increased daylight hours cause the top layer of ice to thaw first, creating a pool of clear water on the surface of the PWSPs.

Typically, this initial melt water is compliant for discharge due to settling of solids at the end of the previous season. If the water quality analysis confirms the meltwater is compliant, it may be discharged to the receiving environment without further treatment.

The discharge will be monitored for compliance following the guidelines given in Section 3.0.

2.3 Membrane Bioreactor Treatment

Baffinland owns and operates Membrane Bioreactors (MBRs) for treatment of sewage at both the Mary River and Milne Inlet sites. If there is available capacity in these plants, impacted water from the PWSPs may be treated through the installed MBRs. This may be achieved either through the use of a vac-truck offloading to the equalization tank, or through installation of a temporary or permanent pumped line to the equalization tanks. Appropriate controls would be installed to ensure the total volume of pond water treated is controlled and recorded, and the equalization tank and MBR treatment system are adequately protected from damage.

An alternate approach that could be considered by Baffinland is to install a package treatment process specifically for the PWSPs. In this case, impacted water from the ponds will be pumped directly into the equalization tank, and treated through the system.

Generally, a package treatment system is comprised of the following processes:

- Equalization tank and pumps
- Coarse filtration system
- Aeration tank, with aeration grid and blowers
- Biological treatment process, including membranes or media, blowers, backwash system, cleaning system etc.
- Sludge pumps and sludge storage
- Sludge handling system, such as a sludge press
- Final effluent holding tank and pumps
- Disinfection system
- Chemical dosing systems

2.3.1 Filter Cake Disposal

Filtered sludge cake generated by the biological treatment process is either incinerated onsite, or backhauled south for disposal at an approved facility. All sludge cake will be handled in accordance with the applicable portions of Baffinland's Fresh Water Supply, Sewage, and Wastewater Management Plan.

2.4 Dissolved Air Flotation

Dissolved Air Flotation (DAF) is a treatment principle typically used to remove solid materials from wastewater, through the use of a recycle stream of air-saturated liquid. Baffinland may employ owned, constructed, or rental DAF units at either site for treatment of the PWSPs. DAF systems typically only remove solid material in the water, making them applicable for removal of BOD, TSS, and total phosphorus.

Wastewater is pumped into the system from the source, through a tube flocculator where coagulation and flocculation chemicals are added prior to entering the main treatment tank through a distribution header. A recycle pump draws a stream of partially-clarified liquid off the side of the tank and pressurizes it in an air saturation tank. At the same time, compressed air is injected into the air saturation tank, creating a recycle stream saturated with dissolved air. This recycle stream is then released back into the main tank, where the saturated air comes out of solution as very fine air bubbles. These bubbles act as nuclei for flocculated/coagulated solids, causing them to rise to the surface. A skimmer transfers floated solids from the

surface of the tank to a hopper, where it's pumped to a tote or tank for storage and disposal. Clarified effluent flows over a weir and out of the system.

Generally, a DAF system is comprised of the following processes:

- Influent pump
- Tube flocculator
- Dissolved air floatation tank, with distribution headers
- Compressor
- Air control panel
- Air saturation tank
- Recycle pump
- Float skimmer and hopper
- Float pump
- Effluent weir
- Solids drain
- Effluent break tank or holding tank, and pumps
- Chemical dosing system

For coagulation, a DAF system may use the following chemicals:

- Aluminum sulfate (alum)
- Poly-aluminum chloride (PAC)
- Sodium aluminate
- Alum potash
- Ferric/ferrous sulfate
- Ferric chloride
- Lime/soda ash
- Caustic soda

For flocculation, a DAF system may use the following chemicals:

- Vendor-specific, proprietary anionic or cationic polymers

2.4.1 Separated Solids Handling

Solids removed from the water by the flotation system are pumped into totes or other appropriate containers, labelled and manifested appropriately, and backhauled seasonally for disposal.

If possible, the floated solids may also be pressed through a filter press and incinerated, if the composition and water content allow.

2.5 Bulk Pond Treatment

If required, removal of TSS, BOD, total phosphorus, total ammonia, and/or faecal coliforms, may be performed in the ponds themselves. Doing so allows for rapid, bulk treatment of the contents of the PWSPs.

A typical treatment system would require:

- A pond mixing system
- Chemical dosing systems
- Inline mixers, such as a mixing tank, tube flocculator, or static mixer
- Flowmeter for flow measurement and totalization

Jar testing would be completed on the raw contents of the PWSP being treated to determine approximate chemical dosing rates required for treatment. The ponds would be mixed and chemicals would be injected into the mixing streams in accordance with dosing rates established during the jar tests. Chemical addition may be completed in multiple steps, to ensure no chemical is dosed beyond what is required for treatment.

Once dosing is complete, the PWSP will continue to be mixed for an appropriate amount of time, to ensure the chemical(s) reacts fully and all contents of the pond have been turned over. Once mixing is complete, the mixing system will be shut off, to allow any coagulated/flocculated solids to settle, or to allow for natural stripping

processes to occur. An effluent discharge system will be set up to allow for recirculation of effluent back into the PWSP. When water quality analyses confirm the clarified water is compliant for discharge, discharge may begin.

For in-pond treatment, the following chemicals may be used:

- Aluminum sulfate (alum)
- Poly-aluminum chloride (PAC)
- Sodium aluminate
- Alum potash
- Ferric/ferrous sulfate
- Ferric chloride
- Lime/soda ash
- Caustic soda
- Vendor-specific, proprietary anionic or cationic polymers
- Sulfuric acid
- Citric acid
- Hydrochloric acid
- Phosphoric acid
- Nitric acid
- Sodium hydroxide
- Sodium bicarbonate
- Magnesium hydroxide

2.5.1 Settled Solids Handling

Solids removed as part of this treatment method will naturally settle to the bottom of the ponds. Based on observations made in previous years, the quantities of settled solids are low enough to be considered insignificant in comparison to the total storage volume of the pond. Any settled solids typically remain settled and degrade naturally over time. If necessary, Baffinland may elect to drain any one of the ponds and remove and dewater any sludge remaining in the bottom.

2.6 pH Adjustment

pH adjustment may be required as a standalone treatment or may be required as part of a larger treatment system in order to maintain compliance. pH adjustment can be carried out in-pond or adjusted inline prior to discharge, depending on the requirements of the system and the condition of the PWSPs.

A typical pH adjustment system could require:

- A pond mixing system
- Chemical dosing systems
- Temporary chemical storage
- Inline mixers, such as a mixing tank, tube flocculator, or static mixer

Past observations suggest that pH in the PWSPs can be acidic, neutral, or basic, depending on what has been contributed to the pond, and what kind of natural biological activity has occurred. Various other treatment methods listed here may also have an impact on effluent pH and may require that pH adjustment be added as part of the treatment process to ensure compliant effluent.

The following chemicals may be used to form part of a pH adjustment system:

- Aluminum sulfate (alum)
- Poly-aluminum chloride (PAC)
- Sodium aluminate
- Alum potash
- Ferric/ferrous sulfate
- Ferric chloride
- Lime/soda ash
- Caustic soda
- Sulfuric acid
- Citric acid

- Hydrochloric acid
- Phosphoric acid
- Nitric acid
- Sodium hydroxide
- Sodium bicarbonate
- Magnesium hydroxide

2.7 Filtration

Filtration systems provide a physical barrier, allowing for the removal of solid matter from a liquid stream. Doing so may be an effective means of reducing/removing TSS, BOD, and total phosphorus. Filtration may be used as a standalone treatment process or as part of a larger treatment system. Solids removal through filtration can also be used as tertiary treatment when combined with other treatment processes, to protect against carry-over or suspended solids.

A typical solids filtration system may employ one or more of the following technologies:

- Basket strainers
- Bag filters
- Disposable cartridge filters
- Backwashing cartridge filters
- Sand filters
- Continuous backwash sand filters
- Multimedia filters
- Rotary drum screens
- Belt filters
- Microfiltration
- Ultrafiltration
- Nanofiltration
- Membrane filtration

Filters used either alone, or in conjunction with other treatment processes, may be stand-alone, skid mounted, packaged, or contained within their own seacan.

2.7.1 Filtered Solids Handling

For most cartridge or bag filtration systems, solids are removed through capture on a fiber media, which cannot be backwashed. The media must be removed and disposed of according to Baffinland's Waste Management Plan.

Effluent from the backwashing of filters may be directed back into the PWSPs, or into dedicated storage for further treatment or disposal.

2.8 Adsorption Media Treatment

For treatment of dissolved compounds in impounded waters, various forms of adsorption media can be employed. The media would be loaded into plastic or steel media vessels and connected to the remainder of a constructed system using hoses. Various types of media may be used in series to remove different contaminants of concern. Media that may be used include:

- Granular activated carbon (GAC)
- Synthetic ion exchange resins
- Activated iron products
- Natural Zeolites
- Other adsorptive and ion exchange media as applicable

Use of adsorption media is typically sensitive to solids in the water, and may become fouled if solids concentrations are too high. Typically adsorption vessels would be preceded by a suitably selected filtration process to prevent fouling.

2.9 Oxidation

Some of the chemical treatment approaches listed use an oxidation-reduction reaction to remove contaminants. However, it is sometimes necessary to augment that oxidation reaction to further remove any contaminants, or to remove specific species that are otherwise hard to treat. Most forms of enhanced oxidation require additional

power and would be purpose-built systems constructed or purchased from vendors and brought to site. These could include:

- Hydrogen peroxide addition
- Ozone addition
- Ultraviolet light (UV)
- Electrochemical oxidation

2.10 Transfer of Water Between Sites

Under some circumstances, it may be necessary to transfer non-compliant effluent or pond water between sites, to facilitate treatment or provide additional capacity to handle upset conditions. Both sites have separate PWSPs, with different capacities and different available methods of treatment. By transferring water from one site to another, Baffinland can more effectively manage and treat non-compliant effluent, during treatment plant upsets.

Treatment between sites is achieved through the use of vacuum trucks specifically designated for hauling non-compliant effluent. The trucks would transport the water between the PWSPs at both sites, as required to achieve treatment and discharge.

3.0 Sampling and Performance Monitoring

The effluent discharge quality criteria for the PWSPs is defined in the Type A Water Licence 2AM-MRY1325 Amendment No. 1 as issued by the Nunavut Water Board, July 31, 2014. The following table summarizes the discharge criteria:

Parameter	Discharge to Freshwater Max concentration of any grab sample (mg/L)	Discharge to Ocean Max concentration of any grab sample (mg/L
BOD_5	30	100
TSS	35	120
Faecal Coliforms	1000 CFU/100 ml	10,000 CFU/100 ml
Oil and Grease	No visible sheen	No visible sheen
pH	>6.0, <9.5	>6.0, <9.5
Ammonia (NH3-N)	4.0	NR
Total Phosphorus	1.0	NR
Toxicity[1]	Not acutely toxic	Not acutely toxic

1: Acute lethality to rainbow trout (Method EPS/1/RM/13) and daphnia magna (Method EPS/1/RM/14)

Prior to commencing any treatment or discharge, Baffinland or their contractors will be required to develop and submit a discharge plan including details on monitoring and sampling frequency, safeguards, internal limits, etc. This plan shall be submitted to the Environmental Superintendent for review and approval before any treatment or discharge begins.

Baffinland will complete sampling to confirm treatment efficacy prior to and during discharge, which will be conducted at the intervals specified in the relevant discharge plan and the results of which will be used to guide treatment implementation and the ability to commence or continue discharge to the receiving environment. Discharge samples will be collected in accordance with the schedule laid out in the Type A Water Licence and provided to regulators to confirm treated effluent discharge meets the applicable criteria outlined above.

If there are any questions, comments, or concerns regarding the content of this memo, please feel free to reach out to Jack Hinds at 519-650-7143 or Jered Munro at 519-650-7130.

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APPENDIX H MOBILE OWS MANUAL

(See BAF-PH1-830-T07-0001)

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Baffinland Iron Mines Corporation

Mobile Oily Water Separator (OWS) Manual

BAF-PH1-830-T07-0001

Rev 0

Prepared By: Andrew Vermeer
Department: Environment
Title: Environmental Coordinator
Date: March 21, 2016

Signature: 

Approved By: Allan Knight
Department: Environment
Title: Environmental Superintendent
Date: March 21, 2016

Signature: 

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1 PURPOSE AND SCOPE

The purpose of this manual is to provide guidance for the commissioning, operation, and decommissioning of the mobile oily water separator (OWS) in a safe, efficient and environmentally responsible manner.

2 REQUIREMENTS

2.1 REGULATIONS

Type A Water Licence No: "2AM–MRY1325 – Amendment No. 1", Nunavut Water Board

Nunavut Mine Health and Safety Act and Regulations.

2.2 HAZARDS AND REQUIRED HSE EQUIPMENT

2.2.1 HAZARDS

Identified hazards associated with commissioning, operation and decommissioning of the OWS include:

- Working with energized equipment and pressurized lines
- Working with electrically energized equipment near water
- Exposure to contaminated water and hazardous chemicals (i.e. diesel, bentonite)
- Working from heights
- Elevated noise levels (generator)
- Spills

2.2.2 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

The following personal protective equipment (PPE) requirements have been assigned to the commissioning, operation and decommissioning of the OWS:

Standard PPE

- Hard hat
- Reflective vest
- Safety glasses
- Steel toed boots
- Rubber gloves

Additional PPE

- Face respirator and P100 particulate cartridge (for handling bentonite and lead media)
- Rubber gloves and hip waiters (when installing the berm sump)
- Nitrile gloves, safety glasses and lab coat when performing sample analysis

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- Ear protection (when working near generator)

All PPE must comply with applicable Baffinland's PPE policy and be inspected for damage prior to use.

2.2.3 Additional Safety and Environmental Equipment

The following safety and environmental equipment should be available at the OWS unit during operation.

- Fire extinguisher
- Spill kit
- Radio
- Spill pads (for fuel and free product tank)
- Quatrex bags (for used bag filters and spent media)

2.3 General Safety Instructions

- Monitor all pressure gauges and immediately shut down the OWS system if any exceedances occur
- Watch for pinch-points when exchanging bag filters
- Only trained personnel shall open or work on the electrical panels
- As a precaution against arc flashing, use your left hand and turn your body away from the electrical panel when switching off main breaker to the OWS
- When opening valves to vent air, do so slowly and carefully. Do not stand directly in front of valve.
- Ensure all electrical cords are in good condition and safely secured
- Practice good housekeeping inside and around the OWS unit
- Walk carefully between adsorption units, being careful not to become entangled with hoses or shut off valves by accident
- Wear all required PPE when working at OWS

2.4 Training and/or Qualifications

Any person commissioning, operating or decommissioning the OWS at the Project is required to have read and be familiar with this document. All operators will be trained by an experienced operator.

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3 DEFINITIONS

Total Adsorption Tank Bed Volume: the maximum total volume of water that the three (3) media vessels can hold when full of their respective medias (i.e. GAC, bentonite, anthracite).

GAC: granular activated carbon

GPM: gallons per minute

LPC: liquid phase carbon

HMI (Human Machine Interface): refers to the screen in the OWS control room.

API: refers to the baffled tank in the first stage of treatment where free product is removed.

BTE: refers to benzene, toluene and ethylbenzene.

4 RESPONSIBILITIES

The following responsibilities have been assigned to Baffinland's Environmental and Surface Works Personnel regarding the commissioning, operation and decommissioning of the OWS.

4.1 ENVIRONMENTAL COORDINATOR

Under the supervision of the Environmental Superintendent, the Environmental Coordinator will be responsible for implementing this SOP at their Project site. In the absence of the Environmental Coordinator, the Project Site Environmental Lead or his/her designate will assume all responsibilities outlined in this procedure. Specifically, the Environmental Coordinator shall:

- Ensure Environmental staff operating the OWS have read, understand and follow this SOP;
- Review and modify this SOP, as necessary;
- Provide updates to the Environment Superintendent and/or Environment Manager on the status and current operations of the OWS;
- Oversee and supervise all OWS operations;
- Report sample analysis results to the Environment Superintendent and/or Environment Manager.

4.2 OPERATORS

Under the supervision of the Environmental Coordinator, OWS operators will be responsible for adhering to and following this manual. Specifically, operators shall:

- Read and adhere to the protocols outlined in this manual
- Wear all required PPE;
- Conduct routine inspections of the OWS work area to ensure adequate controls are in place to mitigate known hazards;

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- Maintain a detailed log of all actions undertaken during operations and record all required data in the Daily Log Sheet (Appendix D);
- Complete required sampling and sample analysis (Section 5.5) to ensure OWS is operating as designed and that the final effluent meets water quality discharge criteria

4.3 Surface Works Personnel

Surface Works personnel shall support OWS operations, as necessary. Specifically Surface Works personnel shall:

- Provide a vacuum truck and operator for removing spent media;
- Assist in transporting, relocating and levelling the OWS unit;
- Assist operators in commissioning OWS by providing electrical support regarding power generation and ancillary components (wiring configuration and electrical switches);
- Provide logistical support in transporting barrels, Quatrex bags, supplies and other components to and from the OWS unit, as required.

5 PROTOCOL

5.1 Oily Water Separator (OWS) Overview

The OWS is a prefabricated system housed in a 40' foot seacan and is designed to remove oil, grease and BTE compounds from wastewater contaminated by hydrocarbons. The unit includes an API type separator to remove free product, a bag filter for solids removal and three adsorption units (one clay and two GAC) for hydrocarbon removal. In the event that the wastewater has lead concentrations that exceed the discharge limits outlined in Baffinland's Type 'A' Water License (2AM-MRY1325 Amendment No. 1), additional treatment barrels containing lead removal media will be added to the end of the OWS system. Refer to Section 5.3 for additional information on configuring the lead treatment barrels.

The OWS unit (Newterra 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.

Error! Reference source not found. shows the Process Flow Diagram for the OWS.

Refer to Appendix A - Section 3 in the Newterra OWS O&M Manual for process and instrumentation drawings These drawings include equipment sizing, valves, and instrumentation as well as equipment/instrument tag and model numbers.

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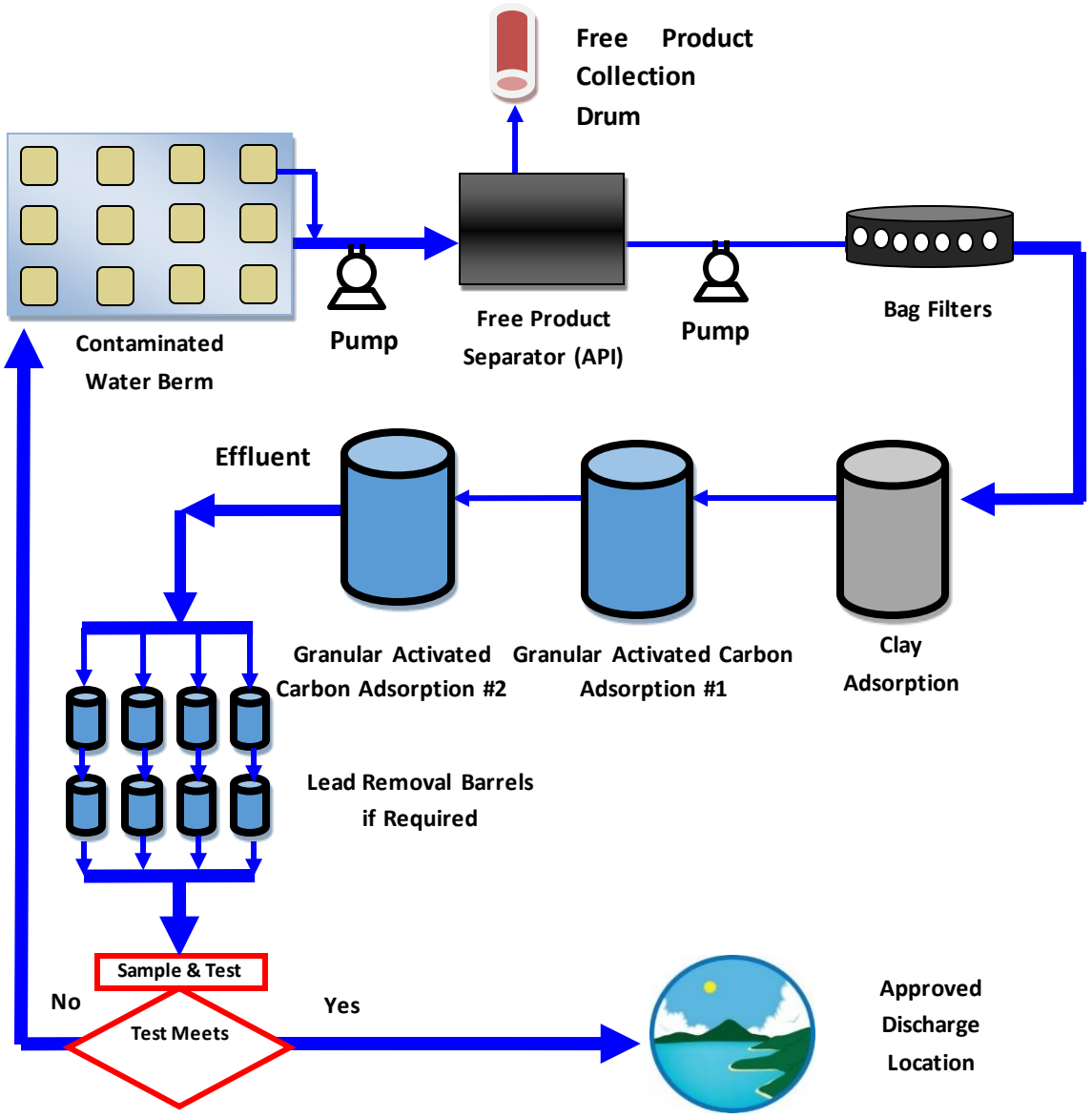


FIGURE 5-1 – OWS PROCESS FLOW DIAGRAM

The following protocols discuss in detail how to operate the OWS unit in a safe, efficient and environmentally responsible manner. Protocols discuss the commissioning, decommissioning and general operation procedures of the OWS unit as well as the water quality discharge criteria outlined in Baffinland's Type 'A' Water Licence (2AM-MRY1325 Amendment No. 1).

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5.2 Water Quality Discharge Criteria

The main sources of the contaminated water (wastewater) that the mobile OWS unit will be treating are the Bulk Fuel Containment Facilities/Berms and the Landfarm Facilities (including the Contaminated Snow Containment Berms).

All discharges from Bulk Fuel Storage Facilities will not exceed the following effluent quality limits outlined in Table 5-1. Applicable Monitoring Stations include MP-03, MP-MRY-7, MS-03, MS-04, MS-MRY-6, SP-04 and SP-05.

TABLE 5-1 – EFFLUENT QUALITY DISCHARGE LIMITS FOR BULK FUEL STORAGE FACILITIES

Parameter	Maximum Concentration of Any Grab Sample (ug/L)
Benzene	370
Toluene	2
Ethylbenzene	90
Total Lead	1
Oil and Grease	15,000 and no visible sheen

*Source: Type A Water Licence (2AM-MRY1325 – Amendment 1) Table 8

All discharges from Landfarm Facilities, including the Contaminated Snow Containment Berms, will not exceed the following effluent quality limits outlined in Table 5-2. Applicable Monitoring Stations include MP-04, MS-05 and SP-06.

TABLE 5-2 – EFFLUENT QUALITY DISCHARGE LIMITS FOR LANDFARM FACILITIES

Parameter	Maximum Concentration of Any Grab Sample (ug/L)
pH	Between 6.0 and 9.0
TSS	15
Oil and Grease	15,000 and no visible sheen
Total Lead	1
Benzene	370
Toluene	2
Ethylbenzene	90

*Source: Type A Water Licence (2AM-MRY1325 – Amendment 1) Table 9

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5.3 Commissioning the Oily Water Separator

Prior to commissioning the OWS, operators should review the OWS Commissioning Job Hazard Analysis (JHA) presented in Appendix B and inventory all chemicals/equipment required for OWS operation, including the supplies needed for sampling and conducting internal sample analysis.

As previously mentioned, the OWS system is a treatment train comprised of an API separator, a bag filter and three adsorption media vessels (tanks). The first process in the system's treatment train is the API separator which separates free-floating product with a skimmer and densely emulsified product with coarse screen filters. After the API separator, contaminated water is put through a bag filter unit to remove solids and is then percolated through three adsorption media tanks to remove any remaining hydrocarbon fractions. The first adsorption tank contains clay media comprised of two chemicals: anthracite and bentonite. Anthracite is a course media which is added to the tank first so that the anthracite is located at the bottom of the tank near the outlets. Anthracite is added first to prevent the finer bentonite media (added after the anthracite) from clogging the outlet filters located at the bottom of the tank. Following the clay adsorption tank, the second and third adsorption tanks are referred to as the GAC (LPC) tanks and are filled entirely with granulated activated carbon (GAC).

Table 5-3 provides the media types used in the OWS adsorption media tanks and their respective quantities.

TABLE 5-3 – ADSORPTION TANK MEDIAS AND QUANTITIES

OWS Adsorption Tank	Media Type	Quantity	# of bags/boxes
Clay (Tank 1)	Anthracite (added first and is utilized as course media around the outlet ports at the bottom of the tank)	1,000 lbs	18
Clay (Tank 1)	Bentonite	5000 lbs	103
GAC #1 (Tank 2)	Granulated Activated Carbon	3000 lbs	54.5
GAC #2 (Tank 3)	Granulated Activated Carbon	3000 lbs	54.5
Lead media (2 barrels per train, 3-4 trains in parallel)	Metsorb HMRG	3.5 cubic feet	3.5

Before commissioning the OWS system for the upcoming season, the influent and effluent TOG results from the previous year's treatment records should be assessed to determine if the existing media in the

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OWS adsorption tanks needs to be replaced. Percent removals for each applicable parameter (i.e. BTE, TOG, lead, etc.) should be calculated using the previous year's influent and effluent analysis results just prior to the previous year's winterization/decommissioning of the OWS system.

$$\text{Percent removal} = \frac{Conc\ influent\ -\ Conc\ effluent}{100}$$

The media is completely spent (used) and will need to be replaced when the influent concentration is equal to the effluent concentration (i.e. percent removal = 0%). The percent removal is used to assess and determine whether the media is capable of effectively treating current hydrocarbon concentrations found in the wastewater to be treated. The media will need to be replaced if the percent removal is not sufficient to reduce the contaminants concentrations below the discharge requirements outlined in Section 5.2. Contact Environmental Coordinator for direction if unsure.

The following steps are required to replace media from the adsorption media tanks:

1. Review JHA (Appendix B) with supervisor. Modify JHA, if necessary.
2. Wear all appropriate PPE (including respirator and P100 particulate cartridge)
3. Remove lids from adsorption tanks.
4. Contact Surface Works to provide vacuum truck to remove media from tanks.
5. Transfer spent media into labelled Quatrex bags (white).
6. Refill tanks with quantities listed in Table 5-3.
   Note: *Bentonite contains silica dust which is carcinogenic and therefore requires personnel to wear a half mask respirator equipped with a P100 particulate cartridge when handling bentonite. Refer to MSDS for full instructions before handling or opening bags.*
7. Reattach adsorption tank lids.

Whether the existing media from the previous year or brand new media is being used, the media in the adsorption tanks must be soaked in clean freshwater for 24 hours prior to running contaminated water through the system. This allows air trapped in the media's pores to be removed and the full surface area of the media to be utilized in treatment.

The following steps are required to soak the media within the adsorption tanks:

1. Contact Surface Works to provide a water truck with a full load of freshwater.
2. Open up all inlet and outlet valves on adsorption tanks except the outlet valve on the last adsorption tank (GAC#2). This will allow water to equalize among all three adsorption tanks
3. Open pressure valves on the top of each adsorption tank for air venting.
4. Hook up water line to inlet of the first adsorption tank.
5. Begin pumping water into the adsorption tanks using water truck. Ensure water truck pump is throttled to its lowest setting.
6. As tanks fill, use a rubber mallet to hit around the circumference of each tank to release any remaining air.

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7. Monitor pressure valves on adsorption tanks and ensure tank pressures **NEVER exceed 40 psi.** If necessary, shut off water truck periodically to allow pressure to release and equalize among tanks.
8. Shut off top pressure valves on each adsorption tank once water begins to come out of the each valve.
9. Shut off water truck once water has come out of each adsorption tank's top pressure valve.
10. Allow media to soak for 24 hours.

The OWS does not have its own power supply and therefore will need to be hooked up to a diesel generator to operate. For a generator and fuel tank, contact Surface Works. Refer to the Newterra OWS manual presented in Appendix A for engineered drawings and detailed instructions on how to hook-up the power line/supply, sump pump, water level float and free-product float.

Prior to starting the OWS unit, the wastewater to be treated (influent) should be sampled and analyzed internally to confirm the OWS unit is able to treat the hydrocarbon (TOG) levels found in the wastewater. If TOG levels are determined to be greater than 120 mg/L, contact the Environmental Coordinator for instruction.

Prior to discharging treated effluent from the OWS to the receiving environment, contaminated water should be re-circulated between the OWS unit and the wastewater containment berm. This is done to (1) flush out the freshwater used to soak the media in the adsorption tanks and (2) confirm the treated effluent discharged from the OWS meets the water quality discharge criteria outlined in Section 5.2 Approximately 10 m^3 (2640 USG) of wastewater must be recirculated through the OWS unit to flush the system of freshwater and confirm effluent quality.

Once the freshwater has been flushed out of the system, effluent samples can be collected for internal and external analysis. External effluent samples should collected and tested for all parameters required by the facility's effluent discharge criteria presented in Section 5.2. Internal samples should be taken in parallel to external samples and tested for TOG on-site using the procedure outlined in Section 5.5.3.

If after receiving the external analysis results, it is determined that lead treatment barrels will be required to ensure that the treated effluent meets the facility's discharge criteria, barrels will be setup following the third adsorption tank (GAC#2) of the OWS. Lead media barrels are typically configured into four trains in parallel with each train made of two barrels hooked up in series. The number of trains used is the limiting factor that determines the overall flow rate that can pass through the system, with each train having an approximate flow rate of 5 gpm. Each lead media barrel is equipped with a pressure gauge and water vent at the inlet valve located at the top of the barrel and an outlet valve at the bottom of the barrel. The effluent manifold should be placed at a higher elevation than the barrels to ensure barrels remain flooded when system is off. Air should be purged from the system upon start up. For more details on how to configure the lead treatment barrels and replace the lead removing media refer to Section 5.4.8.

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Do NOT discharge any treated effluent from the OWS system to the receiving environment unless it has been authorized by the Environmental Manager.

5.4 Operation and Maintenance Procedures

The following procedures provide detail on how to safely operate and monitor the mobile OWS system. Prior to operating the OWS, all operators should review the OWS Operation JHA presented in Appendix C.

5.4.1 Target Operating Conditions

The following table outlines the initial target operating conditions:

TABLE 5-4 – INITIAL OPERATING TARGETS

Parameter	Units	Initial Target
Flow rate from Pump 4901 (FQI 7001) without Lead Treatment trains.	gpm	45-50
Flow rate from Pump 4901 (FQI 7001) with four (4) Lead Treatment trains.	gpm	15-20
Discharge Pressure of Pump 4901 (PI 4901)	psi	55
Max Bag Filter Inlet Pressure (PI 6701)	psi	40
Max Adsorption Unit Inlet Pressure (PI 7001)	psi	40
Max Lead Treatment Barrel Inlet Pressure	psi	10

5.4.2 System Start-up

1. Turn generator **ON** if not already running. Ensure sufficient oil in generator and diesel in fuel tank. **Note:** All operators must be trained by Surface Works electricians on the proper starting and fueling procedures when operating the OWS system.
2. Ensure electrical panel is securely closed/locked. **Note:** Only trained personnel should open and adjust breakers in electrical panel.
3. Turn **ON** main disconnect for power to the OWS if not already on. **DO NOT** stand directly in front of panel when turning **ON** or **OFF** main disconnect.
4. The HMI screen will display system status and active alarms. Scroll right or left to view the active alarms. Address any alarms present. Refer to Section 3 of the Newterra O&M Manual presented in Appendix A for a list of alarms and activation/deactivation conditions.

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Note: Immediate power surge alarm will show on the HMI screen after power up. This will reset itself after five minutes. Address any other alarms present (float switches, free product barrel level, pressure alarms, etc.).

5. Once alarms are addressed go to main menu and clear alarms.
6. Walk through system to check for leaks and ensure influent pump and discharge lines are properly connected. Ensure all valves are properly positioned. Ensure there are no obstacles over any moving parts.
7. Ensure influent/sump pump and discharge lines are properly positioned and connected. If discharging, make sure a dissipater plate is in place at the discharge point to prevent surface erosion.
8. If no issues are observed turn the system **ON** at the HMI. Pumps should be manually set to **AUTO** mode.
9. Observe system operation to ensure the OWS is operating as designed. Check flow rates, pressures and confirm discharge.
10. Open valves at top of adsorption units and bag filter to purge air as described above.

5.4.3 System Shutdown

1. Turn system **OFF** on HMI.
2. Shutdown generator if system will be off for more than approximately 12 hours.
   Important Note: Turn **OFF** main disconnect in the OWS control room if personnel plan on conducting work on the OWS while the system and generator are off.

5.4.4 Routine System Checks

During normal operation the OWS system should be checked every four (4) hours at a minimum. As the amount of wastewater in the berm decreases or as specific concerns arise, the OWS system should be checked more regularly to ensure excessive amounts of sand or free product are NOT entering the system. The following instructions outline the tasks that should be completed during these routine checks.

1. Walk through system to check for leaks and ensure influent pump and discharge lines are properly placed/connected.
2. Confirm discharge flow and conduct visual inspection for any sheen or odor at the discharge location.
3. Record flow rates and pressures. Complete Daily Log presented in Appendix D. Collect samples as outlined in Section 5.5.2.
4. At the API, check level of free product using dipstick and water-detecting paste. If the free product level is 1/4" or more thick adjust the slotted pipe at the far end of the API using a 4" pipe wrench. The slit in the pipe should be at the surface of the liquid, just enough to remove any free product, and leave any remaining water in the tank. **Note: This is a completely manual step. Do not leave the slotted pipe at the liquid surface unattended for long periods of time as the free product**

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level will change over time and result in the free product collection barrel quickly filling up with water.

5. Check level of free product around sump in the berm. If there is significant free product present protect the intake pump with booms. If necessary, the OWS may need to be shut down temporarily to remove excessive amounts of free product within the sump area.
6. Adjust flow balance between influent pump (P 4001) and API discharge pump (P 4901) using the appropriate ball/globe valve if required.
   Note: The target flow rate from the API effluent pump (P 4901) is 30 gpm (20 gpm if using four lead treatment barrel trains in parallel). Flow balance should be such that the desired flow rate through the system is achieved, and the influent pump runs continuously if possible. If the influent pump flow rate is greater than the API effluent pump the LAHH 4901 switch will turn the influent pump off to prevent overflowing the API. This will result in frequent LAHH 4901 alarms on the HMI. A significant amount of flow rate monitoring and adjustment may be required during the initial startup/commissioning of the system to achieve the proper flow balance.
7. Monitor bag filter inlet pressure. Replace bag filters if the maximum bag filter inlet pressure, 35 psi, is reached. Bag filters may require frequent replacement. Refer to Section 5.4.7.
8. Replace GAC/clay media if inlet pressure to the first adsorption unit exceeds 35 psi or if breakthrough of contaminants is observed in the final effluent (visual sheen or high TOG results).
9. Purge any air collected in the system via the vents on the bag filter/adsorption units.
10. Perform/schedule any required maintenance as per the Newterra O&M manual.
11. Collect and analyze samples according to Section 5.5 and take appropriate action.
12. If at any point during the operation of the mobile OWS, the final effluent at the discharge point is discovered to have a sheen or hydrocarbon odour, the OWS must be shut off and all discharge to the natural environment must stop immediately. Contact Environmental Coordinator.
13. If at any point during the operation of the mobile OWS, the internal TOG analyses indicates the final effluent does not meet the required discharge criteria outlined in Section 5.2, the OWS must be shut off and all discharge to the natural environment must stop immediately. Contact Environmental Coordinator.

5.4.5 System Alarms

The OWS system has several shutdown alarms and non-critical alarms. Shutdown alarms will turn the system off. Non-critical alarms will be displayed in the HMI and will activate the alarm light but will not shutdown the system. If an alarm appears on the HMI, investigate the cause and take the appropriate action. Once the issue has been addressed, clear the alarm using the HMI.

Refer to Section 3 in the Newterra O&M manual for details on the how the alarms are activated/deactivated.

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5.4.6 MAINTENANCE

Several maintenance activities will need to be carried out after a recommended number of operating hours have passed. Refer to Section 8 in the Newterra O&M manual for details on the maintenance procedures and required, daily, weekly, monthly and yearly checks.

- Strainer cleaning: every 200 operating hours
- Pumps: every 800 operating hours
- Pressure gauges: every 4000 operating hours

In addition to these activities the filter bags and media will need to be replaced based on system pressures and water quality. See the following sections for more information.

5.4.7 FILTER BAG REPLACEMENT

Filter bags will need to be replaced when the inlet pressure to the filter housings reaches 35 psi. At 40 psi an alarm will be initiated.

To change out the filter bags complete the following steps:

1. Turn the system **OFF**.
2. Close inlet and outlet valves.
3. Relieve the pressure in the bag filter housing via the valve at the top of the housing.
4. Undo the housing bolts and remove lid.
5. If possible remove some of the water from the filter housing by partially draining the housing through the two inch line at the bottom of the stand or by removing the water from the top. Ensure drained water is contained and not spilled on floor. The bag filters can be replaced without removing the water however replacing the filter bags is easier when the housings is not full of water.
6. Place used filter bags into a pail or other container for disposal. The bags will be water logged and heavy. Use two people if required and proper lifting techniques (lift with knees NOT back). Filters can be burned and should be dropped off at the Waste Management Building to be incinerated onsite.
7. Insert new filter bags into the housing. The bags should fit flush at the top. Change all seven bags at the same time.
8. Apply silicon grease to the O-ring to prevent leaks from the lid if required.
9. Close the lid and bolt the lid down.
10. Check strainers and empty if required.
11. Open valves to bag filters.
12. Perform pre-start checks of system and turn system **ON**. Remove air trapped in filter housing by opening valve at top of housing until water is observed.

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5.4.8 Lead Removal Media

As discussed in Section 5.3, eight barrels containing lead removal media (Metsorb HMRG) should be added downstream of the system following the adsorption tanks if lead concentrations in the effluent exceed discharge criteria. The maximum flow through one barrel is 5 gpm, therefore the maximum flow through four barrels in parallel is 20 gpm. At an influent concentration of 5 µg/L (effluent of >1 µg/L) 1 ft^3 of media should be able to process approximately 70 m^3 of wastewater. Other heavy metals and contaminants in the wastewater will also be adsorbed by the media so the volume of water processed by each cubic foot of media will vary and depend on the total amount of metals in the wastewater. Taking samples of the final effluent and the discharge from the first row of barrels will indicate when the media needs to be replaced.

5.4.8.1 Lead Media Replacement Procedure

If breakthrough (exceedance) is observed at the discharge of the first row of four barrels, the media in these barrels should be replaced and the order of the barrels switched. **The four barrels with new media will be moved to the second row and barrels that were originally in the second row with be moved to the first row.**

To change out the lead media in the barrels complete the following steps:

1. Drain barrels.
2. Remove lids and scoop out spent media into labelled Quatrex bags for hazardous waste disposal.
3. Rinse barrels with a small amount of clean water.
4. Replace or rinse filter sock on bottom piping inside the barrels.
5. Put on appropriate respirators and review MSDS for procedures on handling media. Slowly pour new media into barrels being careful not to damage piping at bottom of barrels. Barrels will be approximately 1/3 full of media with 3-3.5 ft^3 of media. Settling of media inside the barrel can be aided by tapping the barrel sides with a rubber mallet.
6. Replace lids and ensure adequate seal.

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5.5 Sampling Schedule, Supplies and Procedures

The following table provides the sampling schedule and requirements for the commissioning and normal operation of the OWS. Confirm with Environmental Coordinator when sending out external samples.

Table 5-5 – **Sampling Schedule**

Parameter	Location within OWS	Internal Sampling Frequency	External Sampling Frequency
Oil and Grease	Influent	Start of open water season at each source/facility that contains wastewater potentially requiring treatment	Start of open water season at each source/facility that contains wastewater potentially requiring treatment
	API Effluent	Every 4 hours	
	Final Effluent	Every 4 hours	Prior to discharge/ Weekly during discharge
Total Lead pH TSS (only effluent)	Influent		Start of open water season at each source/facility that contains wastewater potentially requiring treatment
	Final Effluent		Prior to discharge/ Weekly during discharge
Benzene Toluene Ethylbenzene	Influent		Start of open water season at each source/facility that contains wastewater potentially requiring treatment.
	GAC #1 Effluent		Weekly
	Final Effluent		Prior to discharge/ Weekly during discharge

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5.5.1 SAMPLING EQUIPMENT

- Required PPE (refer to Section 2.2.2)
- Sampling bottles: Group 5 bottle set for external samples (See Appendix E for exact bottle set requirements), 250 mL glass wide-mouth jars for internal samples.

5.5.2 SAMPLING PROCEDURE

1. Obtain and wear appropriate PPE listed in Section 2.2.2.
2. Obtain sampling equipment outlined Section 5.5.1.
3. Check HMI to identify any active alarms.
4. Conduct a visual inspection to identify any leaks, system failures, and potential hazards (high pressures, electrical malfunctions, improperly opened valves, poor discharge/recirculation lines, etc.),
5. Record any system failures, leaks, hazards or inconsistencies observed on the Daily Log (refer to Appendix D).
6. Record all readings on the Daily Log.
7. Collect water samples at designated sampling ports for analyses (see Table 5-5 for required sampling locations and analysis).
8. Use 250mL wide-mouthed glass jars to collecting internal samples. Samples should be labeled with the date, time and sampling location/station. Internal sampling jars can be reused for internal analyses however, if reused, sampling jars should be used for the same sampling locations within the system (i.e. influent, effluent, etc.). Replace jars if suspected cross contamination is occurring.
9. All internal samples should be collected by following steps 1 through 6 at the required intervals outlined by Table 5-5.
10. Analyze internal samples for TOG following the analysis procedure outlined in Section 5.5.3.
11. Complete Daily Log with all the required information filled out including the date, time of routine checks, pressure readings throughout the system, totalizer values and internal TOG results. At the end of the day, information on the Daily Log will be transferred to the electronic Discharge Log located on the Mine Site Environmental Server (refer to Appendix D).
12. External samples must be collected according the Sampling Schedule (Table 5-5) and should be delivered to the onsite ALS lab within 24 hours of being collected accompanied with a completed COC.

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5.5.3 TOG Sample Analysis Procedure

Required Lab Supplies, Equipment and PPE

- 2 x 20ml glass graduated cylinder
- Glass funnel
- TOG analyzer + cuvette(s)
- Sulphuric Acid (98%) + pump
- S-316 Solvent
- Sodium Sulfate, anhydrous
- Spoon
- Pipette and tips
- Two glass mix jars for influent and effluent samples with 100ml marked
- Whatman filter Paper
- Kim wipes
- Nitrile gloves
- Lab coat
- Safety glasses

1. Turn TOG analyzer **ON** if it is not already on. Allow TOG analyzer to warm up for 1 hour.
   Note: The TOG analyzer can be kept on for the entire length of time the mobile OWS is operating.
2. Rinse all glassware with solvent: Horiba S-316 (i.e. funnels, graduated cylinders, pre marked 100mL mix jars, and cuvettes)
3. Add 100mL of sample to pre-marked mix jar.
4. Add 1mL of sulfuric acid (~98% conc.) to sample in mix jar.
5. Shake for 10 seconds.
6. Add 11mL of solvent to sample. The volume of solvent should be 10% of the total volume of solvent-sample mix.
7. Shake the mix jar for 2 minutes, opening mix jar at least twice to release any vapour buildup.
8. Allow mix jar contents to settle. A solvent layer containing the hydrocarbons in the sample should form at the bottom of the mix jar.
9. Fill cuvette with solvent, wipe thoroughly with Kim wipe and place in analyzer. This will serve as a blank.
10. Press and hold ZERO on analyzer. BAL will display on the screen followed by a number. Leave the cuvette in the analyzer and press RUN. If the result is within ± 2 mg/L the analyzer is zeroed.
    Note: The cuvette should be placed in the analyzer with the frosted side facing you. The cuvette should always be placed in the analyzer in the same direction.
11. Add 1 spoonful of sodium sulfate to a folded Whatman filter in the glass funnel.
12. Extract settled solvent layer from bottom of mix jar with a 10mL pipette and filter it through the sodium sulfate inside the Whatman filter and into a clean graduated cylinder. This will remove any remaining water captured during the extraction of the solvent. Only 3-5 mL of filtered solvent

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is required to analyze the solvent layer and determine the hydrocarbon concentration in the sample (i.e. effluent, influent, etc.).

13. Fill cuvette with the filtered solvent, wipe thoroughly with Kim wipe and place in analyzer.
14. Press **RUN** to analyze.
15. Record results on Daily Log.
16. If TOG results seem high in comparison to external results, clean all glassware with solvent and redo analysis. If the hydrocarbon concentration in the influent sample water is equal or greater than 120 mg/L, system checks should be done more frequently and sampling should increase to every two (2) hours. Notify Environmental Coordinator of inflated TOG levels in influent.
17. If at any point during the operation of the mobile OWS, the internal TOG analyses indicates the final effluent does not meet the required discharge criteria outlined in Section 5.2, the OWS must be shut off and all discharge to the natural environment must stop immediately. Contact Environmental Coordinator.

5.6 Decommissioning the Oil Water Separator

The following procedures should be followed to safely and effectively decommission the mobile OWS unit when transporting the unit between Project sites or for winterization/end of season storage.

5.6.1 Decommissioning For Transport

Before transporting the mobile OWS unit between Project sites, the unit must be drained. The draining procedure required for transport is identical to seasonal storage draining procedure (refer to Section 5.6.2), however since this is completed to reduce weight for shipping, the lines and pumps are not required to be drained since this is a very time consuming process. Only media vessels and the API tank are required to be drained prior to transport. Additionally, all valves should remain closed during transport.

5.6.2 Decommissioning For Seasonal Storage

The decommissioning of the mobile OWS unit for seasonal storage requires all water to be drained from the system. Electricians are required to disconnect all wiring. All drained sensors and pumps should be placed and stored inside the control room. All hoses and lines must be drained of any residual water so that lines can be disassembled and will not rupture due to ice expansion. Hoses and lines should be drained using the valves at low points and available ports. Residual water must be drained back into the berm or captured in pails/tubs to be eventually transferred back into berm. Spilling contaminated water onto the ground is considered a spill and must be reported.

Complete removal of all water is required for the adsorption tanks and API tank.

To drain the three (3) adsorption tanks, a 3" trash pump must be hooked up to the bottom ball valve of each adsorption tank and used to effectively pump out all remaining water out of each tank. To minimize the possibility of removing any media in this process, the bottom ball valve on the bottom of each adsorption tank should only be partially opened and the trash pump should be throttled down to its lowest

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setting to reduce the overall flow rate/vacuum at the outlet of each adsorption tank. When each tank is empty and the trash pump begins to suck in air, the trash pump must be shut-down for 5-10 minutes to allow residual water to gravity drain through media and collect at the bottom of the adsorption tank.

Leave the bottom ball valve of each adsorption tank in the open position with a pail placed underneath the valve to catch any residual water dripping out of the tanks (empty as necessary). Open the lid on the top of each media vessel and allow the media to dry for a 2-3 days. If weather is cold, turn heaters on in the OWS unit or use a frost fighter to expedite the drying process.

To drain the API tank, setup a tub underneath the drain port on the outside of the OWS unit. Open the lowest ball valve on the drain port to allow the water in the API tank to gravity drain into the tub. Transfer contaminated water from the tub to the facility's containment berm.

Double-check that all valves and drain ports are opened and drained to ensure ALL residual water has been removed. It is absolutely critical that all lines, pipes, tanks and vessels have been completely drained of any water prior to freeze up.

5.7 OWS Discharge Log, Results Dissemination and Approval for Discharge

All the monitoring documentation to be completed during the operation of the OWS unit is located in the OWS Discharge Log file on the Mine Site Environmental Server at FINAL File System\2.0 ENV MANAGEMENT, MONITORING PLANS (BIM INTERNAL)\2.08 Oily Water Separators. This file contains the Summary Sheet, the External Results Sheet and the Daily Log Forms presented in Appendix G, Appendix F and Appendix D, respectively.

The External Results Sheet presented in Appendix F must be updated upon receipt of any external sample results, including preliminary results. The Environmental Coordinator or his/her designate will provide the results to the Environment Superintendent and/or Manager who will assess the results and determine whether the effluent quality is acceptable for discharge or will assign instructions for additional treatment.

The Daily Log (refer to Appendix D) must be updated to include all internal samples and weekly external samples (if applicable) throughout the treatment process. End-of-shift cumulative discharge values and additional notes must also be recorded on the Daily Log.

The Summary Sheet (refer to Appendix G) must be filled out after all wastewater has been treated for a specific facility (i.e. Bulk Fuel Storage Facility, Landfarm Facility, etc.).

All documentation must be added to the appropriate site server location (FINAL File System\2.0 ENV MANAGEMENT, MONITORING PLANS (BIM INTERNAL)\2.08 Oily Water Separators). Upon the completion of wastewater treatment at a facility, the completed OWS Discharge Log must be provided to the Environmental Coordinator, Superintendent and Manager.

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6 REFERENCES

AMEC FW, (2014). Baffinland Iron Mines field notes OWS. July, 2014

Water Licence No: 2AM-MRY1325 – Amendment No. 1, Nunavut Water Board (July 21, 2015)

Newterra, (2013), Process Treatment System Project # 102140. Operation and Maintenance Manual

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APPENDIX A -

NEWTERRA OWS O&M MANUAL

The information contained herein is proprietary to Baffinland Iron Mines Corporation and is used solely for the purpose for which it is supplied. It shall not be disclosed in whole or in part, to any other party, without the express permission in writing by Baffinland Iron Mines Corporation.

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1.0 Start Up Procedure
Commissioning Checklist

Test Records
Packing List

2.0 Mechanical Drawings

3.0 Electrical Drawings

4.0 Control Panel Module

5.0 Components

6.0 Specs

7.0 Manuals

8.0 System Maintenance, Troubleshooting

An Esselte Corporation

RTS - 151
150 GPM WATER TREATMENT SYSTEM
STARTUP PROCEDURE

- If the system is being started for the first time then work your way through the commissioning checklist in the installation guide or system manual before starting the system.
- If kill switch on panel (red mushroom shaped button) is pulled out then push it in to confirm that system is off.
- Pull kill button out in process room so the system can start at the appropriate time.
- Walk through process piping and check the position of all process valves.
- Check that there are no obstructions over any moving parts.
- Check that main disconnect is on.
- Put all hand/off/auto switches in auto.
- Pull the kill Button (red button on panel) out to start the process.
- Push the reset button on the operator interface to reset all alarms.
- Push the start button on the Operator Interface.
- If an alarm occurred on startup, then review the alarm descriptions and troubleshooting guide in the installation guide or manual for guidance on how to troubleshoot the problem. Fix the alarm condition and restart the system with the above procedure.

RTS - 151 150 GPM

Mech Eng:		Control:	Tester #1:	Warren, Kevin
Mechanical Team:	Electrical Team:	Panel Team:	Tester #2:	
-Select One-	-Select One-	-Select One-		
			Start Date:	8/20/2013
			End Date:	8/27/2013

SECTION A - PRE-TEST FLOW RATES AND POWER DETAILS

P-VLS		B-STRIP	
B-SVE		P-STRIP	
P-OWS		C-SPRG	
OTHER:		OTHER:	

System Certifications	Panel Standard	System Standard	SETPOINTS
Building #1 / Room #1:	UL 698A	MET us, Classified	
Building #2 / Room #2:	N/A	N/A	
Site Power Requirements			
Voltage:	208 Vac	3-Phase , 3-Wire	
Amperage:	125 Amps		

Notes:

SECTION B - WALK AROUND	OK / NA	INITIALS
Check That Walk Through Issues Have Been Resolved, Review Shop Aids	OK	KW
Lay Down Electrical Safety Mat and Set Up Testing Cart	OK	KW
Ensure That Testing Tote Is Connected and That Hoses Are Secure	OK	KW
Ensure That Carbon Vessels Are Bypassed	OK	KW
Verify That Exhaust Mufflers and Elbows are Installed (SVE/Sparge/Compressed Air)	OK	KW
Make Sure That Building Fan and Louvre Shipping Braces Have Been Removed	OK	KW

SECTION C - WALK THROUGH	OK / NA	INITIALS
Inspect Valves and Process Lines	OK	KW
Check Transmitter / Magnehelic Lines for Low Lying Spots Where Moisture can Collect	N/A	KW
Check That Floor Vents Have Been Installed	N/A	KW
Record Process Equipment Model and Serial Numbers* and Motor Nameplates	OK	KW
Notify Project Manager and Production Staff of Any Outstanding Issues	OK	KW

* This includes motors, blowers, compressors, oxygen/ozone generators, pumps, etc.

SECTION D - PANEL OFF INSPECTION	OK / NA	INITIALS
Check for Dielectric Test Label	OK	KW
Check for Auto Re-Start Label, Check for Ground, L1, L2, L3 and High Leg Labels	OK	KW
Check for IS Wiring Warning Stickers in Panel and on Lines From Panel	OK	KW
Ensure Neutral Wire is Connected To Terminal Block	OK	KW
Inspect 24Vdc and 120Vac Relays for Proper Connections	OK	KW
Check That Spare IS Input Wires Are Pulled	OK	KW
Cross Check Fuses, Circuit Breakers and Starters with Fuse Schedule	OK	KW
Determine Service Factor Amps and Set Motor Overloads	OK	KW

SECTION E - PANEL ON INSPECTION	OK / NA	INITIALS
Record Test Supply Voltages		
Primary: L1/L2 213, L2/L3 213, L3/L1 213 Vac; L1/N 124, L2/N 124, L3/N 124 Vac — **Secondary:** L1/L2 245 Vac; L2/L3 124; L3/L1 124 Vac; L3/N Vac		
Record 24Vdc Supply Voltage 24 Vdc	OK	KW
Test GFI and non GFI Outlets	OK	KW
Check "Push To Test" Panel Indicators	OK	KW
	N/A	KW

SECTION F - INITIAL SYSTEM SETUP AND TESTING	OK / NA	INITIALS
Archive Pre-Test Program Revisions and Create New Revision	N/A	KW
Check E-mail Configuration Through ECOM Card on PLC	N/A	KW
Record H0-ECOM100 Firmware Revision v.	N/A	KW
Update PLC Firmware and Record Revision: v.	OK	KW
Initialize Scratch Pad of Automation Direct PLCs	OK	KW
Upload PLC Program	OK	KW
Set PLC Clock and Calendar	OK	KW
Check Functionality of All Discrete Inputs	OK	KW
Check Functionality of All Discrete Outputs	OK	KW
Check Functionality of All Analog Inputs and Outputs	OK	KW
Switch System Outputs to AUTO Mode	OK	KW
Set and Test All Setpoints	OK	KW

SECTION G - OPERATOR INTERFACE (PANEL DOOR / TOUCHSCREEN)	OK / NA	INITIALS
Type of Operator Interface: -Select One-		
Update Display Screen Firmware, Record Revision v.	OK	KW
Upload Panel Program	OK	KW
Test Panel Menu Hierarchy	OK	KW
Check PLC to Panel Communication, Remove Ground Jumper if Necessary	OK	KW
Verify Value, Scale, Significant Digits and Units of Analogue Signals	N/A	KW
Check Functionality of All Discrete Inputs	OK	KW
Check Functionality of All Discrete Outputs	OK	KW
Test All User-Adjustable Setpoints	OK	KW
Verify Correct Hourmeter Values, Ensure Proper Time is Kept	OK	KW

SECTION H - VFD / SOFT START DEVICES	OK / NA	INITIALS
Drive Type and Application: N/A N/A		
Verify Drive Parameter Settings Match Electrical Drawings	N/A	KW
Test Frequency Control	N/A	KW
Check VFD Noise on Analog Signals / Adjust Carrier Frequency Accordingly	N/A	KW
Save VFD Set-up Variables From PowerSuite / Record VFD Settings	N/A	KW
Verify Integrity of RS-485 Communications, Record Settings	N/A	KW
BAUD: N/A PARITY: N/A STOP BITS: N/A CARRIER: N/A		

SECTION I - ANALOG SIGNALS	INITIALS
PLC Card Slot #1: N/A - Not Installed	KW
PLC Card Slot #2: N/A - Not Installed	KW
PLC Card Slot #3: N/A - Not Installed	KW
PLC Card Slot #4: N/A - Not Installed	KW

Check mA Signals at Different Operating Points for Device Hysterisis and Calibration	N/A	KW
Check Conversion Math and Square Root Functions in PLC Logic	N/A	KW

SECTION J - SYSTEM OPERATION	OK / NA	INITIALS
Check Building Fan(s) and/or Heater(s) Operation	OK	KW
Test All Kill Buttons	OK	KW
Bump Motors and Check For Excessive or Abnormal Current Draw	OK	KW
Ensure that LSL Switches are Above Pump Intakes	OK	KW
Set and Test Pressure and Vacuum Relief Valves According to P&ID	N/A	KW
Thoroughly Test Control Logic	OK	KW
Check Functionality of Oxidizer Interlocks	N/A	KW
Run System In Full Automatic	OK	KW
Simulate All Alarms, Check That Non-Critical Alarms Do Not Shut Down System	N/A	KW
Check Magnehelic Gauges for Accuracy, Verify Air Flows Using Hot Wire Anemometer	N/A	KW
Measured CFM: @ PSI/"Hg/"WC		
Measured CFM: @ PSI/"Hg/"WC		
Measured CFM: @ PSI/"Hg/"WC		
Measured CFM: @ PSI/"Hg/"WC		
Verify Logic and Flow For All Solenoid Valves, Including Auto-Oilers	N/A	KW
Run System With Doors Closed and Monitor Ventilation	N/A	KW
Verify Auto Restart Functionality of Whole System (Including VFD)	OK	KW
Check for Water / Compressed Air (Bubble Test) Leaks	OK	KW

SECTION K - PLC FINAL CHECK	OK / NA	INITIALS
Check Hour Meter Variable Memory Locations and Minute Counters	N/A	KW
Force Datalogging	N/A	KW
Update PLC Program Revision(and Operator Interface if Applicable)	OK	KW
Final Program Revision # : v. 2.0		

SECTION L - TELEMETRY	√OK/ NA	INITIALS
Select Communication Type:		
Confirm Remote Access, Record Method	N/A	KW
Check Modem Auto-Reboot Feature	N/A	KW
Test System Operation Using Offsite Package, Review Datalog Files	N/A	KW
Test System Email Out	N/A	KW
Configure Autodialer (Set Sensaphone Passwords to "2000" and "s2000")	N/A	KW
Test Autodialer Alarm Dial-out and Report	N/A	KW

SECTION M - FINAL SYSTEM TESTING / AS BUILT	OK/ NA	INITIALS
Record Max Noise Level dBA @ ft.	N/A	KW
Record Motor Voltages, Currents and Operating Conditions	OK	KW
Add Flow Charts, Piping Labels (Hot**, Directional), Oxygen / Ozone Generator Labels	OK	KW
Pump Water Out Of System	OK	KW
Turn Off All Breakers and HOA Switches	OK	KW
Take System Pictures	OK	KW
Email Project Manager and Production Staff	OK	KW
Update System Approval Data Plates, Fuse Schedule and Startup Procedure	OK	KW
Ensure appropriate approval labels are obtained (GP, Haz). **Rentals require US and CAN.**	OK	KW
Attach System Approval Stickers, Fuse Schedule and Startup Procedure	OK	KW
Take Panel Pictures and Transfer All Pictures to Project Folder	OK	KW
Check Off "Testing" as Being Complete in APES	N/A	KW
Make Changes to the IO and Alarms Tables Are Captured in the Markups	OK	KW
Update Project Software Folder	OK	KW

Copy Completed Test Sheets to Electrical As-Builts Directory with DWG Files and Bill of Materials
Check Off "As-Builts" Box in APES
** Hot Labels to be Applied to Any Piping >/= 140 DegF as Determined by IR Readings

MECHANICAL TEST RECORD

Device Name:	**P-4901**	Manufacturer:	**GOULDS**
Device Model #:	**4SH2K52COW**	Device Serial #:	**F1200054**
Motor Manufacturer:	**WEG**	Area Classification Tag Checked:	
Motor Model #:	**JM007402**	Motor Serial #:	**1014500858**
HP:	**7.50**	Voltage: **208**	Frame: **184JM** RPM: **3480**
Phase:	**3**	Current: **20.70**	SF: **1.15** ENCL.: **TEFC**

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
20.9	**20.6**	**21.4**	Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
213	**213**	**213**	Vac				Vac

Device Name:	**P-4001**	Manufacturer:	**GOULDS**
Device Model #:	**WS15112BHF**	Device Serial #:	**RC-061**
Motor Manufacturer:	**GOULDS**	Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	**1.50**	Voltage: **230**	Frame: RPM: **3450**
Phase:		Current: **18.00**	SF: ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
17.1			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
213			Vac				Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:		Voltage:	Frame: RPM:
Phase:		Current:	SF: ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:		Voltage:	Frame: RPM:
Phase:		Current:	SF: ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

MECHANICAL TEST RECORD

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

MECHANICAL TEST RECORD

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	

Vac	Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Device Name:		Manufacturer:	
Device Model #:		Device Serial #:	
Motor Manufacturer:		Area Classification Tag Checked:	
Motor Model #:		Motor Serial #:	
HP:	Voltage:	Frame:	RPM:
Phase:	Current:	SF:	ENCL.:

Factory Test:				Field Test:			
L1	L2	L3		L1	L2	L3	
			Amps				Amps
L1/L2	L2/L3	L3/L1		L1/L2	L2/L3	L3/L1	
			Vac				Vac

Pre-commissioning Checklist

newterra

Please return copy of completed form to newterra prior to startup Project number and name:

The purpose of this report is that the customer is prepared for startup.

Please send us the completed Pre-Commissioning Checklist 5 days prior to our site visit.

Return to Shane Henderson at shenderson@newterra.com or Fax 613-345-7633

Checked by: Date:

Checklist	Ck
Verify site power is correctly installed to the control panel and necessary electrical approvals have been completed.	
Verify that all input wiring is completed and wired into the control panel according to the installation guide.	
Verify that all power wiring is completed and wired into the control panel according to the installation guide.	
Verify that Compressed air will be connected to system (if required).	
Verify that Fresh Water supply is installed to system (if required).	
Verify that all process piping will be installed and completed.	
Verify that the required approvals are in place to allow the system to discharge air and water as designed.	
Verify that system has been installed on a level pad.	
Verify that all field piping will be completed and wells will be connected to the operating system.	
Verify that phone line is installed and activated if required.	
Additional Checklist Items related to Oxidizers	
Verify that all necessary wiring is completed between the oxidizer and the main control system.	
Verify that all piping between oxidizer and treatment system is completed.	
Verify that Power is connected to oxidizer and necessary electrical approvals have been completed.	
Verify that the required approvals are in place to allow the oxidizer to discharge air to the atmosphere.	
Verify that Gas is connected to the oxidizer and activated to allow for testing of the oxidizer. Note: Please ensure that the gas supply valves are not locked out by the local gas installer at time of commissioning.	
If local gas approval is required for oxidizer, ensure that this is completed or planned to occur during the commissioning.	

******All Tasks will be completed No Later Than 5 Business days prior to newterra Technicians arrival onsite.***

Please note if newterra arrives onsite and items have not been completed there will be a charge associated.

Site Address: _____

_____

_____

Onsite Contact Name & Number: _____

_____

Customer Sign-off Date

System Field Test Checklist

This purpose of this report is to test the functionality of electrical, control, and mechanical components to ensure the system operates as originally designed. This testing is then documented so it can be referenced at a later date if needed.

The following field test records must be completed by the startup technician on site before operating the process system. This is the last quality check ensuring the process equipment is ready for continuous operation.

newterra™ highly recommends that the system is started by a newterra factory trained startup technician to ensure the long term success of your project. We understand that this may not always be feasible in which case we would require a highly skilled technician capable of troubleshooting both mechanical and electrical aspects of a process treatment system and be familiar with our manual, equipment and capable of training the operator on operating and maintenance requirements of the treatment system.

This checklist must be sent back to Product Support department at newterra to validate your equipment warranty which begins on the date of shipment from the factory. It can be sent back in one of the following methods:

Email: service@newterra.com

Fax: Att: Product Support
(613) 345 7633
If you choose to fax the document then, please follow up with an email explaining that a fax was sent so we can ensure that we received the fax and properly validated the equipment warranty.

Project number: _____
Project name: _____

Tested By: _____
Company: _____
Date Tested: _____

newterra

System Field Test Checklist

Minimum Tools Required:

Clamp style amp meter	Socket Set
Multi meter for AC/DC Volts and ma signals	Wire Cutters
Instrumentation Screw Driver	Wire Strippers
Screw Driver Set	Channel Locks
Wrench Set	Pipe Wrenches
Straight Edge for Aligning couplings and belts	

Testing Checklist	Ck	Initial	Date
Verify site power per system design criteria			
Verify building process flow and instrumentation matches P +ID drawing, check off drawing components against actual (preferably with the customer present)			
Ensure all unions are tight, as some are loosened to prevent stress in shipping.			
Walk through system and open all valves that are required to run the system in automatic			
Check panel for lose wiring			
Tighten all terminals where wires are terminated			
Check alignment of motors			
Check field wiring and piping as per drawings			
Check all motor belt tensions			
Turn power on. Measure site voltage. L1/L2_____ L2/L3_____ L3/L1_____ L1/GRD_____ L2/GRD_____ L3/GRD_____			
Test that incoming power has correct phase sequence. Bump a safe 3 phase motor to test rotation.			
Check voltage on AC step down transformer			
Check voltage on DC transformer			
Check rotation of all motors that were field wired.			
Check that PLC Run light is on and the stop/term/run switch is in term			
Manually test inputs as per input table			



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System Field Test Checklist

Check connections of all field wiring to ensure it was completed per the electrical drawings and per the NEC.			
Manually test control logic for each output			
Manually test all shut down alarms			
Manually test that non-critical alarms do not shut down SVE			
Run through complete logic and alarm sequence with customer and make allowable changes.			
Note name of individual and company with whom logic was reviewed:			
Check overload settings for all motors			
Check/Install filter bag in bag filters			
Test analogue inputs			
Run system in full automatic			
Fill out mechanical test record on each motor and check amperage and voltage. Document amperage on the System test records in the operating manual in the Field test load section.			
Wet test all control inputs and outputs			
Wet test all shut down alarms			
Check systems for leaks (liquid and vapor)			
Test position of ball float switches for proper start/stop level			
Test vacuum and pressure relief valve			
Test air stripper and discharge pump operating sequence			
Check flow rate on all pulse meters such that digital and analogue reading increment at the same rate			
Test operation of building exhaust fan			
Test operation of building heater			
Install louver hoods on system			
Test remote access			

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System Field Test Checklist

Test operation of Auto dialer and program if necessary.			
Note newterra modem offsite web address			
Check flow rate discharging from VLS, should maximize flow to prevent a high level shutdown. If you have a centrifugal pump ensure flow rate is low enough to prevent cavitation on the inlet under vacuum.			
Check the skimmer on the oil water separator should be ½" above water level when water is flowing at full speed. Adjust if necessary.			
If Kaeser Compressor Present – Confirm warranty validation has been completed and submitted to Kaeser for warranty			
Check water flow rate into stripper, should be set to minimum flow to keep up with incoming water to maximize contact time in the air stripper. Adjust flow rate if necessary.			
Check flow rate exiting the air stripper, if there is no carbon filters down stream then allow pump to discharge at maximum flow rate. If carbon vessels are installed, then set pump flow rate to the designed system flow rate			

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System Field Test Checklist

Customer Training Checklist			
Review the operating manual with the customer explaining the various components of the manual and sources of information.			
Review the startup and shutdown procedure with operator.			
Review operation of treatment system and describe the maintenance required for each piece of equipment.			
Describe operation of panel and panel components.			
Train customer to troubleshoot alarms based on input conditions to the PLC or relays in the panel.			
Discuss the operating logic with the customer so they understand how the system is configured to work.			



System Field Test Checklist

Operating Data and Records

The following table is a guideline to document the operating conditions of the system when running in automatic mode. The startup technician should document the operating conditions at all the locations in the system. This information can be used at a later date to troubleshoot problems that can arise.

Location of Record Description	Recorded Value
Air Vacuum readings:	
Air Pressure Readings	
Water Pressure Readings	
Water Flow Rates	
Air Flow Rates	
Operating Temperatures:	

System Field Test Checklist

Site Contractor Information: It is important that we capture the site contractor's information who was involved in the mechanical and electrical installation of equipment on site. We may be required to contact these companies during the project life to provide services at a later date.

Electrical Contractor:

Company Name: _____

Contact: _____

Phone Number: _____

Mechanical Contractor:

Company Name:

Contact: _____

Phone Number:

Quality Issues Identified during startup: The intension in this section is to list any problems, deficiencies or quality issues that were identified during startup. If the problem was solved during startup, please indicate. If MLE is required to follow up then please indicate.

Issue 1: Identified:

_____

_____

_____

Check box that applies: newterra Follow up Required ☐ Sorted out on Startup ☐

Issue 2: Identified:

_____

_____

_____

Check box that applies: newterra Follow up Required ☐ Sorted out on Startup ☐

Issue 3: Identified:

_____

_____

_____

Check box that applies: newterra Follow up Required ☐ Sorted out on Startup ☐

System Field Test Checklist

Customer Feedback: newterra is committed to the success of our customers'. Please take a moment and provide any suggestions you may have for our quality and product support teams. We appreciate your comments and look forward to working with you again in the near future.

Please list one item you like about the system you have received:

Please indicate if there are items we could improve upon:

System Field Test Checklist

MECHANICAL TEST RECORD							
Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

System Field Test Checklist

MECHANICAL TEST RECORD							
Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

Device Name:				Manufacturer:			
Device Model #:				Device Serial #:			
Motor Manufacturer:							
Motor Model #:				Motor Serial #:			
HP:		Voltage:	Frame:			RPM:	
Phase:		Current:	SF:			ENCL.:	
Factory Test:				Field Test:			
L1	L2	L3	Amps	L1	L2	L3	Amps
L1/L2	L2/L3	L3/L1	Vac	L1/L2	L2/L3	L3/L1	Vac

Project Packing List

PMProjNum **102140**

SOLD - USED RTS151 - Baffinland 150GPM W

PM_ShippingNotes:

Tag	Part Number	Part Description	Req / Rec	PO # / Line	EngMemo
2	18661	Hose, Assembly, J300, 3"	2	-	
Inlet & Outl	ea	Green Hose	0		
Type: G		-3" x 50' Hose assembly with camlocks		0	
2	10541	Camlock Fitting, Aluminum, 3", Part "F"	4		Male Camlocks
Inlet & Outl	ea	Male Adapter x Male Thread Cam Lock Fitting	4		
Type: F		-	102140-003	2	
2	M1108	Switch, Level, Mech Float, Wide Angle, N.O.,	1	---	
LSH-4001	ea	Tilt Float Level Switch 90deg, w 40' cable	1		
Type: I		13A, SPST, N/O ---	102140-011	9	
2	17149	Manual, System, Hard Copy	2	---	
Manual	ea		0		
Type: P		---		0	
2	9999	Misc Part, See Details	1	---	
OWS VEN	ea	As per detailed specification below	0		
Type: P		2IN. X 4FT. PVC OWS VENT STACK		0	
2	RC061	Pump, Sump, Goulds, 100GPM @ 40'	1	---	
P-4001	month	WS1512BHF, w/ switch	0		
Type: R		230V 1 Ph, 1-1/2 HP ---		0	
2	RTS151	WTS, 150 gpm, OWS-24, Carbon, 40' Contair	1	---	
System	month	208/120V, 3ph, Cl1 Div 2	0		
Type: R		Max Water 150gpm @ 40psi ---		0	
5200	M1272	Camlock Fitting, Aluminum, 2", Part "F"	1	---	
5200-Stack	ea	Male Adapter x Male Thread Cam Lock Fitting	0		
Type: F		---		0	
5200	M1137	Drum, Black, Steel, 45 gal, 2 hole lid, bottom :	1	-	
PST-5201	ea	including palletization	1		
Type: I		-	102140-011	4	
5200	9999	Misc Part, See Details	1	---	
PST-5201	ea	As per detailed specification below	0		
Type: P		2IN. X 5 FT. TANK TRUCK HOSE ASSEMBLY WITH CAMLOCK, TYPE C AND TYPE F		0	
5200	9999	Misc Part, See Details	1	---	
PST-5201	ea	As per detailed specification below	0		
Type: P		2IN. X 4FT. PVC PST VENT STACK		0	

Tag	Part Number	Part Description	Req	PO #		EngMemo
			Rec	Line		
7900	10908	Lock, Passage, 107188, Taymor	2		---	
7900	ea	107188	0			
	Type: I	---			0	
7900	10909	Lock, Deadbolt, 289648, Taymor, 1 cyl, S/S	2		---	
7900	ea	keyed alike #289648	0			
	Type: I	---			0	
7900	24662	Hood, Fan, 27" - on use up	2		---	
F-7901	ea	Fits 24" Fan	2			
	Type: I	---	102140-011		6	
7900	23989	Hood, 15"	2		---	
F-7902	ea	Fits 12" Fan & Louver	2			
	Type: I	---	102140-011		5	

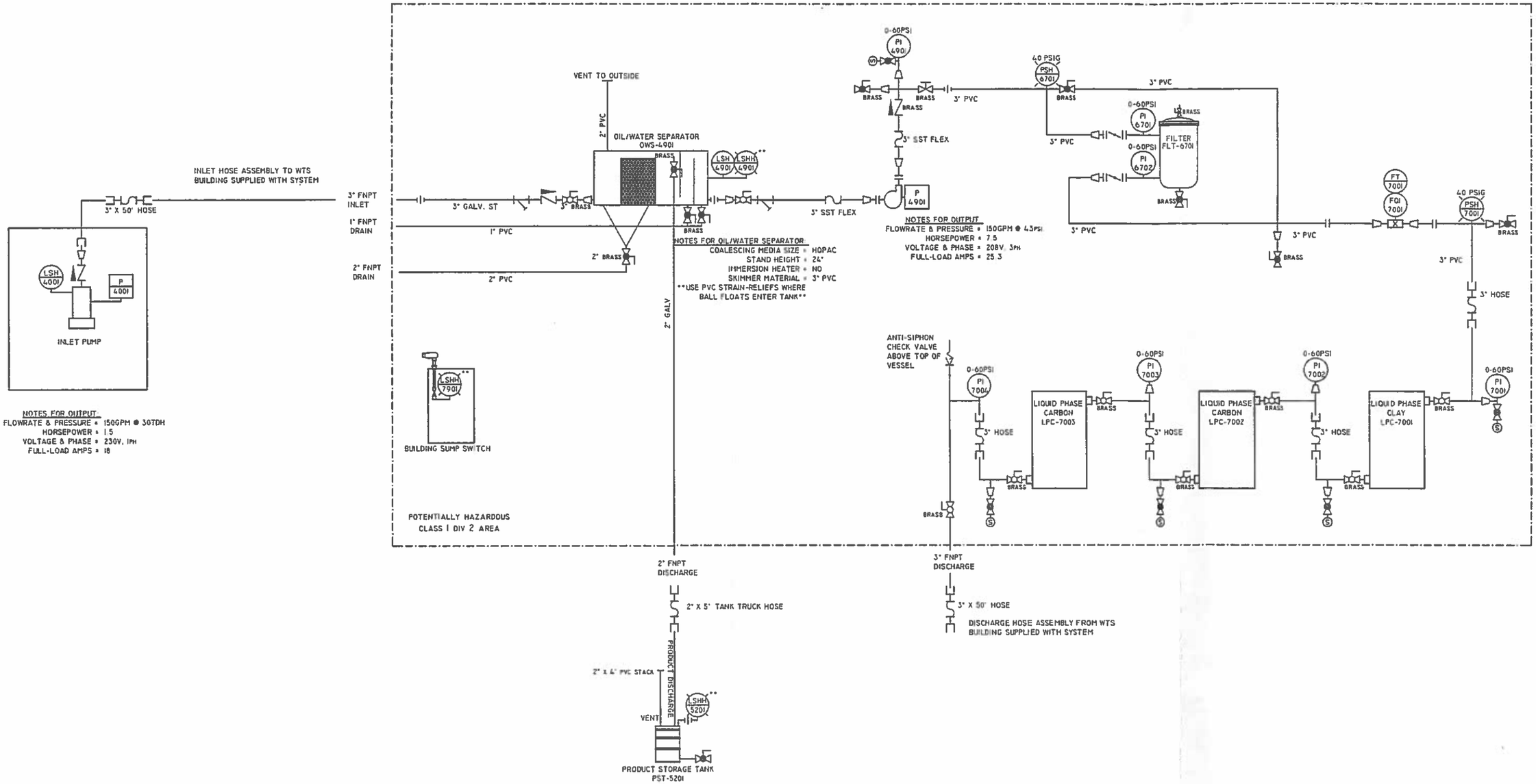
Project Packing List

PMProjNum **102140A**

Baffinland 20' Container for Loose Components

PM_ShippingNotes:

Tag	Part Number	Part Description	Req / Rec	PO # / Line	EngMemo
1	11686	Filter, Bag, FOS P2P, 7" x 32"	120	---	
EXTRA	ea	Oil Absorbing Bags, Sub-micron, Plastic Ring	0		
Type: P		Box Quantity, 20 per box ---		0	
1	25263-T	Melt-Blown Spaghetti Media	15	---	
EXTRA	ea	Filter Bag Insert, Oil-Absorbing, Polypropylene	0		
Type: I		25 lbs/bag ---		0	
1	11214	Media, Clay, TM100	5000	---	
EXTRA	lb	(stocked and ordered in lbs)	0		
Type: I		---		0	
1	20220	Media, Carbon, Liquid, Virgin, 8 x 30 Coconut	6000	---	
EXTRA	lb	Sold in 1100 lb (500 Kg) sacks per pound	0		
Type: I		---		0	
1	9999	Misc Part, See Details	2	---	
EXTRA	ea	As per detailed specification below	0		
Type: P		O-ringsm 4155-1490-B (V6427)		0	
1	21891	Gasket, Flange, Tetrasolv AF Series	6	---	
EXTRA	ea	18" Hatch Gasket	0		
Type: P		Fits, AF250, AF500, AF1000, AF2000, AF300 ---		0	
1	22353	Pump, Part, SSH, Mechanical Seal Kit	2	---	
EXTRA	ea	P/N: RPKSSHS	0		
Type: P		---		0	
1	21605-T	Media, Coal, Anthracite, .9 to .95mm	20	---	
EXTRA	lb	52 lbs/bag; sold in lbs.	0		
Type: I		---		0	
1	11610	Container, 8' x 20' x 8'6"	1	---	
EXTRA PA	ea	5-8 yr	0		
Type: P		---		0	



BUILDING EQUIPMENT AND CONTROL PANEL

BORDER DEFINES THE LIMITS OF THE ENCLOSURE

CONTROL PANEL

TO BE LOCATED ON BUILDING. PANEL TO BE A MINIMUM OF 36" FROM ANY HAZARDOUS PROCESS EQUIPMENT, AND A MINIMUM OF 36" ABOVE GRADE.

TSL 7901, TSL 7902, TSH 7901, TSH 7902, H 7901, H 7902, H 7903, F 7901, F 7902, LSHH 7901**, KILL 7901**

WIRING TO BE CLASS I DIVISION 2, AS PER THE CEC.

IS INPUT WIRING TO BE WIRED FOR INDOORS, ACCORDING CEC FOR HAZARDOUS LOCATIONS.

PIPING DETAILS:
- WATER FLOW METERS: PROVIDE 10 DIA. OF STRAIGHT PIPE BEFORE AND 5 DIA. OF STRAIGHT PIPE AFTER METERS. ENSURE THAT THROTTLING VALVES ARE NOT DIRECTLY IN LINE WITH METERS.
- AIR FLOW METERS: PROVIDE 8 DIA. OF STRAIGHT PIPE BEFORE AND 3 DIA. OF STRAIGHT PIPE AFTER METERS, IF POSSIBLE. AVOID TEES AND ELBOWS BEFORE AND AFTER METERS.
- MATERIALS OF VALVES AND FITTINGS TO BE THE SAME AS THE DESCRIPTION AT THE LINE. IF THERE IS A TRANSITION FROM PVC TO STEEL, THE VALVE SHOULD BE BRASS
- THERE ARE NO SPECIAL PIPING REQUIREMENTS OTHER THAN WHAT IS EXPLAINED ON THE DIAGRAM.
- WHEN PVC HOSE IS SPECIFIED, ALWAYS USE VACUUM HOSE. USE GREEN HOSE FOR PRESSURES LESS THAN 60PSI. USE TANK TRUCK HOSE FOR PRESSURES BETWEEN 60PSI AND 150PSI.
- PVC PIPE MAY BE SUBSTITUTED WITH EQUAL-SIZED PVC HOSE WHERE A FLEXIBLE CONNECTION IS PREFERRED.

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C	2013-08-20	DM	AS BUILT
B	2013-08-06	DAM	FOR PRODUCTION

DWG. NO: 102140-01 (PAGE 1 OF 2)

TITLE: PROCESS & INSTRUMENTATION DRAWING

CUSTOMER: MARY RIVER PROJECT BAFFINLAND

newterra LTD.

VALVES AND PIPING

NO NC

BALL VALVE -
GATE VALVE -
GLOBE VALVE -
NEEDLE VALVE -
SLIDE VALVE -
SOLENOID VALVE -
BUTTERFLY VALVE -
SWING CHECK VALVE -
WAFER CHECK VALVE -
SPRING CHECK VALVE -
WYE STRAINER -
SAMPLE PORT -
PRESSURE RELIEF VALVE -
VACUUM RELIEF VALVE -
CAMLOCK CONNECTION -
FERNCO CONNECTION - FERNCO
FLEXIBLE CONNECTION -
FLANGED CONNECTION -
REDUCER -
UNION -
ADSORBENT FILTER - A DRAIN
COALESCING FILTER - DRAIN
PARTICULATE FILTER - DRAIN
FILTER, SILENCER -
PRESSURE REGULATOR -
REGULATOR W/ FILTER -

EQUIPMENT

AIR STRIPPER

OIL/WATER SEPARATOR

VAPOR/LIQUID, SEAL FLUID SEPARATOR

BAG FILTER

CARBON VESSEL

PRODUCT STORAGE DRUM, TANK

OXIDIZER

CHEMICAL DRUM

STANDARD, CONICAL-BOTTOM TANK

EQUIPMENT

CENTRIFUGAL PUMP -
PROGRESSIVE-CAVITY PUMP -
CHEMICAL-INJECTION PUMP -
CENTRIFUGAL, REGENERATIVE BLOWER -
POSITIVE-DISPLACEMENT BLOWER -
ROTARY-CLAW BLOWER -
LIQUID-RING PUMP -
ROTARY-VANE COMPRESSOR -
RECIPROCATING COMPRESSOR -
HEAT EXCHANGER -
PASSIVE COOLING FINS -

EQUIPMENT

AS - AIR STRIPPER
BLD - BUILDING, TRAILER OR SKID
FLT - FILTER VESSEL
LPC - LIQUID-PHASE CARBON VESSEL
MFD - MANIFOLD
OWS - OIL/WATER SEPARATOR
OX - OXIDIZER
PST - PRODUCT STORAGE TANK
SOS - SEAL OIL SEPARATOR
SWS - SEAL WATER SEPARATOR
TNK - TANK
VLS - VAPOR/LIQUID SEPARATOR
VPC - VAPOR-PHASE CARBON VESSEL

FLOW MEASUREMENT

AVERAGING PITOT TUBE - RANGE PDI 101 H L

VENTURI - RANGE PDI 101 H L

ROTOMETER - RANGE FI 101

WATER FLOW METER - FQI 101

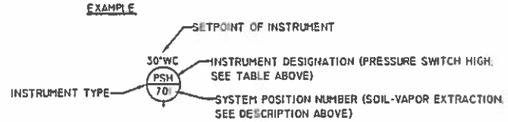
INSTRUMENT DESIGNATION

	INPUT	1ST MODIFIER	2ND MODIFIER	3RD MODIFIER	OUTPUT	1ST MODIFIER	
A			ALARM				A
B						BLOWER	B
C	CYCLE					COMPRESSOR	C
D		DIFFERENTIAL				AIR DRYER	D
E							E
F	FLOW					FAN	F
G	GAS (LEL)		GAUGE				G
H				HIGH	HAND	HEATER	H
I	CURRENT		INDICATOR				I
J							J
K							K
L	LEVEL			LOW			L
M					MOTORIZED		M
N							N
O							O
P	PRESSURE				PNEUMATIC	PUMP	P
Q		QUANTITY					Q
R							R
S	SPEED		SWITCH		SOLENOID		S
T	TEMPERATURE		TRANSMITTER				T
U							U
V						VALVE	V
W							W
X							X
Y							Y
Z	POSITION						Z

INSTRUMENT IDENTIFICATION

- INDICATING INSTRUMENT
- DIGITAL INPUT TO CONTROL PANEL
- DIGITAL INPUT CAUSING ALARM
- ** DIGITAL INPUT CAUSING SYSTEM SHUTDOWN ALARM
- ANALOG INPUT TO CONTROL PANEL
- ANALOG OUTPUT FROM CONTROL PANEL

EXAMPLE



SYSTEM POSITION DESIGNATION

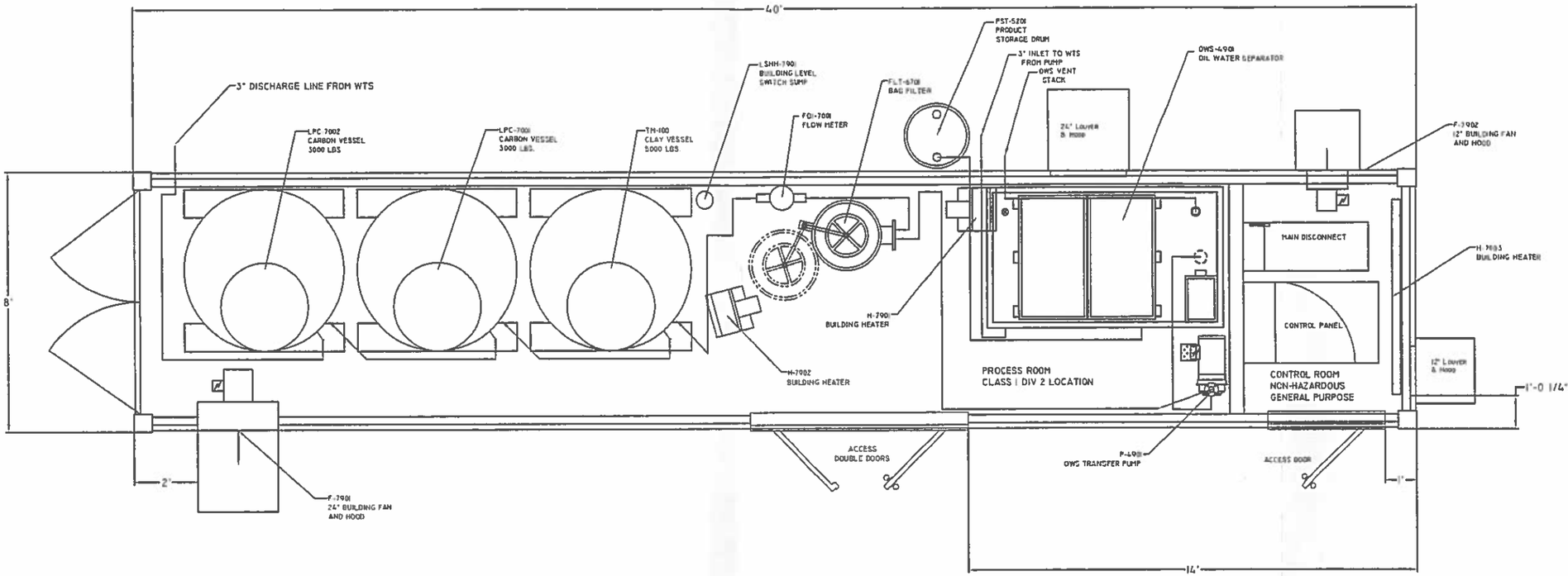
100 - VACUUM INLET MANIFOLD
300 - INLET HEAT EXCHANGER
400 - VAPOR/LIQUID SEPARATOR
500 - VAPOR/LIQUID SEPARATOR - 2
700 - SOIL-VAPOR EXTRACTION
1000 - LIQUID-RING PUMP
1300 - SVE HEAT EXCHANGER
1600 - VAPOR-PHASE CARBON
1900 - OXIDIZER
2200 - AIR SPARGE
2500 - SPARGE HEAT EXCHANGER
2800 - SPARGE OUTLET MANIFOLD
3100 - AIR COMPRESSOR
3400 - COMPRESSED-AIR OUTLET MANIFOLD
3700 - PNEUMATIC WELL PUMPS
4000 - SUBMERSIBLE WELL PUMPS
4300 - SURFACE-MOUNT WELL PUMPS
4600 - GROUNDWATER INLET MANIFOLD
4900 - OIL/WATER SEPARATOR
5200 - PRODUCT STORAGE TANK
5500 - INLET TANK
5800 - UPSTREAM BAG FILTER
6100 - CHEMICAL INJECTION
6400 - AIR STRIPPER
6700 - PRE-CARBON BAG FILTER
7000 - LIQUID-PHASE CARBON
7100 - PRE-MEDIA BAG FILTER
7200 - ACTIVATED ALUMINA
7300 - DISCHARGE TANK
7400 - POST-TREATMENT BAG FILTER
7600 - REINJECTION
7900 - BUILDING, TRAILER OR SKID
8200 - CONTROL PANEL
8500 - ELECTRICAL PARTS
9900 - EXTRAS

PIPING DETAILS
- WATER FLOW METERS: PROVIDE 10 DIA. OF STRAIGHT PIPE BEFORE AND 5 DIA. OF STRAIGHT PIPE AFTER METERS. ENSURE THAT THROTTLING VALVES ARE NOT DIRECTLY IN LINE WITH METERS.
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B	2013-08-06	DAM	FOR PRODUCTION	

DWG. NO: 102140-01 (PAGE 2 OF 2)
TITLE: PROCESS & INSTRUMENTATION DRWG LEGEND
CUSTOMER: MARY RIVER PROJECT BAFFINLAND

SCALE BAR, EACH BLOCK IS 12" LONG



PLEASE NOTE: THIS BUILDING IS SHIPPING ON A BOAT AND MUST NOT BE MORE THE 96" IN WIDTH. THIS INCLUDES ALL EQUIPMENT AND CONNECTIONS THAT PROTRUDE THROUGH THE ENCLOSURE.

**** CIVIL CONSTRUCTION NOTES ****

- BUILDING TO BE PAINTED WITH HEMPATEX HI BUILD 46410 BLUE. HEMPEL COLOUR CODE 33930
- DOOR COLOUR TO BE THE SAME AS BUILDING
- FLOOR TO BE GATOR GUARDED
- PROVIDE WOOD LIP AROUND PERIMETER TO ALLOW SUMP SWITCH TO TRIP
- INSTALL GRATING BETWEEN BUILDING FANS AND OUTSIDE LOUVERS.
- THERMAL INSULATION ON WALLS AND CEILING

****MECH /ELECT ASS'Y NOTES ****

- MAXIMUM WIDTH FOR SHIPPING IS 96". THIS INCLUDES ALL CONNECTIONS THAT PROTRUDE THROUGH THE SIDES OF THE ENCLOSURE
- PLUG AND SEAL (WITH WASHERS) ANY HOLES IN THE FLOOR TO CONTAIN WATER SPILLS.
- LOCATE COOLING THERMOSTAT IN THE WARMEST LOCATION AT CEILING LEVEL.
- LOCATE HEATING THERMOSTAT AT FLOOR LEVEL.

***** COMMISSIONING NOTES *****

- NEWTERRA RECOMMENDS PAD BE AT LEAST 12" LARGER THAN ENCLOSURE IN ALL DIRECTIONS LOCAL CODES MAY REQUIRE ALTERNATE DIMENSIONS.
- BUILDINGS NEED TO BE SHIMMED ON SITE TO ALLOW DOORS TO OPEN FREELY. PLEASE HAVE SHIMMING MATERIAL READY DURING BUILDING INSTALLATION
- FOR BUILDINGS IN COLD WEATHER CLIMATES WHERE THE BUILDING IS ELEVATED, A SKIRT MUST BE BUILT AROUND THE BASE TO PREVENT THE FLOOR FROM FREEZING.
- [illegible] AND LOUVER HOODS NEED TO BE INSTALLED [illegible]. CANNOT SHIP WITH HOODS ATTACHED

***** DIMENSION INFORMATION *****

DESCRIPTION	DIM (L X W X H)	WEIGHT
40' CONTAINER	8' X 42' X 9.5'	?????

FLOW DIRECTION
ELECTRICAL CONNECTION
FLOW INTO THE PAGE
FLOW OUT OF THE PAGE
THIS AREA REPRESENTS SERVICE SPACE REQUIRED

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LEVEL	DATE:	BY	REVISION:
F	2013-08-20	DM	AS BUILT FOR 102140
F2	2013-08-07	DM	PRODUCTION RELEASE FOR 102140

DWG NO: 102140 - 02
TITLE: SYSTEM LAYOUT
CUSTOMER: BAFFINLAND MARY RIVER PROJECT
newterra LTD.

MET US SYSTEM CLASSIFIED

CMET SYSTEM CLASSIFIED

WARNING: INTRINSICALLY SAFE CIRCUIT INSIDE

WARNING : SYSTEM WILL AUTOMATICALLY RESTART AFTER POWER FAILURE

CAUTION: DISCONNECT THE POWER BEFORE OPENING

CMET&US PANEL

DS201

MAIN DISCONNECT

200 AMP
125A FUSES
208V 3PH
108 FLA

OP101
MICRO-GRAPHIC

F1 F2 F3 F4 F5

P-4901
G
LT614

P-4001
G
LT608

SYSTEM ALARM
R
LT755

OFF HAND AUTO
SW609

OFF HAND AUTO
SW615

PUSH TO STOP PULL TO START
KILL318

REC337

15A GFI

NOTE 1: NEMA 3R LOCKABLE PANEL(S)

NOTE 2: LIGHTS & SWITCHES MOUNTED ON INNER SWING PANEL DOOR

WIRE LEGEND

BLACK: POWER
RED: CONTROL
WHITE: NEUTRAL
BLUE: +24VDC & I.S.(Intrinsically Safe)
BL/WH: 0VDC
YELLOW: INTERLOCKS

NOTES:

MET US CERTIFIED, CONTROL ROOM BUILT TO NEC GENERAL PURPOSE STANDARDS, PROCESS ROOM BUILT TO NEC CLASS 1 DIV 2 STANDARDS, ALL WIRING COMPLETE AND ALL EQUIPMENT PRE-PIPED, FACTORY TESTED AND MOUNTED IN ENCLOSURE.

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	NAME	DATE(mm/dd/yy)
DRAWN	PR	JUN18/07
CKD		
APPR		

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PROJECT:
RTS151 / 150GPM OWS
Baffinland Iron Mines Corp
Mary River Project/ PM 005

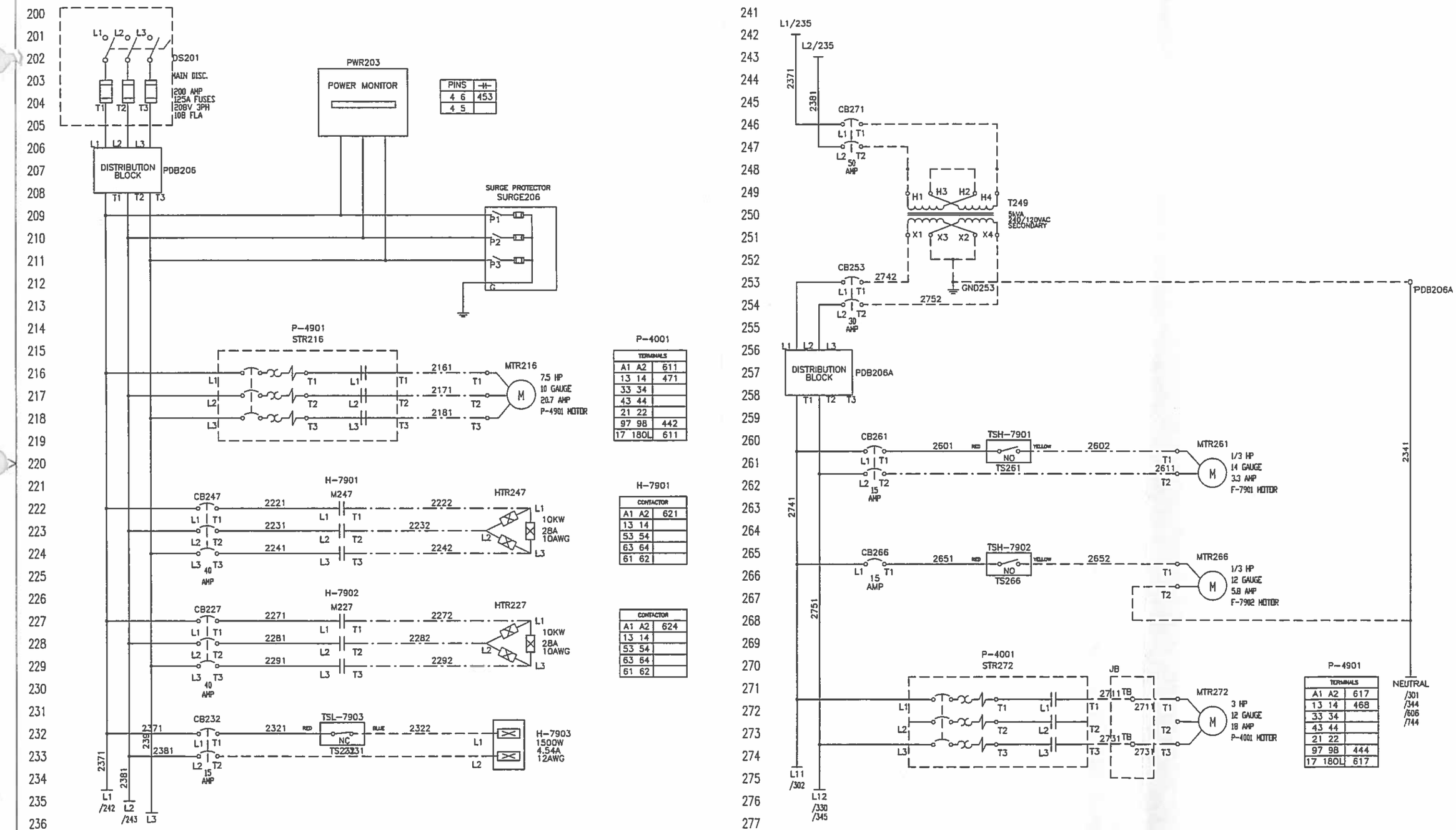
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PAGE DESCRIPTION
PANEL VIEW

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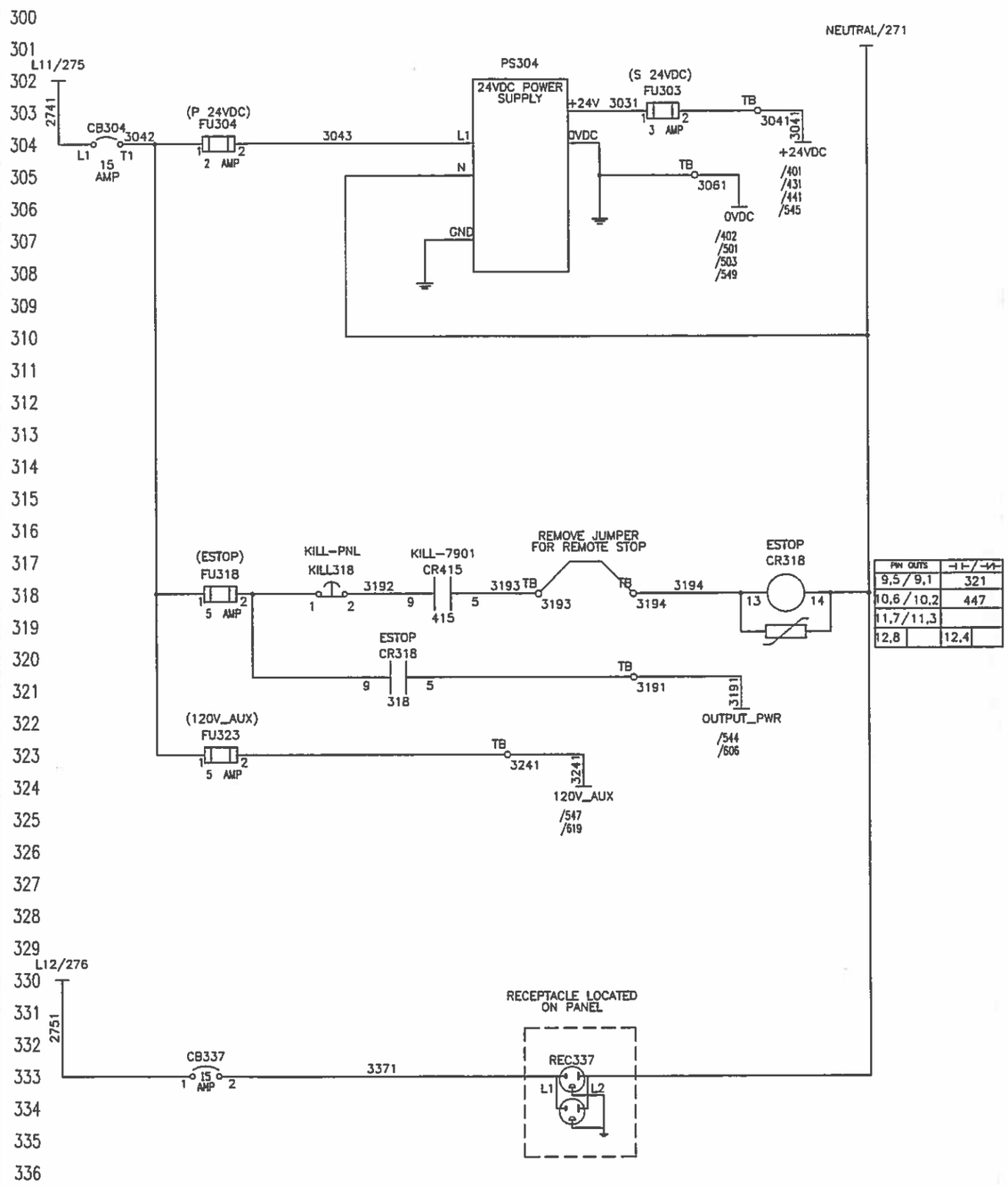
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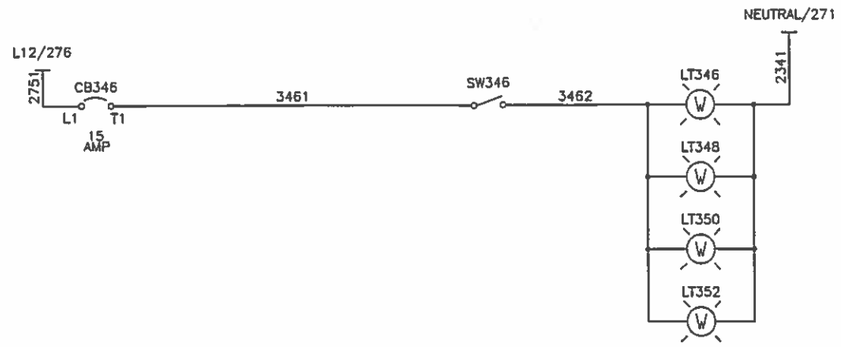
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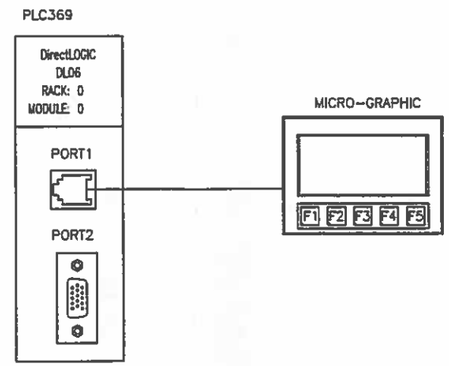
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PIN OUTS	-H-/-V-
9,5/9,1	321
10,6/10,2	447
11,7/11,3	
12,8	12,4





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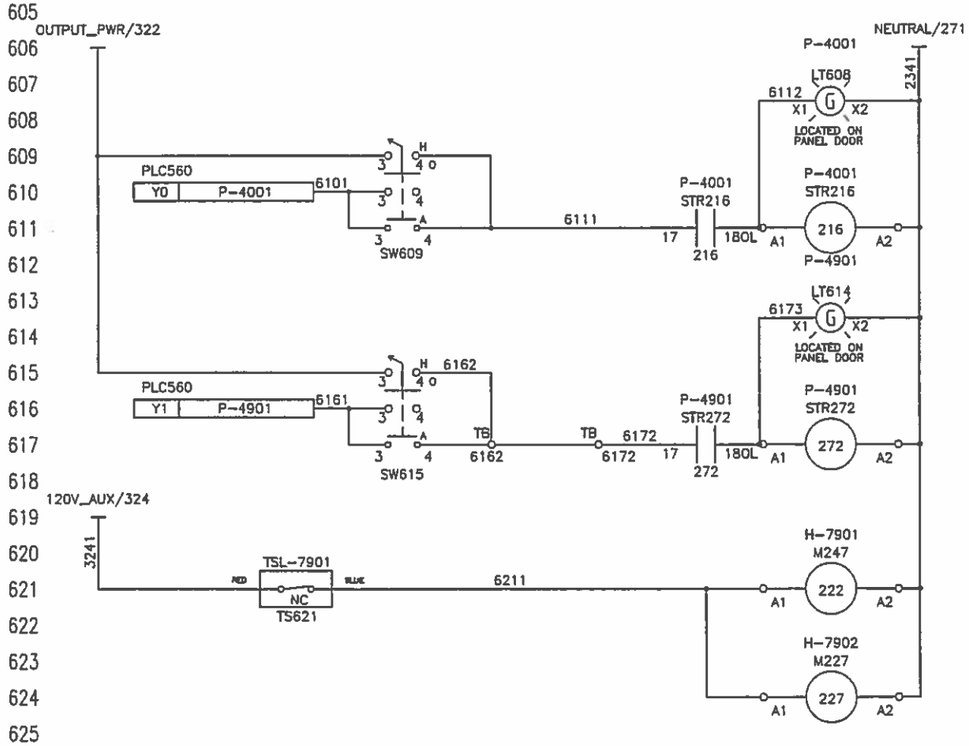
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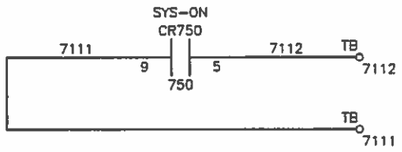
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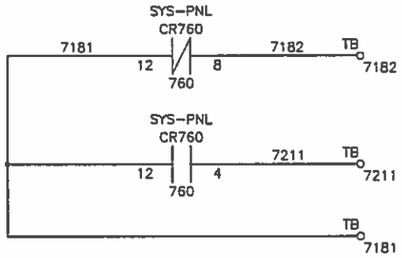
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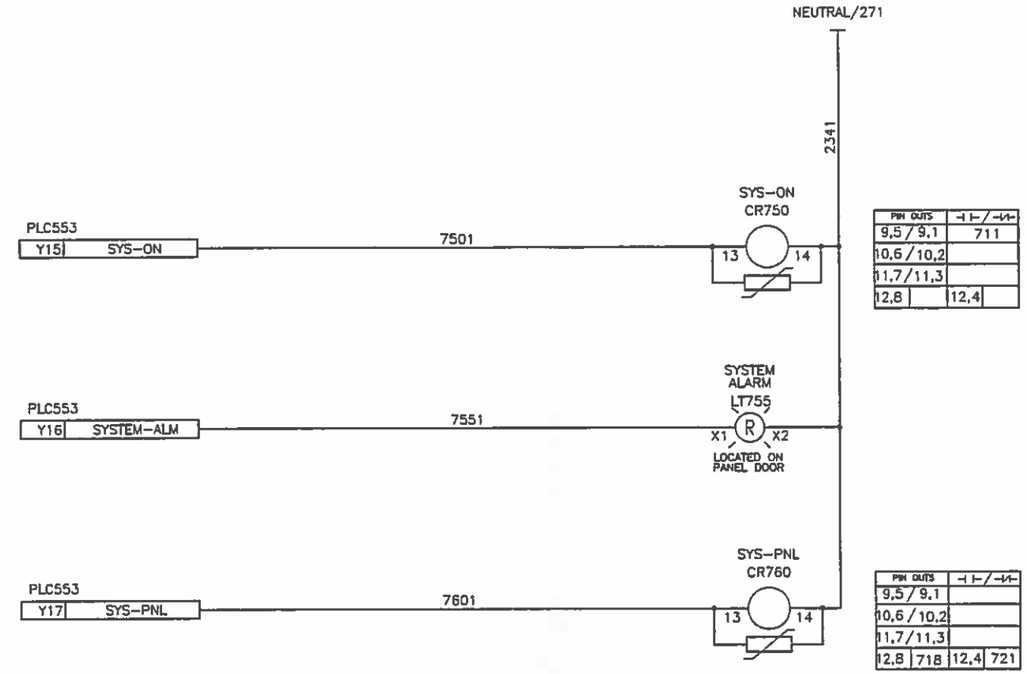
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PLC OUTPUTS

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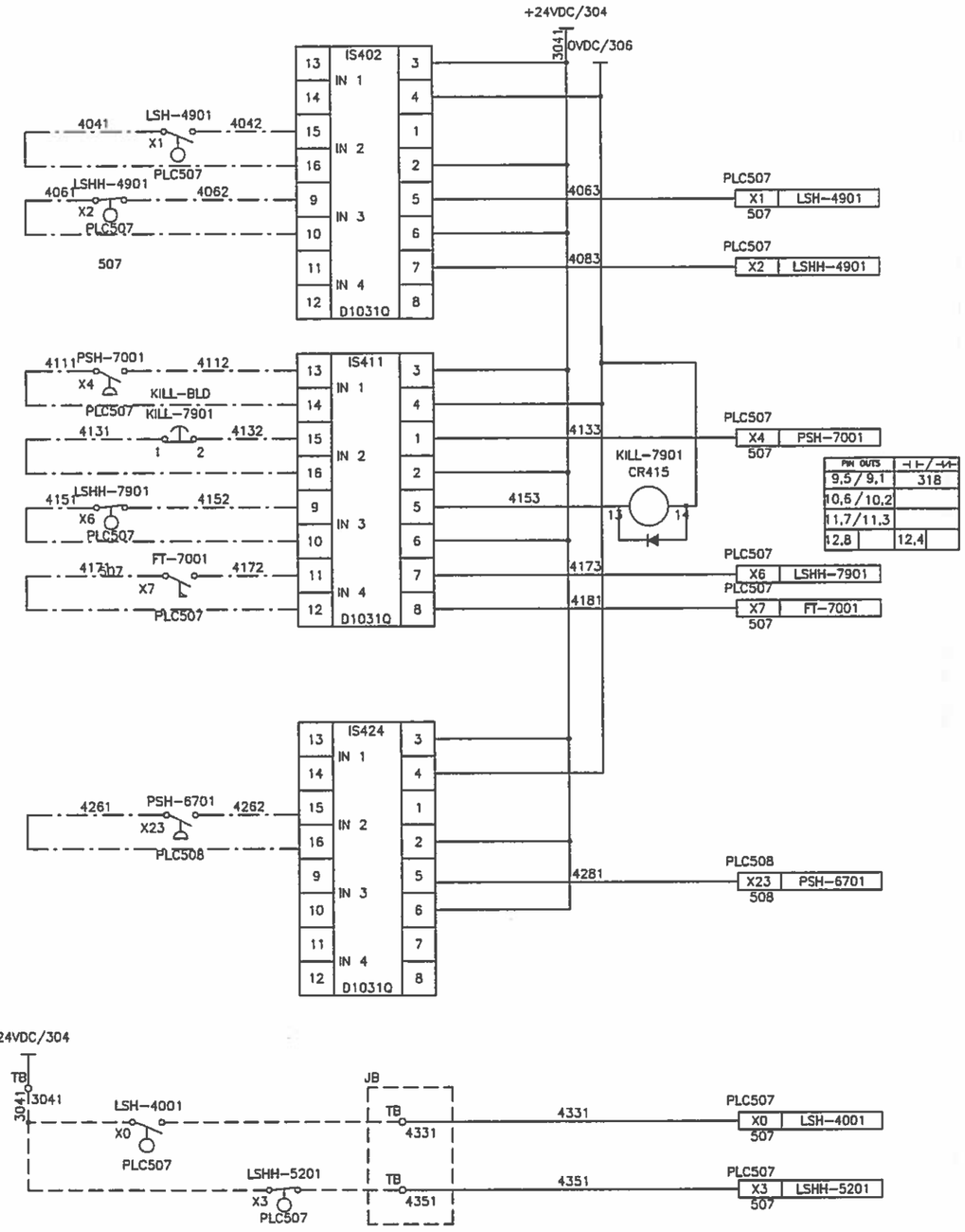
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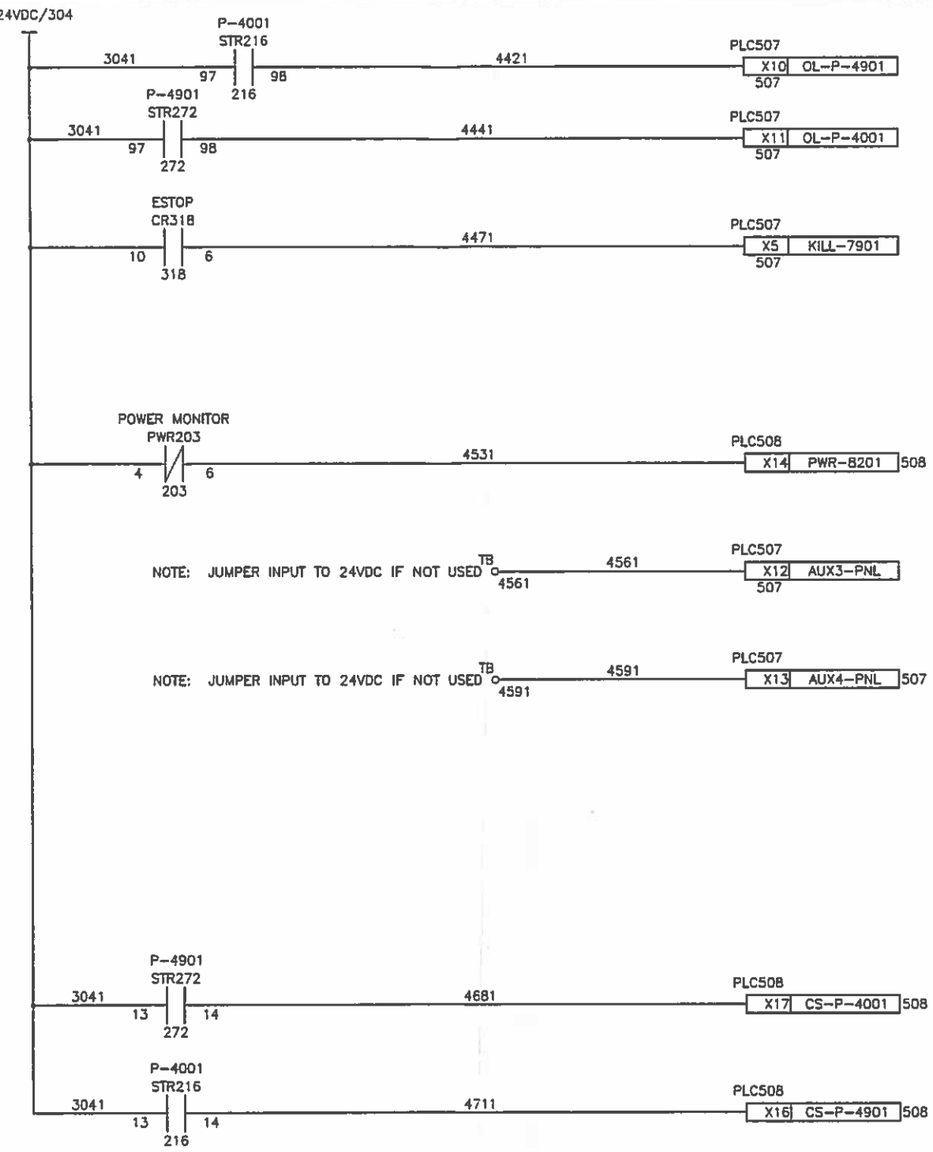
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PLC OUTPUTS

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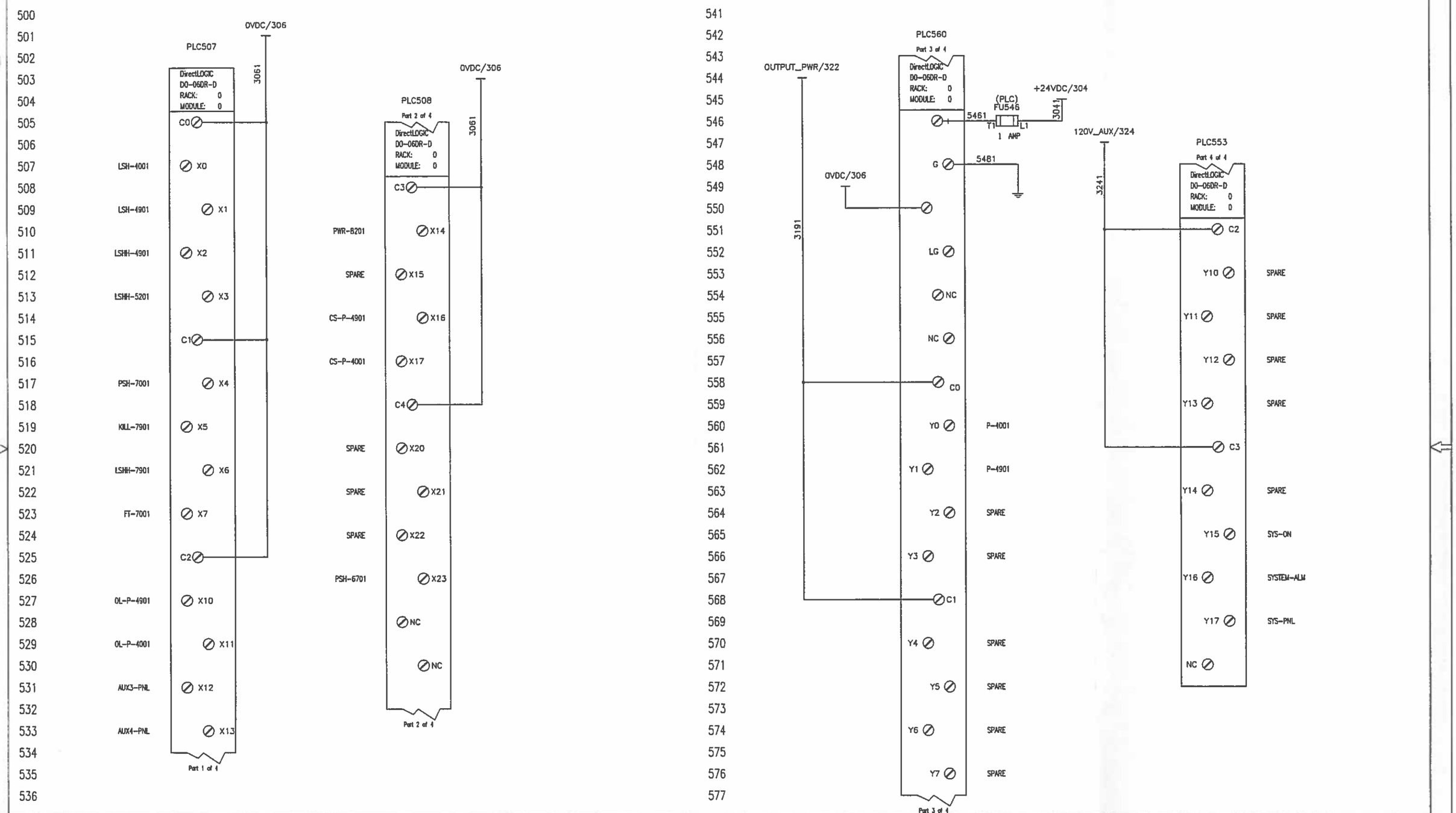
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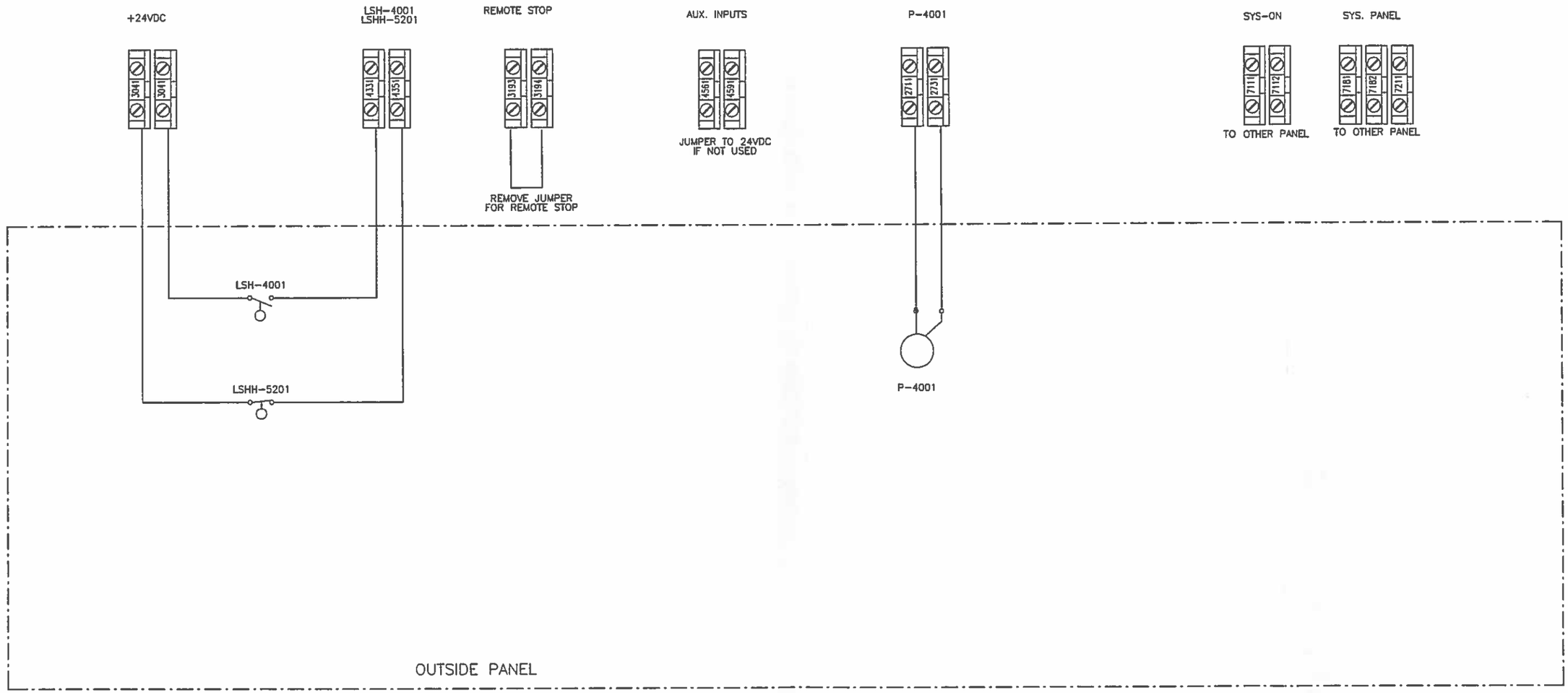
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PLC LAYOUT

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TERMINAL PLAN



WIRE LEGEND

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FIELD WIRING

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Inputs and Setpoints — *Project: RTS151 WTS, 150gpm, OWS-24, Carbon, 4*

Input Summary	
Digital PLC Inputs:	15
Digital PLC Frequency:	1
Analog(4-20) Inputs:	0
Analog(5V) Inputs:	0
Analog(10V) Inputs:	0

IS Barrier Summary	
Analog IS:	0
Digital IS :	9

Legend for Class

ISA : Intrinsically Safe Analog
ISD: Intrinsically Safe Digital
GP: Wire General Purpose
D1: Wire as DI/1
D2: Wire as DI/2

				PLC		Signal							Datalogger (DLO6)	
Tag	Name	Type	Class	Input	Value	State	Low	High	Units	SQRT	Fctr	Offsite_Col	Note	Main	Monthly (Daily for 30 days)
Digital_PLC															
4000 Submersible Pump															
LSH-4001	Level Switch Hi Well Pump 4001	Digital_PLC	ISD	X000		NormOpen	0	0		☐	0			☐ 0	☐ 0
CS-P-4001	P-4001 Status	Digital_PLC	GP	X017		NormOpen	0	0		☐	0			☐ 0	☐ 0
4900 Oil/Water Separator															
LSH-4901	Level Switch High - Oil Water Separato	Digital_PLC	ISD	X001		NormOpen	0	0		☐	0			☐ 0	☐ 0
LSHH-4901	Level Switch High High - Oil Water Sep	Digital_PLC	ISD	X002		NormClose	0	0		☐	0			☐ 0	☐ 0
CS-P-4901	P-4901 Status	Digital_PLC	GP	X016		NormOpen	0	0		☐	0			☐ 0	☐ 0
5200 Product Storage Tank															
LSHH-5201	Level Switch High High - Product Stora	Digital_PLC	ISD	X003		NormClose	0	0		☐	0			☐ 0	☐ 0
6700 Bag Filter															
PSH-6701	Pressure Switch High Bag Filter 6701	Digital_PLC	ISD	X023		NormOpen	0	0		☐	0			☐ 0	☐ 0
7000 Liquid Phase Carbon															
PSH-7001	High Pressure Switch	Digital_PLC	ISD	X004		NormClose	0	0		☐	0			☐ 0	☐ 0
7900 Building, Trailer or Skid															
KILL-7901	Kill Switch 1 - Building	Digital_PLC	ISD	X005		NormClose	0	0		☐	0			☐ 0	☐ 0
LSHH-7901	Level Switch High High - Building	Digital_PLC	ISD	X006		NormClose	0	0		☐	0			☐ 0	☐ 0
8200 Main Control Panel															
OL-P-4901	P-4901 Overload	Digital_PLC	GP	X010		NormOpen	0	0		☐	0			☐ 0	☐ 0
OL-P-4001	P-4001 Overload	Digital_PLC	GP	X011		NormOpen	0	0		☐	0			☐ 0	☐ 0
AUX-8201	Auxiliary Contact - Control Panel	Digital_PLC	GP	X012		NormClose	0	0		☐	0			☐ 0	☐ 0
AUX-8202	Auxiliary Contact - Control Panel	Digital_PLC		X013		NormClose	0	0		☐	0			☐ 0	☐ 0
PWR-8201	Power/Phase Monitor Panel	Digital_PLC		X014		NormClose	0	0		☐	0			☐ 0	☐ 0
Digital_PLC_Freq															
7000 Liquid Phase Carbon															
FT-7001	Flow Transmitter - Liquid Phase Carbo	Digital_PLC_	ISD	X007		NormOpen	0	0		☐	0			☐ 0	☐ 0
Direct															
7900 Building, Trailer or Skid															
TSH-7901	Temperature Switch High - Room #1	Direct				NormOpen	0	0		☐	0			☐ 0	☐ 0
TSH-7902	Temperature Switch High - Room #2	Direct				NormOpen	0	0		☐	0			☐ 0	☐ 0
TSL-7901	Temp Switch Low - Room #1	Direct				NormClose	0	0		☐	0			☐ 0	☐ 0

				PLC		Signal							Datalogger (DLO6)	
Tag	Name	Type	Class	Input	Value	State	Low	High	Units	SQRT	Fctr	Offsite_Col	Note	Main	Monthly (Daily for 30 days)
TSL-7902	Temp Switch Low - Room #2	Direct				NormClose	0	0		☐	0			☐ 0	☐ 0

Outputs Project RTS151 WTS, 150gpm, OWS-24, Carbon, 40

Largest Motor	7.5

575V-3ph:	0
460V-3ph:	0
230V-3ph:	0
208V-3ph:	20.46

230V-1ph	11.43
208V-1ph	0
115V-1ph	12

230V/115-3ph	0

Tag	PLC Loc	Device	Voltage	Watts	HP	Amps	Switches: At Device	Switches: On Panel	Panel Setup: Hourmeter	Panel Setup: Ammeter	Analog Setup: Signal_Low	Analog Setup: Signal_High	Offsite Communication Package: Offsite_Switch	Offsite_Color	Offsite_Name	Hourmeter	Ammeter	Datalog: Monthly	Datalog: Mai
							Logic												
Digital PLC																			
4000 Submersible Pump																			
P-4001	Y000	Motor Cntr	230V-1ph		1.5	7.83	None	Hand/Off/Auto	Display Only	None						☐	☐	☐ 0	☐ 0
Well Pump 4001							PUMPS FEEDING OWS PUMP START: SYSTEM IN RUN AND LAHH-4901 OFF PUMP STOP: SYSTEM NOT IN RUN OR LAHH-4901 ON												
4900 Oil/Water Separator																			
P-4901	Y001	Motor Cntr	208V-3ph		7.5	20.46	None	Hand/Off/Auto	Display Only	None						☐	☐	☐ 0	☐ 0
Pump - Oil Water Separator							PUMP START: SYSTEM IN RUN AND LSH-4901 ON PUMP STOP: SYSTEM NOT IN RUN OR LSH-4901 OFF												
8200 Main Control Panel																			
AL-8201	Y016	Light	115V-1ph				None	None	None	None						☐	☐	☐ 0	☐ 0
Alarm Light							LIGHT ON: SYSTEM IN ALARM. LIGHT OFF: SYSTEM NOT IN ALARM.												
AR-8201	Y017	Relay(110)	115V-1ph				None	None	None	None						☐	☐	☐ 0	☐ 0
Alarm Relay							RELAY ON: SYSTEM IN SHUTDOWN ALARM. RELAY OFF: SYSTEM NOT IN SHUTDOWN ALARM.												
SYS ON	Y015	Relay(110)	115V-1ph				None	None	None	None						☐	☐	☐ 0	☐ 0
System On Relay							RELAY ON: SYSTEM IN RUN AND KILL SWITCH NOT PRESSED RELAY OFF: SYSTEM NOT IN RUN OR KILL SWTICH PRESSED												
Power																			
7900 Building, Trailer or Skid																			
F-7901		Fan	230V-1ph		0.33	3.6	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Fan - Process Room							FAN START: TSH-7901 ON FAN STOP: TSH-7901 OFF												
F-7902		Fan	115V-1ph	0	0.25	2	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Fan - Control Room							FAN START: TSH-7902 ON FAN STOP: TSH-7902 OFF												
H-7901		Heater	208V/120V-3	10000	0	28	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Heater - Process Room #1							HEATER START: TSL-7901 OFF HEATER STOP: TSL-7901 ON												
H-7902		Heater	208V/120V-3	10000		28	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Heater - Process Room #2							HEATER START: TSL-7901 OFF HEATER STOP: TSL-7901 ON												
H-7903		Heater	208V/120V-3	1500	0	4.1	None	None	None	None	0	0				☐	☐	☐ 0	☐ 0
Heater - Control Room							HEATER START: TSL-7902 OFF HEATER STOP: TSL-7902 ON												
Lights		Light	115V-1ph	600		5	None	None	None	None						☐	☐	☐ 0	☐ 0
Inside Lights							LIGHTS ON: LIGHT SWITCH ON LIGHTS OFF: LIGHT SWITCH OFF												

Tag		PLC Loc	Device	Voltage	Watts	HP	Amps	Switches: At Device	Switches: On Panel	Panel Setup: Hourmeter	Panel Setup: Ammeter	Analog Setup: Signal_Low	Analog Setup: Signal_High	Offsite Communication Package: Offsite_Switch	Offsite_Color	Offsite_Name	Hourmeter	Datalog: Ammeter	Datalog: Monthly	Datalog: Mai
								Logic												
1200	Main Control Panel																			
	120V CB		Control Powe	115V-1ph	600		5	None	None	None	None						☐	☐	☐ 0	☐ 0
	120V Control Power																			

Alarms Project RTS151 WTS, 150gpm, OWS-24, Carbon, 40' Contai

Tag		PLC Loc / Logic	Alarm Type	Delay(sec)	Alarms On..	Alarm Setting / Comment
Type: Alarm_PLC						
4900 Oil/Water Separator						
LAHH-4901	**High High Level Alarm - Oil Water Separator**	C103	Recovers	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND LSHH-4901 OPEN FOR DELAY SHOWN ALARM STOP: SYSTEM RESET				
5200 Product Storage Tank						
LAHH-5201	**High High Level Alarm - Product Storage Tank**	C104	Sys_Shutdown	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND LSHH-5201 DEACTIVATED FOR DELAY SHOWN (see table) ALARM STOP: SYSTEM RESET				
5800 Bag Filter						
PAH-6701	**High Pressure Alarm Bag Filter 6701**	C110	Light_Only	5	Open	0
		SOFT ALARM: ALARM START: SYSTEM IN RUN AND PSH-6701 ACTIVATED FOR 5 SECONDS ALARM STOP: SYSTEM RESET				
7000 Liquid Phase Carbon						
PAH-7001	**Pressure Alarm High**	C106	Sys_Shutdown	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM ON AND PSH-7001 OPEN FOR DELAY SHOWN (see table) ALARM STOP: SYSTEM RESET				
7900 Building, Trailer or Skid						
KILLA-7901	**Kill Switch Alarm 1 - Building**	C102	Sys_Shutdown	0	Open	0
		SYSTEM SHUTDOWN: ALARM START: ANY KILL INPUT OPEN ALARM STOP: SYSTEM RESET				
LAHH-7901	**Level Alarm High High - Building**	C105	Sys_Shutdown	5	Open	0
		STANDARD LOGIC SYSTEM SHUTDOWN: ALARM START: LSHH-7901 OPEN FOR DELAY SHOWN ALARM STOP: SYSTEM RESET				
8200 Main Control Panel						
OLA-P-4901	**Overload Alarm OWS Discharge Pump**	C111	Sys_Shutdown	1	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND OL-P-4901 ACTIVATED ALARM STOP: SYSTEM RESET				

Tag		PLC Loc	Alarm Type	Delay(sec)	Alarms On..	Alarm Setting
		Logic				Comment
OLA-P-4001	**Overload Alarm Inlet Discharge Pump**	C112	Sys_Shutdown	1	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND OL-P-4001 ACTIVATED ALARM STOP: SYSTEM RESET				
AUXA-8201	**Auxiliary Alarm - Control Panel**	C113	Sys_Shutdown	5	Open	0
		STANDARD LOGIC SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND AUX-8201 DEACTIVATED ALARM STOP: SYSTEM RESET				
AUXA-8202	**Auxiliary Alarm - Control Panel**	C113	Sys_Shutdown	5	Open	0
		SYSTEM SHUTDOWN: ALARM START: SYSTEM IN RUN AND AUX-8202 DEACTIVATED ALARM STOP: SYSTEM RESET				
PWRA-8201	**Panel Power Alarm**	C114	Sys_Shutdown	0	Open	0
		SYSTEM SHUTDOWN: ALARM START: POWER LOSS OR INCOMING VOLTAGE FAULT ALARM STOP: SYSTEM RESET AND INCOMING POWER IS WITHIN LIMITS Note. Power limits and tolerance, as well as recovery time is all set locally on device.				

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1 Using the newterra Site-Link: Remote Offsite Telemetry

1.1 Document purpose

This document details the various features and functionality of and procedure for logging in to and using the **newterra** Site-Link: Remote Offsite Telemetry portal.

Revision control

Revision	Author	Date
Rev 1. Original draft.	T Coates/ W Moulton	11 April 2012

2 Table of Contents

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3 Overview

The **newterra** Site-Link: Remote Offsite Telemetry is a customized software program and hardware configuration which provides a real-time link to a process control system via cellular modem using our secure Site-Link Server.

Site-Link does not require any additional software to be downloaded or installed and simply uses your favourite internet browser* to view your system from anywhere you can get internet and is Operating System independent (ie Windows/ MAC). This means that you have access to your system via your internet browser enabled computer, smart phone or similar device. To access your system simply type the following address into your browser: https://sitelink.newterra.com.

** **newterra** recommends Internet Explorer 8.0® or higher for best performance with 800x600 resolution or higher.*

Site-Link comes with the following features:

- Customized P&ID layout with System Status
- Start/ Stop/ Reset of System
- Manual Control of most system components†
- Data and Alarm logging exports in .csv format
- Alarm History including Current Alarm Status
- Hour Meters for Equipment††
- Customization of all system set points†

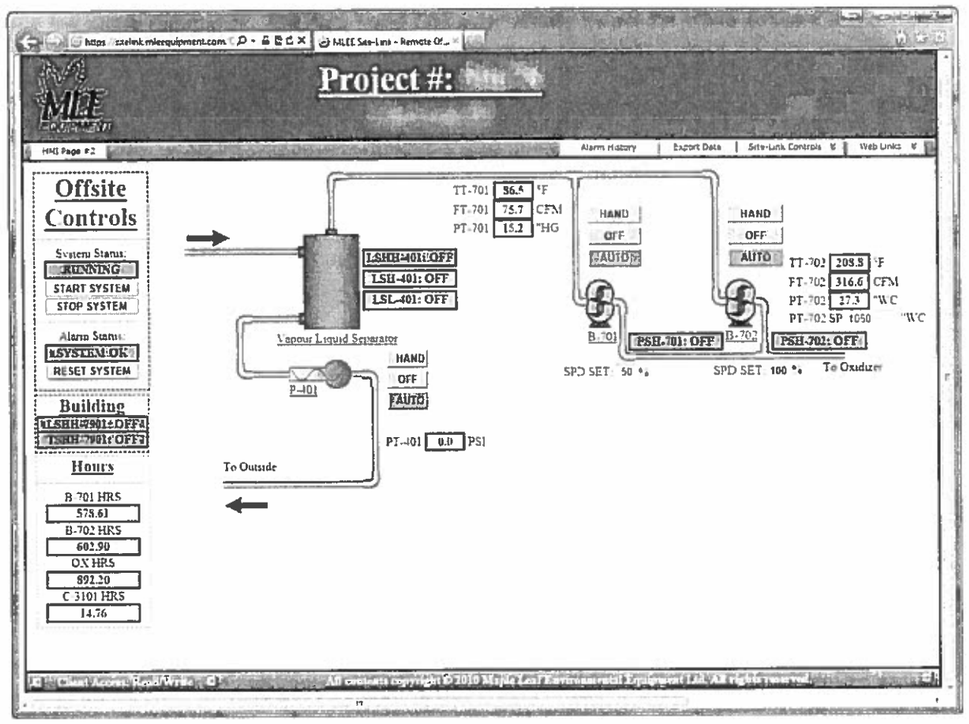
† certain restrictions apply.
†† only applies when hour meters are quoted with system.

Multiple users can have access to Site-Link, each with their own unique login details. Users can have read and write privileges for monitoring and control, or read only privileges for monitoring only. For customers with multiple systems with Site-Link capability, all those systems will be available via the one login account.

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4 P&ID Page 1

P&ID page 1 typically includes system status dialog box (Shutdown/ Running). Start and Stop buttons. Reset button to reset alarms. Alarm status box (System OK/ Alarm). Soft HOA switches for motors/ valves etc. Visual indicators for level switches, active pumps/ motors/ valves etc.
Depending on the components used in the system; instantaneous flow, total flow, analog transmitters and SetPoints.
Tabs for P&ID page 2 (if applicable), alarm history and export data.



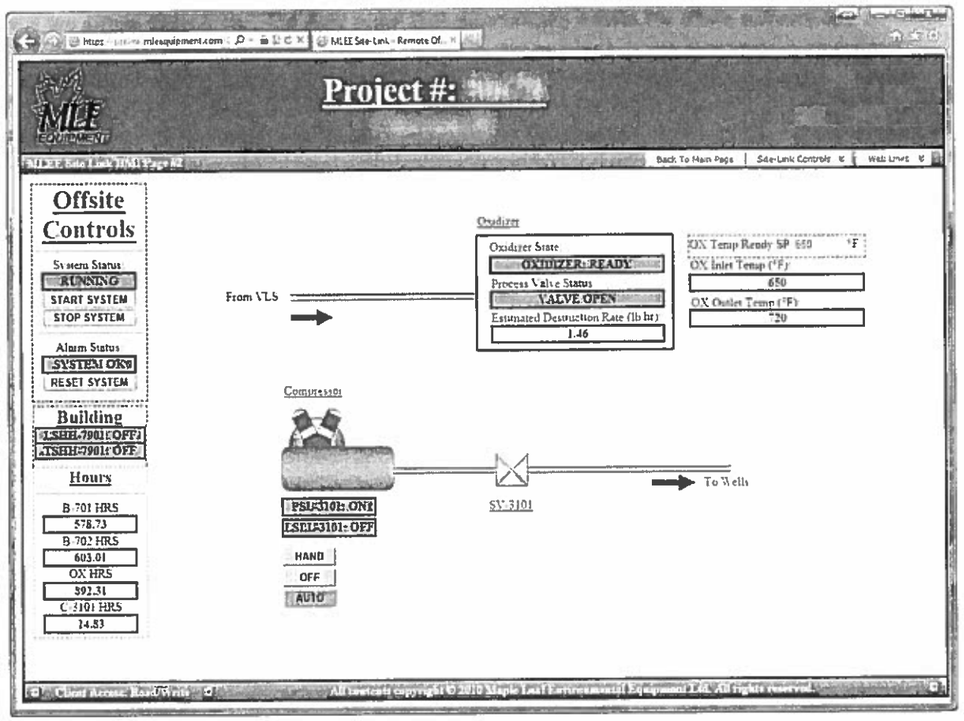
Display refresh rate is once per minute unless a Site-Link button is pressed, in which case the display refresh will be approximately 5 seconds.

To change analog SetPoints simply type into the text box provided and then press the enter key on your computer keyboard.

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5 P&ID Page 2

P&ID page 2 is typically used for larger systems and includes many or all of the same features as mentioned above, depending on the system.



6 Datalogging

Analog values and flow data (if present on the system) and hour meters are logged automatically. If the system only has hour meters the standard logging rate is once per day. If the system has analog values and/ or flow data the standard logging rate is once every 10 minutes.

Note: Data is only retained on the server for 90 days before the oldest data starts to be overwritten by the newest data. Therefore it is recommended that downloads are performed every 2 months (see Export Data section below).

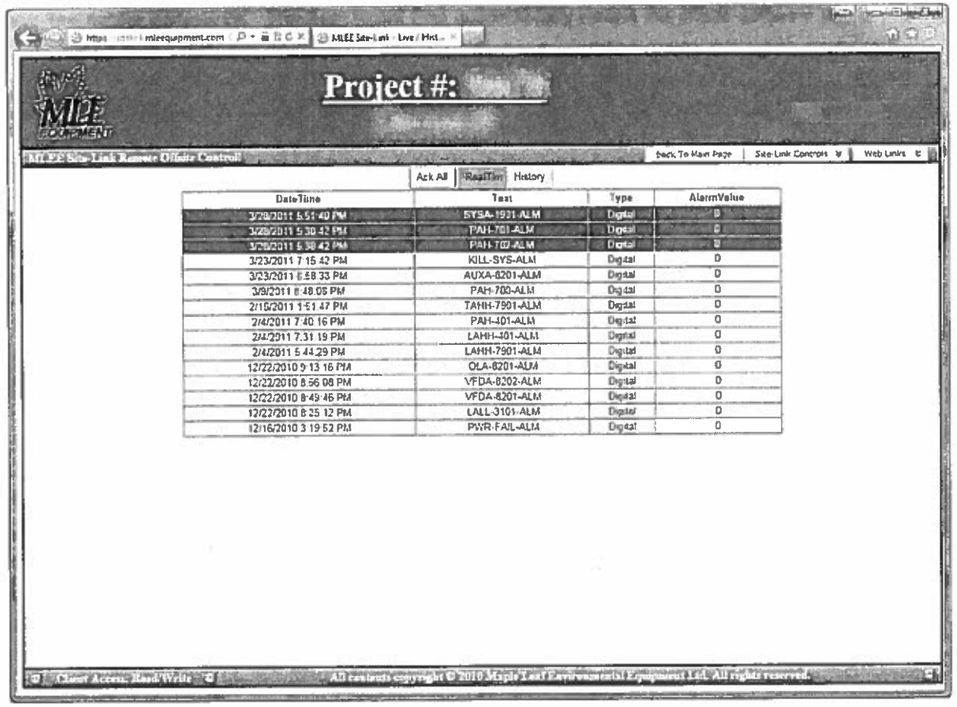
7 Yellow/ orange boxes with ?????

Yellow/ orange boxes with ????? instead of the usual red/ green boxes means the Site-Link server is unable to pull any data from the PLC on site. This typically means there is no power to the control panel or possibly an issue with the wireless signal or modem. If symptoms persist please call **newterra**.

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8 Alarm History

This is a list of all the alarms the system is capable of generating, in the order that the alarm status last changed. It details the last date/ time that alarm changed state. For more detailed alarm history the alarm export data download can be performed.

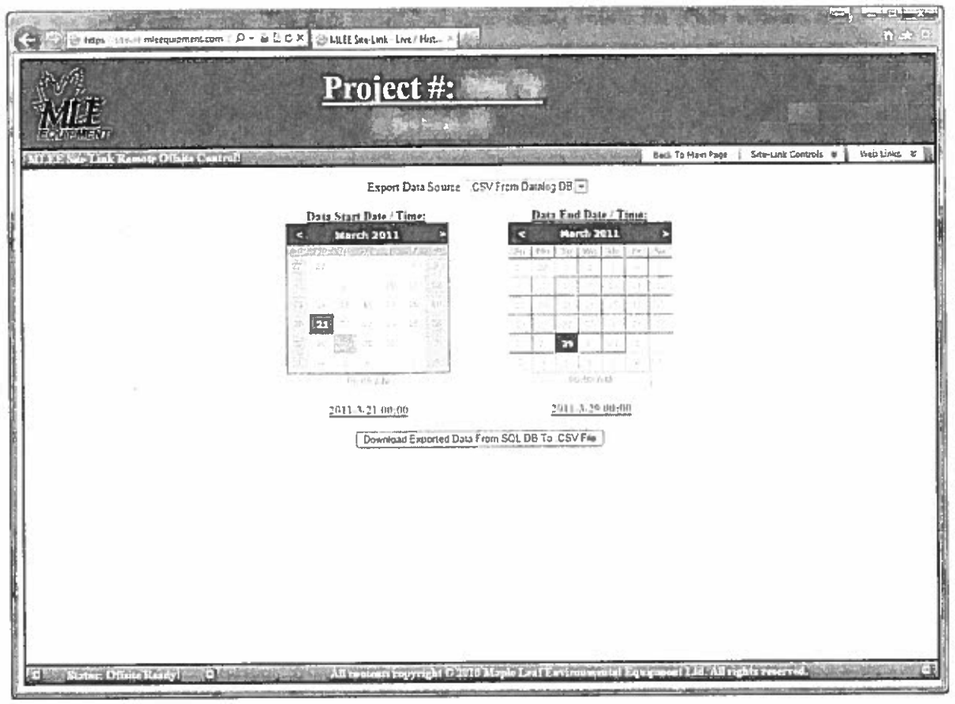


DateTime: Date and time the alarm status changes. (**Note:** All times are taken from the Site-Link server clock which is Eastern Time, EST or EDT depending on the time of year).
Text: Short form alarm code. Please refer to O&M manual for more detailed description.
Type: This will always display Digital.
AlarmValue: 0 indicates that the alarm is inactive. 1 indicates that the alarm is active.
Colour: Yellow indicates alarm statuses that have been acknowledged, even if the alarm is still active. Red indicates alarm statuses that have not been acknowledged since it last changed state, even if the alarm is no longer active (so red does not necessarily mean the alarm is active, just that it has changed state since it was last acknowledged).
Ack All: This will acknowledge all the alarms in the table and turn all the lines yellow, whether the alarm is active or inactive. Please note that this does not physically cancel or reset any alarms on the subject system. An active alarm that has been acknowledged and is displayed on a yellow line will change to a red line once the alarm deactivates, as the alarm has changed state.
History: Provides limited alarm history, it is recommended to use the alarm Export Data download outlined in the next section.

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9 Export Data

Data and/ or alarm logs can be downloaded for recording, reporting or trending purposes. **Note:** Data is only retained on the server for 90 days before oldest data starts to be overwritten by the newest data. Therefore it is recommended that downloads are performed every 2 months.



Select data source: Select the data export source from the drop down box, either Datalog DB or Alarm DB.

Select Start Date/ Time: Select the start date by navigating the Data Start Date/ Time calendar to the desired year/ month and click on the day. Set the desired start time in the box below the calendar. (**Note:** All times are taken from the Site-Link server clock which is Eastern Time, EST or EDT depending on the time of year).

Select End Date/ Time: Select the end date by navigating the Data End Date/ Time calendar to the desired year/ month and click on the day. (**Note:** You have to click on the day even if it is today's date, as today's date will always be highlighted and it looks like it is highlighted but it is not). Set the desired start time in the box below the calendar. (**Note:** All times are taken from the Site-Link server clock which is Eastern Time, EST or EDT depending on the time of year).

Download Data: Click on the 'Download Exported Data From SQL DB To .CSV File' button. When prompted by the File Download dialog box click on the Save button to save the .csv file and then navigate to the location you want to save the file to.

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10 Sample Data Download snap shot

Copy and paste from a data download .csv file from a system with only hour meters.

DateAndTime	V_STATUS	C3101_HRS	C3201_HRS	P4901_HRS	B6401_HRS	P6401_HRS
3/13/2012 12:00:00 AM	2	73	159	6	0	0
3/14/2012 12:00:00 AM	2	76	165	6	0	0
3/15/2012 12:00:00 AM	2	81	173	6	0	0
3/16/2012 12:00:00 AM	2	86	180	6	0	0
3/17/2012 12:00:00 AM	2	90	187	7	0	0
3/18/2012 12:00:00 AM	2	95	195	7	0	0
3/19/2012 12:00:00 AM	2	99	202	7	0	0
3/20/2012 12:00:00 AM	2	103	209	7	0	0
3/21/2012 12:00:00 AM	2	109	217	7	0	0
3/22/2012 12:00:00 AM	102	112	220	7	0	0
3/23/2012 12:00:00 AM	114	113	221	7	0	0
3/24/2012 12:00:00 AM	1	116	225	8	0	0
3/25/2012 12:00:00 AM						
3/26/2012 12:00:00 AM	1	116	225	8	0	0
3/27/2012 12:00:00 AM	2	119	228	9	0	0
3/28/2012 12:00:00 AM	2	126	235	12	0	0
3/29/2012 12:00:00 AM	2	132	242	15	0	0
3/30/2012 12:00:00 AM	2	139	249	18	0	0
3/31/2012 12:00:00 AM	2	145	254	20	0	0
04/01/2012 0:00	2	151	261	23	0	0
04/02/2012 0:00	2	158	268	26	0	0
04/03/2012 0:00	2	164	275	29	0	0
04/04/2012 0:00	2	170	282	32	0	0
04/05/2012 0:00	105	177	288	35	0	0
04/06/2012 0:00	105	183	294	37	0	0
04/07/2012 0:00	105	189	301	40	0	0
04/08/2012 0:00	105	196	307	42	0	0
04/09/2012 0:00	105	202	313	43	0	0

DateAndTime: Date and time data log was taken (Eastern Time). If there are no values for a particular data log date/ time then the server was unable to connect to the system (eg power outage at the system).
V_STATUS: Internal PLC status bit used by Site-Link to determine whether the system is running (2), stopped (1) or in alarm (other value).
C3101_HRS: Accumulated run time hours for component.

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11 Sample Alarm Download snap shot

Cut and paste from alarm download .csv file.

AlarmID	AlarmType	AlarmGroup	Priority	AlarmText	Active	Acked	TimeDelay	AlarmValue	ClearedValue	AlarmDateTime
200213.C-SYSTEM-KILL-ALM_Dig	Digital	ALM200213	0	SYSTEM-KILL-ALM	TRUE	FALSE	0	1		3/21/2012 10:02:22 AM
200213.C-SYSTEM-KILL-ALM_Dig	Digital	ALM200213	0	SYSTEM-KILL-ALM	TRUE	FALSE	0	0		3/22/2012 5:13:44 PM
200213.C-CGA-3101-ALM_Dig	Digital	ALM200213	0	CGA-3101-ALM	TRUE	FALSE	0	1		3/22/2012 7:26:07 PM
200213.C-CGA-3101-ALM_Dig	Digital	ALM200213	0	CGA-3101-ALM	TRUE	FALSE	0	0		3/23/2012 8:16:04 AM
200213.C-SYSTEM-KILL-ALM_Dig	Digital	ALM200213	0	SYSTEM-KILL-ALM	TRUE	FALSE	0	1		3/23/2012 8:25:28 AM
200213.C-SYSTEM-KILL-ALM_Dig	Digital	ALM200213	0	SYSTEM-KILL-ALM	TRUE	FALSE	0	0		3/23/2012 8:25:41 AM
200213.C-LALL-3101-ALM_Dig	Digital	ALM200213	0	LALL-3101-ALM	TRUE	FALSE	0	1		3/23/2012 10:36:42 AM
200213.C-LALL-3101-ALM_Dig	Digital	ALM200213	0	LALL-3101-ALM	TRUE	FALSE	0	0		3/23/2012 11:03:57 AM
200213.C-LAHH-4901-ALM_Dig	Digital	ALM200213	0	LAHH-4901-ALM	TRUE	FALSE	0	1		3/23/2012 11:04:03 AM

AlarmID: Short form alarm code. Please refer to O&M manual for more detailed description.
AlarmType: Will always will report Digital. Unable to suppress column.
AlarmGroup: Will always report ALMxxxxxx. Unable to suppress column.
Priority: Will always report zero. Unable to suppress column.
AlarmText: Short form alarm code. Please refer to O&M manual for more detailed description.
Active: Will always report True. Unable to suppress column.
Acked: Will always report False. Unable to suppress column.
TimeDelay: Will always report zero. Unable to suppress column.
AlarmValue: 1 means alarm is/ became active. 0 means alarm is/ became inactive.
ClearedValue: Will always be blank. Unable to suppress column.
AlarmDateTime: Date and time at which alarm changed state (became active and/ or inactive)

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12 PLC Program Changes

Wireless telemetry also enables **newterra** to perform remote PLC program/ system troubleshooting and upload PLC program modifications remotely.

13 Logging in

Each user is added to the Site-Link database and set up with an account by an Administrator at **newterra**. Once this has been done the user will receive an automated Email similar to the one shown below.

From: MLEE Site-Link Admin <sitelink@newterra.com>
Date: 12 April 2012 08:11
Subject: Re: New User Account Created For: jsmith
To: jsmith <jsmith@email.com>

Site-Link Account Information

Project # / Username: jsmith
Contact E-Mail Address: jsmith@email.com

New Random Password: 96a35b

Please feel free to return to https://sitelink.newterra.com to change your password at any time

----
*Thank You Very Much For Using The **newterra** Site-Link Offsite Software,*

~The Site-Link Administrator

Multiple users can have access to Site-Link, each with their own unique login details. Users can have read and write privileges, for monitoring and control, or read only privileges for monitoring only. For customers with multiple systems with Site-Link capability, all those systems will be available with the one login.

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14 E-Alarm

An instant Email or Email to cell phone text is optionally available as a separate service. Personnel on the call out list will receive an automated Email or text similar to the one shown below.

From: 200000 - ABC Air Sparge [mailto:plc@newterra.com]
Sent: April 13, 2012 8:33 AM
To: plc201217
Subject: ALARM! 200000 - ABC Airsparge

C103 - PAH-2401 SPG1
04/13/12,12:32PM
Help: http://goo.gl/upNS6

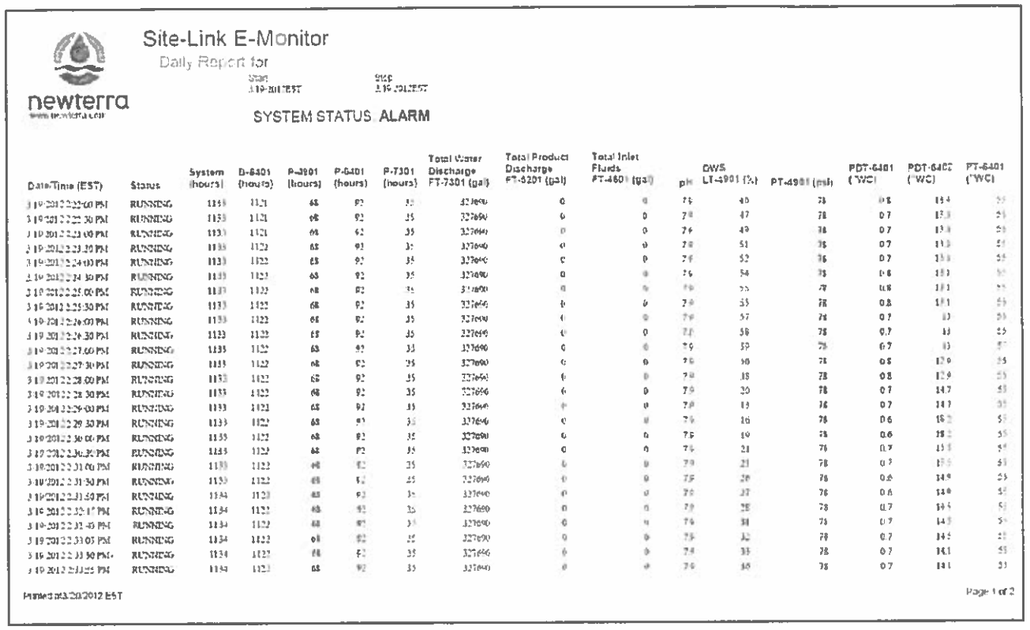
14.1 E-Alarm Re-Email

Any alarm condition will re-Email every 2 hours (unless specified otherwise by the customer) until the alarm either self clears (if it is recoverable) or is reset via the Site-Link P&ID page.

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15 E-Monitor

A daily system status Email is optionally available as a separate service. Personnel on the call out list will receive a daily automated Email similar to the ones shown below, the more complex the system the more detailed the report.



Site-Link E-Monitor

Daily Report for

Start: 3-19-2012 EST Stop: 3-19-2012 EST

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SYSTEM STATUS: ALARM

Date-Time (EST)	Status	System (hours)	B-6401 (hours)	P-4901 (hours)	P-6401 (hours)	P-7301 (hours)	Total Water Discharge FT-7301 (gal)	Total Product Discharge FT-5201 (gal)	Total Inlet Fluids FT-4601 (gal)	pH	DWS LT-4901 (%)	PT-4901 (psi)	PDT-6401 ("WC)	PDT-6402 ("WC)	PT-6401 ("WC)
3-19-2012 2:22:00 PM	RUNNING	1159	1121	68	92	35	327690	0	0	79	46	78	0.8	15.4	59
3-19-2012 2:22:30 PM	RUNNING	1159	1121	68	92	35	327690	0	0	79	47	78	0.7	15.3	59
3-19-2012 2:23:00 PM	RUNNING	1159	1121	68	92	35	327690	0	0	79	49	78	0.7	15.3	59
3-19-2012 2:23:30 PM	RUNNING	1159	1122	68	93	35	327690	0	0	79	51	78	0.7	15.3	59
3-19-2012 2:24:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	52	78	0.7	15.3	59
3-19-2012 2:24:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	54	78	0.8	15.3	59
3-19-2012 2:25:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	55	78	0.7	15.3	59
3-19-2012 2:25:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	55	78	0.8	15.1	59
3-19-2012 2:26:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	57	78	0.7	15	59
3-19-2012 2:26:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	58	78	0.7	15	59
3-19-2012 2:27:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	59	78	0.7	15	59
3-19-2012 2:27:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	60	78	0.8	15.0	59
3-19-2012 2:28:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	38	78	0.8	15.0	59
3-19-2012 2:28:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	20	78	0.7	14.7	59
3-19-2012 2:29:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	18	78	0.7	14.7	59
3-19-2012 2:29:30 PM	RUNNING	1159	1122	68	93	35	327690	0	0	79	16	78	0.6	15.0	59
3-19-2012 2:30:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	19	78	0.6	15.0	59
3-19-2012 2:30:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	21	78	0.7	15.0	59
3-19-2012 2:31:00 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	21	78	0.7	15.0	59
3-19-2012 2:31:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	20	78	0.6	14.9	59
3-19-2012 2:31:59 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	22	78	0.6	14.9	59
3-19-2012 2:32:17 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	25	78	0.7	14.9	59
3-19-2012 2:32:45 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	31	78	0.7	14.9	59
3-19-2012 2:33:05 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	32	78	0.7	14.9	59
3-19-2012 2:33:30 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	33	78	0.7	14.9	59
3-19-2012 2:33:55 PM	RUNNING	1159	1122	68	92	35	327690	0	0	79	35	78	0.7	14.9	59

Printed at 3-20-2012 EST

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Site-Link E-Monitor

Daily Report for

Start
3/22/2012 9:50:00 AM

Stop
3/23/2012 9:20:00 AM

SYSTEM STATUS: **RUNNING**

Analogs:

	VT-LRP
MIN:	16.200000762939
MAX:	17.8999996
AVERAGE:	17.3577464

ALARM STATUS

Last Alarm	Active
KILL-SYS-ALM 3/13/2012 2:42:10 PM	NO

HOUR METERS:

DP-PS	2272
VP-LRP	3043
DP-OWS	505
AB-STRP	1406
DP-STRP	423

3/23/2012 9:22:52 AM

Page 1 of 1

Project As-Built Document

27-Aug-13

RTS151 **WTS, 150gpm, OWS-24, Carbo**

Customer: newterra ltd.

System Site Specifications

Elevation:	0 ft
Max Temp	0 deg F
Min Temp:	0 deg F
Noise Target:	
Gas Required:	
Water Required:	
Telephone Reqd:	
Building:	

System Electrical Specifications

Voltage:	208V/120V-3ph
Main Disconnect	100amp
Panel Approval:	MET1604(CL Class CL1DIV2
System Approval:	Class CL1DIV2
Panel Type:	PLC-DL06
Telemetry:	
Autodialer:	
EMonitor:	Server:

System SVE (First Blower)

0 @ 0

Blower Disch Temp:	0 deg F
Inlet Legs:	0
Disch Press:	0 in wc
Water Flowrate:	0 gpm
Heat xchg Disch:	0 deg F

System SVE (Second Blower)

0 @ 0

Blower Disch Temp:	0 deg F
Inlet Legs:	0
Disch Press:	0 in wc
Water Flowrate:	0 gpm
Heat xchg Disch:	0 deg F

Air Sparge

0 @ 0 psi

Sparge Disch Temp:	0 deg F
Disch Legs:	0
Heat xchg Disch:	0 deg F

Other Specifications

Other Inlet Liquid Flow:	0 gpm
Disch Flow:	150 gpm @ 40 psi
AirTreatment:	None
Water_Treatment:	Carbon
Stripper Airflow:	0 cfm
Stripper Dsn Flow:	0 gpm
OWS_Dsn_Flow:	150 gpm

Contaminants

Other Information May be Presented Below

Connection Info:

Shipping Information

Parts

Module Code: 0

Insulation, Foil Back Foam, 1", R, Thinsulate, 4x8	Part:	10636
	Qty:	34
	Mfg:	
	Mfg Part:	356075
Lumber, Spruce, Dry, 2" x 4" x 10'	Part:	10912
818011	Qty:	96
	Mfg:	
	Mfg Part:	818011
Lumber, Plywood, Spr, STD, 4 x 8 x 3/8"	Part:	14463
620295	Qty:	34
	Mfg:	
	Mfg Part:	620295
Switch, Temperature, Probe, A19ABC-24D	Part:	15651
range -30/100F	Qty:	2
	Mfg:	Johnson Controls
	Mfg Part:	
Breaker, Techna, JTEC4892C40	Part:	17700
240V 40 AMP 2P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
	Mfg Part:	JTEC4892C40
Combination Starter, SQT LUCC32FU	Part:	19434
TeSysU 1 Phase Control Unit 8-32A	Qty:	1
110/120VAC coil	Mfg:	Telemecanique
	Mfg Part:	SQT LUCC32FU
Wire, Stranded, T90, #1 AWG, Black	Part:	25152
	Qty:	10
	Mfg:	
	Mfg Part:	T901BLK

FLT-6701

Filter, Bag, Dewatering, Assembly, Four (4)	Part:	RC036
	Qty:	1
	Mfg:	
---	Mfg Part:	---

PI-6701

Gauge, Pressure, 0-60psi, Indumart, P16K2-FG-60 (back)	Part:	19393
SS, brass internals, Glyc. Filled, back mount	Qty:	8
	Mfg:	
---	Mfg Part:	P16K2-FG-60

PSH-6701

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
---	Mfg Part:	

Rental Components

Module Code: 2

RCHOSE DISCH

Hose, Assembly, J300, 3"	Part:	18661
Green Hose	Qty:	50
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-

RCHOSE-INLET

Hose, Assembly, J300, 3"	Part:	18661
Green Hose	Qty:	50
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-

Submersible Pump

Module Code: 4000

LSH-4001

Switch, Level, Mech Float, Wide Angle, N.O., Red	Part:	M1108
Tilt Float Level Switch 90deg, w 40' cable	Qty:	1
13A, SPST, N/O	Mfg:	Warrick Controls
---	Mfg Part:	GR20W4000

P-4001

Pump, Sump, Goulds, 160GPM @ 40'	Part:	RC073
WS2038BHF, 200V, 3 Ph, 2 HP, w/o switch	Qty:	1
3" Type F Camlock Fitting	Mfg:	Goulds
---	Mfg Part:	

Oil/Water Separator

Module Code: 4900

LSHH-4901

Switch, Level, Mech Float, Narrow Angle, N.C., YEL	Part:	19279
N/C, Yellow float	Qty:	1
	Mfg:	
---	Mfg Part:	PY2CW4000

OWS-4901

Media, Coalescing, HD Q-PAC	Part:	13959
0.25" spacing, 132 sqft/cuft	Qty:	24
	Mfg:	
---	Mfg Part:	HD Q-PAC
Oil Water Separator, OWS-24, Stainless	Part:	16263
24 cubic feet of packing, 304SS	Qty:	1
Note: Build up price from Price Sheet	Mfg:	Maple Leaf Environmental Equipment
To be removed from RTS-148, SVE, WTS returning fron Veron,TX. Purchased used equipment, 50430 Jerry Wood #2 project.	Mfg Part:	
Strain Relief, Connector, PVC, 1/2"	Part:	16884
TSRC10	Qty:	2
	Mfg:	
None	Mfg Part:	TSRC10
Oil Water Separator, Assembly, OWS-24	Part:	17535
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Switch, Level, Mech Float, Wide Angle, N.O., Red	Part:	m1108
Tilt Float Level Switch 90deg, w 40' cable	Qty:	1
13A, SPST, N/O	Mfg:	Warrick Controls
None	Mfg Part:	GR20W4000
Valve, Ball, Brass, 2", 150#	Part:	p1065
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
None	Mfg Part:	601-2
Valve, Ball, Brass, 2", 150#	Part:	p1065
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
None	Mfg Part:	601-2
Valve, Ball, Brass, 1", 150#	Part:	p1067
NPT, Teflon seats, 600 PSI WOG	Qty:	3
	Mfg:	Kitz
None	Mfg Part:	601-1
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	3
	Mfg:	
---	Mfg Part:	601-3

P-4901

Valve, Gate, Brass, 3"	Part:	10167
	Qty:	1
	Mfg:	
None	Mfg Part:	514T10
Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	Part:	16203
SS, brass internals, Glyc. Filled, bottom mount	Qty:	1
	Mfg:	Indumart
None	Mfg Part.	
Reinforced, Adapter, PVC 80, Female, 3", SxSS	Part:	17055
Fitting, transition, socket x SS	Qty:	1
	Mfg:	
---	Mfg Part:	835-030SR
Pump, Piping, Centrifugal, 3" x 3", 170gpm	Part:	17316
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Pump, Suction, Goulds, SSH Series, 4SH2K52C0	Part:	21028
7.5hp, 3ph, 208-230/460V, TEFC	Qty:	1
C Impeller	Mfg:	Goulds
---	Mfg Part:	---
Hose, Braided, SS, 3", MNPT fittings, 12" long	Part:	21971
5680K2	Qty:	2
304SS	Mfg:	
None	Mfg Part:	5680K2
Strainer, Wye, Brass, 3"	Part:	M1523
threaded	Qty:	1
	Mfg:	
None	Mfg Part:	145T10
Valve, Check, Swing, Brass, 3"	Part:	M1524
	Qty:	1
	Mfg:	
None	Mfg Part:	521T10
Valve, Check, Swing, Brass, 3"	Part:	M1524
	Qty:	1
	Mfg:	
None	Mfg Part:	521T10
Union, Galv, 3"	Part:	M1530
	Qty:	2
	Mfg:	
None	Mfg Part:	3GLU
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	
-	Mfg Part:	601-3

Product Storage Tank

Module Code: 5200

LSHH-5201

Switch, Level, Almeg, Vertical, ATB3-48B 1/4NPT ---	Part: Qty: Mfg: Mfg Part:	12351 1 Almeg ATB3-48B
Reducer, Bushing, Galv, 2" x 1/2" Hex ---	Part: Qty: Mfg: Mfg Part:	P1021 1 2X12GZB
Union, Galv, 2" ---	Part: Qty: Mfg: Mfg Part:	P1093 1 2GZU

PST-5201

Tee, Galv, 2" 1 ---	Part: Qty: Mfg: Mfg Part:	10136 1 2GZT
Drum, Black, Steel, 45 gal, 2 hole lid, bottom 2" port including palletization ---	Part: Qty: Mfg: Mfg Part:	M1137 1 SOH00733
Elbow, 90deg, Galv, 2" ---	Part: Qty: Mfg: Mfg Part:	P1058 4 2GZE9
Valve, Ball, Brass, 2", 150# NPT, Teflon seats, 600 PSI WOG ---	Part: Qty: Mfg: Mfg Part:	P1065 1 Kitz 601-2
Nipple, Galv, 2" x Short ---	Part: Qty: Mfg: Mfg Part:	P1192 5 2xSHGZN

Bag Filter

Module Code: 5800

FLT-5801

O-Ring, Buna-N, 8-3/8" OD, 3/16" Thick A70 Hardness * Fits most Filter Innovation EB112 series ---	Part: Qty: Mfg: Mfg Part:	21619 25 369 BUNA
Filter, Bag, Dewatering, Assembly, Four (4) ---	Part: Qty: Mfg: Mfg Part:	RC033 1 ---

FLT-5802

Reducer, Bushing, Galv, 3" x 2" Hex ---	Part: Qty: Mfg: Mfg Part:	10019 4 3X2GZB
Tee, Galv, 2" 1 ---	Part: Qty: Mfg: Mfg Part:	10136 2 2GZT
Nipple, Galv, 2" x Close ---	Part: Qty: Mfg: Mfg Part:	10222 14 2XCLGZN
Tee, Galv, 3" ---	Part: Qty: Mfg: Mfg Part:	10302 2 3GZT
Valve, Ball, Brass, 1/2", 150# NPT, Teflon seats, 600 PSI WOG ---	Part: Qty: Mfg: Mfg Part:	10538 2 601-1/2
Nipple, Galv, 1/2" x Close ---	Part: Qty: Mfg: Mfg Part:	10619 2 12CLGZN
Skid, 2ft x 4ft ---	Part: Qty: Mfg: Mfg Part:	15152 1 Maple Leaf Environmental Equipment
Sample Port Assembly, 1/4" -	Part: Qty: Mfg: Mfg Part:	18682 2 Maple Leaf Environmental Equipment -
Filter, Bag, Housing, #2, Carbon Steel SS Basket, CS legs ---	Part: Qty: Mfg: Mfg Part:	19117 2

Reducer, Bushing, Galv, 2" x 1/2"	Part:	P1021
Hex	Qty:	2
	Mfg:	
---	Mfg Part:	2X12GZB
Valve, Ball, Brass, 2", 150#	Part:	P1065
NPT, Teflon seats, 600 PSI WOG	Qty:	4
	Mfg:	Kitz
---	Mfg Part:	601-2
Union, Galv, 2"	Part:	P1093
	Qty:	4
	Mfg:	
---	Mfg Part:	2GZU

PI-5801

Gauge, Pressure, 0-60psi, Indumart, P16K2-FG-60 (back)	Part:	19393
SS, brass internals, Glyc. Filled, back mount	Qty:	12
	Mfg:	
---	Mfg Part:	P16K2-FG-60

PSH-5801

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
---	Mfg Part:	

Bag Filter

Module Code: 6700

FLT-6701

Nipple, Galv, 3" x Close	Part:	11220
	Qty:	6
	Mfg:	
—	Mfg Part:	3CLGZN
Flange, Companion, Galv, 6"	Part:	12572
threaded	Qty:	2
	Mfg:	
—	Mfg Part:	6GZCIF / 12.0905
Valve, Butterfly, Wafer, Ductile Iron, 6"	Part:	15019
316SS disc & stem, BUNA, 10 position lever	Qty:	2
	Mfg:	
—	Mfg Part:	CIWB-SBL 6" CO
Reducer, Bushing, Galv, 6" x 3"	Part:	19681
Hex	Qty:	2
	Mfg:	
—	Mfg Part:	
Tee, PVC 40, 3", SxSxS, 401-030G	Part:	22578
	Qty:	2
	Mfg:	
—	Mfg Part:	
Elbow, 90deg, PVC 40, 3", SxS, 406-030G	Part:	22619
	Qty:	8
	Mfg:	
—	Mfg Part:	406-030G
Misc Part, See Details	Part:	9999
As per detailed specification below	Qty:	1
	Mfg:	
Pricing from Steve Hughes, Aug. 7th,2013 e-mail	Mfg Part:	Qo8L100RB9
V6427-A, Muilti-Bag Filter Housing - 7 Bag Model - 304 Stainless		
Vessel A - Inlet and Outlet are on the right hand side of the unit when looking at the label.		
Misc Part, See Details	Part:	9999
As per detailed specification below	Qty:	2
	Mfg:	
4155-1490-B, O-rings for V6427-A Bag Filter Housing	Mfg Part:	Qo8L100RB9
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	
—	Mfg Part:	601-3
Elbow, 90deg, Galv, 3"	Part:	P1220
	Qty:	1
	Mfg:	
—	Mfg Part:	3GZE9

FT-6701

Reinforced, Adapter, PVC 80, Female, 3", SxSS	Part:	17055
Fitting, transition, socket x SS	Qty:	4
	Mfg:	
---	Mfg Part:	835-030SR

PSH-6701

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
---	Mfg Part:	

Liquid Phase Carbon

Module Code: 7000

7000

Nipple, Galv, 3" x Close	Part:	11220
	Qty:	2
	Mfg:	
---	Mfg Part:	3CLGZN
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	
---	Mfg Part:	601-3
Adapter, PVC 80, Female, 3", SxT, 835-030G	Part:	P1153
	Qty:	2
	Mfg:	
---	Mfg Part:	835-030

FQI,FT-7001

Meter, Water, 2", US Gal, w/ pulse, Turbine, DLJ	Part:	15499
Flange	Qty:	1
	Mfg:	Daniel L. Jerman Co.
---	Mfg Part:	DLJ200TC

LPC-7001

Reducer, Bushing, Galv, 3" x 2"	Part:	10019
Hex	Qty:	5
	Mfg:	
---	Mfg Part:	3X2GZB
Tee, Galv, 3"	Part:	10302
	Qty:	5
	Mfg:	
---	Mfg Part:	3GZT
Nipple, Galv, 3" x Short (3")	Part:	10445
	Qty:	4
	Mfg:	
---	Mfg Part:	3SHGZN
Camlock Fitting, Aluminum, 3", Part "F"	Part:	10541
Male Adapter x Male Thread Cam Lock Fitting	Qty:	6
	Mfg:	Bayco Industries
-	Mfg Part:	BAL-300F
Camlock Fitting, Aluminum, 3", Part "C"	Part:	10542
Female Adapter x Hose Shank Cam Lock Fitting	Qty:	6
	Mfg:	Bayco Industries
-	Mfg Part:	BAL-300C
Hose, Suction, PVC, Green, 3", J300	Part:	12043
TigerFlex, 65psi@70F, 40psi@100F	Qty:	30
PVC,150F, (min 100ft order)	Mfg:	Kuriyama
-	Mfg Part:	J300
Reinforced, Adapter, PVC 80, Female, 3", SxSS	Part:	17055
Fitting, transition, socket x SS	Qty:	6
	Mfg:	
---	Mfg Part:	835-030SR

Hose, Assembly, J300, 3"	Part:	18661
Green Hose	Qty:	3
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Sample Port Assembly, 1/4"	Part:	18682
	Qty:	3
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Valve, Check, Spring, Brass, 2"	Part:	M1529
	Qty:	1
	Mfg:	
—	Mfg Part:	2BPUCV
Clamp, Hose, SS, 3", HAS48	Part:	P1044
	Qty:	12
	Mfg:	
None	Mfg Part:	HAS48
Valve, Ball, Brass, 3", 150#	Part:	P1104
NPT, Teflon seats, 600 PSI WOG	Qty:	4
	Mfg:	
—	Mfg Part:	601-3
Reducer, Bushing, Galv, 2" x 1/4"	Part:	P1219
Hex	Qty:	5
	Mfg:	
—	Mfg Part:	2x14GZB

PI-7001

Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	Part:	16203
SS, brass internals, Glyc. Filled, bottom mount	Qty:	2
	Mfg:	Indumart
—	Mfg Part:	

PI-7004

Gauge, Pressure, 0-60psi, Indumart, P16K2-FG-60 (back)	Part:	19393
SS, brass internals, Glyc. Filled, back mount	Qty:	1
	Mfg:	
—	Mfg Part:	P16K2-FG-60

PSH-7001

Switch, Pressure, A1F-0-SS-1-2	Part:	20589
4-75 PSI Range	Qty:	1
Deadband at Min Range 4 - Max Range 15	Mfg:	Dwyer
—	Mfg Part:	

Building, Trailer or Skid

Module Code: 7900

7900

Door, Single, 36", Steel slab/no brick moulding, No sill ext 1103A,wooden frame,open out,RH **to be pre drilled for passage and deadbolt** -	Part: Qty: Mfg: Mfg Part:	10822 1 1103-Dalmen
Lock, Passage, 107188, Taymor 107188 None	Part: Qty: Mfg: Mfg Part:	10908 1
Lock, Deadbolt, 289648, Taymor, 1 cyl, S/S keyed alike #289648 None	Part: Qty: Mfg: Mfg Part:	10909 1
Container, Painting, 40ft exterior/interior Building exterior, to be painted our standard white finish.	Part: Qty: Mfg: Mfg Part:	12063 1
Container, Shipping, Tilt load ---	Part: Qty: Mfg: Mfg Part:	13593 1
Container, 8' x 40' x High Cube ---	Part: Qty: Mfg: Mfg Part:	15512 1
Container, Modification As per specification below or drawing provided. ---	Part: Qty: Mfg: Mfg Part:	15513 1
Door, Assembly, 72", Double -	Part: Qty: Mfg: Mfg Part:	19012 1 Maple Leaf Environmental Equipment -
Door, Assembly, 36", Single -	Part: Qty: Mfg: Mfg Part:	19014 1 Maple Leaf Environmental Equipment -

Access Cover

Misc Part, See Details As per detailed specification below As per attached drawing. For 36"x36" Carbon Access Cover	Part: Qty: Mfg: Mfg Part:	9999 3 ---

F-7901

Fan, Building, 24", 1/3hp, 1625rpm, 120/230V, 1ph, XPF SD24-XPF, OSHA Guard,Turnout Box ---	Part: Qty: Mfg: Mfg Part:	10329 1 Canarm SD24-XPF-OSHA

Fan Shutter Assembly,KD,24",KDS24-SS - Use 23082	Part:	10330
	Qty:	1
	Mfg:	Canarm
---	Mfg Part:	KD24-SS
Fan, Hood, White,24",HFPW-24	Part:	M1411
	Qty:	2
	Mfg:	Canarm
---	Mfg Part:	HFPW-24

F-7903

Fan, Shutter, Backdraft damper, 12"x12"	Part:	23080
Non-Motorized	Qty:	1
	Mfg:	Canarm
---	Mfg Part:	SR3212X12
Hood, 15"	Part:	23989
Fits 12" Fan & Louver	Qty:	2
	Mfg:	
---	Mfg Part:	
Fan, Building, 12", 1/4hp, 1750rpm, 120V, 1ph, TEFC	Part:	M1072
CSA Approved, S12-E1	Qty:	1
	Mfg:	Canarm
---	Mfg Part:	SD120311

H-7901

Switch, Temperature, Johnson Controls, Assembly	Part:	18985
	Qty:	2
	Mfg:	Johnson Controls
-	Mfg Part:	-

H-7903

Heater, Baseboard, Ouellet, 1.5kW, OFM1508	Part:	22314
208V, 66" long	Qty:	1
	Mfg:	Ouellet
---	Mfg Part:	OFM1508

TSH-7903

Switch, Temperature, Probe, A19ABC-24D	Part:	15651
range -30/100F	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	
Switch, Temperature, Probe, WEL 14A-602R	Part:	15653
Bulb, Well for Temperature Switch, Brass	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	WEL 14A-602R
Switch, Temperature, Johnson Controls, Assembly	Part:	18985
	Qty:	1
	Mfg:	Johnson Controls
-	Mfg Part:	-

TSL-7903

Switch, Temperature, Probe, A19ABC-24D	Part:	15651
range -30/100F	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	

Switch, Temperature, Probe, WEL 14A-602R	Part:	15653
Bulb, Well for Temperature Switch, Brass	Qty:	1
	Mfg:	Johnson Controls
-30 - 100 F option	Mfg Part:	WEL 14A-602R
Switch, Temperature, Johnson Controls, Assembly	Part:	18985
	Qty:	1
	Mfg:	Johnson Controls
-	Mfg Part:	-

Main Control Panel

Module Code: 8200

8200

Contactor, SQD LC1D32G7	Part:	10520
32A, 10/10/20/25HP	Qty:	1
120VAC coil	Mfg:	Square D
---	Mfg Part:	SQD LC1D32G7
Disconnect, 3ph, D324N	Part:	11163
200A, UL.240V,Nema 1,fusible disconnect	Qty:	1
	Mfg:	Square D
---	Mfg Part:	SQD D324N
Contactor, SQD LC1D09G7	Part:	12547
9A, 2/2/5/7.5HP	Qty:	1
120VAC coil	Mfg:	Square D
---	Mfg Part:	SQD LC1D09G7
Contactor, SQD LC1D50AG7	Part:	12548
50A, 15/15/40/40HP	Qty:	1
120VAC coil	Mfg:	Square D
---	Mfg Part:	SQD LC1D50G7
Modem, Antenna, Airlink GPRS, N-Female	Part:	13723
120-110-2107	Qty:	1
MAX-BMLPVDB800/1900 Antenna & MAX-MTPM-800 Hardwar	Mfg:	
---	Mfg Part:	120-110-2107
PLC, EA1-S3ML	Part:	17233
C-more micro graphic user interface	Qty:	1
	Mfg:	Automation Direct
---	Mfg Part:	EA1-S3ML
PLC, DV-1000CBL	Part:	17234
2m Cable RJ12 to RJ12	Qty:	1
C-more Micro to DL05/06/205	Mfg:	Automation Direct
---	Mfg Part:	DV-1000CBL
Breaker, Techna, JTEC4892C30	Part:	17543
480/277V 30 AMP 2P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4892C30
Breaker, Techna, JTEC4893C06	Part:	17709
480/277V 6 AMP 3P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4893C06
Breaker, Techna, JTEC4893C40	Part:	17717
240V 40 AMP 3P C Trip Cuve	Qty:	2
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4893C40
Breaker, Techna, JTEC4893C50	Part:	17718
240V 50 AMP 3P C Trip Curve	Qty:	1
10k SCCR	Mfg:	Fusetek
---	Mfg Part:	JTEC4893C50

Breaker, Techna, JTEC4891C15 240V 15A, 1P C Trip Curve 10k SCCR ---	Part: Qty: Mfg: Mfg Part:	18359 1 Fusetek JTEC4891C15
Motor Saver, 460 w/Diagnostic 3ph Finger Safe, DIN Rail Mountable ---	Part: Qty: Mfg: Mfg Part:	18396 1 Symcom 460
Combination Starter, SQT LUB12 TeSysU Power Base 12A 3HP@208/240, 7.5HP@480, 10HP@600 ---	Part: Qty: Mfg: Mfg Part:	19264 1 Telemecanique SQT LUB12
Combination Starter, SQT LUA1C20 TeSysU Aux Contact Module 1NO Ready 1NO Fault ---	Part: Qty: Mfg: Mfg Part:	19269 2 Telemecanique LUA1C20
Combination Starter, SQT LU9SP0 TeSysU UL508 Type E Phase Barrier ---	Part: Qty: Mfg: Mfg Part:	19270 2 Telemecanique SQT LU9SP0
Combination Starter, SQT LUB32 TeSysU Power Base 32A 10HP@208/240, 20HP@480, 25HP@600 ---	Part: Qty: Mfg: Mfg Part:	19273 1 Telemecanique SQT LUB 32
Combination Starter, SQT LUCA32FU TeSysU Standard Control Unit 8-32A 110/120VAC coil ---	Part: Qty: Mfg: Mfg Part:	19274 1 Telemecanique SQT LUCA32FU
Combination Starter, SQT LUCC12FU TeSysU 1 Phase Control Unit 3-12 110/120VAC coil ---	Part: Qty: Mfg: Mfg Part:	19456 1 Telemecanique LUCC12FU
Transformer, Hammond, HAT Q005YEKF 208V to 240V,5KVA,UL/CSA,3R,1ph ---	Part: Qty: Mfg: Mfg Part:	19999 1 Hammond Power Solutions HAT Q005BECF
Modem, Cable, RF, N-Male to SMA-Male, 15' Length GW195-180-SM-NM Use with Raven XE ---	Part: Qty: Mfg: Mfg Part:	20569 1 GW195-180-SM-N
Relay, SQT RXM4AB1F7 Miniature Relay 4PDT 120 V AC ---	Part: Qty: Mfg: Mfg Part:	21887 1 Telemecanique SQT RXM4AB1F
Relay, SQT RXM4AB1BD Miniature Relay 4PDT 24 V DC ---	Part: Qty: Mfg: Mfg Part:	21888 1 Telemecanique SQT RXM4AB1B

Relay, SQT RXZE2S114M	Part:	21889
Base/Socket for RXM4 4P Relays	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXZE2S114
Relay, SQT RXZE2S114M	Part:	21889
Base/Socket for RXM4 4P Relays	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXZE2S114
Relay, SQT RXZE2S114M	Part:	21889
Base/Socket for RXM4 4P Relays	Qty:	1
	Mfg:	Telemecanique
---	Mfg Part:	SQT RXZE2S114
Modem, Bracket, Mounting, Airlink Raven XE	Part:	22143
100-170-1015	Qty:	1
Use with Raven XE	Mfg:	
---	Mfg Part:	100-170-1015
Modem, Airlink Raven, XE V2228E-SA w/AC Pwr Adapter, Sprint	Part:	22170
V2228E-SA	Qty:	1
Requires mounting bracket MLE# 22143	Mfg:	Airlink_Communications
---	Mfg Part:	V2221E-SA
Fuse, GLD GDL3	Part:	E1187
3A 250V Time Delay	Qty:	1
Miniature 1/4"x1-1/4"	Mfg:	Ferraz Shawmut
---	Mfg Part:	GLD GDL3
Fuse, GLD TR125R	Part:	E1206
125A 240V Time Delay	Qty:	3
Class R	Mfg:	Ferraz Shawmut
---	Mfg Part:	GLD TR125R

Panel

Misc Part, See Details	Part:	9999
As per detailed specification below	Qty:	1
	Mfg:	
Use and modify the old RTS070 PLC Control panel and Disconnect in the rental tent.	Mfg Part:	---

Bill of Material

Project RTS151
Description Baffinland Iron Mines Corp^Mary River Project/ PM
Ordernumber 102140
Drawing Number

1325 CALIFORNIA AVE.
BROCKVILLE. ONTARIO
CANADA
K6V 5Y6

Installation

No.	Device Id	Function Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
1	CB227		1	17717	Breaker, Techna, JTE	Breaker, Techna, JTEC4893C40 , 240V 40 AMP 3P C Trip Cuve	
2	CB232		1	17397	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C15 , 480/277V 15 AMP 2P C Trip Curve	
3	CB247		1	17717	Breaker, Techna, JTE	Breaker, Techna, JTEC4893C40 , 240V 40 AMP 3P C Trip Cuve	
4	CB253		1	17698	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C20 , 480/277V 20 AMP 2P C Trip Curve	
5	CB261		1	17397	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C15 , 480/277V 15 AMP 2P C Trip Curve	
6	CB266		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
7	CB271		1	17701	Breaker, Techna, JTE	Breaker, Techna, JTEC4892C50 , 240V 50 AMP 2P C Trip Curve	
8	CB304		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
9	CB337		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
10	CB346		1	18359	Breaker, Techna, JTE	Breaker, Techna, JTEC4891C15 , 240V 15A, 1P C Trip Curve	Fusetek
11	CR318	ESTOP	1	21887	Relay, SQT RXM4AB1F7	Relay, SQT RXM4AB1F7 , Miniature Relay 4PDT 120 V AC	Telemechanique
12	CR318	ESTOP	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
13	CR415	KILL-7901	1	21888	Relay, SQT RXM4AB1BD	Relay, SQT RXM4AB1BD , Miniature Relay 4PDT 24 V DC	Telemechanique
14	CR415	KILL-7901	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
15	CR750	SYS-ON	1	21887	Relay, SQT RXM4AB1F7	Relay, SQT RXM4AB1F7 , Miniature Relay 4PDT 120 V AC	Telemechanique
16	CR750	SYS-ON	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
17	CR760	SYS-PNL	1	21887	Relay, SQT RXM4AB1F7	Relay, SQT RXM4AB1F7 , Miniature Relay 4PDT 120 V AC	Telemechanique
18	CR760	SYS-PNL	1	21889	Relay, SQT RXZE2S114	Relay, SQT RXZE2S114M , Base/Socket for RXM4 4P Relays	Telemechanique
19	DS201	200 AMP	1	11163	Disconnect, 3ph, D32	Disconnect, 3ph, D324N , 200A, UL,240V,Nema 1,fusible disconnect	SQD
20	DS201	200 AMP	1	E1206	Fuse, GLD TR125R	Fuse, GLD TR125R , 125A 240V Time Delay	Gould
21	DS201	200 AMP	1	E1206	Fuse, GLD TR125R	Fuse, GLD TR125R , 125A 240V Time Delay	Gould

Installation

No.	Device Id	Function Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
22	DS201	200 AMP	1	E1206	Fuse, GLD TR125R	Fuse, GLD TR125R , 125A 240V Time Delay	Gould
23	FU303		1	E1187	Fuse, GLD GDL3	Fuse, GLD GDL3 , 3A 250V Time Delay	Gould
24	FU303		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
25	FU304		1	E1186	Fuse, GLD GDL2	Fuse, GLD GDL2 , 2A 250V Time Delay	Gould
26	FU304		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
27	FU318		1	E1188	Fuse, GLD GDL5	Fuse, GLD GDL5 , 5A 250V Time Delay	Gould
28	FU318		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
29	FU323		1	E1188	Fuse, GLD GDL5	Fuse, GLD GDL5 , 5A 250V Time Delay	Gould
30	FU323		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
31	FU546		1	E1190	Fuse, GLD GGC1	Fuse, GLD GGC1 , 1A 250V Fast Acting	Gould
32	FU546		1	19077	Fuse, Holder, PHX 30	Fuse, Holder, PHX 3004171 , 1P 10A 250V	Phoenix
33	IS402		1	12475	Barriers, IS, D1031Q	Barriers, IS, D1031Q , Must be marked with UL Approval	GMI
34	IS411		1	12475	Barriers, IS, D1031Q	Barriers, IS, D1031Q , Must be marked with UL Approval	GMI
35	IS424		1	12475	Barriers, IS, D1031Q	Barriers, IS, D1031Q , Must be marked with UL Approval	GMI
36	KILL318		1	14607	Button, E-Stop, ZB5	Button, E-Stop, ZB5 AT4 , E-Stop Button	SQD
37	KILL318		1	14607	Button, E-Stop, ZB5	Button, E-Stop, ZB5 AT4 , E-Stop Button	SQD
38	KILL318		1	14609	Button, ZB5 AZ105	Collar with 1-N/0 and 1-N/C Contact Block	SQD
39	KILL318		1	14609	Button, ZB5 AZ105	Collar with 1-N/0 and 1-N/C Contact Block	SQD
40	KILL318		1	23054	Label, Emergency Sto	Label, Emergency Stop, SQT ZBY9330 ,	
41	KILL318		1	23054	Label, Emergency Sto	Label, Emergency Stop, SQT ZBY9330 ,	
42	LT608	P-4001	1	18625	Button, XB7EV03GP	Button, XB7EV03GP , Green LED Pilot Light 120VAC	Square D
43	LT614	P-4901	1	18625	Button, XB7EV03GP	Button, XB7EV03GP , Green LED Pilot Light 120VAC	Square D
44	LT755	SYSTEM	1	18626	Button, XB7EV04GP	Button, XB7EV04GP , Red LED Pilot Light 120VAC	Square D
45	M227	H-7902	1	10520	Contactor, SQD LC1D3	Contactor, SQD LC1D32G7 , 32A, 10/10/20/25HP	SQD
46	M247	H-7901	1	10520	Contactor, SQD LC1D3	Contactor, SQD LC1D32G7 , 32A, 10/10/20/25HP	SQD
47	OP367	MICRO-GRAPHIC	1	17233	PLC, EA1-S3ML	PLC, EA1-S3ML , C-more micro graphic user interface	
48	OP367	MICRO-GRAPHIC	1	17234	PLC, DV-1000CBL	PLC, DV-1000CBL , 2m Cable RJ12 to RJ12	
49	PDB206		1	E1217	Power Block, GLD 675	Power Block, GLD 67583 , 175A 1Pri 8Sec Aluminum	Gould
50	PDB206		1	16071	Power Block, GLD 857	Power Block, GLD 8570 , safety cover	Gould
51	PDB206		1	16071	Power Block, GLD 857	Power Block, GLD 8570 , safety cover	Gould
52	PDB206		1	16071	Power Block, GLD 857	Power Block, GLD 8570 , safety cover	Gould
53	PDB206A		1	E1215	Power Block, GLD 631	Power Block, GLD 63163 , 90A 1Pri 4Sec Aluminum 3P	Gould

Installation

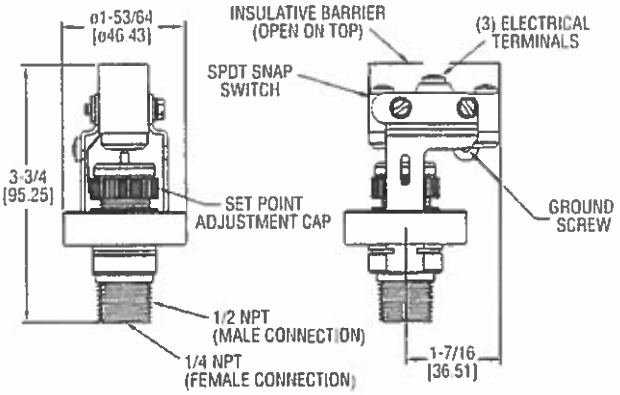
No.	Device Id	Function Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
54	PDB206A		1	16010	Power Block, GLD 853	Power Block, GLD 8530 , safety cover	Gould
55	PDB206A		1	16010	Power Block, GLD 853	Power Block, GLD 8530 , safety cover	Gould
56	PDB206A		1	16010	Power Block, GLD 853	Power Block, GLD 8530 , safety cover	Gould
57	PLC369		1	DLO6			
58	PLC507		1	12752	PLC, D0-06DR-D	PLC, D0-06DR-D , 20PT 24VDC Input 16PT Relay Output Base Unit DL06	Koyo
59	PLC507		1	E1024	PLC, D2-Bat-1	PLC, D2-Bat-1 , Battery for PLC DL05/06/205	
60	PLC508		1	D0-06DR-D			
61	PS304		1	20780	Power supply, Teleme	Power supply, Telemecanique ABL7 RM24025 , In 100-240VAC Out 24VDC 2.5A	Telemechanique
62	PWR203		1	18396	Motor Saver, 460 w/D	Motor Saver, 460 w/Diagnostic 3ph , Finger Safe, DIN Rail Mountable	
63	REC337		1	GFI-15			
64	STR216	P-4001	1	19274	Combination Starter,	Combination Starter, SQT LUCA32FU , TeSysU Standard Control Unit 8-32A	
65	STR216	P-4001	1	19273	Combination Starter,	Combination Starter, SQT LUB32 , TeSysU Power Base 32A	
66	STR216	P-4001	1	19269	Combination Starter,	Combination Starter, SQT LUA1C20 , TeSysU Aux Contact Module	Telemechanique
67	STR216	P-4001	1	19270	Combination Starter,	Combination Starter, SQT LU9SP0 , TeSysU UL508 Type E Phase Barrier	
68	STR272	P-4901	1	20669	Combination Starter,	Combination Starter, SQT LUCC18FU , TeSysU 1 Phase Control Unit 4.5-18	
69	STR272	P-4901	1	19273	Combination Starter,	Combination Starter, SQT LUB32 , TeSysU Power Base 32A	
70	STR272	P-4901	1	19269	Combination Starter,	Combination Starter, SQT LUA1C20 , TeSysU Aux Contact Module	Telemechanique
71	STR272	P-4901	1	19270	Combination Starter,	Combination Starter, SQT LU9SP0 , TeSysU UL508 Type E Phase Barrier	
72	SW609		1	14660	Button, ZB5 AD3	Button, ZB5 AD3 , 3 Pos. Switch, Maintained	SQD
73	SW609		1	14610	Button, ZB5 AZ103	Button, ZB5 AZ103 , 3	SQD
74	SW615		1	14660	Button, ZB5 AD3	Button, ZB5 AD3 , 3 Pos. Switch, Maintained	SQD
75	SW615		1	14610	Button, ZB5 AZ103	Button, ZB5 AZ103 , 3	SQD
76	T249		1	19999	Transformer, Hammond	Transformer, Hammond, HAT Q005YEKF , 208V to 240V,5KVA,UL/CSA,3R,1ph	

Mercoid® Series A1F Compact OEM Pressure Switch

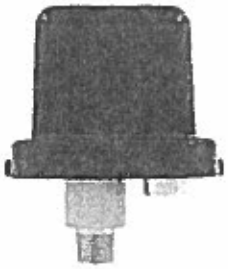
Specifications - Installation and Operating Instructions

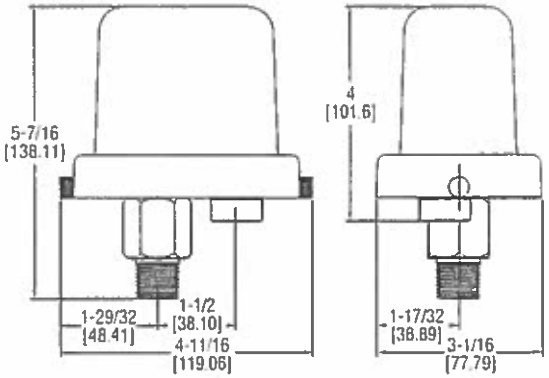
A1F





A1F with A-447





The Series A1F Compact OEM Pressure Switch is ideal for panel mounting wherever a high-quality, economical open-case or weatherproof control is required.

INSTALLATION

1. Location: Select a location where the temperature limits of -40 to 180°F (-40 to 82°C) will not be exceeded. Locate the switch as close as possible to the pressure source. Long lengths of piping will not affect accuracy of the actuation point but will slightly add to response time.

2. Mounting and Processing Connection: Avoid mounting surfaces with excess vibration which could cause false actuation when pressure is near setpoint. The switch should be mounted within 20° of vertical for proper operation. Mount the switch by connecting it to the process piping using either 1/4" NPT female or 1/2" male connection. Pipe joint compound or TFE thread tape should be used to prevent leakage.

3. Electrical Connections: The SPDT snap switch includes normally open, normally closed and common connections. The common and normally open contacts will close and the common and normally closed contacts will open when pressure increases to the setpoint. The actions will reverse when pressure decreases below the setpoint minus the deadband. A green grounding screw is provided on the switch bracket. All wiring should be in accordance with local codes.

SETPOINT ADJUSTMENT

1. Determine the setpoint pressure. The approximate actuation point can be set by turning the adjustment cap up or down, aligning the top of the O-ring, located above the cap, with the appropriate scale graduation.
2. Connect tubing or piping from the pressure port on bottom of switch to one leg of a tee. Connect the second leg to a pressure test gage of known accuracy and in an appropriate range. The third leg should be connected to a controllable source of pressure.
3. Connect a volt/ohm meter or other circuit tester to the snap action terminals to indicate when switching occurs.
4. Slowly apply pressure to the system and note the pressure at which switching occurs.
5. Operate the switch through several cycles to confirm proper actuation point.
6. Remove test apparatus and attach switch to pressure source and control circuit wiring. Place switch in service.

SPECIFICATIONS

Service: Compatible liquids and gases.
Wetted Materials:
Pressure Chamber: 316 SS.
Diaphragm: Fluorocarbon.
Temperature Limit: -40 to 175°F (-40 to 80°C).
Pressure Limits: 750 psig (51 bar).
Enclosure Rating: No rating for open construction. Installed properly within an optional A-447 enclosure meets NEMA 4X standards.
Switch Type: SPDT snap switch.
Electrical Rating: 15A @ 120/240/480 VAC, 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC.
Electrical Connection: Screw terminals.
Process Connection: 1/4" female NPT and 1/2" male NPT.
Mounting Orientation: Within 20° of vertical.
Set Point Adjustment: Knurled screw cap with indicating scale.
Deadband: Fixed, See deadband chart.
Weight: 10.5 oz (297 g).

DWYER INSTRUMENTS, INC.
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Example of how to order:

A1F - O - SS - 1 - 4
1 2 3 4 5

1. Diaphragm Designation:
   F - Fluorocarbon
2. Enclosure Designation:
   O - Open Construction No Enclosure
3. Housing Material Designation:
   SS - 316SS
4. Switch Designation:
   1 - SPDT Snap Action Switch
5. Operating Pressure Range Designation:
   1 - 2 to 15 psig
   2 - 4 to 75 psig
   3 - 8 to 225 psig
   4 - 16 to 450 psig

Series A1F Deadband Chart-psig (bar)

Range	Deadband at Minimum Range	Deadband at Maximum Range
2 to 15 (0.14 to 1.03)	2 (0.14)	3 (0.21)
4 to 75 (0.28 to 5.17)	4 (0.27)	15 (1.0)
8 to 225 (0.55 to 15.5)	8 (0.55)	25 (1.7)
16 to 450 (1.1 to 31.0)	15 (1.0)	50 (3.5)

MAINTENANCE

Upon final installation of the Series A1F Compact OEM Pressure Switch, no routine maintenance is required. A periodic check of the system calibration is recommended. The Series A1F is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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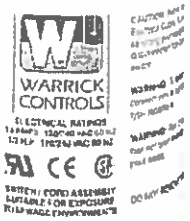
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Series M
Mechanical Tilt Float Level Switch



- Non-Mercury Switch
- Sealed Cable
- Impact & Corrosion Resistant ABS Shell
- N.O., N.C., SPDT Contacts
- Various Cable Lengths
- Color Coded Body

Designed for level control and alarm applications in difficult liquids such as sewage and waste water. Series M mechanical tilt floats are ideal for applications where the presence of mercury is a concern. Series M Switches have impact resistant ABS shell and neoprene jacketed cable.



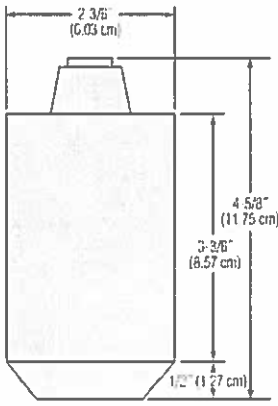
Specifications

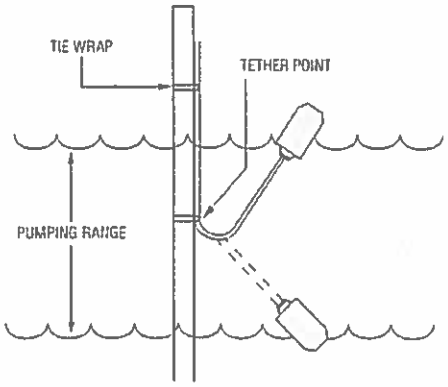
Cord	2 or 3 conductor 16 AWG wire SJOW Oil Resistant CPE
Contact Rating	13 amp @ 120/240 VAC 1/2 hp
Contact Design	SPST, Normally Open or Normally Closed Common with N.O. & N.C. (form C)
Temperature Rating	
Dry	32°F to 194°F (0°C to 90°C)
Water Resistant	32°F to 140°F (0°C to 60°C)
Overall Weight	1.0 lbs. (not including weight)
Tether Method	Tie-wrap nylon, weight: 2.5 lbs.
Approvals	U.L. Recognized, CSA Cert.

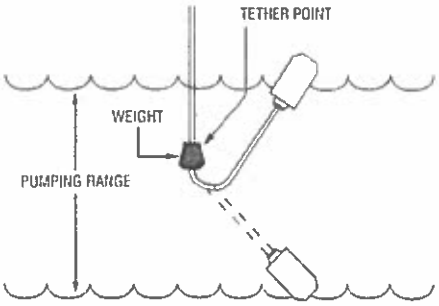
Applications

- Level Control
- Alarms
- Sewage Lift Systems
- Slurries
- Drainage Sumps
- Wastewater Treatment
- Holding Tanks

Dimensions







How to Order

Use the **Bold** characters from the chart below to construct a product code.

M XXX XX X

Series
M

Contact Configuration
BLU – SPST, Normally Open, narrow angle[1]
YEL – SPST, Normally Closed, narrow angle[1]
RED – SPST, Normally Open, wide angle[2]
WHI – SPST, Normally Closed, wide angle[2]
GRE – SPDT, Form C, wide angle[2]

Length
40 – 40 feet (12.19 m)

Tether Method
T – Tie
W – Weight

Tether Method	Part Number
Tie Wrap	7762360
Weight	7762381

Notes:
1. Narrow angle pumping range approximately 2 in. to 8 in.
2. Wide angle pumping range approximately 5 in. to 18 in.

newterra
smart technology. sustainable solutions.

OIL WATER SEPARATORS – OWS SERIES

Application:

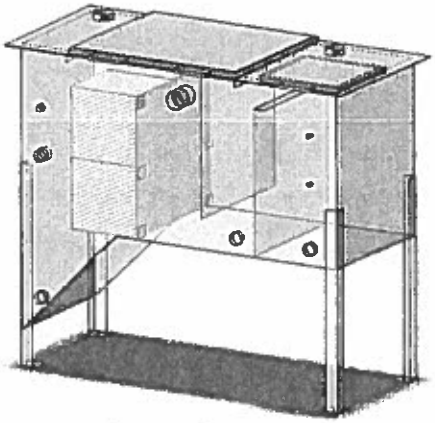
newterra Oil Water Separators are designed to remove oil from a liquid phase inlet stream. As the oil/water mixture is passed through the coalescing oil/water separator, larger oil droplets migrate to the surface to be collected and skimmed off. The media collects the smaller droplets until they are large and buoyant enough to float to the surface.

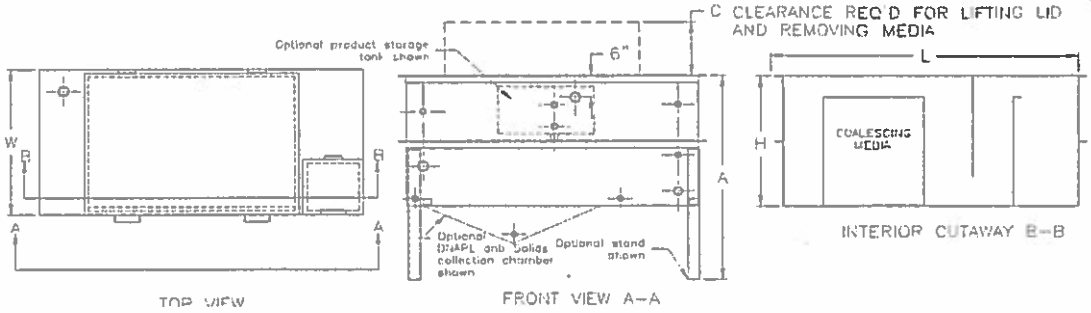
Construction:

The standard OWS Series are fabricated from carbon steel. For corrosion resistance, the interior is epoxy coated and the exterior is painted. Optional stainless steel construction is also available. A large lid allows access to the coalescing media and oil skimmer while a small lid allows access to the pump-out tank.

Standard Features:

- Standard finish: Interior is epoxy coated. Exterior is painted **newterra** blue over zinc primer (except stainless steel option)
- Sacrificial anode to prevent corrosion of tank.
- 11 AWG carbon steel construction
- Sludge containment section
- Adjustable oil skimmer
- Water underflow/overflow weir design
- Easy removal of coalescing media for cleaning
- High Alarm Level Coupling and Pump High/Low Level Coupling in the pump-out chamber





Dimension Chart:

Part Number	Width "W"	Standard Height "H"	Standard Overall Length	Length with Extended Pump-out	Height with Elevated Pump-out "A"	Overhead Clearance "C"	Standard Pump-out Volume	Extended Pump-out Volume	Elevated Pump-out Volume	Product Tank Volume
OWS-2	16"	30"	64"	76"	n/a	14"	23 Gal	41 Gal	n/a	8.1 Gal
OWS-4	28"	30"	64"	76"	n/a	26"	46 Gal	81 Gal	n/a	8.1 Gal
OWS-8	28"	30"	76"	88"	n/a	26"	46 Gal	81 Gal	n/a	8.1 Gal
OWS-12	40"	30"	76"	88"	n/a	38"	70 Gal	122 Gal	n/a	8.1 Gal
OWS-18	40"	30"	88"	n/a	60"	24"	70 Gal	n/a	130 Gal	12.2 Gal
OWS-24	52"	30"	88"	n/a	60"	24"	93 Gal	n/a	173 Gal	12.2 Gal
OWS-36	52"	42"	88"	n/a	72"	24"	133 Gal	n/a	212 Gal	17.8 Gal
OWS-45	64"	42"	88"	n/a	72"	24"	166 Gal	n/a	265 Gal	17.8 Gal
OWS-72	100"	42"	88"	n/a	72"	24"	266 Gal	n/a	425 Gal	17.8 Gal

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OIL WATER SEPARATORS – OWS SERIES

Specification Chart:

Part Number	HQ PAC		½" Packing		¾" Packing		1¼" Packing		Slant Plate	
	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)
OWS-2	9.7	27.0	5.0	14.1	3.5	9.8	2.3	6.3	0.9	2.5
OWS-4	19.3	54.0	10.1	28.2	7.0	19.7	4.5	12.7	1.8	4.9
OWS-8	38.6	108.1	20.2	56.5	14.0	39.3	*9.1*	*25.4*	*3.5*	*9.8*
OWS-12	57.9	162.1	30.3	84.7	21.1	59.0	13.6	38.1	5.3	14.7
OWS-18	86.9	243.2	45.4	127.1	31.6	88.4	20.4	57.1	7.9	22.1
OWS-24	115.8	324.2	60.5	169.5	42.1	117.9	27.2	76.1	10.5	29.5
OWS-36	159.2	445.8	68.1	190.7	47.4	132.6	30.6	85.7	11.8	33.2
OWS-45	199.0	557.3	85.1	238.4	59.2	165.8	38.2	107.1	14.8	41.5
OWS-72	318.5	891.7	136.2	381.4	94.7	265.3	61.2	171.3	23.7	66.3

Rated US GPM (Based on 25 micron particles at 65 deg F and design safety factor of 1.25)
Larger spaced packing will not plug as quickly as closely spaced packing allowing longer intervals between maintenance requirements. The coalescing slant plate should be used in applications with heavy sludge loads because it does not foul quickly.

Options Table:

Option	Description
Stand	The separator will be elevated above ground to assist in gravity discharge or to provide room underneath the separator for blowers and pumps. This replaces the standard foot mounts. The maximum stand height for 8' clearance is 36" for OWS-18 and OWS-24 and 24" for OWS-36 and larger.
Oversize Pump-out (Extended)	OWS-2, OWS-4, OWS-8 and OWS-12 only. The final section of the separator can be oversized to allow a greater water pump-out volume. For the OWS-2, OWS-4, OWS-8 and OWS-12 the oversized pump-out will be an extended length of the final section of the separator.
Oversize Pump-out (Elevated)	OWS-18, OWS-24, OWS-36 and OWS-45 only. The final section of the separator can be oversized to allow a greater water pump-out volume. For the OWS-18, OWS-24, OWS-36 and OWS-45 the separator will be raised on a stand and the final section will extend to the ground to give the oversized volume.
Top Inlet	A top mounted option is available to allow for pre-separation of air and liquid at the inlet to the separator.
Product Storage Tank	A tank may be mounted on the front of the separator to collect the oil from the skimmer. The volume of the product storage tank is: OWS-2, OWS-4, OWS-8 and OWS-12: 8.1 US Gal OWS-18, OWS-24 12.2 US Gal OWS-36, OWS-45 17.8 US Gal
Teleretle Basket	A teleretle basket may be added to allow for a high surface area polishing media for final hydrocarbon removal.
Oversize Inlet and Outlet	The inlet and outlet couplings may be increased by one size to allow for higher flow through the separator.
Stainless Steel	Each separator can be purchased with Stainless Steel construction instead of the standard Carbon Steel.
Main Tank Low Coupling	Additional couplings may be added to allow for the installation of a low level switch in the main separator tank. NOTE: This option covers only the cost of installing the coupling, the switches must be purchased separately.
Main Tank High High Coupling	Additional couplings may be added to allow for the installation of a high high level switch in the main separator tank. NOTE: This option covers only the cost of installing the coupling, the switches must be purchased separately.
Custom Size	A custom sized separator can be designed to meet specific project needs.
Media	Custom media available for contaminants other than oil/BTEX such as chlorinated solvents and other DNAPL products.
DNAPL Separation	The separator can be supplied with a DNAPL sump to capture heavy fluids and solids and allow collection below the media of the oil water separator.

Sample Ordering Format:

OWS-4 with ½" Packing
SG: 0.9
Temp: 65 deg F
Minimum Micron Size: 25
Design Safety Factor: 1.25
Options:
Oversize Pumpout (Extended)
Product Storage Tank
Stand: 24"

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ATB 3 and ATS3 Series Spec Sheet
Level Switch - Small Size - Heavy Duty



The ATB3 is designed for high or low level alarm or switch point applications in rugged situations similar to oil tank reservoirs or industry vessels that require a more robust level switch. Notice the larger brass one piece machined hex to get a wrench on - this model also has an optional brass set screw locking collar in place of the clip.

Internal reed switch selection is the same Almeg quality standard but we've beefed up the external part as well as fully encapsulated the reed switch to maintain a complete moisture free environment. The leads are wire wrapped (not clipped) soldered and heat shrink sealed to the reed switch before encapsulating.

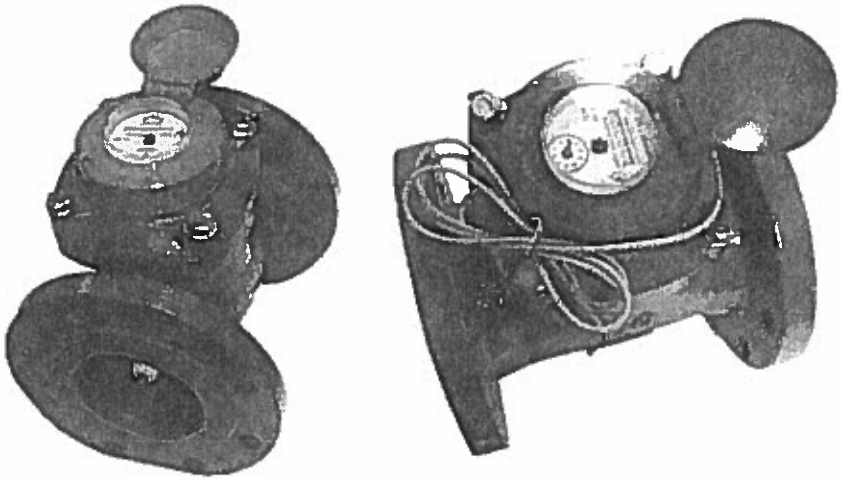
The TRUE closed cell Buna float will not swell or take on moisture - even if cut or drilled. It is designed like a tight bee hive or honey comb construction.

100% of our controls are tested before shipping.

The ATB3 is available in a single order or OEM applications.

DLJ Epoxy Coated Cast Iron Turbine Meters

200T, 250T, 300T, 400T, 600T, 800T



Description

Operation DLJ Turbine Meters are horizontal Woltman type water meters designed for installation where occasional low and moderate to high sustained flows are demanded. Water flow drives a vertical impeller in direct proportion to the quantity of water passing through the meter. Impeller revolutions are transferred to the register assembly through a reduction gear and magnetic drive.

Compliance The DLJ Turbine Meters comply with AWWA C701 and ISO 4064 Class B standards.

Installation The meter must be installed in a clean pipeline, free of any foreign materials. Install the meter with direction of flow as indicated by the arrow cast into the meter body. You can install the meter vertically or horizontally and the registers are fully revolvable for ease of reading. It is recommended to strain the incoming water to prevent foreign debris damage and to reduce the effects of water turbulence.

Application The DLJ Cold Water Turbine Meters are for use only with cold water up to 120 degrees F (50 degrees C)

Construction The meter consists of a fully epoxy coated cast iron main case with the flow direction cast into it and a removable measuring element for easy maintenance.

	Specifications					
Characteristics	**DLJ 200T 2"**	**DLJ 250T 2 1/2"**	**DLJ 300T 3"**	**DLJ 400T 4"**	**DLJ 600T 6"**	**DLJ 800T 8"**
Flow Rating (gpm)	325	395	495	1250	2500	3450
Continuous Flow (gpm)	250	300	375	1000	2000	2800
Low Flow (gpm)	4	5	6	9	32	38
Maximum Pressure (psi)	175	175	175	175	175	175
Maximum Temperature (°F)	120	120	120	120	120	120
Sweep Hand Registers (Gallons)	10/100	10/100	10/100	10/100	10/100	10/100
Register Capacity (Millions of Gallons)	1000	1000	1000	1000	1000	1000

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DLJ Meter

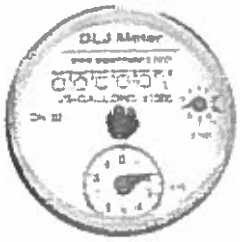


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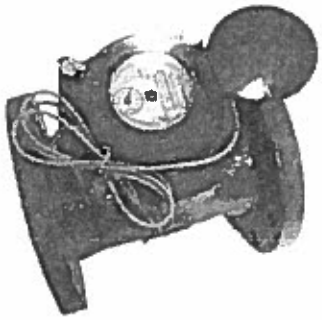
DLJ Epoxy Coated Cast Iron Turbine Meters

200T, 250T, 300T, 400T, 600T, 800T

Direct Read Register The register is contained in a hermetically sealed nylon casing with a 5mm tempered glass lens. The totalizer wheels are large and easy to read and the sweep hands are offset on seperate 10 gallon and 100 gallon register wheels. The large black spinning trickle indicator is excellent for leak detection. Each register clearly show's it's applicable meter size.



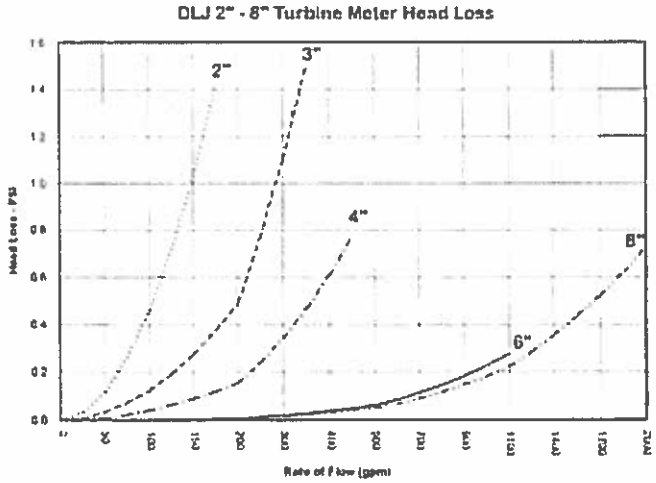
Pulse Output The DLJ line is available with a dry contact reed switch pulse output. This requires external DC power, 4 watts, 30VDC maximum. Contact closure is 1 pulse per 100 gallons on the 2 - 3" Turbines and 1 pulse per 1000 gallons on the 4 - 8" Turbines



Magnetic Drive The magnetic drive design eliminates all miscouplings associated with conventional right angle drives. Excess torque is eliminated in the encased undergear assembly, ensuring constant magnet coupling.

Maintenance The register/measuring assembly is easily removable and replaceable if needed, and doesn't require taking the meter off line.

Connections The DLJ Turbine Meters are available with standard Class 150lb ANSI flanges (4 bolt in 2, 2 1/2" and 3", 8 bolt in 4, 6 and 8"). Companion Flange sets in Cast Iron or PVC and Uni-Flanges are available for ease of connection.



Characteristics	Specifications					
	DLJ 200T 2"	DLJ 250T 2 1/2"	DLJ 300T 3"	DLJ 400T 4"	DLJ 600T 6"	DLJ 800T 8"
Length (Inches)	12	7.75	8.75	9.75	11.6	13.6
Weight (Pounds)	32	29	35	40	92	141
Crated Weight (Pounds)	43	40	47	50	110	150

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Stacking Shipping Containers on Land for an Off-Axis Detector

J. Cooper, J. Kilmer, B. Wands
Fermi National Accelerator Laboratory, Batavia, IL 60510

(May 29, 2003)

Introduction

Fig. 1 shows a typical International Standards Organization (ISO) Series 1 shipping container.

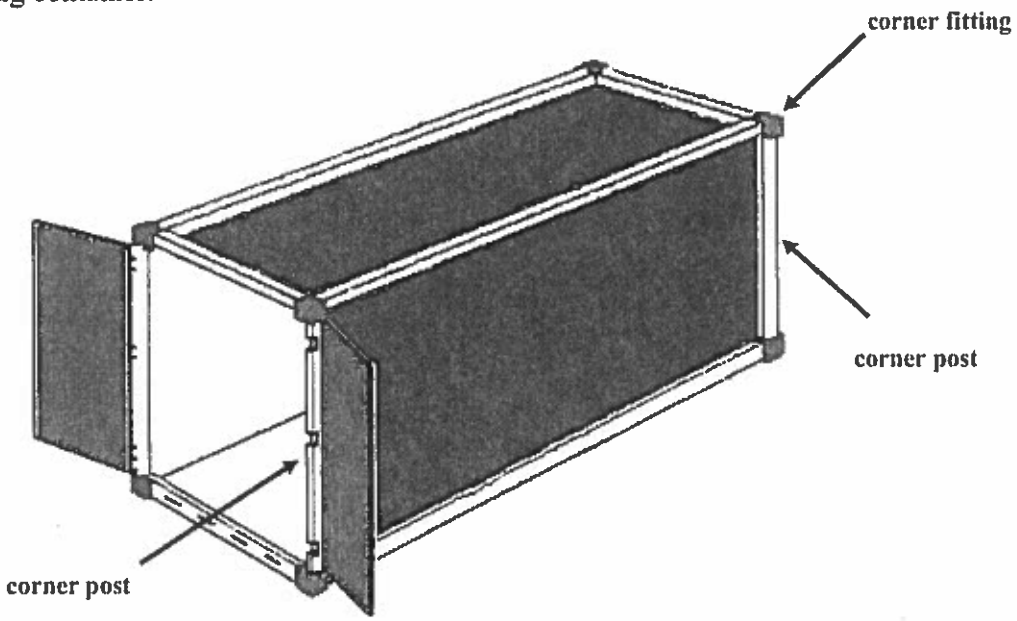


Figure 1. ISO Series 1 Shipping Container

These containers are designed to make vertical contact with each other through discrete corner fittings; when stacked, all vertical force is transferred through these fittings, in turn loading the corner posts, and not the walls, of the container. The number of containers which can be stacked on each other is determined by the strength of the corner posts.

ISO Standard 1496[1] states that the corner posts of ISO Series 1 containers should be tested to a load of 86,400 kg (190,480 lbs). This is the load applied to the posts of the bottom container in an 8-on-1 stack of 24,000 kg (gross weight) containers,

multiplied by a factor of 1.8. This extra factor is used to take into account "conditions aboard ship and the relative eccentricities between superimposed containers."[1] The "conditions aboard ship" were derived from a 1964 study of maximum acceleration values under the worst sea and wind conditions.[2]

Calculating the safe stacking height for loaded containers *on land* requires some understanding of the corner posts, their material properties, possible failure modes, and what constitutes an adequate factor of safety.

Corner Post Geometry and Compressive Load-Bearing Capacity

Corner post steels typically correspond to the specification ASTM A-572, with a yield stress of 47,000 psi, and an ultimate stress of 70,000 psi. This is a low alloy columbium or vanadium steel commonly used for high-strength steel weldments, such as bridges. The load-bearing characteristics of corners posts are complex, because in a walled container the posts receive substantial lateral stability, and compressive cross sectional area, from the participation of the walls and doors.

The corner post can fail in two ways: The first is collapse, or buckling. This occurs in a slender column when the compressive load reaches a critical load P_{cr} which is so large that the column can no longer recover from small lateral displacements along its length. The result is sudden and catastrophic loss of stiffness, and gross deformation of the column and its attached material.

A second type of failure can occur if the compressive load P_{comp} exceeds the value S_yA, where S_y is the yield stress of the material, and A is the cross sectional area of the post. Even a column which is stable against buckling failure can fail from compressive yielding. Failures of this type are rare for columns, since the yielding will tend to produce larger cross sectional area through plastic deformation, and eventually become self-limiting. This self-limit may not be reached before even a very short column becomes unstable, however, resulting in a type of collapse that is characterized by large amounts of plastic deformation.

The most likely failure mode, given the substantial lateral constraint offered by the walls, is probably a combination of collapse and gross yielding, a type of failure referred to as elastic/plastic collapse.

The calculation of collapse (buckling) loads for long, slender steel columns uses the Euler equation:

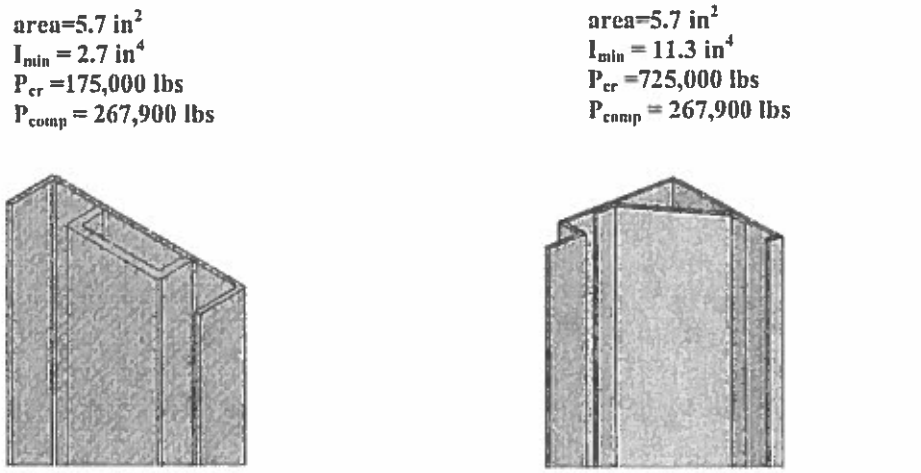
$$P_{cr} = k\pi^2 EI/L^2$$

where P_{cr} = critical (collapse) load
E = modulus of elasticity of steel = 30e6 psi
I = minimum moment of inertia of section
L = length of column
k = factor for end rotational restraint (theoretical range from 1-4)

For the corner posts, the degree of end rotational restraint is difficult to quantify. The top, bottom, and side rails will serve to provide substantial restraint, and even the corner fitting contact of the loading container above a corner post will tend to limit rotation. Therefore, a k factor of 2 is chosen for calculating the estimates of collapse load.[3] This is less than the complete rotational restraint (k = 4), but greater than free rotation (k = 1).

In addition to resisting collapse, the corner post must also work at a compressive stress that is below the yield of the material. Corner posts will yield at a stress of 47,000 psi. Therefore, the minimum cross sectional area for resisting the corner post loads is A = 190,840/47,000 = 4.05 in^2.

While the minimum performance of a corner post is standardized via ISO, the actual geometry of the post is not. Manufacturers have explored many different designs for many different types of containers, all of which will pass the ISO test load of 86,400 kg or 190,840 pounds. Figure 2 shows the most common corner post cross-sections at the door and walled ends of a Series 1 container. These posts are made of 6mm thick pressed steel shapes welded together along the length of the post. In the case of the door end post, a piece of hot rolled channel 113 x 40 x 10 mm is welded to the 6mm plate. Both posts in Figure 2 have adequate cross sectional area from the standpoint of compressive stress. However, the Door End post (a), has a collapse load which is less than the load required by the ISO standard, and therefore must rely on interaction with the walls and doors of the container to produce the necessary load-bearing capacity.



(a) Corner Post at Door End **(b) Corner Post at Walled End**

Figure 2. Corner Post Cross Sections -- Properties and Load Capacities without Wall/Door Participation

The effect of participation of the walls and doors is illustrated in Fig. 3 The profile of Fig. 2(a) has been used with a 3-inch wide strip of adjacent container sidewall (3.6 mm thick) and a 2-inch wide strip of door panel (2 mm thick), to form a column of considerably higher strength than the profile of Fig. 2(a) alone. The cross section shown, with walls, has a critical load of approximately 252,000 lbs, which is well above the 175,000 lbs of the corner post alone, and well above the 190,480 lbs required by the ISO Standard.

These calculations show that the door is an important part of the load path under stacking, providing additional cross-sectional area for compression and stability. The door also acts as a sheer wall, preventing the parallelogram deformation of the end referred to as "racking" or "sidesway." For these reasons, in commercial practice, the doors on a container within a stack are presumably never opened. This is not a constraint on the way the containers are used in commerce, since only one container at a time is loaded or unloaded at terminals, with stacking occurring only during transit.

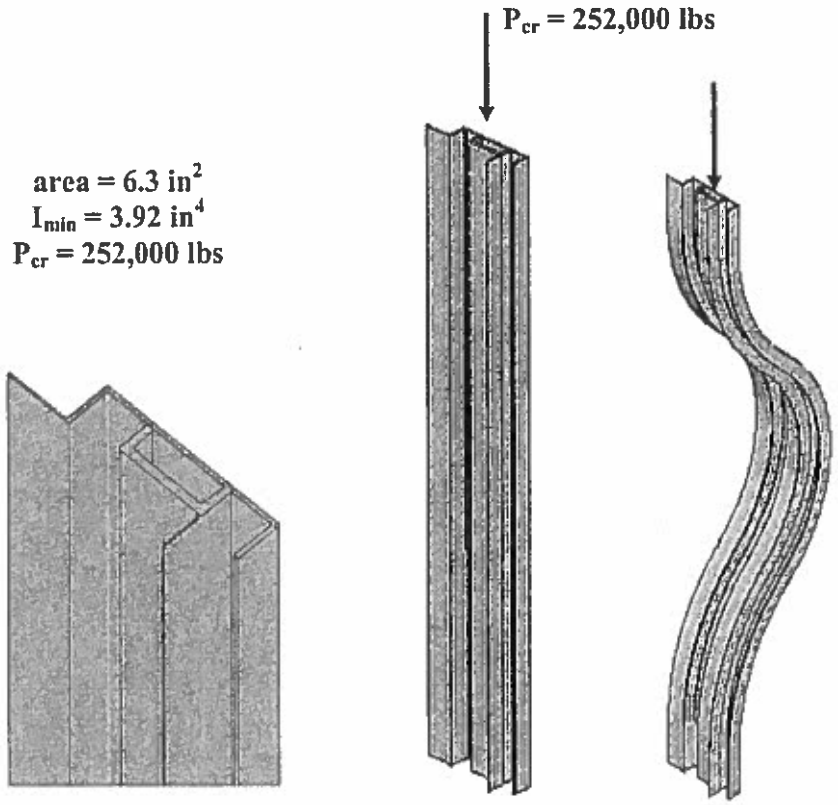


Figure 3. Corner Post from Fig. 2(a) showing increase in buckling strength due to participation of wall

Corner Fittings

The corner fittings shown in Figure 1 are an integral part of the load-bearing column in the container. ISO 1161-1984(E)[4] states "Corner fittings for Series 1 freight containers shall be capable of withstanding the loads calculated in accordance with the requirements of ISO 1496/1 for Series 1 containers." This means that the bottom corner fitting of the bottom container in a stack must withstand the weight of the containers stacked above it, plus the weight of the bottom container itself. The maximum load which a single corner fitting must take is then

$$P_{tot} = 190{,}480 + (52{,}800/4) = 203{,}680 \text{ lbs}$$

A typical corner fitting is shown in Fig. 4.. The cross sectional area of this fitting is shown in Fig. 5. The total cross sectional area available for compression is 10.15 in^2. This results in an average compressive stress under maximum load of 20,067 psi.

Corner fittings are typically cast and machined from A-216 steel, which has a minimum specified yield stress of 40,000 psi. Therefore, under maximum load, a corner fitting of the cross section shown below operates with a safety factor on yield of nearly 2.0

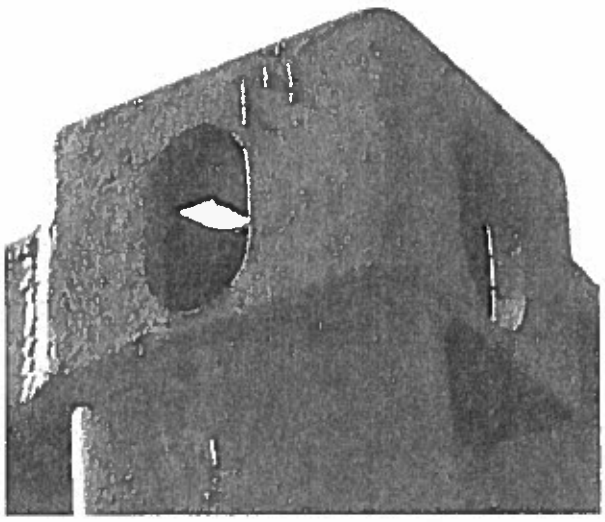


Figure 4. Corner Fitting

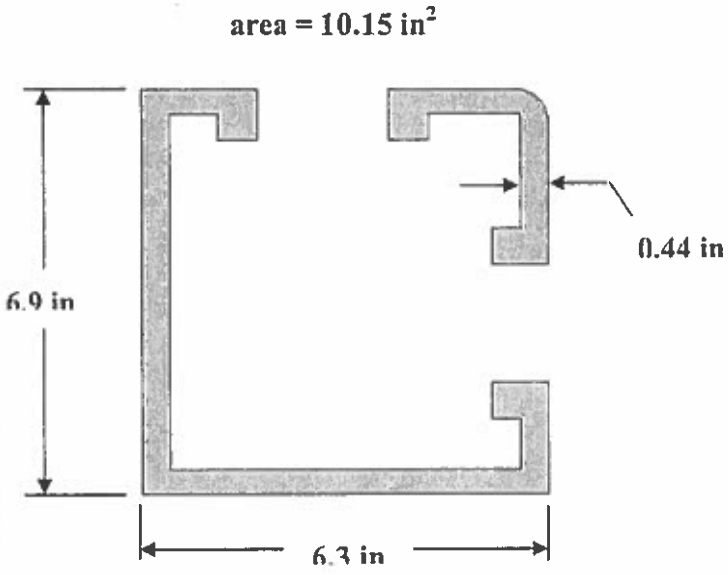


Figure 5. Fitting Cross Section

Safety Factor for Stacking Containers on Land

A safety factor for the corner posts in the bottom container of a stack can be defined as

$$SF = F_{cp\text{-}fail}/F_{cp\text{-}act}$$

where SF = safety factor
$F_{cp\text{-}act}$ = actual operating load on corner post
$F_{cp\text{-}fail}$ = failure load of corner post

The ISO Standard, however, does not define a force $F_{cp\text{-}fail}$; rather, it specifies the load that each corner post must withstand *without* failure. In this sense, the specified load is a *proof* load, F_{cp_proof}, which is simply a load which each corner post must be shown capable of resisting. For the purposes of calculating a safety factor, the specified test load can be thought of as an absolute lower limit on the failure load. Any safety factor calculated with $F_{cp\text{-}fail} = F_{cp_proof}$ will be smaller than the actual safety factor, since F_{cp_proof} is always smaller than $F_{cp\text{-}fail}$.

Using the expression above, the safety factor of an 8-on-1 stack of containers on land is at least 1.8 . Safety factors in engineering commonly range from 1.25 to 2.0 or greater, depending on the amount of confidence the designer has in material performance and load characterization. The AISC Steel Construction Code[5], for example, uses a safety factor of 2 for column loading; however, conservative design in civil structures is necessary because there is typically no load-testing of the parts; they are designed, manufactured, and set in place with only the calculation and fabrication standards serving as proof of merit. Aircraft design, however, uses safety factors closer to 1.25, due to the great penalties incurred by excess weight. The extremely rigorous materials and testing programs common in the aviation industry justify these smaller safety factors.

Because the corner posts of all containers are known to have been tested to the load stipulated by ISO 1496 with no failures occurring at a load that is less than the test load, a safety factor of about 1.5 is adequate for a stack of containers on land. Table I shows the safety factor on the corner post loading of the bottom container in a stack, for stacks of various heights. This table is based on the application of the equation for safety factor, with $F_{cp\text{-}fail} = F_{cp\text{-}proof} = 190{,}480$ lbs, and containers of 52,910 lbs gross weight:

Table I. Safety Factors on Land for Various Stack Heights on Land with Container Corner Post Capacity of 190,480 lbs (86,400 kg)

Number of Containers Stacked on One	Total Height of Stack	Safety Factor on Corner Post Loading
8	9	1.80
9	10	1.60
10	11	1.44
11	12	1.31

The table shows that we can stack 9-on-1 on land, and maintain a safety factor of greater than 1.5.

Possible Modifications

For a final detector design, good engineering practice would require that the corner posts of several containers be loaded to failure to more precisely determine F_{cp_fail}, from which more accurate stacking safety factors could be calculated. Some advantage might be taken of the fact that while $F_{cp\text{-}fail}$ is not known, it is certainly higher than 190,480 lbs (86,400 kg). If the measured failure load is just 4% higher than the test (proof) load, the safety factor on a 10-on-1 stack becomes 1.5, and stacking to that height becomes defensible.

Some vendors advertise containers with a higher capacity[(6)] than the ISO Series 1 standard, and advantage could be taken of the greater payload, as well as the higher post strength, in configuring the detector array. The typical higher post rating quoted is 214,290 lbs (97,400 kg), allowing exactly 9 on 1 stacking of 52,910 lb (24,000 kg) containers at sea and therefore allowing 10 on 1 on land with a safety factor of (9/8)*(1.44) = 1.62.

Similarly, if the Off-Axis detector density is small enough that our standard gross weight container is less than 52,910 lbs (24,000 kg), then even higher stacks could be supported. Table II shows the stack heights possible when the higher strength containers are used. A container volume of 33.2 m^3 is assumed with a tare weight of 2,250 kg and four different detector gross weights of 22,150 kg, 24,000 kg, 26,000 kg and 30,480 kg. The 30,480 kg number is the vendor quoted maximum gross weight for the higher strength containers. Comparing Tables I and II shows that the higher strength posts lead to the same height stacks as the lower strength posts for containers of density 0.75 gm/cc vs. 0.66 gm/cc.

Table II. Stack Heights on Land forVarious Detector Densities with Container Corner Post Capacity of 214,290 lbs (97,400 kg)

Number of Containers Stacked on One	Total Height of Stack (m)	Safety Factor on Corner Post Loading			
		with payload density = **0.60 g/cc** (22,150 kg gross)	with payload density = **0.66 g/cc** (24,000 kg gross)	with payload density = **0.75 g/cc** (27,150 kg gross)	with payload density = **0.85 g/cc** (30,480 kg gross)
8 on 1	23.3	2.20	2.03	1.80	1.60
9 on 1	25.9	1.95	1.80	1.59	1.42
10 on 1	28.5	1.76	1.62	1.43	1.28
11 on 1	31.1	1.60	1.48	1.30	1.16

Conclusion

Stacking ISO containers 10 high on land is reasonable, and stacks as high as 12 may be possible depending on the type of container purchased and on the loading of the container with Off-Axis detector elements. For a final detector design, good engineering practice would require that the corner posts of the selected containers be loaded to failure to more accurately determine the safety factor of the stacked array.

References

1. ISO 1496-1:1990 *Series 1 freight containers – Specification and testing – Part 1: General cargo containers for general purposes*

2. ISO/TR 15070:1996(E) *Series 1 freight containers – Rationale for structural test criteria*

3. "Commentary on the Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", Section 1.8, American Institute of Steel Construction, 1978

4. ISO 1161-1984(E) *Series 1 freight containers – Corner fittings – Specification*

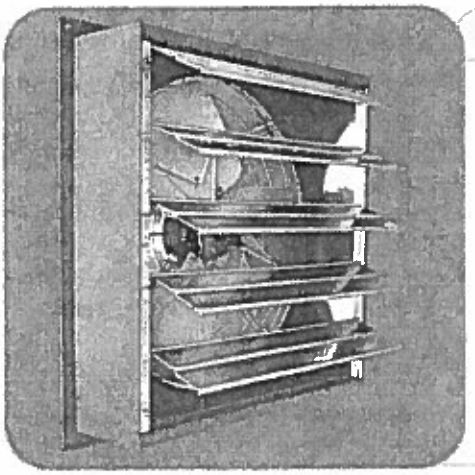
5. "Commentary on the Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", Section 1.5.1.3, American Institute of Steel Construction, 1978

6. We have several specification documents from container vendors that stipulate a higher load capacity, but no details on just how this is accomplished by any container manufacturer via changes in the post configuration. We suspect that these vendors may just be taking advantage of a specification requiring a higher measured failure load as discussed in the preceding paragraph. After all, our post calculations for Figures 2(b) and Figure 3 indicate that these "standard" posts should easily pass a failure load test at 214,290 lbs vs. the original ISO test at 190,480 lbs.

STANDARD FANS

Efficient • Low Maintenance • Easy Installation

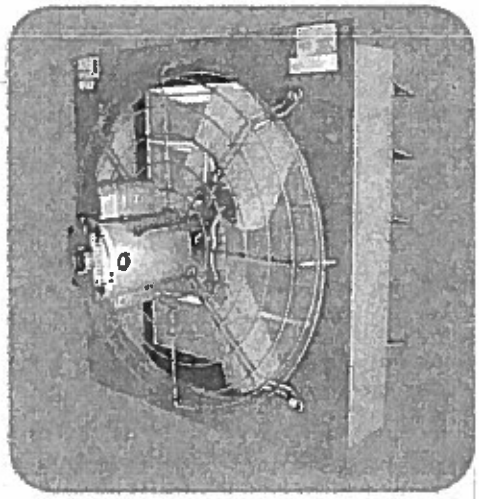
Canarm's Standard Fans follow a tradition of quality in design, materials and construction.



Features

- Available in 8" to 36" sizes.
- Single, two and variable speed models are available.
- All fans use a totally enclosed, ball bearing motor with thermal overload protection.
- The motor mount is manufactured with heavy welded rods and has a powder coated finish.
- The fan blades are well-balanced, heavy gauge aluminum.
- The rugged steel welded box housing has a durable powder coated finish.
- Aluminum louver shutters are supported by long life nylon bushings (30" and 36" have PVC louvers).
- All fans are shipped completely assembled.

General Information



Canarm's Standard Fans follow a tradition of quality in design, materials and construction. All our Standard Fans are developed to be efficient and economically priced. All variable speed Standard Fans use an energy efficient variable speed, dual voltage motor and blade combination.

To determine the proper Canarm Fan for your applications, use the following formula.

Number of cubic feet in room / Number of minutes per air change = Required C.F.M. Capacity

*****Example*****

A general office, (see chart) which requires an air change every ten minutes, would require the following fan capacity. If office is 100' x 40' x 10' = 40,000 cubic feet

40,000 cubic feet / 10 minutes per air change = 4000 Required C.F.M.

From the "Performance Data" section on the back of this page, you would select a fan that is rated at 4000 C.F.M. at 1/8" S.P. (Static Pressure)

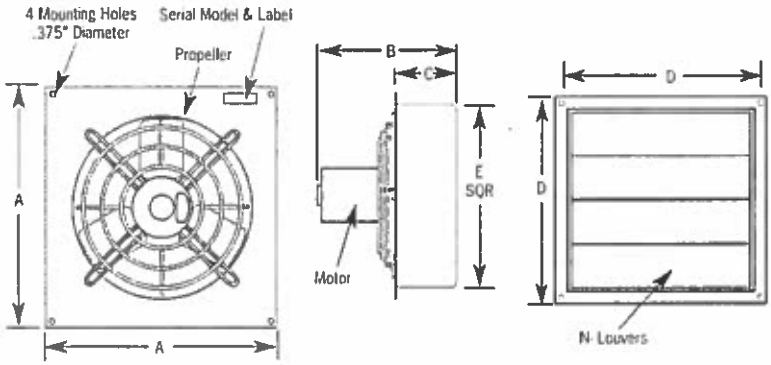
Fan Selection Chart

Application	Minutes per Air Change	Application	Minutes per Air Change	Application	Minutes per Air Change
Assembly Hall	7	Department Store	6	Plating Room	3
Auditorium	10	Dry Cleaning	5	Pressing Room	1
Bakery	3	Engine Room	6	Projection Booth	2
Barber Shop	6	Forge Room	3	Restaurant	6
Basement	8	Foundry	4	School	7
Battery Room	4	Garage	5	Summer Cooling	1
Boiler Room	1	General Office	10	Store	8
Bowling Alley	5	Gymnasium	8	Tavern	3
Church	15	Hospital	8	Toilet	3
Cocktail Bar	3	Kitchen	2	Transformer Room	1
Corridor	10	Laundry	2	Warehouse	12
Dairy	4	Locker Room	3	Welding Shop	2
		Machine Shop	8		

STANDARD FANS

Fan Dimensions

Fan Auto	A	B	C	D (c/c)	E	N
8"	13 1/4"	10"	4"	12"	10 3/4"	2
10"	15 1/4"	10"	4"	14"	12 3/4"	2
12"	17 1/4"	14"	6"	16"	14 3/4"	3
14"	19 1/4"	14"	6"	18"	16 3/4"	3
16"	21 1/4"	14"	6"	20"	18 3/4"	4
18"	23 1/4"	15"	6"	22"	20 3/4"	4
20"	25 1/4"	16"	6"	24"	22 3/4"	5
24"	29 1/4"	16"	6"	28"	26 3/4"	5
30"	35 1/4"	19"	6"	34"	32 3/4"	16
36"	41 1/4"	16"	6"	40"	38 3/4"	20



Performance Data & Specifications

Model Number	Fan Size	Motor HP	Operation Speed	Fan RPM	Current Load Amps @ 115V	Current Load Amps @230V	Input Watts	Airflow Capacity - CFM 0" S.P.	.10" S.P.	.125" S.P.	.25" S.P.	CFM Watts	Sound Level Decibel (A)	Framing Dimensions	Shipping Weight Lbs.
S8-B2	8"	1/20	Two	High 1550 Low 1300	0.95 0.45	- -	109	360 300	270 150	230 110	0 0	2.5	48 43	11" x 11"	12
S10-B2	10"	1/20	Two	High 1550 Low 1300	1.2 0.7	- -	125	690 580	590 460	570 390	0 0	4.72	56 50	13" x 13"	13
S12-E1	12"	1/4	Single	1750	3.5	-	245	1,640	1,540	1,510	1,390	6.00	63	15" x 15"	28
S12-E2			Two	High 1760 Low 1180	3.4 2.3	- -	230 132	1,650 1,090	1,550 950	1,520 930	1,390 -	6.74 7.31	64 50		32
SD12-EV			Variable	Max 1625 Min 600	2.2	1.1	205	1,650 560	1,540 440	1,510 420	1,390 -	7.50	60 -		32
S14-E1	14"	1/4	Single	1740	3.6	-	257	2,170	2,070	2,030	1,860	8.05	67	17" x 17"	30
S14-E2			Two	High 1740 Low 1170	3.8 2.2	- -	253 137	2,180 1,350	2,080 1,190	2,060 1,160	1,890 -	8.22 8.69	65 53		34
S16-E1	16"	1/4	Single	1740	3.7	-	274	2,370	2,270	2,210	2,060	8.28	68	19" x 19"	33
S16-E2			Two	High 1740 Low 1170	3.7 2.3	- -	270 152	2,380 1,640	2,280 1,490	2,230 1,430	2,070 -	8.44 9.80	69 55		36
SD16-EV			Variable	Max 1625 Min 450	2.6	1.3	248	2,370 610	2,270 580	2,210 570	2,063 -	9.15	63 -		36
S18-F1	18"	1/3	Single	1700	4.8	-	448	3,200	3,090	3,040	2,920	6.89	73	21" x 21"	37
S18-F2			Two	High 1700 Low 1140	5.7 3.1	- -	446 250	3,200 2,100	3,090 1,890	3,040 1,820	2,920 -	6.93 7.56	74 64		43
SD18-FV			Variable	Max 1625 Min 390	3..7	1.9	378	3,150 700	3,050 650	2,980 630	2,860 -	8.07	74 -		45
S20-F1	20"	1/3	Single	1735	4.8	-	322	3,420	3,220	3,170	2,920	10.00	77	23" x 23"	41
S20-F2			Two	High 1745 Low 1165	4.3 2.6	- -	315 190	3,440 2,300	3,240 2,000	3,180 1,950	2,930 -	10.20 10.52	77 67		45
SD24-F1	24"	1/3	Single	1075	4.3	-	370	5,000	4,500	4,300	3,600	12.80	70	27" x 27"	46
SD24-GV		1/2	Variable	Max 1100 Min 310	4.2	2.1	290	5,050 800	4,940 710	4,810 650	4,400 -	13.2	72 -		56
SD30-G1D	30"	1/2	Single	1075	4.6	2.3	600	8,000	7,000	6,000	5,000	11.5	82	33" x 33"	72
SD36-G1D	36"	1/2	Single	850	6.0	3.0	660	12,000	11,000	10,500	9,500	13.0	72	39" x 39"	88

NOTE: RPM Min (Minimum) is determined when louvers are opened one inch

Note: Wind has a significant effect on exhaust fans. A 10 mph wind creates a 0.05" pressure against the fan. A 20 mph wind creates 0.20" pressure and 30 mph a 0.45" pressure. These pressures are in addition to the static pressure in the building. Wind blocks or hoods should be included in all designs where fans will be subjected to winds above 10 mph.

Warranty

- 1 year on all components

CANARM LTD. - Corporate Office
2157 Parkedale Ave., Brockville, ON
Canada K6V 5V6
Tel: (613) 342-5424 Fax: 1-800-263-4598

CANARM LTD. - USA Warehouse
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Ogdensburg, New York, USA 13669
Tel: 1-800-267-4427 Fax: 1-800-263-4598

Arthur Manufacturing Facility
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Canada N0G 1A0
Tel: (519) 848-3910 Fax: (519) 848-3948
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E-Mail: **sales@bsmagri.com**

Web Site: **www.canarm.com**
E-Mail: **agsales@canarm.ca**

Subject to Change without notice.

Printed in Canada - 01/05

Code No. LIT-1927010
Issued February 1, 2009

A19 Series

Remote Bulb Control

Description

The A19 Series are single-stage temperature controls that incorporate environmentally friendly liquid-filled sensing elements.

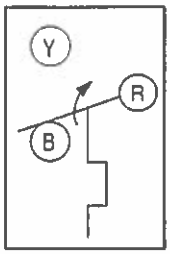
Features

- wide temperature ranges available
- constant differential throughout the entire range
- compact enclosure
- fixed or adjustable differential available
- variety of sensing element styles
- unaffected by cross-ambient conditions

Applications

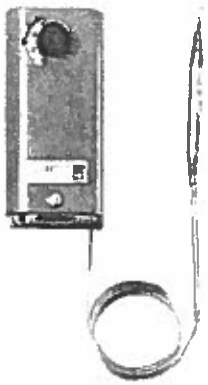
The A19 is suitable for temperature control in heating, ventilating, air conditioning, and refrigeration.

A19 Series



Action on increase of Temperature

A19 Series
Terminal Arrangement for SPDT



A19ABC-24

Selection Charts

A19 Series Remote Bulb Control[1]

Code Number	Switch Action	Range °F (°C)	Diff F° (C°)	Bulb and Capillary	Bulb Well No. (order separately)	Range Adjuster	Max. Bulb Temp. °F (°C)
Adjustable Differential (Wide Range)							
A19ABA-40C [2]	SPST Open Low	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver Slot	140 (60)
A19ABC-4C	SPDT	50 to 130 (10 to 55)	3 1/2 to 14 (1.9 to 8)	3/8 in. x 5 in., 8 ft. Cap.	WEL14A-603R	Knob	170 (77)
A19ABC-24C [3]	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 8 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-36C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 20 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-37C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ABC-74C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential							
A19AAF-12C	SPDT	25 to 225 (-4 to 107)	3 1/2 (1.9)	3/8 in. x 3 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	275 (135)
Fixed Differential (Case Compensated)							
A19AAC-4C	SPDT	0 to 80 (-18 to 27)	5 (2.8)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAD-12C	SPST Open Low	-30 to 50 (-34 to 10)	2 1/2 (1.4)	3/8 in. x 4 in., 7 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential (Close)							
A19AAD-5C [4]	SPST Open Low	30 to 50 (-1 to 10) (Bulk Milk Cooler)	2 1/2 (1.4)	3/8 in. x 2 5/8 in., 6 ft. Cap.	WEL16A-601R	Screwdriver slot	190 (88)
A19AAF-20C	SPDT	-30 to 100 (-34 to 38)	2 1/2 (1.4)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAF-21C	SPDT	40 to 90 (4 to 32)	1 1/2 (0.8)	3/8 in. x 5 3/4 in., 6 ft. Cap.	WEL14A-603R	Screwdriver slot	140 (60)
Manual Reset							
A19ACA-14C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in. 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ACA-15C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in. 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ADB-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 3 1/2 in. 6 ft. Cap.	WEL14A-602R	Knob	290 (143)
A19ADN-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 4 in. 6 ft. Cap.	WEL14A-602R	Screwdriver slot	290 (143)

1. Specify the control model code number, packing nut code number (if required), and bulb well code number (if required).
2. Replaces White-Rodgers 1609-101
3. Replaces White-Rodgers 1609-12, -13, Ranco 010-1408, -1409, - 1410, -1490, 060-110, Honeywell L6018C-1006, L6021A-1005, T675A-1011, -1508, -1516, -1821, T4301A-1008, T6031A-1011, T6031A-1029
4. Case-Compensated

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2009 Johnson Controls, Inc.

Remote Bulb Control (Continued)

Selection Charts (Continued)

Replacement Parts

Code Number	Description
CVR28A-617R	Concealed adjustment cover
CVR28A-618R	Visible scale cover
KNB20A-602R	Replacement Knob Kit

Accessories

A packing nut is available for closed tank application.
Specify the part number **FTG13A-600R**.

Bulb wells (WEL14A Series) are available for liquid immersion applications.
Refer to the selection chart or to *Bulb Wells Catalog Page, LIT-1922135.*

Technical Specifications

Electrical Ratings

Motor Ratings VAC	120	208	240
Wide Range – Adjustable Differential			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A [1]	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
Fixed Differential and Close Differential			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Case Compensated – Fixed Differential A19AAC-4			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A [1]	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
A19AAD-12			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Manual Reset			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A	16.0	9.2	8.0
Pilot Duty – 125 VA, 24 to 600 VAC			

1. SPST and N.O. contact of SPDT control.
SPDT N.C. contact- 16 amps 120 to 277 VAC

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2009 Johnson Controls, Inc.

Features

The 460's universal range from 190-480VAC, 50/60 Hz provides the versatility needed to handle global applications.

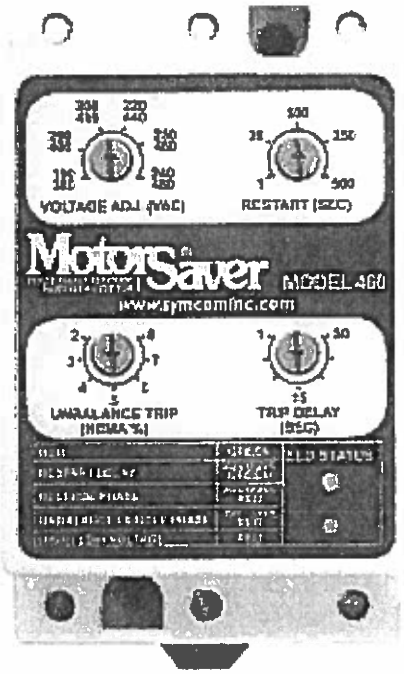
Four adjustment pots provide versatility for a variety of applications.

Diagnostic LEDs indicate trip status and provide simple troubleshooting.

Microcontroller-based circuitry provides better accuracy and higher reliability than analog designs.

Single-phase conditions are detected regardless of regenerated voltages.

Transient protection meets IEEE and IEC standards and permits operation under tough conditions.



MotorSaver
THREE-PHASE ELECTRONIC MOTOR PROTECTOR

Model 460

Three-Phase Voltage Monitor

•

Engineered Protection

•

Microcontroller Based

Protects 3-Phase Motors from:

- Loss of any phase
- Low voltage
- High voltage
- Voltage unbalance
- Phase reversal
- Rapid cycling

Additional Features:

- Compact design
- UL and cUL listed
- CE compliant
- Finger-safe terminals
- 5-year warranty
- Made in USA
- Standard surface or DIN rail mountable
- Standard 1-500 sec. variable restart delay
- Standard 2-8% variable voltage unbalance
- Standard 1-30 sec. variable trip delay
- One 10 amp general purpose Form C relay
- Optional manual reset

The **Model 460** is designed to protect 3-phase motors from damaging power conditions. The 460's wide operating range combined with UL and CE compliance enables quick access to domestic and global markets.

A unique microcontroller-based voltage and phase-sensing circuit constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level for a specified amount of time (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

The Model 460 automatically senses whether it is connected to a 190-240V, 60Hz system, a 440-480V, 60Hz system, or a 380-416V, 50Hz system. An adjustment is provided to set the nominal line voltage from 190-240 or 380-480VAC. Other adjustments include a 1-30 second trip delay, 1-500 second restart delay, and 2-8% voltage unbalance trip point.

SymCom Inc
Motor Protection & Controls Since 1974

2880 North Plaza Drive • Rapid City, SD 57702
(800) 843-8848 • (605) 348-5580 • FAX (605) 348-5685
www.symcominc.com • email: sales@symcominc.com

10/05

MotorSaver®
THREE-PHASE ELECTRIC MOTOR PROTECTOR

Specifications
•
Operating Points
•
Special Options

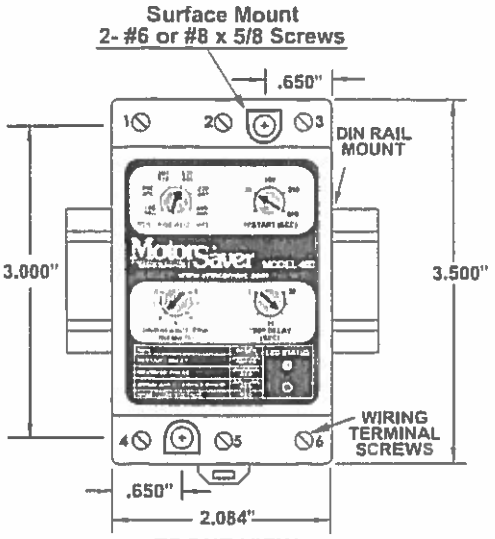
Model 460
Three-Phase Voltage Monitor

Specifications

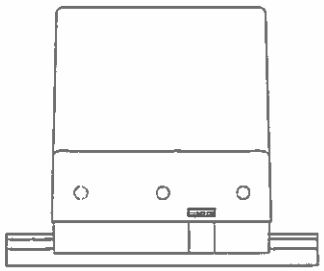
3-Phase Line Voltage	190-480VAC (475-600VAC optional) (95-120VAC optional)
Frequency	50*/60Hz
Low Voltage (% of setpoint)	
•Trip	90% ±1%
•Reset	93% ±1%
High Voltage (% of setpoint)	
•Trip	110% ±1%
•Reset	107% ±1%
Voltage Unbalance (NEMA)	
•Trip	2-8% adjustable
•Reset	Trip setting minus 1% (5 - 8%) Trip setting minus .5% (2 - 4%)
Trip Delay Time	
•Low, High and Unbalanced Voltage	1-30 seconds adjustable
•Single-Phasing Faults	1 second fixed
Restart Delay Time	
•After a Fault	1-500 seconds adjustable
•After a Complete Power Loss	1-500 seconds adjustable
Output Contact Rating	
•1-Form C	10A General Purpose @ 240VAC Pilot Duty 480VA @ 240VAC, B300
Power Consumption	6 Watts (max.)
Weight	14 oz
Enclosure	Polycarbonate
Terminal Torque	6 in.-lbs.
Wire Type	Stranded or solid 12-20 AWG, one per terminal
Safety Marks	
•UL	UL508
•CE	IEC 60947-6-2
Standards Passed	
•Electrostatic Discharge (ESD)	IEC 1000-4-2, Level 3, 6kV contact, 8kV air
•Radio Frequency Immunity, Radiated	150 MHz, 10V/m
•Fast Transient Burst	IEC 1000-4-4, Level 3, 3.5kV input power & controls
Surge	
•IEC	IEC 1000-4-5, Level 3, 4kV line-to-line, Level 4, 4kV line-to-ground
•ANSI/IEEE	C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
•Hi-potential Test	Meets UL508 (2 x rated V +1000V for 1 minute)
Environmental	
Temperature Range	Ambient Operating: -20° to 70° C (-4° to 158°F) Ambient Storage: -40° to 80° C (-40° to 176°F)
Class of Protection	IP20, NEMA 1 (FINGER SAFE)
Relative Humidity	10-95%, non-condensing per IEC 68-2-3
Special Options	
Manual Reset	External momentary pushbutton required

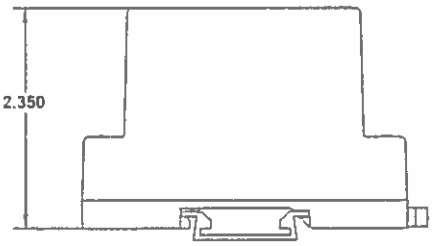
*Note: 50 Hz will increase all delay timers by 20%

SymCom warrants its microcontroller based products against defects in material or workmanship for a period of five (5) years from the date of manufacture. All other products manufactured by SymCom shall be warranted against defects in material and workmanship for a period of two (2) years from the date of manufacture. For complete information on warranty, liability, terms, returns, and cancellations, please refer to the SymCom Terms and Conditions of Sale document.

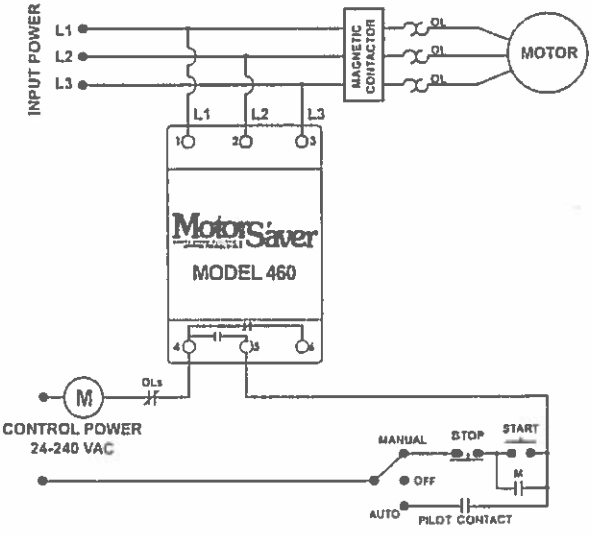


FRONT VIEW


BOTTOM VIEW



SIDE VIEW



TYPICAL WIRING DIAGRAM

SymCom Inc
Motor Protection & Controls Since 1974
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Manual Document List

PMProjNum **RTS151**

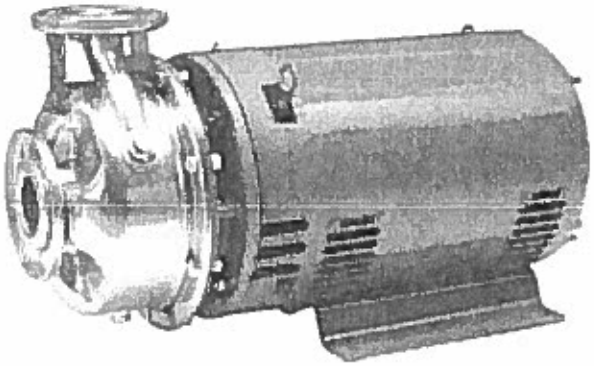
WTS, 150gpm, OWS-24, Carbon, 40' Container

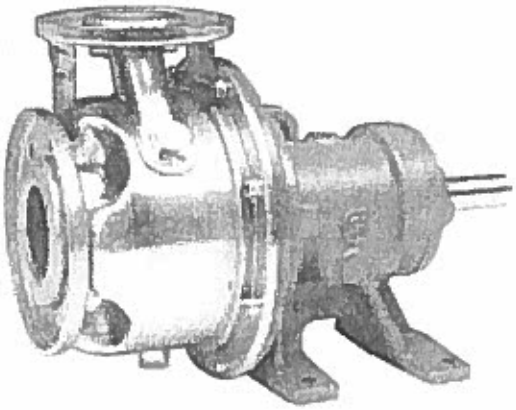
Tag	Part Number	Part Description		
Module:		*4900*		
P-4901	21028	Pump, Suction, Goulds, SSH Series, 4SH2K	Manucturer:	Goulds
			ManDoc:	#N:\Library\Goulds\Manuals\Goulds_Pu
Module:		*8200*		
8200	18396	Motor Saver, 460 w/Diagnostic 3ph	Manucturer:	Symcom
			ManDoc:	N:\Library\Symcom\Manuals\Motor Sav

G&L Pumps

Installation, Operation and Maintenance Instructions

Models SSH-C and SSH-F





Owner's Information

Please fill in data from your pump nameplate.
Warranty information is on page 28.

Pump Model: _____

Serial Number: _____

Dealer: _____

Dealer's Phone Number: _____

Date of Purchase: _____

Installation Date: _____

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Goulds Pumps

ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a SAFETY ALERT SYMBOL. When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that WILL cause serious personal injury, death or major property damage.

⚠WARNING Warns of hazards that CAN cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that CAN cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠WARNING



UNIT NOT DESIGNED FOR USE WITH HAZARDOUS LIQUIDS OR FLAMMABLE GASES. THESE FLUIDS MAY BE PRESENT IN CONTAINMENT AREAS.

NOTICE: INSPECT UNIT FOR DAMAGE AND REPORT ALL DAMAGE TO THE CARRIER OR DEALER IMMEDIATELY.

1. Important Instructions

1. Inspect unit for damage. Report damage to carrier immediately.
2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire sizes, etc., per National and Local electrical codes. Install an all-leg disconnect switch near pump.

⚠WARNING



ALWAYS DISCONNECT ELECTRICAL POWER WHEN HANDLING PUMP OR CONTROLS.

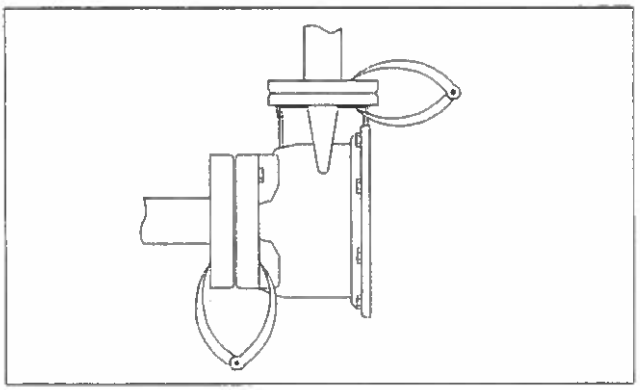
3. Motors must be wired for proper voltage (check nameplate). Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.
4. Single-Phase: Thermal protection for single-phase units is sometimes built-in (Check nameplate). If no built-in protection is provided, use a contactor with proper overload. Fusing is permissible if properly fused.
5. Three-Phase: Provide three-leg protection with proper size magnetic starter and thermal overloads.
6. Maximum Liquid Temperatures:
   212°F (100°C) with standard seal.
   250°F (120°C) with optional high-temperature seal.
7. Maximum allowable operating pressure: 230 PSI (15 bars).
8. Maximum number of starts per hour: 20, evenly distributed.
9. Regular Inspection and Maintenance will increase service life. Base schedule on operating time.

2. Installation

1. Close-coupled units may be installed inclined or vertical.

⚠ CAUTION DO NOT INSTALL WITH MOTOR BELOW PUMP. CONDENSATION WILL BUILD UP IN MOTOR.

2. Locate pump as near liquid source as possible (below level of liquid for automatic operation).
3. Protect from freezing or floods.
4. Allow adequate space for servicing and ventilation.
5. For close-coupled pumps, the foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration. Tighten motor hold-down bolts before connecting piping to pump.
6. For frame-mounted pumps, permanent and solid foundation is required for smooth operation. Bedplate must be grouted to a foundation with solid footing.
7. Place unit in position on wedges located at four points (Two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit, bringing coupling halves into reasonable alignment. Level or plumb suction and discharge flanges.
8. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming if necessary.
9. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before further tightening foundation bolts.
10. All piping must be supported independently of the pump, and must "line-up" naturally. Never draw piping into place by forcing the pump suction and discharge connections!
11. Angular alignment of the flanges can best be accomplished using calipers at bolt locations (See illustration).



12. On frame-mounted units, tighten foundation, pump and driver hold-down bolts before connecting piping to pump.
13. Avoid unnecessary fittings. Select sizes to keep friction losses low.
14. After completing piping, rotate unit by hand to check for binding. **Note:** A screwdriver slot or flats are provided in end of motor shaft.

3. Alignment

1. No field alignment is necessary on close-coupled pumps.
2. Even though the pump-motor unit may have a factory alignment, in transit this alignment could be disturbed and must be checked prior to running.
3. Check the tightness of all hold-down bolts before checking the alignment.
4. If re-alignment is necessary, always move the motor. Shim as required.
5. Final alignment is achieved when parallel and angular requirements are achieved with both pump and motor hold down bolts tight.

⚠CAUTION ALWAYS RECHECK BOTH ALIGNMENTS AFTER MAKING ADJUSTMENTS.

6. Parallel misalignment exists when the shafts are not concentric. Place dial indicator on one hub and rotate this hub 360° while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Reading is .005" or less.
7. Angular misalignment exists when the shafts are not parallel. Place dial indicator on one hub and rotate this hub 360° while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005" or less.

4. Suction Piping

1. Low static lift and short, direct suction piping is desired. For suction lift over 15 feet, consult pump performance curve for *Net Positive Suction Head Required.*
2. Suction pipe size must be at least equal to suction connection of pump.
3. If larger pipe is used, an eccentric pipe reducer (with straight side up) must be used at the pump.
4. Installation with pump below source of supply:
   4.1. Install isolation valve in piping for inspection and maintenance.
   4.2. Do not use suction isolation valve to throttle pump!
5. Installation with pump above source of supply:
   5.1. To avoid air pockets, no part of piping should be higher than pump suction connection. Slope piping upwards from liquid source.
   5.2. All joints must be airtight.
   5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.
   5.4. Suction strainer open area must be at least triple the pipe area.
6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump.

5. Discharge Piping

1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or inspection of pump or check valve.
2. If reducer is required, place between check valve and pump.

6. Rotation

⚠WARNING



DO NOT PLACE HANDS IN PUMP WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

1. Pumps are right-hand rotation (Clockwise when viewed from the driver end). Switch power on and off. Observe shaft rotation. On frame-mounted units, check rotation before coupling pump to motor.
2. Single-Phase: Refer to wiring diagram on motor if rotation must be changed.
3. Three-Phase: Interchange any two power supply leads to change rotation.

7. Operation

1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

⚠CAUTION PUMPED LIQUID PROVIDES LUBRICATION. IF PUMP IS RUN DRY, ROTATING PARTS WILL SEIZE AND MECHANICAL SEAL WILL BE DAMAGED.

2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. Check coupling alignment.
3. Do not operate at or near zero flow. Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent scoring or seizing.

8. Maintenance

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY MAINTENANCE CAN CAUSE SHOCK, BURNS OR DEATH.

1. Bearings are located in and are part of the motor. For lubrication procedure, refer to manufacturer's instructions.
2. On frame-mounted units, regrease at 2,000 hours use or after 3 months. Use #2 Sodium or Lithium grease and fill until grease comes out of the relief fitting.

9. Disassembly

1. Always turn power off.
2. Drain system. Flush if necessary.
3. Remove motor hold-down bolts on close-coupled or disconnect coupling and remove spacer.
4. Remove casing bolts and pump hold-down bolts.
5. Remove motor and rotating element from casing.
6. Unscrew impeller bolt with a socket wrench. Do not insert screwdriver between impeller vanes to prevent rotation. It may be necessary to use a strap wrench around the impeller if impacting the socket wrench will not loosen the impeller bolt.
7. Remove impeller o-ring.
8. Insert two pry bars (180° apart) between impeller and seal housing. Pry off impeller.
9. Remove shaft sleeve, seal spring, cupwasher, seal rotary and impeller key.
10. Remove seal housing.
11. Place seal housing on flat surface. Press out stationary seal parts.
12. Remove deflector from shaft on frame-mounted units.
13. Remove bolts holding bearing cover to frame and remove bearing cover (frame-mount).
14. Remove lip seals from bearing frame and bearing cover (frame-mount).
15. Remove shaft and bearings from frame (frame-mount).
16. Remove bearing retaining ring (frame-mount).
17. Use bearing puller or arbor press to remove ball bearings (frame-mount).
18. Remove wear ring if excessively worn. Use pry bar and/or vicegrips.

10. Reassembly

1. All parts should be cleaned before assembly.
2. Refer to parts list to identify required replacement items.
3. Reassembly is the reverse of the disassembly procedure.
4. Replace lip seals if worn or damaged (frame-mount only).
5. Replace ball bearings if loose, rough or noisy when rotated (frame-mount only).
6. Check shaft for maximum runout of .005" TIR. Bearing seats and lip seal areas must be smooth and free of scratches or grooves. Replace if necessary (frame-mount only).
7. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.
8. If wear ring is being replaced, do not use lubricants on the metal-to-metal fit when pressing in the replacement.
9. If the impeller is removed, as for example to effect a mechanical seal change, this procedure must be followed: Old impeller bolt and impeller o-ring cannot be reused.
10. Install the mechanical seal stationary seat in the seal housing, using soapy water as a lubricant to ease insertion.
11. S-Group – Install the mechanical seal spring retainer, spring and rotary assembly on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft, be sure that a new shaft sleeve o-ring is used.

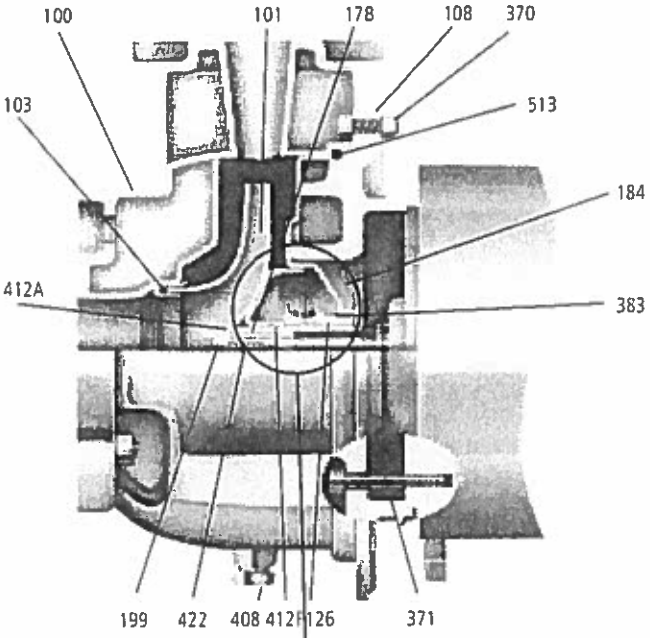
NOTE: THE SHAFT SLEEVE O-RING AND IMPELLER WASHER O-RING ARE ALMOST IDENTICAL IN DIAMETER. BE SURE TO USE THE SQUARE CROSS-SECTION O-RING IN THE IMPELLER WASHER. THE ROUND CROSS-SECTION O-RING IS USED IN THE SHAFT SLEEVE.

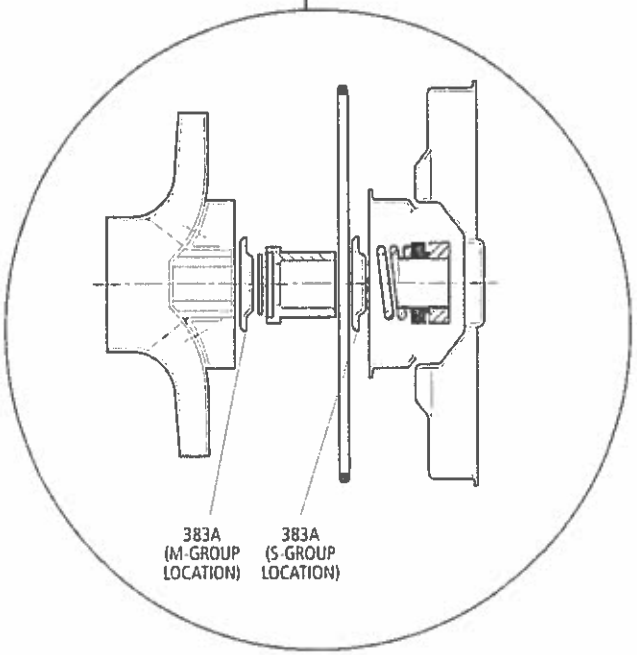
11. M-Group – Install the mechanical seal spring and rotary on the shaft sleeve using soapy water to lubricate. Slide the shaft sleeve over the pump shaft. Be sure that a new shaft sleeve o-ring is used. Place the mechanical seal spring retainer over the impeller hub.
12. Place the impeller key into the shaft keyway and slide the impeller in place. Install the impeller stud and impeller washer. Be sure that a new impeller o-ring is used. Tighten S-Group (⅜" thread) to 17 lb.ft. and M-Group (½" thread) to 38 lb.ft.

11. Troubleshooting

1. Motor does not start, and no noise or vibration occurs:
   1.1. Power supply not connected.
   1.2. Fuses or protection device tripped or defective.
   1.3. Loose or broken electrical connections.
2. Motor will not start, but generates noise and vibration:
   2.1. Motor not wired as directed on diagram.
   2.2. Shaft locked due to mechanical obstructions in motor or pump.
   2.3. Low voltage or phase loss on three phase supply.
3. Pump does not deliver rated capacity:
   3.1. Pump not filled and primed.
   3.2. Pump has lost prime due to leaks in suction line.
   3.3. Direction of rotation incorrect. See Rotation.
   3.4. Head required is higher than that originally specified. (Valve may be partially closed.)
   3.5. Foot valve clogged.
   3.6. Suction lift too high.
   3.7. Suction pipe diameter too small.
4. Protection trips as unit starts:
   4.1. Phase loss on three-phase supply.
   4.2. Protection device may be defective.
   4.3. Loose or broken electrical connections.
   4.4. Check motor resistance and insulation to ground.
5. Protection device trips too often:
   5.1. Protection may be set to a value lower than motor full load.
   5.2. Phase loss due to faulty contacts or supply cable.
   5.3. Liquid is viscous or its specific gravity is too high.
   5.4. Rubbing occurs between rotating and stationary parts.
6. Shaft spins with difficulty:
   6.1. Check for obstructions in the motor or the pump.
   6.2. Rubbing occurs between rotating and stationary parts.
   6.3. Check bearings for proper conditions.
7. Pump vibrates, runs noisily, and flow rate is uneven:
   7.1. Pump runs beyond rated capacity.
   7.2. Pump or piping not properly secured.
   7.3. Suction lift too high.
   7.4. Suction pipe diameter too small.
   7.5. Cavitation caused by insufficient liquid supply or excessive suction losses.
   7.6. Impeller blockage.
8. When stopped, unit turns slowly in the reverse direction:
   8.1. Leaks on air locks in suction pipe.
   8.2. Partial blockage in check valve.
9. In pressure boosting applications, the unit starts and stops too often:
   9.1. Pressure switch settings are incorrect.
   9.2. Tank size may be incorrect.
10. In pressure boosting applications, the unit does not stop:
    10.1. Pressure switch maximum setting is higher than was specified.
    10.2. Direction of rotation incorrect. See Rotation.

SSH-C Components





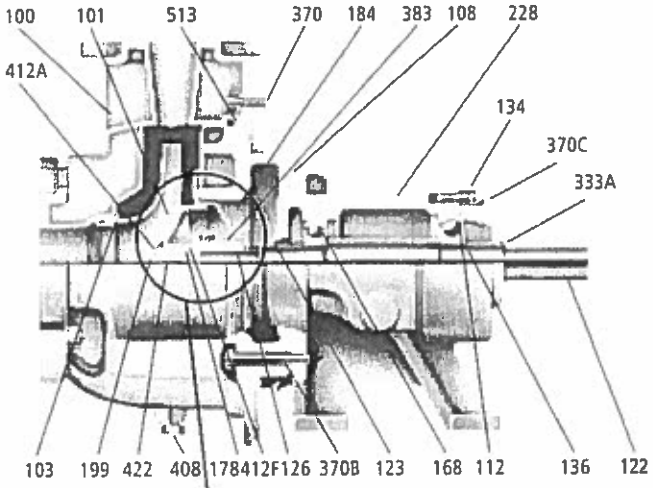
MATERIALS OF CONSTRUCTION

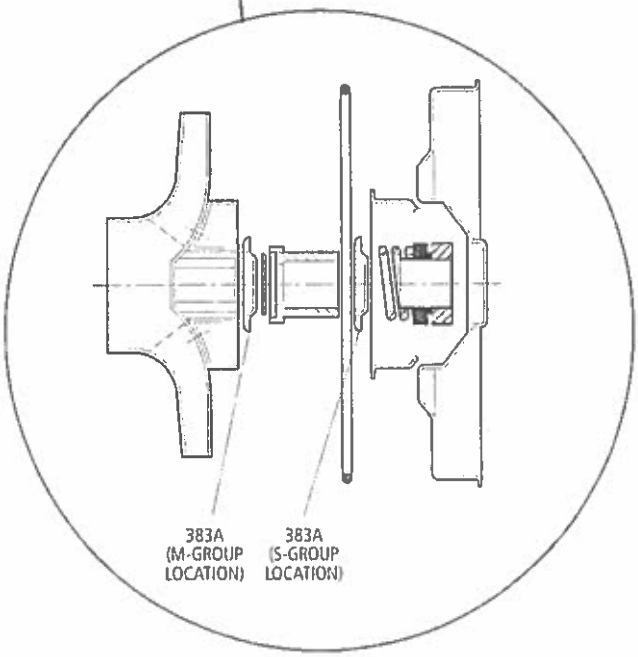
Item	Description	Material
100 101 103 184 370	Casing Impeller Wear Ring Seal Housing Socket Head Cap Screw (Casing to Adapter)	AISI TYPE 316L Stainless Steel
408	Drain Plug — ¾ NPT	AISI TYPE 316 SS
126	Shaft Sleeve	316 SS
178	Impeller Key	Steel
422	Impeller Stud	Steel
199	Impeller Washer	316 SS
108	Adapter	Cast Iron ASTM A48CL20
371	Hex Head Cap Screw (Adapter to Motor)	Steel
412A	O-ring, impeller	BUNA-N
412F	O-ring, shaft sleeve	BUNA-N
513	O-Ring	BUNA-N
383	Mechanical Seal Part No. 10K13	Carbon/Ceramic Buna Elastomers 316 SS Metal Parts
383A	Spring Retainer	AISI Type 316 SS

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive

SSH-F Components





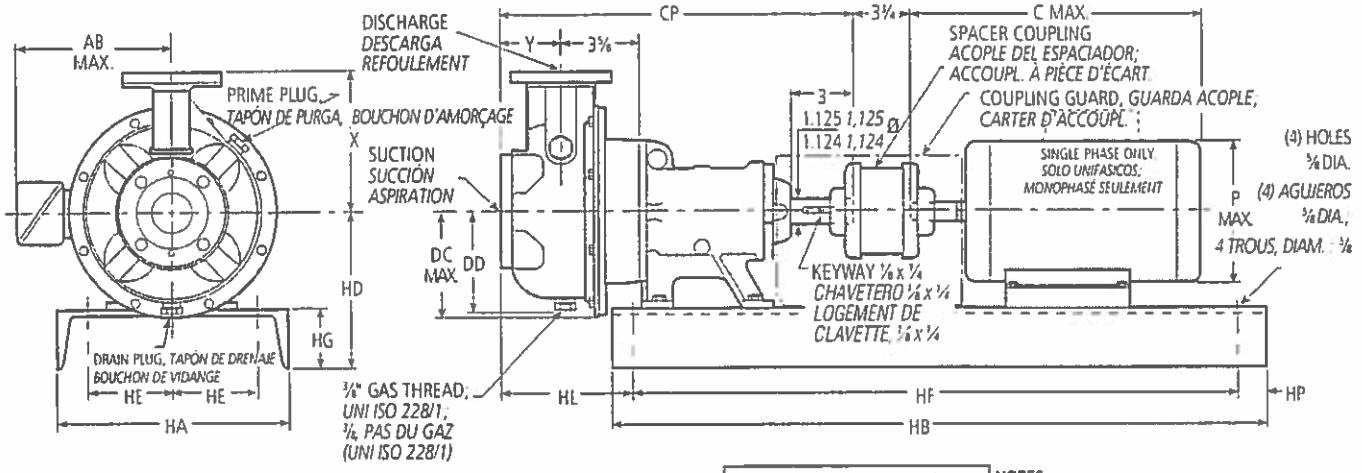
MATERIALS OF CONSTRUCTION

Item		Description	Material
Pump End Components	100 101 103 184 370	Casing Impeller Wear Ring Seal Housing Socket Head Cap Screw	AISI TYPE 316L Stainless Steel
	408	Drain plug – ¼ NPT	AISI TYPE 316 SS
	126	Shaft Sleeve	316 SS
	178	Impeller Key	Steel
	422	Impeller Stud	Steel
	199	Impeller Washer	316 SS
	412A	O-ring, impeller	BUNA-N
	412F	O-ring, shaft sleeve	BUNA-N
	513	O-Ring	BUNA-N
	383	Mechanical Seal Standard Part No. 10K13	Carbon/Ceramic BUNA-N Elastomers 316 SS Metal Parts
	383A	Spring Retainer	AISI Type 316SS
Power End Components	108 228 134	Adapter Bearing Frame Bearing Cover	Cast Iron ASTM A48 CL20
	122 168 112 136 370B 370C	Pump Shaft Ball Bearing (Inboard) Ball Bearing (Outboard) Retaining Ring Hex Head Cap Screw (Adapter to Bearing Frame) Hex Head Cap Screw (Bearing Frame to Cover)	Steel
	333A	Lip Seal	BUNA-N
	193	Grease Fitting	Steel
	123	V-Ring Deflector	BUNA-N

OPTIONAL MECHANICAL SEALS

John Crane Type 21 Mechanical Seals						
Item	Part No.	Rotary	Stationary	Elastomers	Metal Parts	Intended Duty
383 Options	10K19	Carbon	Ni-Resist	EPR	316 SS	Hi-Temperature
	10K25		Ni-Resist	Viton		Chemical
	10K27		Tungsten Carbide	EPR		Hi-Temperature Mild Abrasive

Channel Steel Bedplate, Clockwise Rotation Viewed from Drive End;
Fundación de Acero, Rotación en Dirección de las Agujas del Reloj Visto desde el Extremo del Motor;
Plaque de base profilée en U et rotation en sens horaire (vue de l'extrémité du moteur)



Dimensions and Weights – Determined by Pump,
Dimensiones y Pesos – Determinados por la Bomba;
Dimensions et poids – pompe

Pump, *Bomba, Pompe*		Suction ① *Succión ① Aspir.*	Discharge ① *Descarga ① Refoul.*	CP	DC Max., *DC Máx. DC max.*	DD	X	Y	Wt. (lbs.), *Peso (lib.) Poids*	Dimension "HL" Determined by Pump and Bedplate, *Dimensión "HL" determinada la bomba y el motor, Dimensions HL – pompe et plaque de base* Motor Frame Size, *Tamaño del bastidor del motor, Carcasse de moteur* 143/145	183/184	213/215	254/256	284/286
9SH	1 X 2–6	2	1	16⅜	5	4¼	6⅛	3¼	56	9⅛		7⅛		3⅛
10SH	1 X 2–8				5⅛	5⅛	7⅛		64					
11SH	1 X 2–10			17¼	6⅛	6⅛	8⅛		86	10		8½		4½
4SH	1½ X 2½–6	2½	1½	16½	5	4¼	6⅛	3¼	57	9¼		7¼		4
7SH	1½ X 2½–8			17¼	5⅛	5⅛	7⅛	4	66	10		8½		4¼
5SH	2 X 2½–6		2		5	4¼			57					
8SH	2 X 2½–8				6	5¼	7¹⁵⁄₁₆		68					
6SH	2½ X 3–6	3	2½						59					

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTES:
1. All pumps shipped in vertical discharge position. May be rotated in 90° increments. Tighten ⅛ – 16 casing bolts to 12 ft./lbs. torque.
2. Dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not to be used for construction purposes.

NOTAS:
1. Todas las bombas transportadas en posición de descarga vertical. Pueden rotarse en aumentos de 90°. Apretar ⅛ – 16 tornillos de carcasa a 12 pies/libras potencia.
2. Las dimensiones en pulgadas.
3. Las dimensiones puede que varíen con los fabricantes.
4. No para propósitos de construcción.

NOTA :
1. L'orifice de refoulement est orienté vers le haut. On peut le tourner de 90° en 90°. Serrer les vis ⅛ - 16 du corps de pompe à 12 lbf pi.
2. Les dimensions sont en pouces, et le poids en livres.
3. Les dimensions et le poids du moteur peuvent varier selon le fabricant.
4. Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.

Available Motor and Bedplate Dimensions and Weights,
Pesos y Dimensiones Disponibles de la Fundación y del Motor
Dimensions et poids – moteur et plaque de base

Motor Frame, *Armazón del Motor, Carcasse de moteur*	HP @ 3500 RPM, *HP a 3500 RPM, hp à 3 500 trimin*				HP @ 1750 RPM, *HP a 1750 RPM, hp à 1 750 trimin*				AB Max., *AB Máx., AB max.*	C Max., *C Máx., C max.*	P Max., *P Máx., P max.*	Wt. Max., *Peso Máx., Poids max.*	Bedplate Data, *Datos de la Fundación, Plaque de base*								
	Single Phase, *Monofásicos, 1 Ø*		Three Phase, *Trifásicas, 3 Ø*		Single Phase, *Monofásicos, 1 Ø*		Three Phase, *Trifásicas, 3 Ø*						HA	HB	HD*	HE	HF	HG	HP*	Wt. (lbs.), *Peso (libras), Poids*	Motor Shim, *Plancha de relleno del motor Cale de moteur*	Bearing Frame Shim *Plancha de relleno del bastidor del cojinete, Cale de palier*
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC														
143T					1	1	1	1	5¼	13⅜	6⅛	45	10	28	8	3¾	24	2¾	¼	48	1¼	–
145T	2	2	2 or ou 3	2	1½	1½	1½ or ou 2	1½ or ou 2		14½		53										
182T	3	3	5	3	2	2	3	3	5⅛	16⅛	7⅛	74										
184T	5	5	7½	5	3 or ou 5	3	5	3		18⅛		95										
213T			10	7½					7⅛	18	9⅛	116	12	31	8¼	4¼	29	3	1	65	–	–
215T			15	10						19¼		136										
254T			20	15					10⅛	21⅜	13	266	13	42	9¼	5¼	38½	4	1¼	110	–	1
256T			25	20						23¾		264										
284TS			30	25					12⅝	24¼	15	392	15	44	10½	5¾	40½	3½		124	–	1¾
286TS			40	30						26¼		432										

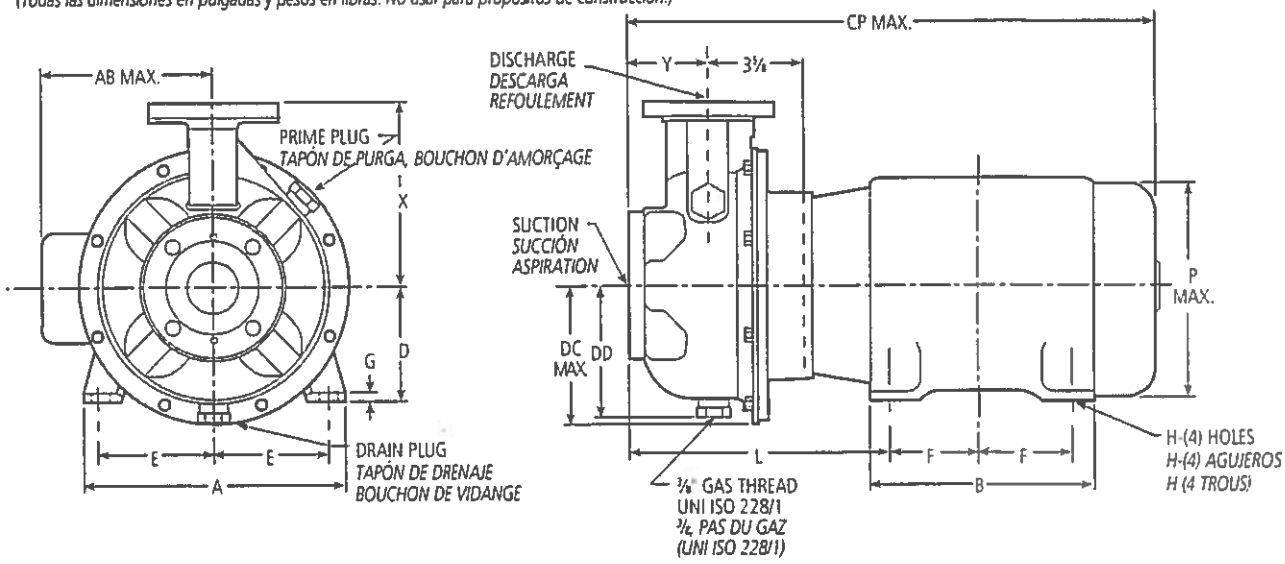
Dimensions and weights vary with manufacturers. Dimensions in inches and weights in lbs.
"HP" Dimensions at motor end only.
* "HD" Dimension for 254T/256T motor frame on 1 x 2-10 only is 11", A ¾" motor shim and a 1¼" bearing frame shim are required.

Dimensiones y pesos varían con los fabricantes. Dimensiones en pulgadas y pesos en libras.
Dimensiones "HP" sólo en el extremo del motor.
** La dimensión "HD" para el bastidor del motor 254T/256T de 1 x 2 - 10 es sólo 11", se requieren una cuña del motor de ¾" y una cuña del bastidor de apoyo de 1¼".*

ODP = carcasse abritée (à ouvertures de ventilation protégées) , TEFC = carcasse fermée autoventilée.
**Dimensions HP à l'extrémité du moteur seulement. La dimension HD pour la carcasse 254T ou 256T, version 1X2-10 seulement, est de 11 po ; une cale de moteur de ¾ po et une cale de palier de 1¼ po sont requises.*

SSH S-Group Close Coupled – Dimensions and Weights, *SSH Acople Cerrado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur moteur, groupe S*

(All dimensions in inches and weights in lbs. Do not use for construction purposes.)
(Todas las dimensiones en pulgadas y pesos en libras. No usar para propósitos de construcción.)



Dimensions "L" Determined by Pump and Motor, *Dimensiones "L" Determinadas por la Bomba y el Motor, Dimensions L – pompe et moteur*													
Pump, *Bomba, Pompe*		150 lb. Flange, *Brida de 150 lib., Bride, 150 lbfpo²*		CP Max., *CP Máx., CP max.*	DC Max., *DC Máx., DC max.*	DD	X	Y	Motor Frame Size, *Tamaño del Armazón del Motor, Carcasse de moteur*				Wt. (lbs.), *Pesos (libras), Poids*
		Suct. ① *Succ. ① Aspir.*	Disch. ① *Desc. ① Refoul.*						143/145	182/184	213/215	254/256	
9SH	1 x 2 – 6	2	1	25¾	5	4¼	6⅜	3⅛	9⅛	10¼	11¼	—	24
10SH	1 x 2 – 8				5⅜	5⅛	7⅛						32
11SH	1 x 2 – 10			27⅛	6¼	6⅜	8⅛	4	10½	11⅛	12⅛	12⅜	54
4SH	1½ x 2½ – 6	2½	1½	25½	5	4¾	6⅛	3¼	9¼	10⅜	11⅜	—	25
7SH	1½ x 2½ – 8			27⅞	5⅜	5⅛	7⅛	4	10½	11⅛	12⅛	12¾	34
5SH	2 x 2½ – 6		2		5	4¼	6⅛						25
8SH	2 x 2½ – 8				6	4¾	7 15/16						36
6SH	2½ x 3 – 6	3	2½										27

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:
1. Pumps shipped in vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten ¾ – 16 bolts to 12 ft./lbs., ⅞ – 14 bolts to 20 ft./lbs.
2. ALL dimensions in inches.
3. Motor dimensions may vary with motor manufacturer.
4. Not for construction purposes.

NOTA:
1. *Las bombas se transportarán en descarga vertical como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posicion deseada, y apretar ¾ – 16 tornillos a 12 pies/libras, ⅞ – 14 tornillos a 20 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *Las dimensiones puede que varíen con los fabricantes.*
4. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ¾ - 16 à 12 lbf pi et ⅞ - 14 à 20 lbf pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Dimensions Determined by JM Motor Frame, *Dimensiones Determinadas por el Armazón del Motor JM, Dimensions – carcasse de moteur JM*

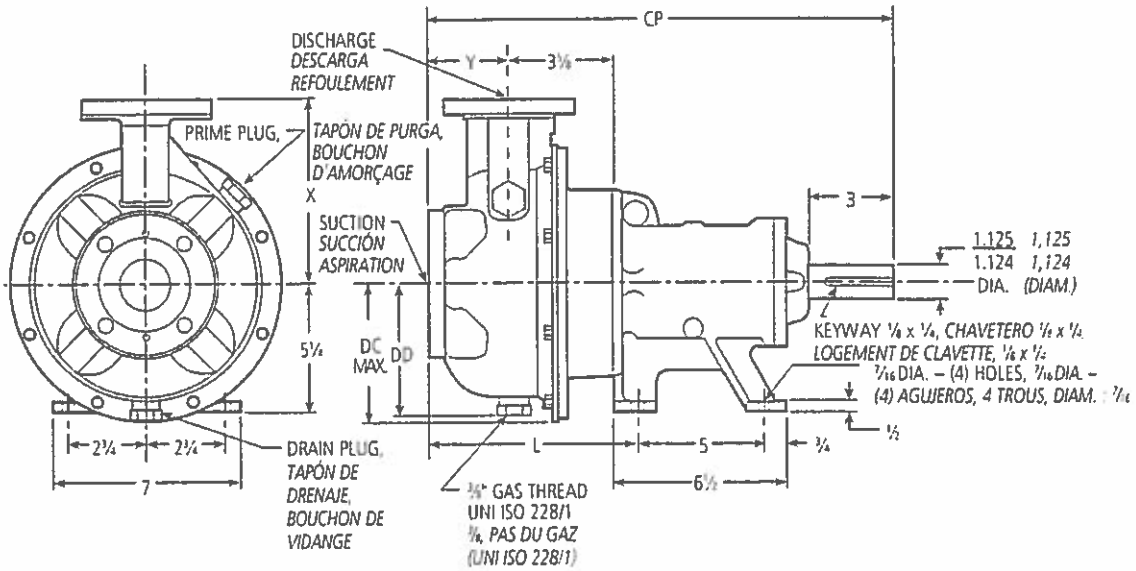
JM Frame, *JM Armazón, Carcasse*	A	AB	B	D	E	F	G	H Dia., *H Diám., H (diam.)*	P Max., *P Máx., P max.*	Motor Wt. (lbs.) *Peso Motor (lib.), Poids du moteur*
143JM	6½	5¼	6	3½	2¾	2	⅛	11/32	6⅝	41
145JM						2½				57
182JM	8½	5⅛	6½	4½	3¾	2¼	3/16	13/32	7⅛	77
184JM						2¼				97
213JM	9½	7⅛	8	5¼	4¼	2¼	7/32		9⅝	122
215JM						3½				155
254TCZ	11¼	9	9½	6¼	5	4⅛	¼	17/32	11½	265
256TCZ			11¼			5				320

Motor Frame Selections, *Selecciones del Armazón del Motor, Choix de carcasses de moteur*

Motor Frame, *Armazón del Motor, Carcasse*	Motor Horsepower, *Potencia del Motor, Puissance (hp)*							
	3500 RPM, *3500 RPM, 3 500 trimin*				1750 RPM, *1750 RPM, 1750 trimin*			
	1Ø, *Monofásicos 1 Ø*		3Ø, *Trifásicos 3 Ø*		1Ø, *Monofásicos 1 Ø*		3Ø, *Trifásicos 3 Ø*	
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC
143JM	–	–	–	–	–	–	1	1
145JM	2	2	2-3	2	1-1½	1-1½	1½-2	1½-2
182JM	3	3	5	3	2	2-3	3	3
184JM	5	5	7½	5	3	–	5	5
213JM	7½	–	10	7½	5	–	7½	7½
215JM	10	–	15	10-15	–	–	–	–
254TCZ	–	–	20	–	–	–	–	–
256TCZ	–	–	25	20-25	–	–	–	–

ODP = carcasse abritée (à ouvertures de ventilation protégées),
TEFC = carcasse fermée autoventilée.

SSH S-Group Frame-Mounted – Dimensions and Weights, *SSH Armazón Montado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur palier, groupe S*



Dimensions and Weights – Bare Pump Only,
Dimensiones y Pesos – Solamente Bomba,
Dimensions et poids – pompe nue seulement

Pump, *Bomba, Pompe*		150 lb. Flange, *Brida de 150 lib., Bride, 150 lb/po²*		DC Max., *DC Máx., DC max.*	DD	CP Max., *CP Máx., CP max.*	L	X	Y	Wt. (lbs.), *Peso (libras), Poids*
		Suction ① *Succión ① Aspir.*	Discharge *Descarga ① Refoul.*							
9SH	1 x 2 – 6	2	1	5	4¾	16¾	7¾	6⅛	3¼	56
10SH	1 x 2 – 8			5⅛	5⅛			7⅛		64
11SH	1 x 2 – 10			6⅛	6⅛	17¼	8½	8⅛	4	86
4SH	1½ x 2½ – 6	2½	1½	5	4¾	16½	7¾	6⅛	3¼	56
7SH	1½ x 2½ – 8			5⅛	5⅛	16½	8½	7⅛	4	64
5SH	2 x 2½ – 6		2	5	4¾					57
8SH	2 x 2½ – 8			6	5¼			6⅛		66
6SH	2½ x 3 – 6	3	2½							57

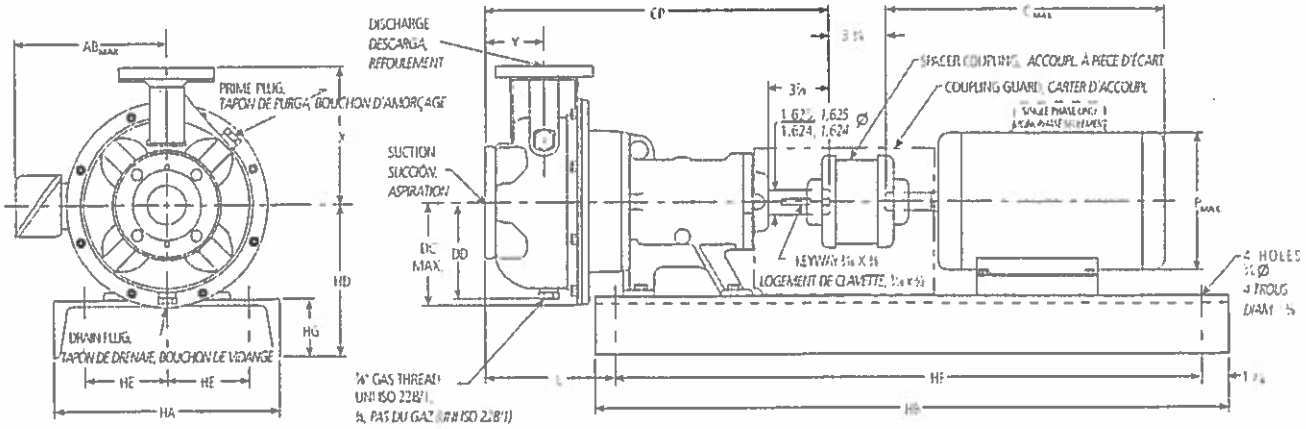
① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:
1. Pumps will be shipped with top vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten ⅜ –16 bolts to 12 ft./lbs., 7/16 – 14 bolts to 20 ft./lbs.
2. ALL dimensions in inches.
3. Not for construction purposes.

NOTA:
1. *Las bombas se transportarán con la descarga vertical superior como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras, 7/16 – 14 tornillos a 20 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ – 16 à 12 lbf·pi et 7/16 – 14 à 20 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Channel Steel Bedplate, Clockwise Rotation Viewed from Drive End;
Fundación de Acero, Rotación en Dirección de las Agujas del Reloj Visto desde el Extremo del Motor;
Plaque de base profilée en U et rotation en sens horaire (vue de l'extrémité du moteur)



Dimensions and Weights – Determined by Pump,
Dimensiones y Pesos – Determinados por la Bomba,
Dimensions et poids – pompe

Pump, *Bomba, Pompe*	Pump Size, *Tamaño de la Bomba, Dimensions*	① Suction *Succión Aspir.*	① Discharge *Descarga Refoul.*	CP	DC Max., *DC Máx., DC max.*	DD	L	X	Y	Wt. (lbs.), *Peso (libras), Poids*
24SH	1½ x 2 ½-10	2½	1½	23	6⅞	6⅛	10⅛	8¹⁵⁄₁₆	4	125
25SH	2 x 2½-10		2							125
22SH	2½ x 3-8	3	2½		6⅛	5⅞				125
27SH	2½ x 3-10				6⅞	6⅛		9¹⁵⁄₁₆		134
23SH	3 x 4-8	4	3	24			11⅛		5	136
28SH	3 x 4-10				7⅝	7⅛		11⅛		148

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTE:
1. Pumps will be shipped with top vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position and tighten ⅜ – 16 bolts to 12 ft./lbs.
2. ALL dimensions in inches.
3. Not for construction purposes.

NOTA:
1. *Las bombas se transportarán con la descarga vertical superior como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ - 16 à 12 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Available Motor and Bedplate Dimensions and Weights,
Pesos y Dimensiones Disponibles de la Fundación y del Motor,
Dimensions et poids – moteur et plaque de base

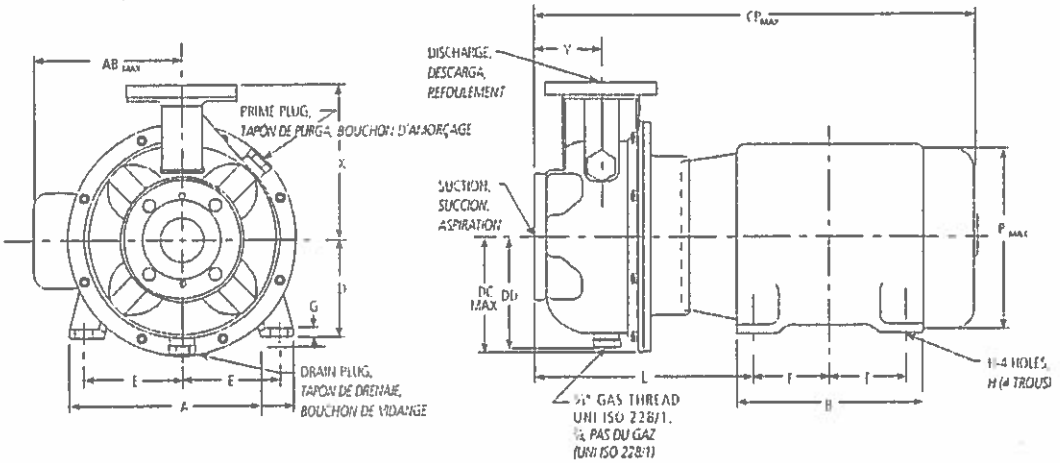
Motor Frame, *Armazón del Motor, Carcasse de moteur*	HP @ 3500 RPM, *hp à 3 500 tr/min*		HP @ 1750 RPM – T-Frame Only *hp à 1 750 tr/min – carc. T seulem.*				AB Max., *AB Máx., AB max.*	C Max., *C Máx., C max.*	P Max., *P Máx., P max.*	Wt. Max., *Peso Máx., Poids max.*	Bedplate Data, *Datos de la Fundación, Plaque de base*						
	Three Phase, *Trifásicos, 3 Ø*		Single Phase, *Monofásicos, 1 Ø*		Three Phase, *Trifásicos, 3 Ø*						HA	HB	HD	HE	HF	HG	Wt. (lbs.), *Peso (libras), Poids*
	ODP	TEFC	ODP	TEFC	ODP	TEFC											
184T			3 or ou 5	3	5	5	5⅞	18⅛	7⅛	95	13	42	10¼	5¼	38½	4	111
213T					7½	7½	7⅜	18	9⅝	116							
215T	15				10	10		19⅛		136							
254T	20	15			15	15	9½	21⅝	13	266							
256T	25	20			20	20		23⅜		264							
284TS/T	30	25			25	25	12⅝	24⅞	15	392	15	44	10½	5¾	40½	3½	124
286TS/T	40	30						26⅝		422							
324TS/T	50	40					14⅛	28¾	17⅜	592	18	48	12	7¼	44½	4	183
326TS/T	60	50						30¼		634							
364TS/T	75	60					15⅞	31⅝	18⅞	834			13				
365TS/T	100	75						32⅝		1000							
405TS/T		100					18	36¼	20½	1060	22	56	14	7¼	52½	4	214

Dimensions and weights vary with manufacturers. Dimensions in inches and weights in lbs
Dimensiones y pesos varían con los fabricantes. Dimensiones en pulgadas y pesos en libras.

ODP = carcasse abritée (à ouvertures de ventilation protégées) ; TEFC = carcasse fermée autoventilée.

SSH M-Group Close Coupled – Dimensions and Weights, *SSH Acople Cerrado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur moteur, groupe M*

(All dimensions in inches and weights in lbs. Do not use for construction purposes.)
(Todas las dimensiones en pulgadas y pesos en libras. No usar para propósitos de construcción.)



Dimensions "L" Determined by Pump and Motor, *Dimensiones "L" Determinadas por la Bomba y el Motor, Dimensions L – pompe et moteur*																
Pump, *Bomba, Pompe*	Pump Size, *Tamaño de la Bomba, Dimensions*	① Suction *Succión Aspir.*	① Discharge *Descarga Refoul.*	CP Max., *CP Máx., CP max.*	DC Max., *DC Máx., DC max.*	DD	X	Y	Wt. (lbs.), *Peso (libras), Poids*	Motor Frame Size, *Tamaño del Armazón del Motor, Carcasse de moteur*						
										140	180	210	250	280	320	360
24SH	1½ x 2 ½-10	2½	1½	34½	6⅞	6⅝	8 15/16	4	75	10½	11⅛	12⅛	13⅜		14⅜	-
25SH	2 x 2½-10		2	36					75							15
22SH	2½ x 3-8	3	2½		6⅛	5⅞			72	-						
27SH	2½ x 3-10				6⅞	6⅝	9 15/16		84	-	-					
23SH	3 x 4-8	4	3	37				5	86	11½	12⅛	13⅜	14⅞		15⅜	16
28SH	3 x 4-10				7⅛	7⅜	11⅛		98	-	-					

① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTES:
1. Pumps shipped in vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, and tighten ⅜ – 16 bolts to 12 ft./lbs., ⅞ – 14 bolts to 20 ft./lbs., ½ – 13 bolts to 35 ft./lbs.
2. Motor dimensions may vary with motor manufacturer.
3. Not for construction purposes.

NOTAS:
1. *Las bombas se transportarán en descarga vertical como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras, ⅞ – 14 tornillos a 20 pies/libras, ½ – 13 tornillos a 35 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ - 16 à 12 lbf·pi, ⅞ - 14 à 20 lbf·pi et ½ - 13 à 35 lbf·pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

Dimensions Determined by JM Motor Frame, *Dimensiones Determinadas por el Armazón del Motor JM, Dimensions – carcasse de moteur JM*

Frame, *Armazón, Carcasse*	A	AB Max., *AB max.*	B	D	E	F	G	H	P Max., *P Máx., P max.*
145JM	6½	5¼	6	3½	2¼	2½	⅛	11/32	7 5/16
182JM	8½	5⅞	6½	4½	3¾	2¼	3/16	13/32	8½
184JM						2¾			
213JM	9½	7⅜	8	5¼	4¼	3½	7/32		10 3/16
215JM									
254JM	11¼	9	11¾	6¼	5	4⅛	¼	17/32	13¼
256JM						5			
284JM	12¼	12¼	12¼	7	5½	4¾			15
286JM						5½			
324JM	14	13¼	14	8	6¼	5½	5/16	21/32	16 5/16
326JM						5½			
364TCZ	17¾	15½	15½	9	7	5⅝	1		19
365TCZ						6⅛			

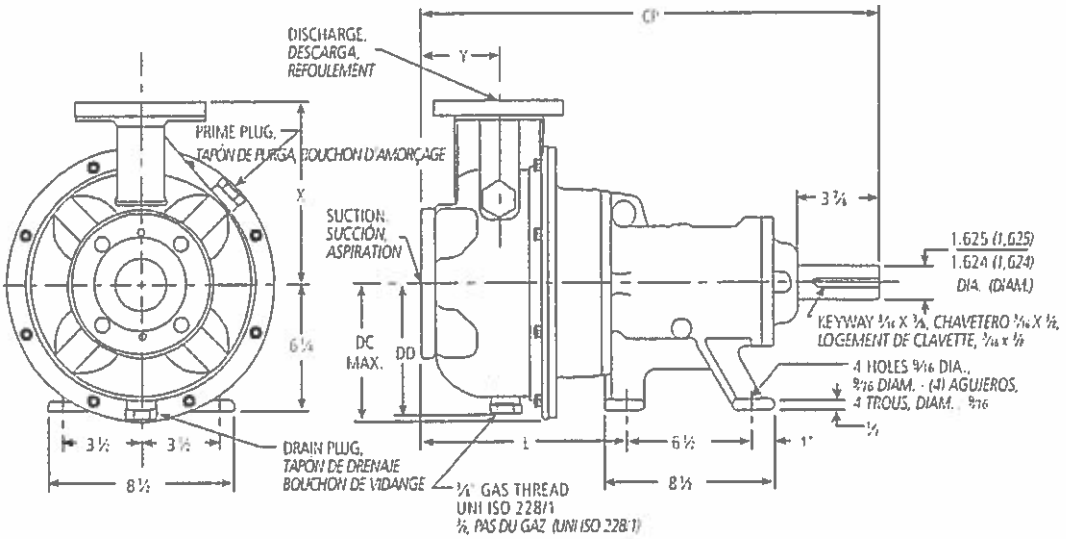
364TCZ and 365TCZ frames are built with 326JM shaft extensions.
Dimensions may vary with manufacturer.;
Los armazones 364TCZ y 365TCZ se construyen con extensiones del eje 326JM.
Las dimensiones puede que varíen con los fabricantes.;
Les carcasses 364TCZ et 365TCZ possèdent la rallonge d'arbre de la 326JM.

Motor Frame Selections, *Selecciones del Armazón del Motor, Choix de carcasses de moteur*

Frame, *Armazón, Carcasse*	Motor Horsepower, *Potencia del Motor, Puissance (hp)*						Wt. Max., *Peso Máx., Poids max.*
	3500 RPM, *3500 r/min*		1750 RPM, *1750 r/min*				
	3 PH, *Trifásicos, 3 Ø*		1 PH, *Monofásicos, 1 Ø*		3 PH, *Trifásicos, 3Ø*		
	ODP	TEFC	ODP	TEFC	ODP	TEFC	
145JM	–	–	–	–	2	2	57
182JM	–	–	2	2, 3	3	3	77
184JM	–	–	3	–	5	5	97
213JM	10	–	5	–	7½	7½	141
215JM	15	10	–	–	10	10	155
254JM	20	15	–	–	15	15	265
256JM	25	20	–	–	20	20	320
284JM	30	25	–	–	25	25	419
286JM	40	30	–	–	–	–	422
324JM	50	40	–	–	–	–	562
326JM	60	50	–	–	–	–	625
364TCZ	75	60	–	–	–	–	775
365TCZ	100	75, 100	–	–	–	–	905

364TCZ and 365TCZ frames are built with 326JM shaft extensions.
Los armazones 364TCZ y 365TCZ se construyen con extensiones del eje 326JM.
ODP = carcasse abritée (à ouvertures de ventilation protégées) ; TEFC = carcasse fermée autoventilée. Les carcasses 364TCZ et 365TCZ possèdent la rallonge d'arbre de la 326JM.

SSH M-Group Frame Mounted – Dimensions and Weights, *SSH Armazón Montado – Dimensiones y Pesos, Dimensions et poids – SSH montée sur palier, groupe M*



Dimensions and Weights – Bare Pump Only,
Dimensiones y Pesos – Solamente Bomba
Dimensions et poids – pompe nue seulement

Pump, *Bomba, Pompe*	Pump Size, *Tamaño de la Bomba, Dimensions*	① Suction *Succión Aspir.*	① Discharge *Descarga Refoul.*	CP	DC Max., *DC Máx., DC max.*	DD	L	X	Y	Wt. (lbs.), *Peso (libras), Poids*
24SH	1½ x 2 ½-10	2½	1½	23	6⅞	6⅝	10½	8 15/16	4	125
25SH	2 x 2½-10		2							125
22SH	2½ x 3-8	3	2½		6⅛	5⅞				125
27SH	2½ x 3-10									134
23SH	3 x 4-8	4	3	24	6⅜	6½	11½	9 15/16	5	136
28SH	3 x 4-10				7⅛	7⅜		11⅛		148

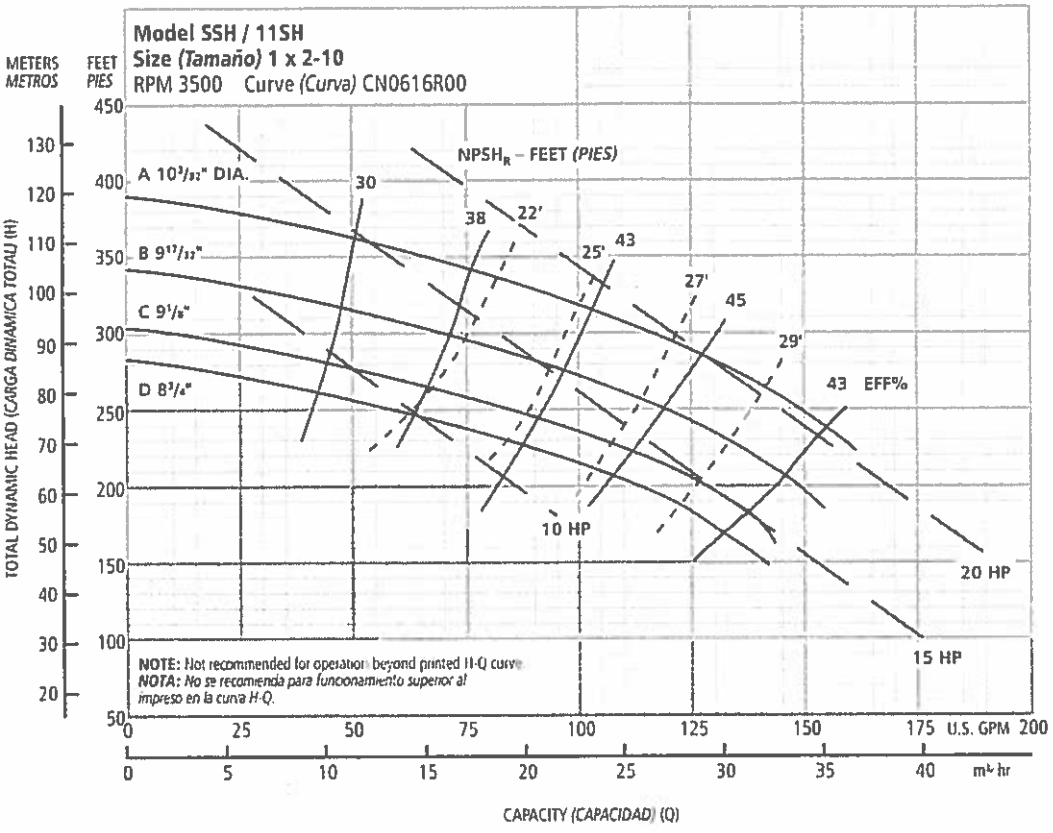
① For use with ANSI class 150 mating flanges.
Para usar con bridas que casan ANSI clase 150.
À utiliser avec des contre-brides ANSI, classe 150.

NOTES:
1. Pumps will be shipped with top vertical discharge as standard. For other orientations, remove casing bolts, rotate discharge to desired position, replace and tighten ⅜–16 bolts to 12 ft./lbs.
2. Motor dimensions may vary with motor manufacturer.
3. Not for construction purposes.

NOTAS:
1. *Las bombas se transportarán con la descarga vertical superior como estándar. Para otras orientaciones, retirar los tornillos de la carcasa, rotar la descarga a la posición deseada, y apretar ⅜ – 16 tornillos a 12 pies/libras.*
2. *TODAS las dimensiones en pulgadas.*
3. *No para propósitos de construcción.*

NOTA :
1. *L'orifice de refoulement est orienté vers le haut. Pour l'orienter autrement, enlever les vis de fixation du corps de pompe, placer l'orifice dans le sens voulu, puis reposer et serrer les vis ⅜ – 16 à 12 lbf pi.*
2. *Les dimensions sont en pouces, et le poids, en livres.*
3. *Les dimensions et le poids du moteur peuvent varier selon le fabricant.*
4. *Ne pas utiliser les dimensions pour la construction si elles ne sont pas certifiées à cette effet.*

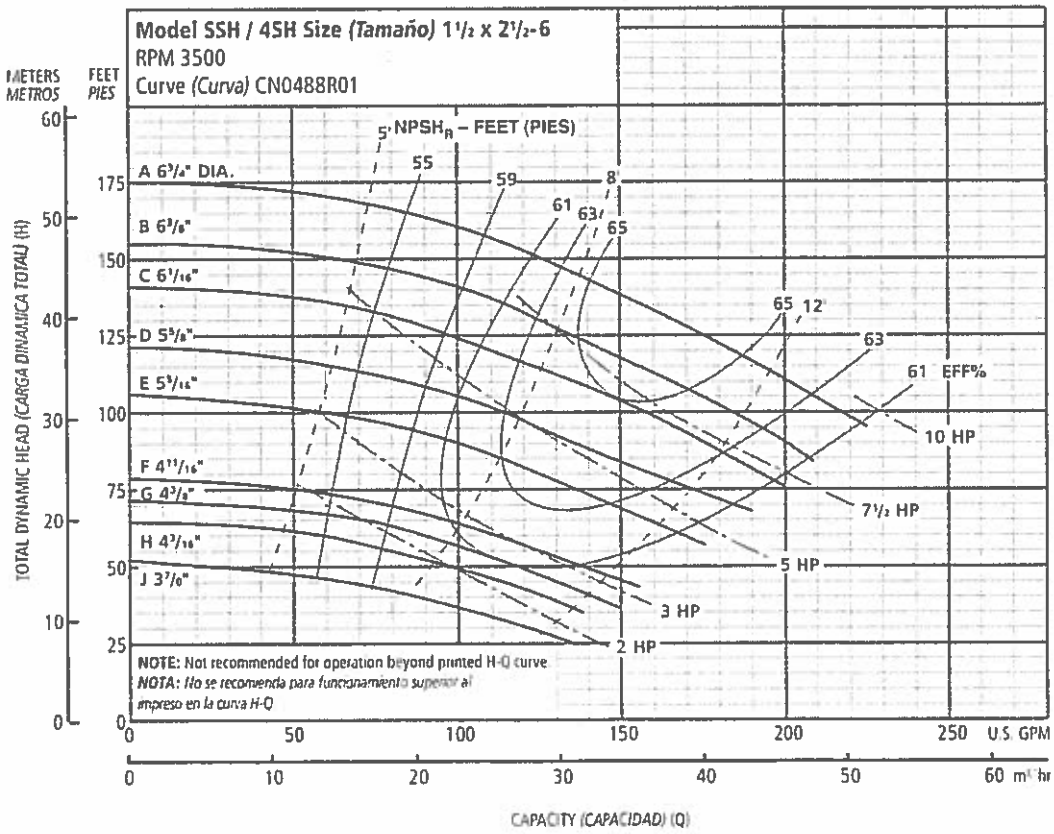
Performance Curves – 60 Hz, 3500 RPM
Curvas de Funcionamiento – 60 Hz, 3500 RPM



Optional Impeller, *Impulsor Opcional*		
Impeller Code, *Código del Impulsor*	Dia., *Diá.*	Standard HP Rating, *Estándar HP Potencia*
A	10 3/32"	20
B	9 17/32	15
C	9 1/8	15
D	8 3/4	15

NOTE: Pump will pass a sphere to 1/4" diameter.

NOTA: La bomba pasará una esfera a 1/4" diámetro.



Optional Impeller, *Impulsor Opcional*		
Impeller Code, *Código del Impulsor*	Dia., *Diá.*	Standard HP Rating, *Estándar HP Potencia*
A	6 3/4"	10
B	6 3/8	7 1/2
C	6 1/16	7 1/2
D	5 5/8	5
E	5 5/16	5
F	4 11/16	3
G	4 3/8	3
H	4 3/16	2
J	3 7/8	2

NOTE: Pump will pass a sphere to 3/16" diameter.

NOTA: La bomba pasará una esfera a 3/16" diámetro.

GOULDS PUMPS

Wastewater Pumps
Dewatering, Effluent and Sewage
Installation and Operation Manual

Owner's Information

Pump Model Number: _____

Pump Serial Number: _____

Control Model Number: _____

Dealer: _____

Dealer Phone No. _____

Date of Purchase: _____ Installation: _____

Current Readings at Startup:

1Ø	3Ø	L1-2	L2-3	L3-1
Amps: _____	Amps: _____	_____	_____	_____
Volts: _____	Volts: _____	_____	_____	_____

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Goulds Pumps

ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a SAFETY ALERT SYMBOL. When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that WILL cause serious personal injury, death or major property damage.

⚠ WARNING Warns of hazards that CAN cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that CAN cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

⚠ WARNING All electrical work must be performed by a qualified technician. Always follow the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer's installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, provide unsatisfactory performance, and may void manufacturer's warranty.

⚠ WARNING Standard units are not designed for use in swimming pools, open bodies of water, hazardous liquids, or where flammable gases exist. These fluids and gases may be present in containment areas. Tank or wetwell must be vented per local codes.

Only pumps specifically Listed for Class 1, Division 1 are allowable in hazardous liquids and where flammable gases may exist. *See specific pump catalog bulletins or pump nameplate for all agency Listings.*

⚠ WARNING Disconnect and lockout electrical power before installing or servicing any electrical equipment. Many pumps are equipped with automatic thermal overload protection which may allow an overheated pump to restart unexpectedly.

⚠ CAUTION All three phase (3Ø) control panels for submersible pumps must provide Class 10, quick-trip, overload protection.

PRE-INSTALLATION CHECKS

Open all cartons and inspect for shipping damage. Report any damage to your supplier or shipping carrier immediately.

Important: Always verify that the pump nameplate Amps, Voltage, Phase, and HP ratings match your control panel and power supply.

Many of our sewage pumps are oil-filled. If there are any signs of oil leakage or if the unit has been stored for an extended period check the oil level in the motor dome and the seal housing, if so equipped.

Check the motor cover oil level through the pipe plug on top of the unit. The motor chamber oil should just cover the motor. Do not overfill, leave room for expansion!

To check the seal housing oil level, where used, lay the unit on its side with the fill plug at 12 o'clock. Remove the plug. The oil should be within ½" (13mm) of the top. If low, refill with an ASTM 150 turbine oil. Replace the plug.

Oil is available in 5 gallon cans through our distributors. You can also source oil locally at motor repair shops. Typical oil brands are: Shell Turbo 32, Sunoco Sunvis 932, Texaco Regal R&O 32, Exxon Nuto 32 and Mobil DTE Light.

Check the strain relief nut on power cable strain assemblies. Power cables should be torqued to 75 in. lbs. for #16 cables and 80 in. lbs. for all other cable assemblies. Seal/heat sensor cables, where used, should be torqued to 75 in. lbs.

Warranty does not cover damage caused by connecting pumps and controls to an incorrect power source (voltage/phase supply).

Record the model numbers and serial numbers from the pumps and control panel on the front of this instruction manual for future reference. Give it to the owner or affix it to the control panel when finished with the installation.

LIFTING OF PUMP

⚠ WARNING



DO NOT LIFT, CARRY OR HANG PUMP BY THE ELECTRICAL CABLES. DAMAGE TO THE ELECTRICAL CABLES CAN CAUSE SHOCK, BURNS OR DEATH.

Lift the pump with an adequately sized chain or cable attached to the lifting eye bolt. DO NOT damage electrical and sensor cables while raising and lowering unit.

OPTIONAL GUIDE RAIL OR LIFT-OUT SYSTEM

In many effluent and sewage basins or lift stations it is advisable to install the pump on a guide rail system or on a lift-out adapter to facilitate installation and removal for inspection and/or service. Most codes do not allow personnel to enter a wetwell without the correct protective equipment and training. Guide rails are designed to allow easy removal of the pump without the need for entry into the wetwell or need to disturb piping. The guide rail or lift-out adapter should locate the pump opposite the influent

opening preventing stagnate areas where solids can settle. The basin or pit must be capable of supporting the weight of the pump and guide rail. The pit floor must be flat.

NOTICE: FOLLOW THE INSTRUCTIONS THAT ARE PROVIDED WITH THE GUIDE RAIL ASSEMBLY.

PIPING

Discharge piping should be no smaller than the pump discharge diameter and kept as short as possible, avoiding unnecessary fittings to minimize friction losses.

Install an adequately sized check valve matched to the solids handling capability of the pump to prevent fluid backflow. Backflow can allow the pump to "turbine" backwards and may cause premature seal and/or bearing wear. If the pump is turning backwards when it is called on to start the increased torque may cause damage to the pump motor and/or motor shaft and some single-phase pumps may actually run backwards.

Install an adequately sized gate valve AFTER the check valve for pump, plumbing and check valve maintenance.

Important – Before pump installation. Drill a 3/16" (4.8mm) relief hole in the discharge pipe. It should be located within the wetwell, 2" (51mm) above the pump discharge but below the check valve. The relief hole allows any air to escape from the casing. Allowing liquid into the casing will insure that the pump can start when the liquid level rises. Unless a relief hole is provided, a bottom intake pump could "air lock" and will not pump water even though the impeller turns.

All piping must be adequately supported, so as not to impart any piping strain or loads on the pump.

The pit access cover must be of sufficient size to allow for inspection, maintenance and crane or hoist service.

WIRING AND GROUNDING

Important notice: Read Safety Instructions before proceeding with any wiring.

⚠ Use only stranded copper wire to pump/motor and ground. The ground wire must be at least as large as the power supply wires. Wires should be color coded for ease of maintenance and troubleshooting.

⚠ Install wire and ground according to the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes.

⚠ Install an all leg disconnect switch where required by code.

⚠ Disconnect and lockout electrical power before performing any service or installation.

⚠ The electrical supply voltage and phase must match all equipment requirements. Incorrect voltage or phase can cause fire, motor and control damage, and voids the warranty.

⚠ All splices must be waterproof. If using splice kits follow manufacturer's instructions.

⚠ WARNING Select the correct type and NEMA grade junction box for the application and location. The junction box must insure dry, safe wiring connections.

⚠ WARNING Seal all controls from gases present which may damage electrical components.

⚠ WARNING Hazardous voltage

FAILURE TO PERMANENTLY GROUND THE PUMP, MOTOR AND CONTROLS BEFORE CONNECTING TO POWER CAN CAUSE SHOCK, BURNS OR DEATH.

SELECTING AND WIRING PUMP CONTROL PANELS AND SWITCHES

FLOAT SWITCH TYPES

There are two basic float switch designs; single-action and wide-angle. Single-action switches operate over a range of 15° so they open and close quickly. Wide-angle floats operate over a 90° swing with the tether length between the float body and the pivot point controlling the On-Off range. The design determines how many floats are required with different systems or controls.

Floats may be normally open (NO) for pump down applications or to empty a tank. Normally closed (NC) switches are used to pump up or to fill a tank.

A single-action control switch may be used only with a control panel, never direct connected to a pump.

The wide-angle, pump down switches may be used as direct connected pump switches or as control switches.

SETTING THE FLOAT SWITCHES

There are no absolute rules for where to set the float switches, it varies from job to job.

Suggested Rules to Follow:
All floats should be set below the Inlet pipe!

Off Float: Best: set so the water level is always above the top of the pump (motor dome). **Next Best:** set so the water level is not more than 6" below the top of the pump.

On Float: set so the volume of water between the On and Off floats allows pumps of 1½ HP and under to operate for 1 minute minimum. Two (2) HP and larger pumps should run a minimum of 2 minutes. Basin literature states the gallons of storage per inch of basin height.

Lag/Alarm Float(s): should be staggered above the Off and On floats. Try to use most of the available storage provided by the basin, save some space for reserve storage capacity. *See Diagrams and Charts in Float Switch Chart Section.*

PANEL WIRING DIAGRAMS

Our control panels are shipped with instructions and wiring diagrams. Use those instructions in conjunction with this IOM. Electrical installation should be performed only by qualified technicians. Any problem or questions pertaining to another brand control must be referred to that control supplier or manufacturer. Our technical people have no technical schematics or trouble shooting information for other companies' controls.

ALARMS

We recommend the installation of an alarm on all Wastewater pump installations. Many standard control panels come equipped with alarm circuits. If a control panel is not used, a stand alone high liquid level alarm is available. The alarm alerts the owner of a high liquid level in the system so they can contact the appropriate service personnel to investigate the situation.

SINGLE PHASE PUMPS

Single phase (1Ø) pumps may be operated using a piggyback or hard wired float switch, a contactor, or a Simplex or Duplex control panel. *See Figures 1, 2 and 5.*

All 1/3 and 1/2 HP, 115 or 230 volt pumps, and some 3/4 and 1 HP pumps, are supplied with plug style power cords. They may be plugged into piggyback float switches for simple installations. It is allowable to remove the plugs in order to hardwire or connect to a Simplex or Duplex controller. Removing the plug neither voids the warranty nor violates the agency Listings. *See Figure 5.*



PLUG-CONNECTED UNITS MUST BE CONNECTED TO A PROPERLY GROUNDED, GROUNDING TYPE RECEPTACLE.

ON NON-PLUG UNITS, DO NOT REMOVE CORD AND STRAIN RELIEF. DO NOT CONNECT CONDUIT TO PUMP.

Pumps with bare lead power cords can be hard-wired to a float switch, wired to a 1Ø contactor, a Simplex controller or a Duplex controller. Always verify that the float switch is rated for the maximum run amperage, maximum starting amperage, and the HP rating on the pump. Single-phase wastewater pumps contain on-winding overloads, unless noted on the pump nameplate. *See Figures 1 and 2.*

THREE PHASE PUMPS:

As a Minimum a 3Ø pump requires a 3 pole circuit breaker/fused circuit, an across the line magnetic starter rated for the pump HP, and ambient compensated Quick Trip Class 10 overloads.

SINGLE AND THREE PHASE CONTROL PANELS:

Control panels are available as Simplex (controls 1 pump) or Duplex (controls 2 pumps). Our standard SES Series Panels are available with many standard features and can be built with our most popular options. We also custom build panels which offer many more design options than the SES panels. Custom control panels are available in many different configurations. Custom panel quote requests may be forwarded to Customer Service through any authorized distributor.

Our "SES" Duplex panels feature a solid-state printed circuit board design with standard high level alarm circuits. Other standard features are: an auxiliary dry alarm contact for signaling a remote alarm and float switch position indicator lights. Our 3Ø panels have built-in, adjustable, Class 10 overloads. The adjustable overloads on all our 3Ø panels mean less labor for the installer and no need to order specific overloads. Most SES panels are in stock for immediate delivery.

On pumps equipped with seal fail and/or heat (high temperature) sensors it is recommended that you use our control panel with the appropriate options. The pump sensors do not function without a seal fail relay or terminal connection in the control panel and a warning device such as a bell, horn or light.

Seal Failure Circuit - Some dual seal pumps are equipped with a standard, built-in seal failure circuit, which may also be called a moisture detection circuit. This circuit must be connected to a control panel with an optional seal fail relay. The panel must be special ordered with the seal fail relay and alarm. There are also stand alone seal fail panels such as the A4-3 or A4-4 available as standard items. The pumps can be identified by an extra control cable exiting the motor cover. The cable contains two wires, a black wire, connects to panel "terminal" going to "probe"; and a white wire, connects to the panel "terminal" going to the relay ground. Do not connect to the panel ground screw. Follow the wiring instructions supplied with the panel.

Heat Sensor and Seal Failure Circuit - Some pumps are equipped with a seal fail and normally closed, on-winding high temperature thermostats (heat sensors). The pumps have a control cable with four (4) leads, black (probe) and green (relay ground) for the seal fail circuit and red and white for the high temperature circuit. Connect the high temperature (heat sensor) circuit to the panel terminal strip as indicated on the panel drawing using the red and white wires. The high temperature panel circuit is also an optional item which you must specifically order when you order your control panel. The high temperature circuit is different from the Class 10 overloads which are always required on three phase pumps. *Follow the wiring instructions supplied with the panel.*

INSTALLATION

Connect the pump(s) to the guide rail pump adapters or to the discharge piping. Slide rail bases should be anchored to the wetwell floor.

Complete all wiring per the control panel wiring diagrams and NEC, Canadian, state, provincial and/or local codes. This a good time to check for proper rotation of the motors/impellers.



DO NOT PLACE HANDS IN PUMP SUCTION WHILE CHECKING MOTOR ROTATION. TO DO SO WILL CAUSE SEVERE PERSONAL INJURY.

Always verify correct rotation. Correct rotation is indicated on the pump casing. Three phase motors are reversible. It is allowable to bump or jog the motor for a few seconds to check impeller rotation. It is easier to check rotation before installing the pump. Switch any two power leads to reverse rotation.

Lower the pump(s) into the wetwell.

Check to insure that the floats will operate freely and not contact the piping.

OPERATION

Once the piping connections are made and checked you can run the pumps.

Piggyback Switch Operation – Plug the piggyback switch into a dedicated grounded outlet and then plug the pump into the switch. Test the pump by filling the wetwell until the pump goes On. If the pumps run but fail to pump, they are probably air locked, drill the relief holes per the instructions in the Piping Section.

Check the operating range to insure a minimum one minute run time and that the pump goes Off in the correct position.

Control Panel Operation – Fill the wetwell with clear water.

Use the pump H-O-A (Hand-Off-Automatic) switches in Hand to test the pumps. If they operate well in Hand proceed to test Automatic operation. If the pumps run but fail to pump, they are probably air locked, drill the relief holes per the instructions in the Piping Section.

Place Control Panel switch(es) in Automatic position and thoroughly test the operation of the ON, OFF, and Alarm floats by filling the wetwell with clear water. **Important:** Failure to provide a Neutral from the power supply to a 10, 230 volt Control Panel will not allow the panel control circuit to operate. The Neutral is necessary to complete the 115 volt control circuit.

Check voltage and amperage and record the data on the front of this manual for future reference. Compare the amperage readings to the pump nameplate maximum amperage. If higher than nameplate amperage investigate cause. Operating the pump off the curve, i.e. with too little head or with high or low voltage will increase amperage. The motor will operate properly with voltage not more than 10% above or below pump nameplate ratings. Performance within this range will not necessarily be the same as the published performance at the exact rated nameplate frequency and voltage. Correct the problem before proceeding. Three phase unbalance is also a possible cause. *See Three Phase Power Unbalance and follow the instructions.*

Reset the Alarm circuit, place pump switch(es) in the Automatic position and Control Switch in ON position. The system is now ready for automatic operation.

Explain the operation of the pumps, controls and alarms to the end user. Leave the paperwork with the owner or at the control panel if in a dry, secure location.

FLOAT SWITCH AND PANEL CHART

The purpose of this chart is to show the required switch quantities and the function of each switch in a typical wastewater system. The quantities required vary depending on the switch type, single-action or wide-angle. Switch quantities also vary by panel type: simplex with and without alarms, and duplex with alarms.

Duplex Panels using single-action switches:

Three Float Panel Wiring

SW1	Bottom	Pumps Off
SW2	Middle	1st Pump On
SW3	Top	2nd Pump & Alarm On

Four Float Panel Wiring ②

SW1	Bottom	Pumps Off
SW2	2nd	1st Pump On
SW3	3rd	2nd Pump On
SW4	Top	Alarm On

Duplex Panels using wide-angle switches:

Three Float Panel Wiring

SW1	Bottom	1st Pump On/Both Off
SW2	Top	2nd Pump & Alarm On

Four Float Panel Wiring

SW1	Bottom	1st Pump On/Both Off
SW2	Middle	2nd Pump On
SW3	Top	Alarm On

Simplex Panel using single-action switches:

Simplex Panel with Alarm ①

SW1	Bottom	Pump Off
SW2	Middle	Pump On
SW3	Top	Alarm On/Off

Simplex Panel with No Alarm

SW1	Bottom	Pump Off
SW2	Top	Pump On

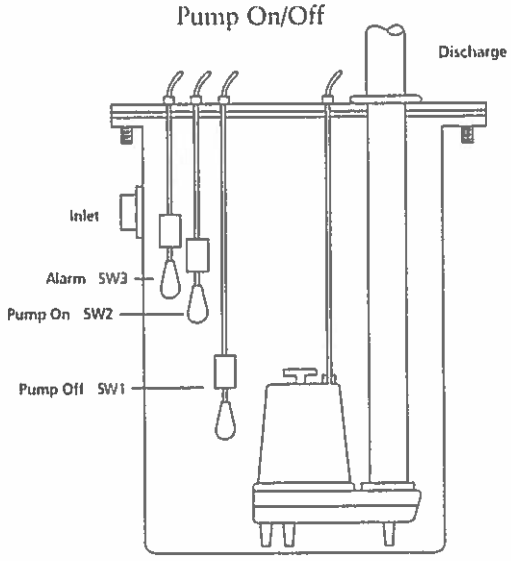
Simplex Panel using wide-angle switches:

Simplex Panel with Alarm

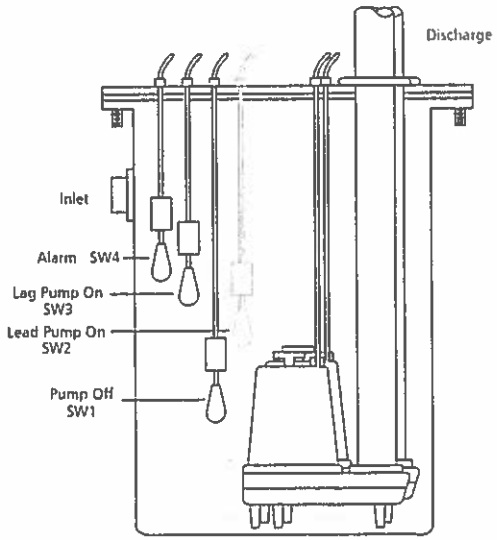
SW1	Bottom	Pump On/Off
SW2	Top	Alarm On/Off

Simplex Panel with No Alarm

SW1	Pump On/Off



Simplex ①



Duplex ②

THREE PHASE POWER UNBALANCE

A full three phase supply consisting of three individual transformers or one three phase transformer is recommended. "Open" delta or wye connections using only two transformers can be used, but are more likely to cause poor performance, overload tripping or early motor failure due to current unbalance.

Check the current in each of the three motor leads and calculate the current unbalance as explained below.

If the current unbalance is 2% or less, leave the leads as connected.

If the current unbalance is more than 2%, current readings should be checked on each leg using each of the three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.

To calculate percent of current unbalance:

A. Add the three line amp values together.

B. Divide the sum by three, yielding average current.

C. Pick the amp value which is furthest from the average current (either high or low).

D. Determine the difference between this amp value (furthest from average) and the average.

E. Divide the difference by the average. Multiply the result by 100 to determine percent of unbalance.

Current unbalance should not exceed 5% at service factor load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the power source.

Contact your local power company to resolve the imbalance.

	Hookup 1			Hookup 2			Hookup 3		
Starter Terminals	L1	L2	L3	L1	L2	L3	L1	L2	L3
	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T	⊥ T
Motor Leads	R	B	W	W	R	B	B	W	R
	T3	T1	T2	T2	T3	T1	T1	T2	T3

Example:

T3-R = 51 amps	T2-W = 50 amps	T1-B = 50 amps
T1-B = 46 amps	T3-R = 48 amps	T2-W = 49 amps
T2-W = 53 amps	T1-B = 52 amps	T3-R = 51 amps
Total = 150 amps	Total = 150 amps	Total = 150 amps
÷ 3 = 50 amps	÷ 3 = 50 amps	÷ 3 = 50 amps
— 46 = 4 amps	— 48 = 2 amps	— 49 = 1 amps
4 ÷ 50 = .08 or 8%	2 ÷ 50 = .04 or 4%	1 ÷ 50 = .02 or 2%

INSULATION RESISTANCE READINGS

Normal Ohm and Megohm Values between all leads and ground

Condition of Motor and Leads	Ohm Value	Megohm Value
A new motor (without drop cable).	20,000,000 (or more)	20 (or more)
A used motor which can be reinstalled in well.	10,000,000 (or more)	10 (or more)
Motor in well. Readings are for drop cable plus motor.		
New motor.	2,000,000 (or more)	2 (or more)
Motor in good condition.	500,000 - 2,000,000	.5 - 2
Insulation damage, locate and repair.	Less than 500,000	Less than .5

Insulation resistance varies very little with rating. Motors of all HP, voltage and phase ratings have similar values of insulation resistance.

Insulation resistance values above are based on readings taken with a megohmmeter with a 500V DC output. Readings may vary using a lower voltage ohmmeter, consult factory if readings are in question.

This table was reprinted through the courtesy of Franklin Electric.

Engineering data for specific models may be found in your catalog and on our website (address is on the cover).

Control panel wiring diagrams are shipped with the control panels. Please use the control panel drawings in conjunction with this instruction manual to complete the wiring.

PUMP CONSTRUCTION	
Minimum Submergence	
Continuous Duty	Fully Submerged
Intermittent Duty	6" Below Top of Motor

Maximum Fluid Temperature	
Continuous Operation	104° F 40° C
Intermittent Operation	140° F 60° C

Pumpmaster and Pumpmaster Plus - Hard Wired

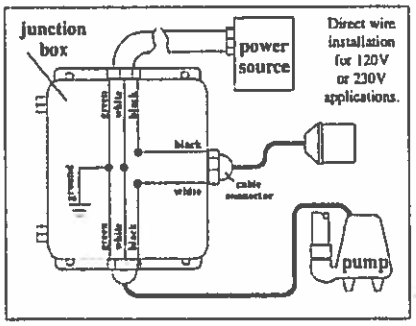


Fig. 1

Single-Action Float Switch "Typical" Installation

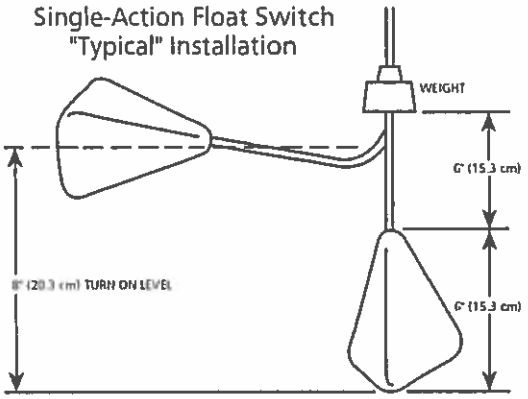


Fig. 4

Double Float - Hard Wired

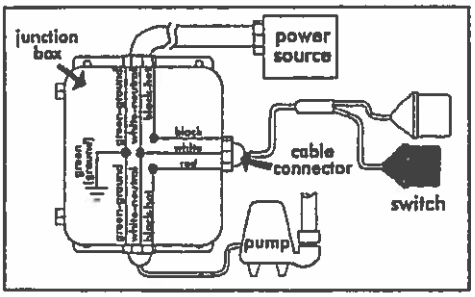


Fig. 2

Wide-Angle Float Switch

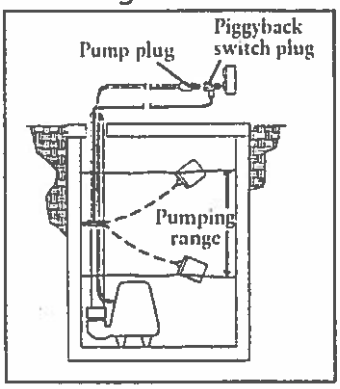


Fig. 5

Determining Pumping Range

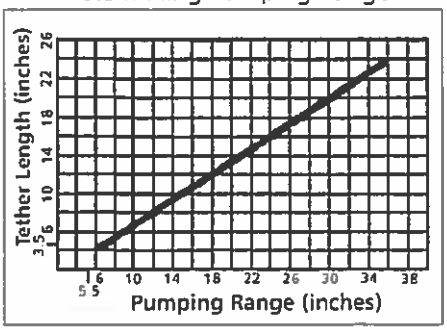


Fig. 3

Three Phase Connection Diagram

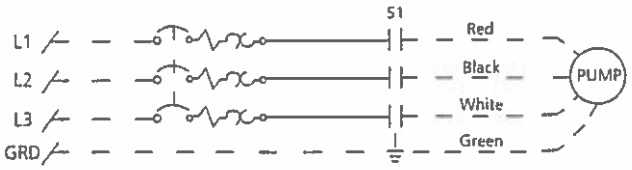
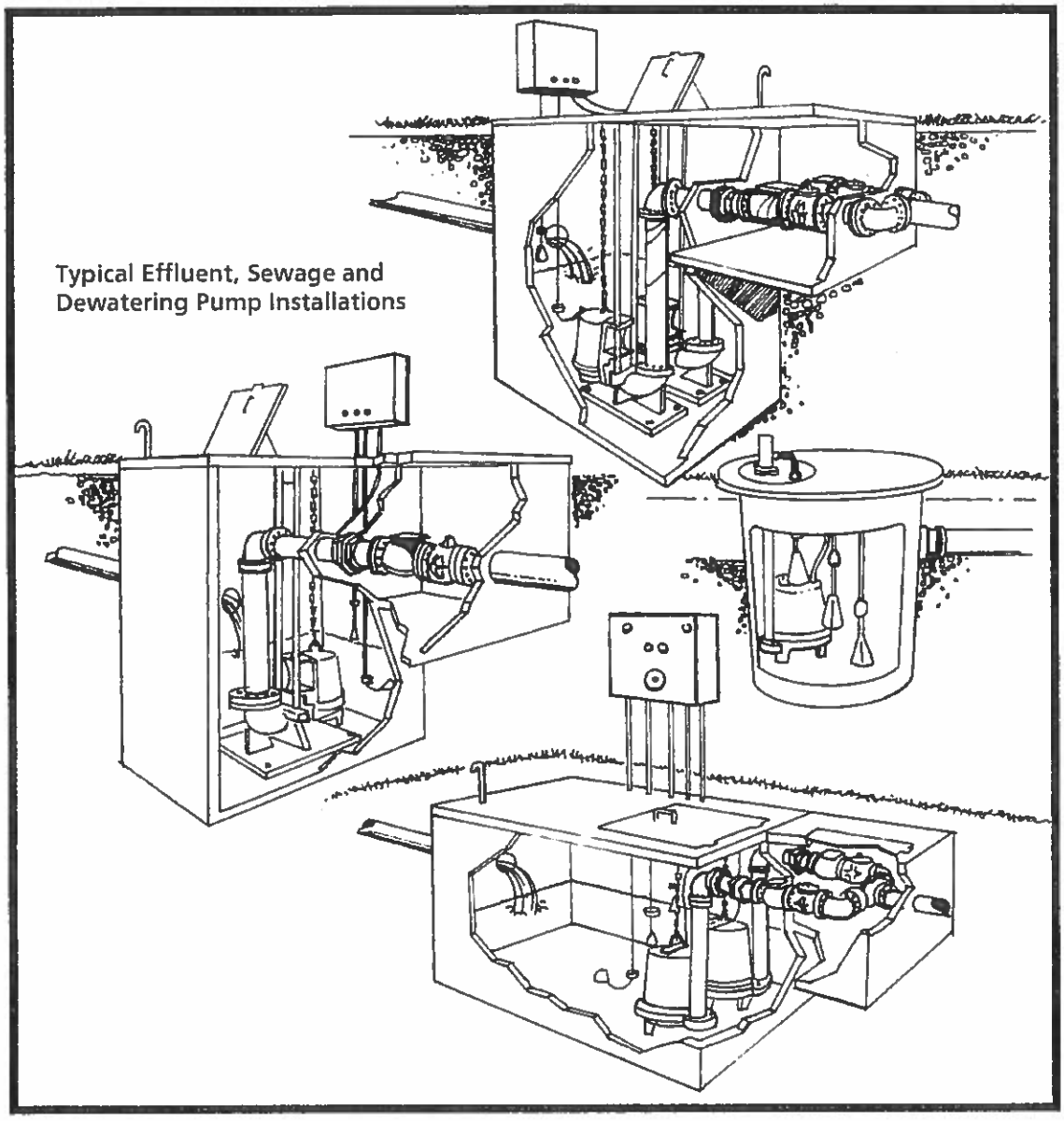


Fig. 6


Typical Effluent, Sewage and
Dewatering Pump Installations

⚠WARNING
Hazardous voltage

FAILURE TO DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY SERVICE CAN CAUSE SHOCK, BURNS OR DEATH.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
MOTOR NOT RUNNING NOTE: If circuit breaker "OPENS" repeatedly, DO NOT reset. Call qualified electrician.	Motor thermal protector tripped.	Allow motor to cool. Insure minimum pump submergence. Clear debris from casing and impeller.
	Open circuit breaker or blown fuse.	Determine cause, call a qualified electrician.
	Pump impeller binding or jammed.	Check motor amp draw. If two or more times higher than listed on pump nameplate, impeller is locked, motor bearings or shaft is damaged. Clear debris from casing and impeller, consult with dealer.
a) Manual operation	Power cable is damaged.	
	Inadequate electrical connection in control panel.	
b) Automatic operation	No neutral wire connected to control panel.	Resistance between power leads and ground should read infinity. If any reading is incorrect, call a qualified electrician.
	Inadequate electrical connection in control panel.	Inspect control panel wiring. Call a qualified electrician.
NOTE: Check the pump in manual mode first to confirm operation. If pump operates, the automatic control or wiring is at fault. If pump does not operate, see above.	Defective liquid level switch.	With switch disconnected, check continuity while activating liquid level switch. Replace switch, as required.
	Insufficient liquid level to activate controls.	Allow liquid level to rise 3" to 4" (76 mm - 101 mm) above turn-on level.
	Liquid level cords tangled.	Untangle cords and insure free operation.
PUMP WILL NOT TURN OFF	Liquid level cords tangled.	Untangle cords and insure free operation.
	Pump is air locked.	Shut off pump for approximately one minute, then restart. Repeat until air lock clears. If air locking persists in a system with a check valve, a 3/16" (4.8 mm) hole may be drilled in the discharge pipe approximately 2" (51 mm) above the discharge connection.
	Influent flow is matching pump's discharge capacity.	Larger pump may be required.
LITTLE OR NO LIQUID DELIVERED BY PUMP	Check valve installed backwards, plugged or stuck closed.	Check flow arrow on valve and check valve operation.
	Excessive system head.	Consult with dealer.
	Pump inlet plugged.	Inspect and clear as required.
	Improper voltage or wired incorrectly.	Check pump rotation, voltage and wiring. Consult with qualified electrician.
	Pump is air locked.	See recommended action, above.
	Impeller is worn or damaged.	Inspect impeller, replace as required.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
PUMP CYCLES CONSTANTLY	Discharge check valve inoperative.	Inspect, repair or replace as required.
	Sewage containment area too small.	Consult with dealer.
	Liquid level controls defective or improperly positioned.	Inspect, readjust or replace as required.
	Influent excessive for this size pump.	Consult with dealer.

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water systems pumps manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized Goulds Pumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

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ITT Industries

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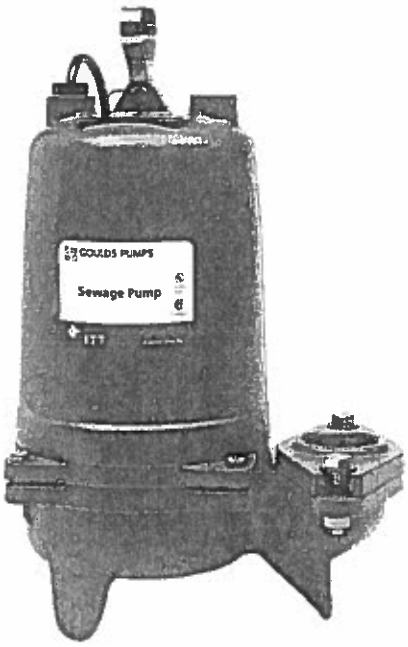
Wastewater

Goulds Pumps

WS_BHF Series Model 3887BHF

Submersible Sewage Pump

Prosurance available for residential applications.



FEATURES

- **Impeller:** Cast iron, enclosed, non-clog, dynamically balanced with pump out vanes for mechanical seal protection.
- **Casing:** Cast iron flanged volute type for maximum efficiency. Designed for easy installation on A10-20 slide rail or base elbow rail systems.
- **Mechanical Seal:** Silicon Carbide vs. Silicon Carbide sealing faces for superior abrasive resistance, stainless steel metal parts, BUNA-N elastomers.
- **Shaft:** Corrosion resistant, 300 series stainless steel. Threaded design. Locknut on all models to guard against component damage on accidental reverse rotation.
- **Fasteners:** 300 series stainless steel.
- Capable of running dry without damage to components.
- Designed for continuous operation, when fully submerged.

GOULDS PUMPS

AGENCY LISTINGS

Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association — File #LR38549

Goulds Pumps is ISO 9001 Registered.

Goulds Pumps is a brand of ITT Corporation.

www.goulds.com

Engineered for life

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Sewage systems
- Dewatering/Effluent
- Water transfer
- Light industrial
- Commercial applications

Anywhere waste or drainage must be disposed of quickly, quietly and efficiently.

SPECIFICATIONS

Pump

- Solids handling capabilities: 2" maximum.
- Capacities: up to 220 GPM.
- Total heads: up to 81 feet TDH.
- Discharge size: 2" NPT threaded companion flange as standard. 3" option available but must be ordered separately. (Order no. A1-3)
- Temperature: 104°F (40°C) continuous
  140°F (60°C) intermittent.

MOTORS

- Fully submerged in high grade turbine oil for lubrication and efficient heat transfer. All ratings are within the working limits of the motor.
- Class B insulation on ⅓-1½ HP models.
- Class F insulation on 2 HP models.

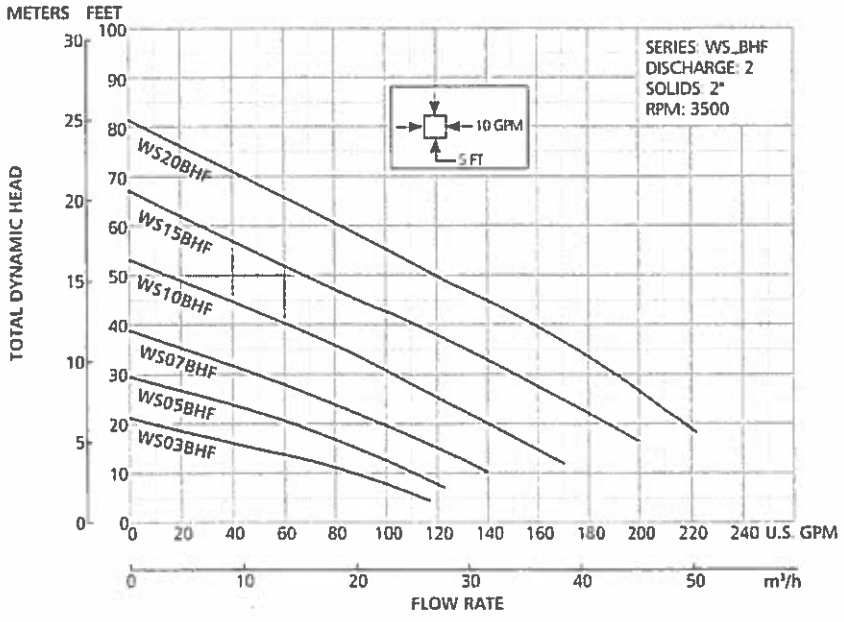
Single phase (60 Hz):

- Capacitor start motors for maximum starting torque.
- Built-in overload with automatic reset.
- SJTOW or STOW severe duty oil and water resistant power cords.
- ⅓ – 1 HP models have NEMA three prong grounding plugs.
- 1½ HP and larger units have bare lead cord ends.

Three phase (60 Hz):

- Class 10 overload protection must be provided in separately ordered starter unit.
- STOW power cords all have bare lead cord ends.

- **Designed for Continous Operation:** Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage when fully submerged.
- **Bearings:** Upper and lower heavy duty ball bearing construction.
- **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. Standard cord is 20'. Optional lengths are available.
- **Motor Cover O-ring:** Assures positive sealing against contaminant and oil leakage.

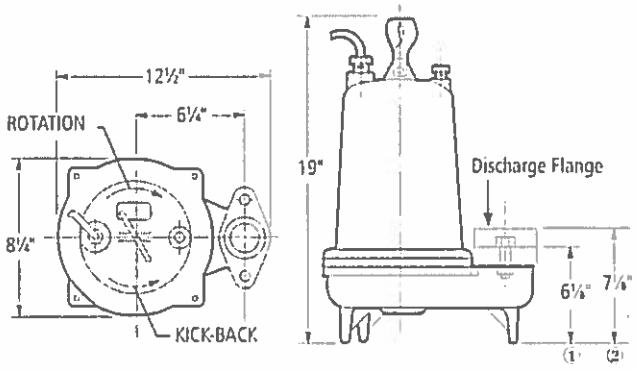


MOTOR AND MODEL INFORMATION

ORDER NUMBER	HP	PHASE	VOLTS	RPM	IMPELLER DIA. (IN.)	MAX. AMPS	LOCKED ROTOR AMPS	KVA CODE	FULL LOAD MOTOR EFF. %	RESISTANCE	
										START	LINE-LINE
WS0311BHF	0.33	1	115	3500	2.94	12.4	46.0	M	54	7.5	1.0
WS0318BHF	0.33	1	208			6.8	31.0	K	68	9.7	2.4
WS0312BHF	0.33	1	230			6.2	34.5	M	53	9.6	4.0
WS0511BHF	0.5	1	115		3.19	14.5	46.0	M	54	7.5	1.0
WS0518BHF	0.5	1	208			8.4	31.0	K	68	9.7	2.4
WS0512BHF	0.5	1	230			7.6	34.5	M	53	9.6	4.0
WS0538BHF	0.5	3	200			4.9	22.6	R	68	–	3.8
WS0532BHF	0.5	3	230			3.6	18.8	R	70	–	5.8
WS0534BHF	0.5	3	460			1.8	9.4	R	70	–	23.2
WS0537BHF	0.5	3	575			1.5	7.5	R	62	–	35.3
WS0718BHF	0.75	1	208		3.44	11.0	31.0	K	68	9.7	2.4
WS0712BHF	0.75	1	230			10.0	27.5	J	65	12.2	2.7
WS0738BHF	0.75	3	200			6.2	20.6	L	64	–	5.7
WS0732BHF	0.75	3	230			5.4	15.7	K	68	–	8.6
WS0734BHF	0.75	3	460			2.7	7.9	K	68	–	34.2
WS0737BHF	0.75	3	575			2.2	9.9	L	78	–	26.5
WS1018BHF	1	1	208		3.75	14.5	59.0	K	68	9.3	1.1
WS1012BHF	1	1	230			13.0	36.2	J	69	10.3	2.1
WS1038BHF	1	3	200			8.6	27.6	M	77	–	2.7
WS1032BHF	1	3	230			7.5	24.1	L	79	–	4.1
WS1034BHF	1	3	460			3.8	12.1	L	79	–	16.2
WS1037BHF	1	3	575			3.1	9.9	L	78	–	26.5
WS1512BHF	1.5	1	230		4.00	18.0	52.0	J	67	2.76	0.53
WS1538BHF	1.5	3	200			10.0	42.4	K	78	–	1.7
WS1532BHF	1.5	3	230			9.6	42.4	K	78	–	1.7
WS1534BHF	1.5	3	460			4.8	21.2	K	78	–	6.6
WS1537BHF	1.5	3	575			3.9	16.3	L	78	–	10.5
WS2012BHF	2	1	230		4.44	18.0	49.6	F	78	3.2	1.1
WS2038BHF	2	3	200			12.0	42.4	K	78	–	1.7
WS2032BHF	2	3	230			11.6	42.4	K	78	–	1.7
WS2034BHF	2	3	460			5.8	21.2	K	78	–	6.6
.WS2037BHF	2	3	575			4.7	16.3	L	78	–	10.5

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)



Discharge Flange:

① 2" NPT standard

② 3" NPT optional (order an A1-3)

ITT

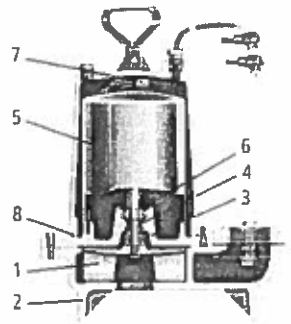
Wastewater

PERFORMANCE RATINGS (gallons per minute)

Order No.		WS03BHF	WS05BHF	WS07BHF	WS10BHF	WS15BHF	WS20BHF
HP ▶		1/3	1/2	3/4	1	1 1/2	2
RPM ▶		3500	3500	3500	3500	3500	3500
Total Head Feet of Water	10 ▶	86	110	140	–	–	–
	15	48	88	120	158	–	–
	20	–	62	98	139	186	217
	25	–	32	74	120	170	204
	30	–	–	49	101	150	190
	35	–	–	21	82	130	175
	40	–	–	–	60	110	159
	45	–	–	–	38	88	140
	50	–	–	–	–	67	120
	55	–	–	–	–	47	100
	60	–	–	–	–	29	80
	65	–	–	–	–	–	62
	70	–	–	–	–	–	43
	75	–	–	–	–	–	23

COMPONENTS *(for reference only)*

Item No.	Description
1	Impeller
2	Casing
3	Mechanical Seal
4	Motor Shaft
5	Motor
6	Ball Bearings
7	Power Cable
8	Casing O-Ring



** For repair parts, reference repair parts book.*

GOULDS PUMPS

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SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

B3887BHF April, 2007

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Engineered for life

MotorSaver®
THREE-PHASE ELECTRIC MOTOR PROTECTOR

INSTALLATION INSTRUCTIONS FOR SYMCOM'S MOTORSAVER®
MODEL 460

DANGER!

HAZARDOUS VOLTAGES MAY BE PRESENT DURING INSTALLATION.
Electrical shock can cause death or serious injury.
Installation should be done by qualified personnel following all national, state and local electrical codes.

BE SURE POWER IS DISCONNECTED PRIOR TO INSALLATION!
FOLLOW NATIONAL, STATE, AND LOCAL CODES!
READ THESE INSTRUCTIONS ENTIRELY BEFORE INSTALLATION!

! WARNING !

UNEXPECTED OUTPUT ACTUATION CAN OCCUR.
Use hard-wired safety interlocks where personnel and/or equipment hazards exist.
Failure to follow this instruction can result in death, injury or equipment damage.

The Model 460 MotorSaver® is an auto ranging voltage monitor designed to protect three-phase motors regardless of size. The MotorSaver® is used on 190-480 VAC, 50 to 60 Hz motors to protect from damage caused by single phasing, low voltage, high voltage, phase reversal, and voltage unbalance.

CONNECTIONS

1. Mount the MotorSaver® in a convenient location in or near the motor control panel. If the location is wet or dusty, the MotorSaver® should be mounted in a NEMA 4 or 12 enclosure. The MotorSaver® can be mounted to a back panel using two #6 or #8 x 5/8 screws or can be snapped onto a DIN rail.
2. Connect L1, L2 and L3 on the MotorSaver's terminal strip to the LINE SIDE of the motor starter. (See Figure No. 1).
3. Connect the output relay to the circuitry to be controlled. For motor control, connect the normally open contact in series with the magnetic coil of the motor starter as shown in Figure No. 1. For alarm operation, connect the normally closed contact in series with the control circuit as shown in Figure No. 2.

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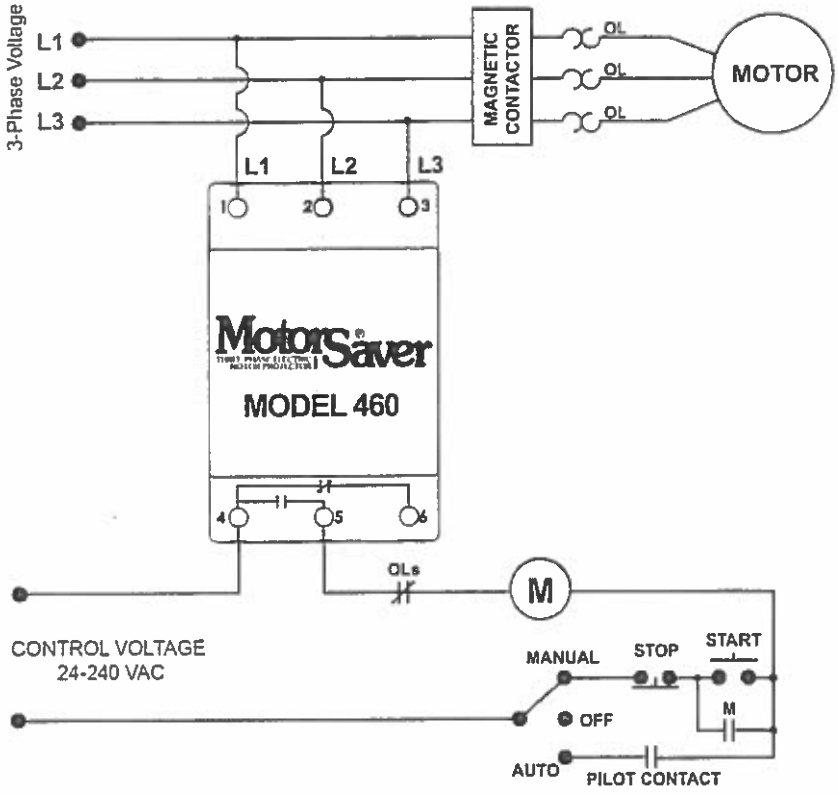


FIGURE NO. 1: CONTROL WIRING DIAGRAM

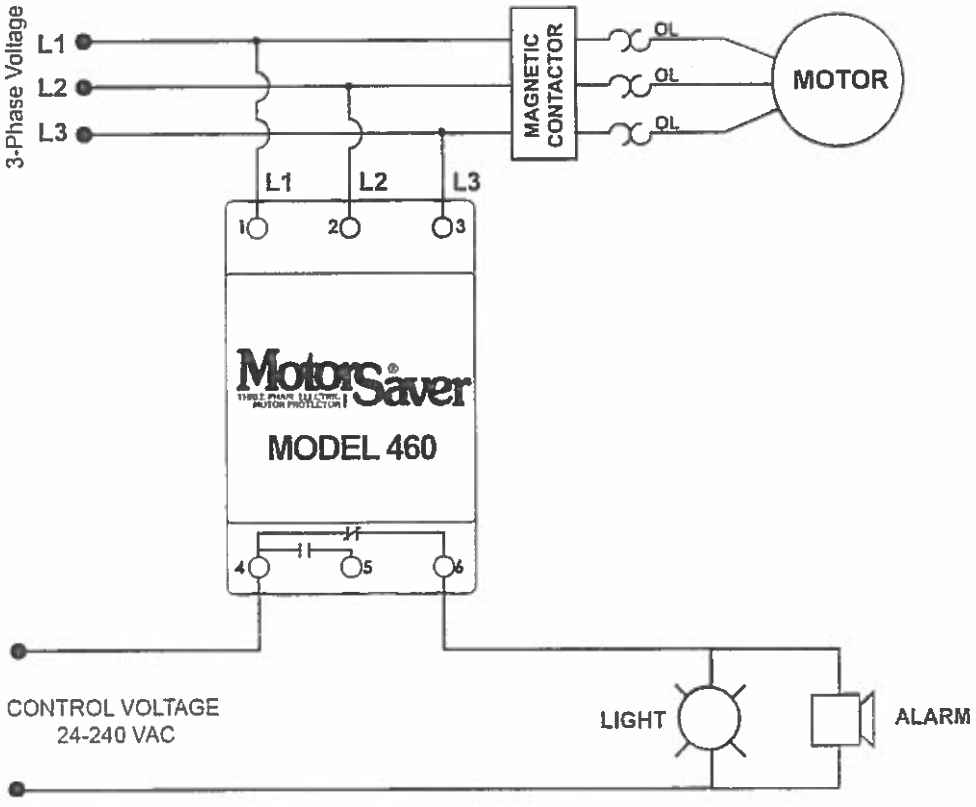
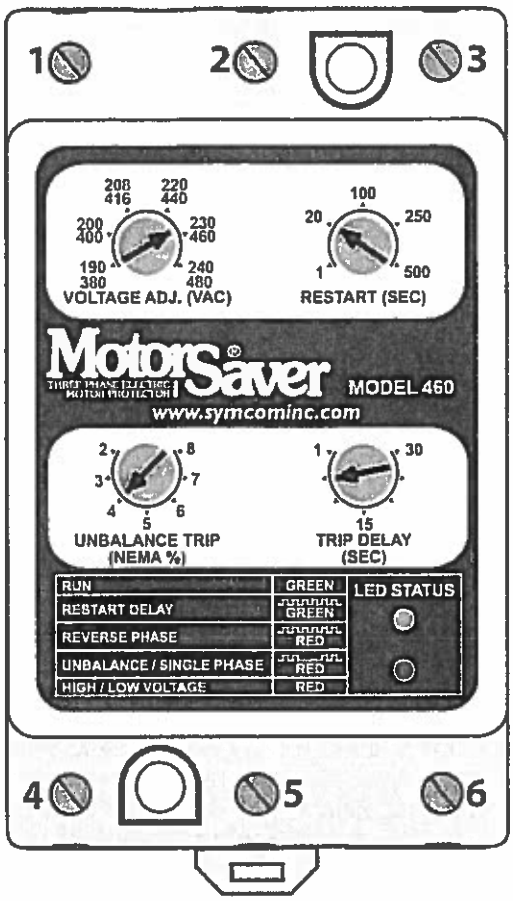


FIGURE NO. 2: ALARM WIRING DIAGRAM

SETTINGS



1. Line voltage adjustment: Rotate the **"VOLTAGE ADJ. (VAC)"** to the nominal three-phase line voltage feeding the motor to be protected.
2. Restart delay adjustment: Rotate the **"RESTART (SEC)"** adjustment to the desired position. The restart delay is the time between MotorSaver® seeing acceptable voltage and the MotorSaver® closing its output contacts. For compressor applications, the restart delay should be set for the approximate time it takes for the head pressure to bleed off of the compressor. For other applications, the restart delay is typically set between 2 and 10 seconds.
3. Trip delay adjustment: Rotate the **"TRIP DELAY (SEC)"** adjustment to the desired setting. This adjustment does not affect the trip delay on phasing faults. Typically, the trip delay adjustment is set between 1 and 5 seconds. In areas where voltage fluctuations are frequent, the trip delay adjustment may be set greater than 10 seconds.
4. Voltage unbalance adjustment: Rotate the **"UNBALANCE TRIP (NEMA%)"** adjustment to the desired unbalance trip level. The NEMA MG1 standard does not recommend operating a motor above 1% voltage unbalance without derating the motor. The NEMA MG1 standard also recommends against operating a motor above a 5% voltage unbalance under any circumstances. SymCom recommends consulting the motor manufacturer for specific tolerances.

$$\text{Percent Unbalance} = \frac{\text{Maximum Deviation from the Average}}{\text{Average}} \times 100$$

Example: The measured line-to-line voltages are 203, 210, and 212.

$$\text{Average} = \frac{203 + 210 + 212}{3} = 208.3$$

The maximum deviation from the average is the largest difference between the average voltage (208.3) and any one voltage reading.

208.3 - 203 = 5.3 210 - 208.3 = 1.7 212 - 208.3 = 3.7

The maximum deviation from the average is 5.3.

$$\frac{5.3}{208.3} \times 100 = 2.5\% \text{ Unbalance}$$

POWER-UP

Turn on the 3∅ power to the motor. The MotorSaver's green RUN light will blink during the RESTART delay. After the RESTART delay, the MotorSaver® will energize its output contacts and the green RUN light will illuminate. If the contacts do not energize and the RUN light does not illuminate, see the TROUBLESHOOTING section.

DIAGNOSTIC INDICATOR LIGHTS	
RUN	GREEN
RESTART DELAY	 GREEN
REVERSE PHASE	 RED
UNBALANCE / SINGLE PHASE	 RED
HIGH / LOW VOLTAGE	RED

CONGRATULATIONS!!
YOU HAVE JUST INSTALLED THE FINEST MOTOR PROTECTION AVAILABLE!!

TROUBLESHOOTING

SYMPTOM	LIGHT PATTERN	SOLUTION
No lights are on. The unit seems completely dead.	N / A	Measure the three line-to-line voltages. If any of the voltages are below 150 VAC, the MotorSaver® does not have enough power to operate its internal electronics. This may occur on a single-phased system. If the voltages are correct, call SymCom at 1-800-843-8848 or 1-605-348-5580.
Red light is blinking (on initial power up).	 RED	Turn off the three-phase power. Swap any two leads powering the MotorSaver® (L1, L2, or L3). There is a 50-50 chance of connecting L1, L2, and L3 correctly the first time. Re-apply the three-phase power.
Red light is blinking (after the motor has been previously running).	 RED	The incoming lines have been reverse phased. The MotorSaver® is preventing the motor from running backwards. Correct the phase sequence.
Red light is blinking in this pattern.	 RED	The voltage is unbalanced or single-phased. Measure the incoming line voltages and calculate the % unbalance. If the voltage unbalance does not exceed the % unbalance reset value, call SymCom at 1-800-843-8848 or 1-605-348-5580.
Red light is on steady.	RED	The voltage is out of tolerance. Measure the three line-to-line voltages. Calculate the average of the three voltages. If the average is 7% above or below the nominal voltage as selected by the LINE VOLTAGE ADJUST, the MotorSaver® is functioning properly. If the voltage is within ±7% of the selected line voltage, call SymCom at 1-800-843-8848 or 1-605-348-5580.
Green light blinks and motor is not running.	 GREEN	The MotorSaver® is in restart delay.
Green light is on steady, but motor does not start.	GREEN	The MotorSaver® is in run mode. Ensure other control devices are allowing the motor to start. Check control circuit for loose wires or malfunctioning switches.

Any questions or comments call SymCom at 1-800-843-8848 or 1-605-348-5580

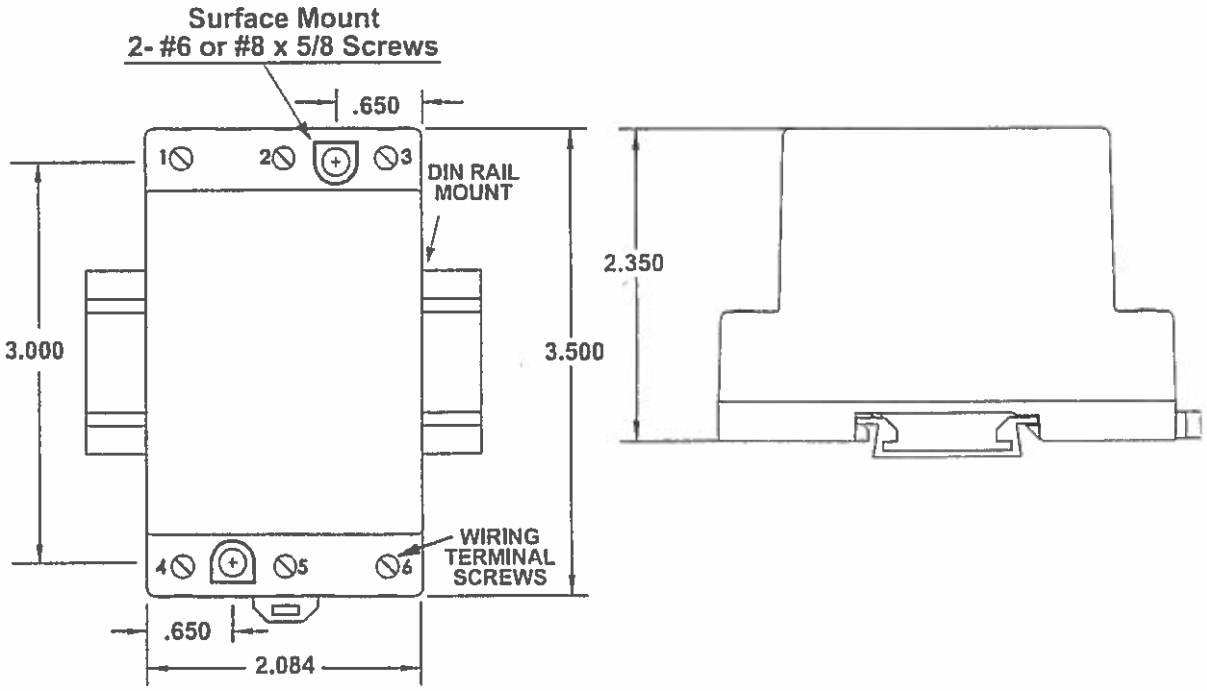
SPECIFICATIONS

3 - Phase Line Voltage	190 - 480 VAC
Frequency	50* - 60 Hz
Low Voltage (% of setpoint)	
Trip	90% ± 1%
Reset	93% ± 1%
High Voltage (% of setpoint)	
Trip	110% ±1%
Reset	107% ±1%
Voltage Unbalance (NEMA)	
Trip	2 - 8% Adjustable
Reset	Trip Setting minus 1% (5 - 8%)
	Trip Setting minus 0.5% (2 - 4%)
Trip Delay Time	
Low, High, and Unbalanced Voltage	1 - 30 Seconds Adjustable
Single-phasing faults (>25% UB)	1 Second Fixed
Restart Delay Time	
After a fault or complete power loss	1 - 500 Seconds Adjustable
Output Contact Rating - SPDT	
Pilot Duty	480 VA @ 240 VAC
General Purpose	10 A @ 240 VAC
Power Consumption	6 Watts (maximum)
Weight	14 oz
Enclosure	Polycarbonate
Terminal	
Torque	6 Inch-Pounds Max.
Wire AWG	12 - 20 AWG
Safety Marks	
UL	UL508 (File # E68520)
CE	IEC 60947-6-2
Standards Passed	
Electrostatic Discharge (ESD)	IEC 1000-4-2, Level 3, 6 kv contact, 8 kv air
Radio Frequency Immunity, Radiated	159 MHz, 10 V/m
Fast Transient Burst	IEC 1000-4-4, Level 3, 3.5 kv input power and controls

*NOTE: 50 Hz will increase all delay timers by 20%

Surge	
IEC	IEC 1000-4-5, Level 3, 4kv line-to-line; Level 4, 4kv line-to-ground
ANSI / IEEE	C62.41 Surge and Ring Wave Compliance to a level of 6kv line-to-line
Hi-potential Test	Meets UL508 (2 x rated V +1000V for 1 minute)
Environmental	
Temperature Range	Ambient Operating: -20° - 70° C (-4° - 158°F) Ambient Storage: -40° - 80° C (-40° - 176°F)
Class of Protection	IP20, NEMA 1 (Finger Safe)
Relative Humidity	10-95%, non-condensing per IEC 68-2-3

DIMENSIONS



SymCom warrants its microcontroller based products against defects in material or workmanship for a period of five (5) years* from the date of manufacture. All other products manufactured by SymCom shall be warranted against defects in material and workmanship for a period of two (2) years from the date of manufacture. For complete information on warranty, liability, terms, and conditions, please refer to the SymCom Terms and Conditions of Sale document.

Visit our website at www.symcominc.com for our complete catalog and new product listings!

SymCom Inc
Motor Protection & Controls Since 1974

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FAX: (605) 348-5685

Warning: This document does not replace the manufacturer's recommended maintenance schedules as referenced in the OM manual provided by the equipment manufacturer. It is provided as a quick guide to required OM activities for this project.

Section1: General Maintenance Activities
Section2: Cross Reference Maintenance Code to Parts
Section3: Maintenance Schedule by Hours

General Maintenance Activities

Daily

- Check the control panel for running status.
- Contact the system remotely to check system operation for:
  - Alarms
  - Operating Conditions

Weekly

- Check for Leaks.
- Check the volume of consumables. i.e. Chemicals, oil etc
- Check for excessive noise of various components.
- Check for Alarms.
- Check and record Flow Rates, Vacuums, Pressures, Temperatures, pH.
- Check for excessive moisture inside the control panels and transducer wiring boxes.
- Check for corrosion and grease the moving parts if required to reduce corrosion.

Monthly

- Test critical inputs for proper shutdown capacity.
- Test the operation of the overloads.
- Test building sump switch if it is present.

Yearly

- Test each input.
- Test alarm conditions.
- Test the operation of each output device.

Parts Listing per Maintenance Code

Fan

	Part		Qty	Module
F-7901	10329	Fan, Building, 24", 1/3hp, 1625rpm, 120/230V, 1ph, XPF	1	Building, Trailer or Skid
F-7903	M1072	Fan, Building, 12", 1/4hp, 1750rpm, 120V, 1ph, TEFC	1	Building, Trailer or Skid

Flow Meter (Liquid)

	Part		Qty	Module
FQI,FT-7001	15499	Meter, Water, 2", US Gal, w/ pulse, Turbine, DLJ	1	Liquid Phase Carbon

Gauge, Pressure

	Part		Qty	Module
PI-7001	16203	Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	2	Liquid Phase Carbon
P-4901	16203	Gauge, Pressure, 0-60psi, Indumart, P16T2-FG-60	1	Oil/Water Separator

Oil Water Separator

	Part		Qty	Module
OWS-4901	16263	Oil Water Separator, OWS-24, Stainless	1	Oil/Water Separator

Pump, Discharge

	Part		Qty	Module
P-4901	21028	Pump, Suction, Goulds, SSH Series, 4SH2K52C0	1	Oil/Water Separator

Strainer

	Part		Qty	Module
P-4901	M1523	Strainer, Wye, Brass, 3"	1	Oil/Water Separator

Vertical Level Switch (Almeg)

	Part		Qty	Module
LSHH-5201	12351	Switch, Level, Almeg, Vertical, ATB3-48B	1	Product Storage Tank

EVERY 200 OPERATING HOURS

Strainer

Remove strainer basket. Inspect strainer and empty if necessary.

EVERY 800 OPERATING HOURS

Pump, Discharge

Close-Coupled Unit
Ball bearings are located in and are part of the motor. They are permanently lubricated. No greasing required.

Frame-Mounted Units
Regrease frame with a #2 sodium or lithium based grease. Fill until grease comes out of relief fittings, or lip seal. Then wipe off excess. Follow motor and coupling manufacturers' lubrication instructions.

Note: Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

Fan

1) Check the fan outlet pressure.
2) Check to ensure nothing is obstructing the air intake.
3) Check the fan wheel for corrosion.
4) Check the fan wheel alignment and positioning.

Flow Meter (Liquid)

Test the operation of the flow meter. Disassemble and clean the internal components if dirt or particles are preventing the meter from working properly.

Vertical Level Switch (Almeg)

1) Test the operation of the switch.
2) Remove the switch and check for debris buildup that can potentially cause a failure of normal operation.

EVERY **4000** OPERATING HOURS

Gauge, Pressure

1) Check accuracy of gauges.
2) Zero gauge if required.

Oil Water Separator

After the first 6 months of operation, the inlet should be inspected and cleaned as follows:
1) Stop the flow of influent to the separator.
2) Remove separator cover.
3) Dispose of separated oil per regular procedures.
4) Remove water from separator through drain or hose. Measure and record the depth of the solids. Use this measurement as the timing basis for the next solids inspection and clean out. Consult OWS drawing for depth of sludge baffle. Solids should not exceed this depth.
5) The HD Q-PAC plates can be either cleaned in place or removed and cleaned.
6) Examine the tank interior for damage and repair any damage to internal coating.
7) To restart separator, install HD Q-PAC plate packs and polishing pack in original position. Make sure that both are securely in place so that they do not float when unit is operational.

WINTER OPERATION AND STORAGE IN COLD CLIMATES

GENERAL

Systems operating in climates where seasonal temperatures regularly fall below freezing may need to be winterized. Depending on the equipment in the system, different steps must be taken to prepare for winter operation.

If the system is going to be shut down and stored for the winter, additional measures should be taken above and beyond normal maintenance practices for an extended shut down.

SYSTEMS OPERATING THOUGH THE WINTER

- Confirm that the enclosure heater is working. This can be done by adjusting the set point on the low temperature switch (TSL) to a setting above the ambient temperature inside the enclosure. Verify that the heater has turned on before adjusting the setting on the low temperature switch to a point above 32℉. If the heater is controlled by a temperature transmitter (TT), the set point can be adjusted through the HMI.
- Confirm that the control panel heater is working by adjusting the thermostat inside the panel – follow the procedure above.
- If the enclosure has a sump with a high level switch, ensure the sump is free of water to prevent ice from forming and potentially disabling the switch.
- If the system has a heat exchanger or rotary screw compressor, provisions may be included to prevent cycling cold air through the system. Depending on the design of the system, the following options may be available for winter operation:
    - Systems where the heat exchanger/compressor is recessed from the wall or ceiling, by removing the hood and withdrawing the insert, the discharge port can be fully or partially boarded up to allow warm air to be re-circulated back into the enclosure. See Figure 1.
    - The hood provided on the exterior of the enclosure may have been designed to allow air to be re-circulated back into the container through a duct on the wall above the heat exchanger/compressor or through the roof. See Figure 2.

Note: Depending on the parameters of the system, the above mentioned options may need to be fine-tuned onsite to optimize performance of the system. While these methods are good for maintaining the temperature inside the enclosure above freezing, there are some situations where too much air is being re-circulated and the heat exchanger is not able to cool the process air sufficiently. This will cause the high temperature switch on the discharge of the heat exchanger to trip and send the system into alarm.

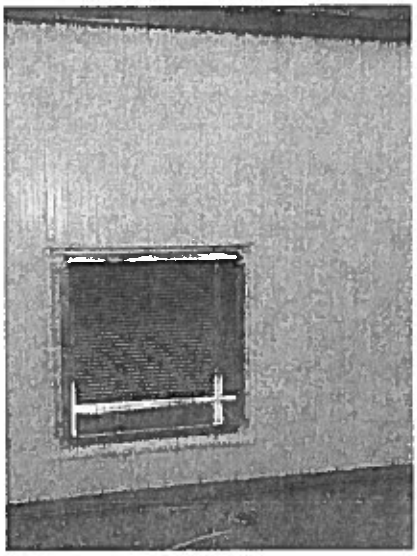


Figure 1: Recessed Heat Exchanger



Figure 2: Re-circulating Hood

SYSTEMS BEING STORED THROUGH THE WINTER

- All water must be drained from the system where possible.
- Valves should be left open to allow ice to expand in the event residual water was left in the system without damaging piping or equipment.
- Additional O&M as required for long-term system shutdowns.

WINTERIZING PROCEDURE

Progressive Cavity Pumps (Moyno)

- Remove bolts from pump end and ensure all water is removed.

Centrifugal Pumps (Goulds)

- Remove drain plug on the bottom of the outer steel body. Keep in mind water inside lines will also drain through these plugs depending on elevations.

Inlet Manifolds

- Drain all water from SVE and ground water extraction manifolds.

Vapor/Liquid Separators

- Drain all water from VLS.

Bag Filter Housings

- Drain all water and remove bag filter from housing.
- Pour antifreeze into bottom of housing ensuing drain valve is closed.

Oil/Water Separators

- Pour antifreeze in bottom of OWS, filling 1 to 2" from the bottom, ensuring drain lines are filled with antifreeze.

Air Strippers

- Sump should be drained and trays disassembled.
- Pour antifreeze in bottom of stripper and ensure drain lines are filled with antifreeze.

Air Compressors

- Drain receiver tank of any condensate.

Water Flow Meters (Paddlewheels and Rotameters)

- Remove via unions and drain. Store for the winter.



CAUTION

Freezing water poses a serious threat to the equipment in a system. Pipes, vessels and pumps can be severely damaged by freezing water.

Troubleshooting Chart

Symptom	Potential Cause	Possible Solution
Electrical Motor		
Motor will not start and there is no noise.	Motor may not be receiving the proper power.	Check fuses and power distribution between power lines to motor.
	Overload is tripped.	Reset overload.
	Main power may be off.	Check main power.
	Contactor may not be closing because motor is in manual position.	Switch motor to Auto position.
	Contactor may not be closing because PLC is not telling output to be on.	Check PLC operating sequence to determine if a start requirement is not met.
Motor will not start but makes a humming noise.	One of the phases of power is not getting to the Motor as a result of a blown fuse.	Change fuse.
	One of the phases of power is not getting to the Motor as a result of a poor wire connection.	Check wiring for a loose wire or a poor connection.
	The driven component (i.e. pump) will not spin and could be seized up.	Disassemble driven component, check clearances and clean internal components and replace any damaged components.
	Bearing on drive shaft of motor or driven component may be seized up.	Replace bearings.
Overloads trip immediately after startup.	Check for short circuit in motor windings.	Re-wind motor.
	One of the phases of power is not getting to the motor as a result of a blown fuse.	Change fuse.
	Motor power wires may be shorting out to ground.	Search for wiring short and replace wiring if required.
	Motor may have too much load or backpressure as a result of operating the driven component outside of its operating capabilities.	Check operating capabilities of driven component. I.e. Ensure positive displacement pump is not over pressured or that centrifugal pump is not operating at too high a flow rate.
Motors amps are above the allowable value on the nameplate.	Motor may be designed to operate on the upper limit.	Calculate maximum allowable amps. Name plate amps x safety factor.
	Driven component may have scale build up inside.	Clean internal components of driven component.

	Driven component may be rotating in the wrong direction.	Check direction of rotation and switch rotation of motor if it is incorrect.
	Check voltage of power. Low voltage results in high amps.	Adjust overloads for higher amps if the difference is only slight, otherwise change power or motor.
Centrifugal Pumps		
Pump does not produce sufficient pressure/vacuum.	Pump is not primed.	Prime pump.
	Pump is rotating in wrong direction.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Pump is not operating at required RPM.	Check and replace motor if required.
	Pump has wrong sized impeller.	Check impeller and replace if required.
	Pump pressure or vacuum is lost due to an obstruction located between the pump and gauge.	Check for flow restrictions and clean strainers or piping if required.
	Pump is not turned on.	Turn pump on.
	Coupling between pump and motor is no longer connected preventing the pump from rotating with the motor.	Reconnect and realign motor and pump.
Pump is leaking.	Gaskets are worn or faulty.	Replace gaskets.
	Mechanical seal has been overheated. This is often a result of operating the pump without any water.	Replace mechanical seal.
	Fittings are leaking on or around pump.	Tighten fittings.
	Water may be coming from another location.	Check for leaks around pump.
Pump flow rate is too low.	Backpressure is too high for pump.	Reduce backpressure.
	Pump may not be sized correctly for process.	Replace pump.
	Pump impeller is too small.	Change pump impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter.	Replace filter and clean line.

Pump is making excessive noise during operation.	Manually rotate pump impeller and listen for clearance problems.	Disassemble pump and fix clearance problems.
	Alignment of pump may be off causing the flexible coupling to degrade.	Check alignment and reset alignment if needed. Replace flexible coupling if it is degraded.
Liquid Ring Pump		
Pump does not produce enough vacuum.	Pump is not primed.	Prime pump and start under vacuum.
	Service fluid is to low in seal oil tank.	Add seal oil.
	No restriction on inlet of pump.	Close valves to create suction.
	Dilution valve is open.	Close dilution valve.
	Service fluid is not flowing into the pump.	Check for flow restrictions in service fluid lines. Check strainer.
	Pump is rotating in the wrong direction.	Check and change direction if required.
	Vacuum gauge is not working correctly.	Replace vacuum gauge.
	Pump seals may be allowing air into the pump.	Check for leaking and replace seals if required.
	Pump is too small for application.	Replace pump.
	Vacuum relief valve is set too low.	Replace or reset vacuum relief valve.
	Air may be leaking into vapor lines.	Check for air leaks in vapor lines.
	Pump internal components are damaged.	Disassemble pump and replace components if required.
Pump is making a growling noise.	Cavitation is occurring.	Decrease the vacuum.
	Insufficient seal fluid flow or excessive seal fluid flow.	Increase/decrease seal fluid flow rate.
Pump is leaking.	Gaskets are faulty.	Replace gaskets.
	Mechanical seal has been overheated or is faulty.	Replace mechanical seal.
	Oil may be leaking from 1/8" vacuum relief valves in pump housing.	Remove valves and install plugs.
Pump is running too hot.	Seal fluid strainer is plugged restricting seal fluid.	Clean out strainer.
	LRP is not providing enough suction to draw sufficient seal fluid.	Increase seal oil suction. Pipe seal fluid into a higher vacuum port of pump.

	Seal fluid flow rate is too low.	Open seal fluid control valve to allow more seal fluid to enter the pump.
	Seal fluid heat exchanger is not working properly.	Check heat exchanger.
Excessive discharge pressure built up in seal oil tank.	Demister filter is plugged and requires replacement.	Replace demister.
	Seal oil is not being drawn out of demister filter through scavenger line.	Increase vacuum of LRP to allow oil to be sucked through scavenger line. Ensure that scavenger line has sufficient vacuum to draw oil out of the demister filter.
Seal Oil Low Level Alarm	Seal oil temperature may be operating too high causing the oil to evaporate.	Check seal oil operating temperature and increase seal oil flow.
	Seal oil suction line may be plugged causing seal oil to collect in bottom of demister filter.	Check for plugging of seal oil return line and clean or replace if required.
Air to Air and Air to Fluid Heat Exchangers		
Heat exchanger fan is drawing too many amps.	See troubleshooting for motors.	
	Fan blade pitch and diameter may be wrong.	Change fan blade.
	Motor may be operating at wrong RPM for fan blade.	Replace motor or fan blade.
	Check clearance of fan blade.	Make adjustments if blade is making contact.
Phase Separator		
Water will not pump out of phase separator.	Base of separator may be plugged with sand.	Flush sand and debris out of separator.
Electric Solenoid Valve		
Valve will not completely shut.	May have dirt or rocks preventing it from shutting properly.	Disassemble and clean out internal components.
Valve will not open	Check for power to solenoid.	Trace power lines and determine why power is not going to valve.
	PLC may not be telling it to open.	Check start requirements in manual.
	Coil may be damaged or faulty.	Replace coil.
Level Switches		
Level switch is staying closed when water in tank drops below switch.	Level switch is upside down or on its side.	Check orientation of level switch. Level switch may be designed as normally closed and therefore will be upside down.

	Sight glass is plugged giving a false level in the tank.	Clean sight glass.
	Level switch has dirt or film causing it to stick up.	Remove level switch, clean and test for normal operation using a millimeter.
	Level switch may be damaged or faulty and failed closed regardless of the switch position.	Replace switch.
	Wiring to level switch may be shorting out to ground causing the switch to appear closed at all times.	Disconnect switch from system wiring and separate system wires so they are not in contact with each other or any metal. If the input is still on, the input wiring is being grounded somewhere. Find short and replace or fix wiring.
	IS barrier is shorted out internally.	Switch IS barrier with working barrier and if problem goes away then the barrier may be faulty and should be changed.
	Input wiring is loose in terminal strip.	Tighten terminal strip where field wiring is brought into panel.
	Level switch is wired incorrectly.	Consult input wiring diagram and inspect wiring of level switch. Change if required.
Level switch stays open when water in tank is above the switch.	Level switch is upside down or on its side.	Check orientation of level switch. Level switch may be designed as normally closed and therefore will be upside down.
	Sight glass is plugged giving a false level in the tank.	Clean sight glass.
	Level switch has dirt or film causing it to stick down.	Remove level switch, clean and test for normal operation using a millimeter.
	Level switch may be damaged or faulty and failed open regardless of the switch position.	Replace switch.
	IS barrier is blown preventing the level switch signal from crossing the barrier.	Switch IS barrier with working barrier and if problem goes away then the barrier may be blown. If barrier is blown, the input wire on the right side of the barrier will have 24 V DC and the wire on the opposite side will have 0V DC.
	Level switch is wired incorrectly.	Consult input wiring diagram and inspect wiring of level switch. Change if required.

Regenerative Blowers		
Blower does not produce sufficient pressure/vacuum.	Blower is not turned on.	Turn on blower.
	Wrong direction of rotation.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Blower is not operating at required RPM.	Check and replace motor if required.
	Blower has wrong sized impeller.	Check impeller and replace if required.
	Pressure or vacuum is lost due to obstruction located between blower and gauge.	Check for flow restrictions and clean strainers or piping if required.
Blower is leaking.	Fittings are leaking on or around blower.	Tighten fittings.
Blower flow rate is too low.	Backpressure is too high for blower.	Reduce backpressure.
	Blower may not be sized correctly for process.	Replace blower.
	Blower impeller is too small.	Change blower impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter.	Replace filter and clean line.
Air Stripper		
Stripper leaks.	Gaskets are leaking.	Apply silicon grease to gaskets and close up stripper. If they cannot be fixed the gaskets may need to be replaced.
Pressure or vacuum is building up in stripper.	Stripper is being fouled by mineral precipitates.	Clean stripper with acid to dissolve precipitates.
	Airflow rate through stripper has risen or is above the design value.	Decrease airflow rate.
Stripper is not cleaning contaminants sufficiently.	Inlet concentrations are higher than the design values.	Decrease water flow rate to obtain required stripping capacity.
	Flow rate of water through stripper is too high.	Decrease flow rate allowing longer residence time in stripper.
	Water temperature is lower than the design (below 60°F).	Increase water temperature or slow down water flow rate or increase airflow rate.
	Airflow rate is not high enough.	Increase airflow rate or decrease water flow rate.

	Products that are not easily strippable may be in higher concentrations than originally planned.	Consult manufacturer with test results of discharge contaminants.
	Stripper may have been shut down manually causing the contaminated water in the trays to fall into the sump without being cleaned.	Allow stripper to go through proper shutdown cycle when stopping the unit.
	Stripper may be setup wrong allowing the water to bypass trays.	Check orientation of trays to ensure water will flow through each tray properly.
	Some contaminants may be present that are affecting the ability to strip other contaminants.	Consult manufacturer with test results of intake and discharge contaminants.
	Increase in pressure causes a decrease in airflow resulting in a decrease of contaminant concentrations.	See pressure rise in stripper troubleshooting above.
Water is collecting in discharge piping of stripper.	Air leaving the stripper is very humid and will condense some water in the pipelines.	Install a knockout drum in discharge line before air is piped to another section of the process.
	The stripper causes foaming of the water which results in water collecting in the discharge lines.	Test for foaming contaminants such as soaps and install antifoaming dosing system to prevent foaming.
	Airflow rate is higher than the design value causing water to be carried over into the discharge lines.	Decrease flow rate to within design range.
Stripper often shuts down on a high stripper sump alarm.	Transfer pump is flowing faster than the discharge pump.	Slow transfer pump or speed up discharge pump.
	Discharge pump is not working properly.	Troubleshoot discharge pump.
Moyno Pumps		
Pump does not produce sufficient pressure/vacuum.	Pump is not primed.	Prime pump.
	Wrong direction of rotation.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Pump is not operating at required RPM.	Check and replace motor if required.
	Pump has wrong sized impeller.	Check impeller and replace if required.
	Pump pressure or vacuum is lost due to obstruction located between pump and gauge.	Check for flow restrictions and clean strainers or piping if required.

	Pump is not turned on.	Turn pump on.
	Coupling between pump and motor is no longer connected preventing the pump from rotating with the motor.	Reconnect and realign motor and pump.
Pump is leaking.	Gaskets are worn or faulty.	Replace gaskets.
	Mechanical seal has been overheated. This is often a result of operating the pump without any water.	Replace mechanical seal.
	Fittings are leaking on or around pump.	Tighten fittings.
	Water may be coming from another location.	Check for leaks around pump.
	Pump was run in reverse allowing the rotor to spin off of the pump shaft.	Disassemble pump and screw rotor back onto shaft (See manufacturer's manual).
Pump flow rate is too low.	Backpressure is too high for pump.	Reduce backpressure.
	Pump may not be sized correctly for process.	Replace pump.
	Pump impeller is too small.	Change pump impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter.	Replace filter and clean line.
Pump is making excessive noise during operation.	Manually rotate pump impeller and listen for clearance problems.	Disassemble pump and fix clearance problems.
	Alignment of pump may be off causing the flexible coupling to degrade.	Check alignment and reset alignment if needed. Replace flexible coupling if it is degraded.
Pressure Switch/Vacuum Switch		
Switch is not reacting at desired set point.	Switch is out of adjustment.	Change set point to desired value.
Switch is not working.	Switch may be faulty.	Remove input wires and test switch at desired pressure. If it does not trigger, it should be replaced.
Flow meter		
Flow meter is not rotating.	Dirt could have caused meter internals to jam up.	Disassemble flow meter and clean internal components.
Flow meter is rotating but pulse input is not working.	Switch on meter may be faulty.	Remove wiring and test contacts on meter to ensure that they are opening and closing. If not meter head needs to be replaced.

	Input wiring may be grounding out preventing the signal from opening and closing.	Test input wiring by isolating input wires and checking if input is on. If so you have a grounded input wire.
	Input to PLC is not working.	Simulate rotating meter by contacting input wires together and check for a detected flow rate and change in totalized flow.
Belt Driven Assemblies		
Squealing noise occurs on startup.	Belt is too loose.	Check tension of belt and tighten if required.
Excessive wear on bearings.	Belt is too tight.	Loosen belt tension.
Belt is wearing excessively.	Check orientation of blower and motor.	Adjust orientation if required.
Carbon Vessel		
Vessel is operating over pressure.	Silt may have collected in water phase vessel.	Remove lid and check for silt. Remove top layer of silt or replace vessel.
Vessel is breaking through earlier than expected.	Flow rate through vessel may be too high. Check design specifications.	Decrease flow rate.
	Air contaminant concentrations are higher than expected.	Test inlet concentrations.
	Check piping orientation to ensure that water is going in the top of water phase vessels and air is going in the bottom of air phase vessels.	Repipe vessel if piping is wrong.
	Ensure that there is not a large trapped air gap in the top of the water phase carbon vessel allowing the water to bypass a portion of the carbon.	Release air gap if present.
Bag Filter		
Vessel is operating over pressure.	Bag filter may be full of dirt and silt.	Remove cover and check for dirt buildup in the bag. Replace filter element if required.
	Equipment down stream of bag filter may be plugging.	Check for pressure buildup down stream of filter and fix pressure buildup downstream if found.
Water will not flow through filter fast enough.	Pump may not be able to supply enough pressure.	Check pressure output of pump with pump curve. Replace pump if needed.
Filters are plugging too fast	Filter element micron size may be too low.	Install larger micron filter element.

	Filter pressure switch setpoint may be too low.	Increase high pressure shutdown setpoint.
Oil Water Separator		
Water is collecting in product tank	Oil water separator may not be level causing water to spill into the skimmer tube.	Check level of oil water separator and adjust if necessary.
	Skimmer tube is not adjusted properly.	Check position of skimmer tube ensure that tube is rotated so the skimming slot allows at least 1-2" of oil to collect before spilling over into the oil tank.
	Skimmer tube is cracked or leaking.	Check that skimmer tube is not cracked, replace if necessary.
	Separator can be full of sludge on the bottom restricting water flow through to the clean water reservoir.	Check for dirt buildup in bottom. Drain and clean separator if necessary.
Oil is collecting on the clean water side	Oil water separator may be operating outside of design parameters.	Check that specific gravity of product and flow rate of separator match site-specific design print out for oil water separator. This can be found in the oil water separator section of your **newterra** manual or submittal package.
	Oil water separator was not primed with clean water on startup and large amounts of product were initially pumped into separator contaminating the clean water sections.	Drain separator, clean separator and media, and fill with clean water before proceeding.
	Silt can build up in the bottom of the separator restricting volume capacity and flow through media.	Inspect bottom of separator and inside of media. Drain and clean separator and clean or replace media if plugged or restricted.
	Inlet side of separator can have excessive amounts of oil on the top layer. This will reduce effective capacity of oil water separator.	Check level of oil collected in inlet side of separator. Adjust skimmer if required. Re-prime separator so only 1-2" of product remains on the top of the separator.
	Biological bacteria is suspending product in high-density mucus like collections that are passing through the separator.	Check for signs of bacteria in the inlet side of the separator. Contact **newterra** to discuss solutions to eliminating biological suspension.
	Product may be made up of two different components. The component breaking through may have a different density from what the separator was designed for.	Collect a sample of what is breaking through and confirm that it has the same properties as the product collecting on the inlet side.

	Oil storage tank may be full and high-level alarm not working properly. This will back the product up and fill the inlet side of the separator with product until the product passes under the lower weir and collects in the clean-water side.	Check product storage tank and ensure that level switch is working properly and that tank has not overfilled.
Oil and water is building up on inlet side but is not passing through separator and collecting in the clean water side.	Sludge and dirt may have built up on floor of separator preventing the water from passing by the lower weir.	Check for dirt buildup on bottom of separator. Drain and clean if necessary.
	Oil Water interface may be too low indicating that the separator has insufficient water to properly separate.	Fill the separator with clean water allowing water to collect in the inlet side forcing the oil water interface level to rise up too about 1" - 2" below the skimmer level.
	Only product is being pumped into inlet of separator.	If water is not present in sample entering the separator then it will not collect in the clean water side.
Water is in the oil outlet.	Skimmer opening is below the oil/water interface.	Adjust skimmer alignment to allow more oil to collect before skimming.
Oil is making its way to the outlet.	Water flow rate is too high.	Reduce flow rate through system.
	Filter media is plugged.	Replace or clean media.
	Oil discharge is plugged backing up OWS.	Drain oil down stream of skimmer.
Sand Filter		
Vessel is operating over pressure.	Sand filter may be full of dirt and silt.	Remove cover and check for dirt buildup on top of filter. Backwash filter.
	Equipment down stream of sand filter may be plugging.	Check for pressure buildup down stream of filter and fix pressure buildup downstream if found.
Water will not flow through filter fast enough.	Pump may not be able to supply enough pressure.	Check pressure output of pump with pump curve. Replace pump if required.
Filters are plugging too fast.	Filter was not backwashed properly.	Backwash filter vessel as per manufacturer's instructions.
	Filter pressure switch setpoint may be too low.	Increase high-pressure shutdown setpoint.
	Filter sand has solidified with calcification.	Replace sand in filter.

	Process water flow rate is operating above the design flow rate for the sand filter.	Check process flow rate and compare with design flow rate listed on manufacturer's literature or on the component sheet of the sand filter section of your **newterra** Manual.
Rotary Screw Compressor Package		
Compressor not starting.	Motor Overload.	Reset overload. Check compressor output pressure. Oil separator may be dirty, replace if needed. Check supply voltage.
	Stopped by compressed air temperature relay.	Oil level is too low. Not enough cooling air flow. Wrong compressor oil. Ambient temperature too high. Cooler dirty.
Insufficient air output.	Clogged intake filter.	Check condition of the filter and replace if needed.
	Clogged oil separator element.	Check condition of the oil separator element and replace if needed.
	Pressure switch is not working.	Check pressure switch adjustment. Repair or replace if switch is faulty.
	Receiver blow down valve open.	Disassemble and clean out internal components.
	Too high air consumption.	Check network for leaks and air powered devices.
	Drive belt slipping.	Check tension of belt and tighten if required. Replace belt if worn.
Compressor overheating.	Insufficient amount of oil.	Add more oil.
	Clogged oil filter.	Check condition of the filter and replace if needed.
	Cooler dirty.	Clean.
	Ambient temperature too high.	Check temperature and air circulation.
High oil consumption.	Oil return tube or its orifice is blocked.	Open and clean all internal components.
	Oil separator or sealing damaged or loosened.	Check seals and repair if needed.
	Oil separator dirty.	Replace.
	Wrong compressor oil.	Change oil. Use the correct oil as specified in the manufacturer's instructions.
	Output air temperature too high.	Check output temperature correct if it is too high.

	Faulty non-return valve of oil return pipe.	Check operation and replace valve if needed.
	Too much oil.	Drain extra oil out.
Network pressure rises over set valve.	Pressure switch is not working or damaged.	Check operation of switch.
	Output valve leaking.	Replace seal.
	Loose wire connections.	Check for loose wires and correct as needed.
Compressor doesn't restart automatically.	Pressure switch damaged.	Replace pressure switch.
	Output valve leaks.	Replace seals of output valve.
	Loose wires.	Check for loose wires and correct as needed.
Compressor doesn't stop automatically.	Output valve leaks.	Replace seals of output valve.
	Pressure Switch Damaged.	Replace pressure switch.
Refrigerated Dryer		
Water down stream of dryer.	Residual air in piping.	Blow out system with dry air.
	Air bypass system is open.	Check the bypass valve position.
	Inlet and Outlet conditions are reversed.	Check for correct connection.
	Air temperature on outlet of dryer may be too low.	Add heat trace to piping.
	Automatic drain mechanism is not working.	Replace drain mechanism.
	Dryer overloaded.	Check flow rate and inlet temperature.
High pressure drop across dryer.	Inlet air strainer clogged.	Clean inlet air strainer.
	Excessive air flow.	Check flow rate and reduce if needed.
	Separator filter clogged.	Replace filter sleeve.
	Freezing of moisture in evaporator.	Shut down dryer until system thaws.
Fault Alarm.	Dryer overloaded resulting in high air outlet temperature.	Check operating conditions.
	High outlet air temperature.	Correct high temperature.
	Thermostat switch is malfunctioning or not securely mounted.	Replace thermostat switch.
Refrigeration system not functioning properly in on position.	Power failure.	Check power.
	Line disconnect switch is open.	Check disconnect.

	Fuses blown, breaker blown.	Check fuses or breaker.
	Loose or faulty wiring.	Check wiring.
Refrigeration system cycles on and off.	High or low ambient conditions.	Check min/max temperature ranges.
	Air filter clogged.	Clean filter.
	Condenser fins clogged.	Clean fins.
	Fan motor or control switch not working.	Replace fan motor or switch.

Analog 4-20mA Transmitters		
Transmitter is sending a signal that is not accurate.	There may be water in the air sampling lines that is throwing off the readings.	Drain any moisture out of the air sampling lines.
	Transmitter may be out of calibration.	Refer to transmitter specification sheets on how to calibrate the transmitter. Note if transmitter is more than 10-25% out of calibration it will likely require factory recalibration.
Transmitter is sending 0-2 mA to the PLC input.	Transmitter may not be wired properly or one or more wire connections may be loose.	Check wiring with device specification sheet and newterra drawing. Check wiring for loose connections.
	Transmitter may be damaged or not working properly.	If you have a similar transmitter installed in another location on the system, switch them around to determine if the faulty transmitter works in another location. If the transmitter works you know the transmitter is not the problem. If the transmitter does not work in the other location then it is likely the transmitter. If the good transmitter does not work in the faulty location the problem is likely the wiring at that location or the input into the PLC.
Transmitter is sending over 20 mA to the PLC.	Transmitter is likely damaged.	Send back to manufacturer for re-calibration.
PLCs		
Power is on, Lights are on but PLC is not running the logic. Run light is not on.	PLC may not be in run mode. If the power has been off to the panel for an extended period of time, the PLC will switch out of run mode and stop running the logic.	Use external switch on PLC to switch from "term" to "run" then back to "term". This will force the PLC back into run mode. The run light should now indicate that the PLC is in run mode.
Power is on to panel but PLC lights are not on.	Fuse for PLC is pulled out or blown.	Test PLC fuse and replace if necessary. This is in the "PLC" fuse holder.

APPENDIX I METAL AND DIAMOND MINING EFFLUENT REGULATIONS ERP

(See BIM-5200-PLA-003)

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Baffinland Iron Mines Corporation

BIM-5000-PLA-0003 METAL AND DIAMOND MINING EFFLUENT REGULATIONS EMERGENCY RESPONSE PLAN

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DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Rev #	Prepared By	Reviewed By	Approved By	Description of change and purpose of issue
01/15/18	0	BW	BW	WB	Use
01/30/18	1	BW	BW	GR	Use
02/27/19	2	CD	CD	GR	Use
12/16/20	3	CD	CD	FG	Use
05/15/21	4	CD	CD	FG	Use
06/06/22	5	KB	CD	MB	Use
03/31/23	6	KNB	CD	FG	Use
04/30/24	7	KNB	CD		Use

TRACK CHANGES TABLE

Index of Major Changes/Modifications in Revision 7

Item No.	Description of Change	Relevant Section
1	Added details of the planned seepage collection system	4.8
2	Reorganization of document for clarity	entire document
3	Added clarification regarding water used for dust supression	5.1

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1. PURPOSE

The purpose of this Emergency Response Plan is to adhere to Part 3, Section 30 of the Metal and Diamond Mining Effluent Regulations (MDMER; ECCC, 2022). (Table 1)

Revisions to this plan will be completed based on future modifications to the work scope, emergency and spill response procedures, and the associated approvals. Updates to this Plan will be completed in accordance with the terms and conditions of the MDMER, Baffinland's water licenses, QIA Commercial Lease (Q13C301; issued September 6, 2013), the amended Project Certificate No. 005 [issued May 28, 2014 by the Nunavut Impact Review Board (NIRB)] and any subsequent requirements that may be issued.

A spill under the MDMER is defined as the unauthorized deposit of a deleterious substance or acutely lethal effluent to the receiving environment. A deleterious substance is defined as any substance that does not meet the criteria of Schedule 4 Table 2 of the MDMER. Baffinland's MDMER Emergency Response Plan provides a guide for preventing and controlling the release of effluent outside of the normal course of events for areas regulated under the MDMER.

Table 1 Cross-Reference of MDMER, 30 (1) to 30 (2), to this MDMER Emergency Response Plan

MDMER Reference	Description	Emergency Response Plan Reference
30 (1)	The owner or operator of a mine shall prepare an emergency response plan that describes the measures to be taken in respect of a deleterious substance within the meaning of subsection 34(1) of the Act to prevent any deposit out of the normal course of events of such a substance or to mitigate the effects of such a deposit.	Entirety of Document
30 (2)(a)	The identification of any deposit out of the normal course of events that can reasonably be expected to occur at the mine and that can reasonably be expected to result in damage or danger to fish habitat or fish or the use by man of fish, and the identification of the damage or danger;	Sections 3, 4 and 5
30 (2)(b)	A description of the measures to be used to prevent, prepare for and respond to a deposit identified under paragraph (a);	Sections 4, 5, and 6
30 (2)(c)	A list of the individuals who are to implement the plan in the event of a deposit out of the normal course of events, and a description of their roles and responsibilities;	Section 7
30 (2)(d)	The identification of the emergency response training required for each of the individuals listed under paragraph (c);	Section 8
30 (2)(e)	A list of the emergency response equipment included as part of the plan, and the equipment's location; and	Appendix C and D
30 (2)(f)	Alerting and notification procedures including the measures to be taken to notify members of the public who may be adversely affected by a deposit identified under Section 30 paragraph 2(a).	Section 7 and Appendix F

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2. APPLICATION

This MDMER Emergency Response Plan (BIM-5000-PLA-0003) applies to all departments and to all Baffinland employees, contractors and visitors when involved in controlled activities at Baffinland's MDMER regulated ponds.

Baffinland's ERP (BIM-5000-PLA-0005) identifies potential environmental, health, and safety emergencies that could arise during the operation phase of the Mary River Project. The ERP establishes the framework for responding to these situations, and applies to all facets of the Mary River Project. It defines requisite organizational roles and responsibilities for project personnel, internal and external contact information, training, resources, and reporting requirements. All Baffinland employees and project contractors are required to comply with the ERP.

3. DEFINITIONS AND ABBREVIATIONS

3.1 ABBREVIATIONS

Abbreviation	Definition
CF	Crusher Facility
ECCC	Environment and Climate Change Canada
ERP	Emergency Response Plan
ERT	Emergency Response Team
FDP	Final Discharge Point
GEVP	Group Executive Vice President
MDMER	Metal and Diamond Mining Effluent Regulations
MHR	Mine Haul Road
NIRB	Nunavut Impact Review Board
QIA	Qikiqtani Inuit Association
WRF	Waste Rock Facility
WTP	Water Treatment Plant

3.2 DEFINITIONS

Statement	Definition
Acute Lethality	During discharge periods effluent discharge samples collected from the FDPs of MDMER regulated ponds on a monthly basis, with monthly sampling dates being at least 15-days apart, are sent to a licenced laboratory for acute lethality testing. Baffinland's effluent is determined to be acutely lethal if the following results occur during acute lethality testing on effluent at 100% concentration: • When the salinity of the effluent is less than ten parts per thousand and the effluent is not deposited into marine waters, the effluent kills more than 50% of rainbow trout test specimens over a 96-hour testing period. The specific test conditions for this acute lethality test are defined in Section 14.1 of the MDMER (ECCC, 2022); or, • When the salinity of the effluent is less than four parts per thousand and the effluent is not deposited into marine waters, the effluent kills more than 50% of Daphnia magna test specimens over a 48-hour testing period. The specific test conditions for this acute lethality test are defined in Section 14.3 of the MDMER (ECCC, 2022).

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Final Discharge Point	The FDPs are the identifiable discharge points of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent (ECCC, 2022). Baffinland has a designated FDP at each MDMER regulated pond, where Baffinland has identified that they no longer exercise control over the discharged effluent from the respective pond.
pH of Effluent	Baffinland is authorized to deposit effluent only if the pH of the effluent is equal to or greater than 6.0 but is not greater than 9.5 (ECCC, 2022).
Prescribed Deleterious Substances	Deleterious substances prescribed under the MDMER consist of the following: • Arsenic; • Copper; • Cyanide; • Lead; • Nickel; • Zinc; • Suspended solids; • Un-ionized Ammonia; and, • Radium 226.
Spill	A spill is defined in this Plan as the uncontrolled release of a deleterious substance from its containment into a receiving environment. A deleterious substance is defined as any acutely lethal effluent or any substance that does not meet the criteria in Table 4. Under MDMER (ECCC, 2022), Schedule 4, table 2, outlines the discharge limits for substances that must be prevented from being deposited into the receiving environment. Such releases are potentially hazardous to humans, vegetation, water resources, aquatic organisms and terrestrial wildlife, both directly and through food web interactions. The severity of impact varies depending on several factors, including the type and quantity of spilled material, the location of the spill, and the time of year. MDMER discharge limits are used as the standards for risk analysis of releases to the environment from the MDMER regulated pond releases to the environment. As a result, additional levels of spill response have been developed for spills that exceed the MDMER limits. Additional products with the potential for release include hydrocarbon fuels, antifreeze, hydraulic fluid and lubricants from machinery.
Spill prevention	Spill prevention is an effective means of maintaining the health and safety of site personnel and the environment. Spills are less likely to occur when adhering to the criteria listed below. Inspections of the MDMER regulated ponds are conducted by the Mine Operations, Crusher Operations, and the Environment Department, when it is safe to do so. The conditions of the surrounding environment and currently understood risk will determine the frequency of inspections, such as: freshet melt, heavy rain events, increasing pond levels (with limited freeboard space), and changing water quality conditions.

3.3 PONDS SUBJECT TO MDMER

Baffinland has four surface water management ponds that are subject to the MDMER (Appendix B), all of which are located at the Mine Site. For MDMER monitoring and reporting purposes, Baffinland identifies these MDMER regulated ponds as:

- Crusher Facility (CF) Pond as ‘MS-06’,
- KM106 run-of-mine (ROM) ore stockpile pad pond (KM106 Stockpile Pond) as ‘MS-07’;
- Waste Rock Facility (WRF) Pond as ‘MS-08’, and,
- KM105 Surface Water Management Pond (KM105 Pond) as ‘MS-11’.

3.3.1 CF Pond (MS-06)

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The CF is located approximately four kilometres southwest of the WRF and two kilometres west of the KM106 Stockpile (Appendix A). The CF at the Mine Site consists of a pad that houses three (3) crusher spreads as well as associated run-of-mine, lump and fines ore stockpiles. The CF Pond, which collects storm water runoff diverted in perimeter collection ditches around the CF, is located west of the CF. Water from the CF Pond is treated to remove solids via pond-based settling. The MDMER regulated FDP is a sampling port located after the discharge pump at the north side of the CF Pond, before the connection to the treated sewage effluent pipeline (Appendix A).

Effluent discharged from the pond at the FDP is pumped to the approved Mary River outfall discharge location approximately 1.3 km southeast of the pond using the Mine Site's treated sewage effluent pipeline, originating at the Mine Site sewage treatment plant. The frequency and volume of effluent discharged from the CF pond is dictated by the pond capacity, weather, flight logistics, sample holding times and settling requirements. Effluent is typically discharged intermittently on an as-needed basis between late June and early September. MDMER effluent and water quality monitoring is restricted to periods of effluent discharge.

3.3.2 KM106 Stockpile Pond (MS-07)

The KM106 Stockpile is located approximately 4 km south of the WRF immediately east of the Mine Haul Road (MHR). Ore from Deposit 1 is placed on the KM106 Stockpile on an intermittent basis during periods when the CF is near capacity. The KM106 Stockpile Pond, which collects storm water runoff diverted in perimeter collection ditches around the KM106 Stockpile, is located south of the KM106 Stockpile. Water from the KM106 Stockpile Pond is treated to remove solids via pond-based settling. The MDMER regulated FDP is located on tundra land approximately 20 m east of the southeast corner of the KM106 Stockpile Pond.

Effluent discharged from the pond is pumped to the FDP via hose and then follows an existing surface water drainage path approximately 275 meters to the approved Mary River outfall discharge location. Effluent discharge volumes are monitored and recorded during periods of discharge using a flow totalizer with equivalent or similar specifications to a GPI TM Series 3" Flowmeter (Model No. TM300-N). The frequency and volume of effluent discharged from the KM106 Stockpile Pond is dictated by pond capacity, weather, flight logistics, sample holding times and sampling requirements. Effluent is typically discharged intermittently on an as-needed basis between late June and early September. MDMER effluent and water quality monitoring is restricted to periods of effluent discharge.

3.3.3 WRF Pond (MS-08)

The WRF at the Mine Site is located approximately one kilometre north of the Deposit 1 mine (Appendix A), and is the storage location for mine area's waste rock and overburden. Surface water runoff originating from the WRF is intercepted by Facility's perimeter collection ditches

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and directed downstream into the WRF Pond. In-pit water is also transferred to the WRF Pond via a hard line pipe. When required, water from the WRF Pond is pumped into the Water Treatment Plant (WTP) for pH adjustment, and subsequently discharged into a Geotube adjacent to the WTP for solids removal via filtering and settling (as per the Waste Pond Water Treatment Plant Operations BAF-PH1-340-PRO-048). The MDMER regulated Final Discharge Point (FDP) for MS-08 is a sampling port located after the discharge pump (Appendix A). Following the FDP, effluent passes through approximately 475 m of hard line pipe and is discharged to the tundra of the approved receiving environment, the Mary River watershed.

The WTP consists of physical and chemical treatment for pH adjustment, chemical precipitation and removal of solids by physical barrier. The water treatment processes include coagulation, pH adjustment, precipitation, flocculation and filtration. Water from the WRF Pond is pumped to the first reactor tank and mixed by an aeration system. Lime and coagulant (ferric sulfate) solutions are added and the pH is adjusted to a desired value to assist the precipitation of heavy metals. The intent of coagulation is to neutralize the electric charge on colloidal particles, and assist with the precipitation of heavy metals. The coagulated water then enters a second reactor tank to provide additional mixing and retention time for reactions to occur. The pH-adjusted water then flows to the third reactor in which polymer is added for flocculation. Flocculation creates flocs to assist with the separation of solids and liquids in subsequent stages. The overflow from the third reactor tank is pumped to the Geotube to facilitate the removal of solids via a membrane. The filtered final effluent from the Geotube is collected in the sump and discharged to the receiving environment via hard line pipe if internal effluent water quality is in compliance with the applicable discharge criteria. Effluent that does not comply with the applicable discharge criteria is recirculated to the WRF pond for further treatment.

The WTP treatment system has a 280 m^3/hr treatment 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 are continuously monitored. Ferric sulfate and polymer is added based on flow rate, while lime dosage is based on the pH in Reactor Tank 1. The chemical dosage rate is adjusted in the PLC by the Plant Operator to meet the operating targets. Monitoring of the treated effluent at various stages of the treatment system is conducted to monitor the treatment system performance.

Effluent discharge volumes are monitored and recorded during periods of discharge using a Krohne Enviromag 6” Magnetic Flow Meter. The frequency and volume of effluent discharges from the WTP is dictated by the pond capacity, weather, flight logistics, sample holding times and treatment requirements. Effluent is typically discharged intermittently on an as-needed basis between late June and early September. MDMER effluent and water quality monitoring is restricted to periods of effluent discharge.

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3.3.4 KM105 Sedimentation Pond (MS-11)

The KM105 Pond is located northeast of the KM104 laydown (Appendix A). The KM105 Pond collects storm water runoff and snowmelt originating from the Mine Haul Road (MHR) via a ditch that runs along the MHR and directs the flow to the KM105 Pond, Water from the KM105 Pond is treated to remove solids via pond-based settling. The MDMER regulated FDP is a sampling port located after the discharge pump at the west side of the KM105 Pond (Appendix A).

Effluent discharged from the pond at the FDP is pumped to the approved discharge location using two submersible pumps. The effluent is then pumped through 10" HDPE pipe down the slope of the spillway. The effluent then travels 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. Effluent discharge volumes are monitored and recorded during periods of discharge using a Krohne Enviromag Magnetic Flow Meter. The frequency and volume of effluent discharged from the KM105 pond is dictated by the pond capacity, weather, flight logistics, sample holding times and settling requirements. Effluent is typically discharged intermittently on an as-needed basis between late June and early September. MDMER effluent and water quality monitoring is restricted to periods of effluent discharge.

The KM105 Pond Surface Water Treatment System consists consist 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.

4. EMERGENCY SPILL RESPONSE PROCEDURES

4.1 SPILL RESPONSE PROTOCOLS

This MDMER Emergency Response Plan provides a guide for preventing and controlling the release of water outside of the normal course of events for MDMER regulated pond operations. This Plan has been prepared in accordance with MDMER (ECCC, 2022), and is to be used in conjunction with Baffinland's Emergency Response Plan (BIM-5000-PLA-0005) and the Spill Contingency Plan (BIM-5200-PLA-0012).

Baffinland requires all site personnel to be trained on the specific spill response initiation and reporting procedures. Refer to Table 1 for key internal contact information if a spill occurs. All site personnel must comply with the following procedure upon initiation of a spill response involving a regulated substance:

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1. Immediately warn other personnel working near the spill area.
2. Evacuate the area if the health and safety of personnel is threatened.
3. In the absence of danger, and before the spill response team arrives at the scene, take any safe and reasonable measure to stop, contain, and identify the nature of the spill.
4. Notify the Environmental Superintendent and the department who owns the facility, who will initiate further spill response operations.

Upon initiation of spill response, as directed by the Environmental Superintendent or designate, the following procedure shall be completed by the spill response team:

Source Control – If safe to do so, reduce or stop the flow of product. This may be accomplished with simple actions such as: turning off a pump, closing a valve, sealing a punctured liner with readily available materials, raising a leaking or discharging hose to stop flow, or transferring product from a leaking container (if required activate Baffinland's Emergency Response Plan; BIM-5000-PLA-0005).

Contain and Control the Free Product – If safe to do so, prevent or minimize the spread of the spilled product. Accumulate/concentrate spilled product in an area to facilitate recovery. Barriers positioned down-gradient of the spill will slow or stop flow of liquid. Barriers can consist of absorbent booms and pads, dykes, berms, fences, and/or trenches (dug in the ground, snow or ice).

Protection – Evaluate the risk of the impacted area to affect the surrounding environment. Protect sensitive ecosystems (i.e. fish-bearing streams) and/or natural resources that are at risk by isolating the area and/or diverting the spilled material to a less sensitive area. Protection/isolation may be achieved using the above-mentioned barriers.

Spill Clean-up – Recover and dispose of as much product as possible.

Report the Spill – Record information about the spill such as: date and time of occurrence, location and approximate size, type and amount of discharge product, photos, actions already taken to stop and contain the spill, ambient conditions, and any perceived threat to human health and safety or the environment. Internal Incident Reports shall be completed as per Baffinland's Incident Investigation and Reporting Procedure (BIM-5100-SOP-0021). As per section 9.0 Baffinland's Spill Contingency Plan (BIM-5200-PLA-0012) Spills of regulated substances in excess of reporting thresholds that occur outside of secondary or tertiary containment will be reported to the NT-NU Spill Line, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), and/or ECCC, as applicable, depending on the nature of the spill.

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4.2 LEVELS OF EMERGENCY SPILL RESPONSE

To effectively manage emergency responses, Baffinland has adopted a tiered emergency classification scheme (Figure 1). Each level of emergency, based on its severity, require varying degrees of response, effort, and support. Each level has distinct effects on normal business operations, as well as requirements for investigation and reporting. The ERP details each level of emergency and classification specific to spill response according to the following:

Level 1 (Low) – Minor accidental release of a deleterious substance with:
- No threat to public health and safety; and/or
- Negligible environmental impact to the receiving environment.

Level 2 (Medium) – Major accidental release of a deleterious substance with:
- Some threat to public health and safety; and/or
- Potential Moderate environmental impact to the receiving environment

Level 3 (High) – Uncontrolled hazard which:
- Jeopardizes project personnel health and safety: and/or
- Potential significant environmental impacts to the receiving environment

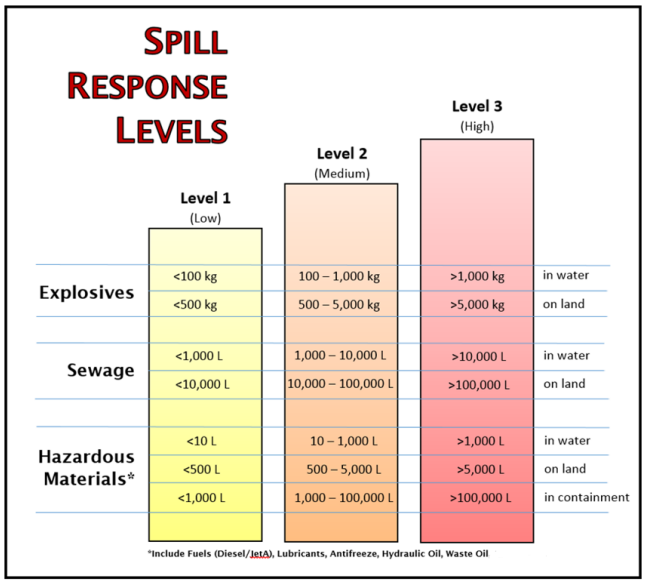


FIGURE 1 EMERGENCY SPILL RESPONSE LEVELS

4.3 WATERFOWL LANDING IN PONDS

Migratory birds use the Mary River project area during open-water season in their migration routes. The presence of open water in the MDMER regulated ponds mimics the natural habitat of some of these birds. This creates the risk of migratory birds landing in the MDMER regulated ponds. Occasions when the MDMER regulated ponds contain non-compliant effluent (i.e. effluent with pH < 6.0) pose a hazard to migratory birds.. Harming migratory birds is prohibited under the Migratory Birds Convention Act (ECCC, 1994).

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Deterrent techniques must be employed to prevent birds from landing in the ponds. Deterrent techniques may include human or predatory bird scarecrow statues or noise making devices. If migratory birds land on any of the ponds, all reasonable efforts must be focused on response measures that act as a deterrent to the birds that causes them to flee the area and travel to natural water bodies. MDMER regulated ponds are not expected to contain hydrocarbons however; If birds are impacted by any hydrocarbons, Canadian Wildlife Service (CWS) will be contacted and consulted to determine additional mitigations for birds that are affected by hydrocarbon residues.

4.4 SPILLS ON LAND

The main control techniques for spills on land are to construct physical barriers such as dykes, berms, trenches, booms and fences. Such barriers slow or stop the progression of the spill and also serve as containment to facilitate spill recovery. They should be placed down gradient from the source of the spill as close as possible to the source. Depending on the volume spilled, conditions at the spill location, and available equipment and materials, a berm may be constructed using soil, booms, lumber and snow. Construct temporary berms in a “V” shape or horseshoe shape that will accumulate a thick layer of free product in a convenient location where it can be recovered. Trenches are useful in the presence of permeable soil and when there is potential for spilled product to migrate below the ground surface, to facilitate spill recovery and/or containment.

4.5 BERM INTEGRITY FAILURE

Runoff collected in the MDMER regulated ponds can be released into the receiving environment if the integrity of the pond berm structure(s) is compromised. Factors that can compromise berm integrity include construction activities, rainfall, snowmelt, berm design, frost heaving, and poor maintenance. Notify Operations, Environment, and Health and Safety immediately if signs of berm failure are identified during an inspection.

In the event of failure of a MDMER regulated pond berm, a Code 1 emergency should be called immediately, depending upon the extent of the failure and the potential for impacts to the health and safety of humans and the receiving environment. The ERT will deploy emergency response equipment and ERT personnel to help set up pumps, manage effluent, and help stop/prevent further uncontrolled release into the receiving environment. Operations will provide personnel and equipment necessary to seal or hold the breach. Departmental managers and superintendents of Operations and Environment will provide additional response direction during such an occurrence.

4.6 PERIMETER COLLECTION DITCH INTEGRITY FAILURE

In the event of high runoff flows during freshet and heavy rainfall events, the capacity of the perimeter collection ditches that collect runoff from the WRF, CF, MHR and KM106 Stockpile

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may be compromised. There is the potential for the water levels in the diversion ditches to rise over the height of the ditch berms, resulting in an uncontrolled overflow release into the receiving environment. A potential result of high water levels in a ditch, even if the ditch berm walls are not breached, is the seepage of ditch water through permeable ditch berms into the surrounding environment (further discussed in Section 4.6).

In such an event, immediate corrective actions must aim to ensure all water in ditches reports to the ponds. Controlled pumping from ditches into the pond may alleviate the volume of water required to be contained by the ditches, and temporary emergency berms can be constructed to increase the capacity of the ditch berms. Any water that overflows and does not report to the ponds must be sampled with a full suite of samples.

During routine inspections of the perimeter collection ditches, flowing water may be observed originating from the toe of the collection ditch berms, potentially indicating water in the ditch as the source, and that the integrity of the ditch has been compromised. In such an event, temporary emergency berms should be constructed to ensure contact water in the Facility reports to the pond. Water accumulating in the Facility should be pumped directly to the pond to bypass the suspected berm integrity failure location.

Preventative efforts must include daily inspections of the perimeter collection ditches at the WRF, CF, MHR and KM106 Stockpile. Inspections must include visual assessments of all culvert crossings to ensure there are no blockages that would prevent the free flow of runoff. Personnel must notify their supervisors of impending overflow situations to enable an effective emergency response.

4.7 CONTROLLED EMERGENCY DISCHARGES AND EMERGENCY SPILLWAYS

In the event that runoff inflows to the MDMER regulated ponds exceed the rate that can be intentionally discharged for a prolonged period of time, pond levels may reach an elevation that results in effluent being released to the receiving environment via the engineered emergency spillway. In such an event, the first mitigative response will be to implement an emergency controlled discharge to prevent effluent from being released via the emergency spillway. The plan to implement an emergency controlled discharge will be formulated by the Operations and Environmental Manager/ Superintendents. If the controlled emergency discharge does not lower the level of effluent in the pond(s), the emergency spillway will be used as designed, to release volumes of effluent that exceed the pond capacity and prevent failure of the pond berm structures. In such an occurrence, close monitoring of the pond and emergency spillway is required to assess the integrity of the berms and identify any erosional degradation of the berms, spillway and surrounding tundra. Monitoring to be conducted in the event that the emergency spillway is used, includes inspecting pond infrastructure and adjacent tundra areas for signs of cracking, slumping, movement and/or the formation of sinkholes. As the level of control is significantly reduced when using the emergency spillway,

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a controlled emergency discharge is the first and preferred mitigative response to be undertaken. If signs of instability or erosional degradation are noticed during a spillway discharge, the Mine Operations, Crushing and Environmental Superintendents should be notified immediately.

In the event of a controlled emergency or spillway discharge, a full suite sample set, including the MDMER-FDP and an acute lethality sample will be collected to determine the quality of the effluent being discharged into the receiving environment. Volumes of effluent released during such an event will be measured using a flow meter or suitable estimation method (i.e. flow rate extrapolation) and recorded. Regulators must be notified for such events.

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4.8 SEEPAGE

The potential exists for contact water to seep from engineeed design structures. Close monitoring of the areas surrounding the MDMER regulated ponds will be conducted during the open-water season. Inspections will look to identify newly formed wet areas, flowing water, and/or areas of pooling. Any contact water from a facility must be arrested from entering the collection ditches if they are suspected to have areas of seepage. If suspected seepage is observed, the Operations and Environmental Superintendents will be notified immediately. If seepage of effluent is confirmed, all reasonable and safe emergency containment methods must be implemented to capture the seepage and/or minimize the extent of seepage migration. For example, an emergency containment ditch and sumps may be utilized to capture observed seepage. This seepage will be characterized through sampling and if deemed to be above criteria listed in Section 4 table 2 of the MDMER; must be pumped back into the pond, and any seepage that cannot be contained will be sampled with a full suite sample set to determine potential impacts on the receiving environment.

In the event that ongoing seepage is occurring, a seepage collection system may be installed to effectively collect and monitor effluent that passes through this area. An engineered seepage collection system may be constructed to effectively contain and characterize water quality and quantity as per the regulations.

4.9 SPILLS INTO CONTAINMENT FACILITY

If hazardous products (i.e. hydrocarbons or antifreeze) are released into the MDMER regulated ponds, spill response should be initiated as per the Spill Contingency Plan. To determine the best method for spill containment and recovery, the Environmental Superintendent or their designate should be consulted. Responses to a spill in a pond can include various containment and recovery techniques, including skimming and booming, in concert with water treatment. Mechanical recovery equipment (i.e. skimmers and oil/water separators) will be utilized, as required.

4.10 SPILLS AT THE WRF WTP

The effluent from the WRF Pond is treated in the WTP in a three-step process involving the injection of chemicals into temporary storage tanks, and a final step of filtration in the Geotube.. The water is first treated in the temporary storage tanks using iron precipitation, hydroxide precipitation, and flocculation, while pH is monitored to indicate when pH reaches desired values. With a desired pH value, the partially treated effluent is discharged from the WTP into the Geotube for removal of suspended solids. The effluent from the Geotube sump can be discharged either back into the WRF Pond, if deemed non-compliant after settling, or into the receiving environment if deemed compliant (refer to sections 6.1 and 6.2 for guidance on this decision).

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Chemicals used during the treatment of the WRF Pond effluent include ferric sulphate, lime and polymer. Additionally, there is fuel and other hydrocarbon products present at the plant for heating and power generation purposes. A spill of these hazardous products would necessitate spill response if released into the environment. Figure 1 must be consulted to determine the level of Emergency Spill Response in the event of a spill at the WRF Pond.

4.11 SPILLS AT THE WRF KM105 SEDIMENTATION POND

Treatment at the KM105 Sedimentation pond will include chemical addition, pH adjustment, setteling and clarification.

Chemicals used during the treatment of the WRF Pond effluent include ferric sulphate, lime and polymer. Additionally, there is fuel and other hydrocarbon products present at the plant for heating and power generation purposes. A spill of these hazardous products would necessitate spill response if released into the environment. The treatment system will consist of a chemical dosing system at the inlet to the pond for the addition of flocculant, coagulant, as well as lime for pH control.

4.12 NON-COMPLIANT PIT WATER

If non-compliant pit water accumulates within the pit, a water transfer process will be implemented to transfer water from the pit to the WRF Pond to contain and eliminate the potential for non-compliant water migrating outside of the pit benches into the surrounding mountain tundra.

During the transfer of pit water, the pump, hoses and/or water truck will be routinely monitored for leaks. If non-compliant water is released through the pit or during transfer, on land control techniques, such as berms, dykes, trenches, and fences, will be implemented. Such barriers slow the progression of water migration and serve as containment to facilitate recovery. They should be placed down gradient from the source of the release, and as close as possible to the source. Depending on the volume released, the site of the release, as well as available equipment and materials, a temporary barrier may be built with soil, lumber and/or snow. Trenches are useful in the presence of permeable soil to facilitate recovery and/ or containment when the released product is potentially migrating below the ground surface.

5. EFFLUENT MANAGEMENT

Baffinland uses a variety of methods to manage effluent from MDMER regulated ponds

5.1 WATER RECYCLING FOR DUST SUPRESSION

Baffinland uses this recycled water for dust suppression on the MHR and within mine working areas at Deposit 1 providing the effluent meets all MDMER discharge criterion, and the effluent quality discharge limits for sedimentation ponds outlined in Baffinland's water licence (Water

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Licence No. 2AM-MRY1325, Table 10: Effluent Quality Discharge Limits for Open Pit, Stockpiles, and Sedimentation Ponds), with the exception of TSS. Water used for dust suppression is quickly absorbed by dry road surfaces and therefore treated pond effluent used for dust suppression is not expected to leave the immediate area of use. The use of treated effluent for dust suppression within the mine area would eliminate the need to travel longer distances to source water and therefore improve the efficiency and effectiveness of dust suppression operations. This provision is only applicable to the Mine Haul Road and mine working areas of Deposit 1 that ultimately report to an MDMER regulated facility.

5.2 POND TO POND TRANSFER

In the event that a containment facility is at risk of over-topping, pond to pond transfer will occur in order to safely lower 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.

6. REPORTING REQUIREMENTS IN THE EVENT OF A SPILL

In accordance with the Fisheries Act, in the event of an unauthorized release of a deleterious substance, a written report must be submitted to ECCC. The information required to be included in the spill report submitted to ECCC is outlined in Section 31 of the MDMER. In the event of a spill of deleterious substances from the MDMER regulated ponds or associated facilities, the spill report submitted by the Environmental Superintendent to applicable regulators (Appendix F) must contain the following information:

- The name, description and concentration of the deleterious substance deposited;
- The estimated quantity of the spill and how this estimate was achieved;
- The day on which, and hour at which, the deposit occurred;
- The quantity of the deleterious substance that was deposited at a place other than through a FDP and the identification of that place, including the location by latitude and longitude and, if applicable, the civic address;
- The quantity of the deleterious substance that was deposited through a FDP and the identification of that discharge point;
- The name of the receiving body of water, if there is a name, and the location by latitude and longitude where the deleterious substance entered the receiving body of water;
- The results of the acute lethality tests conducted under subsection 31.1(1) or a statement indicating that acute lethality tests were not conducted but that notification was given under subsection 31.1(2);
- The circumstances of the deposit, the measures that were taken to mitigate the potential effects of the deposit and, if the emergency response plan was implemented, details concerning its implementation; and

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- The measures that were taken, or that are intended to be taken, to prevent any similar occurrence of an unauthorized deposit. (ECCC, 2022)

6.1 PROCEDURE FOR DISCHARGING CONTAINMENT PONDS

All personnel must adhere to the following procedure when planning to discharge from a containment pond. If personnel are unsure of a task at any time, the work must cease, and the worker must contact their supervisor to request further direction.

1. Prior to sampling, the YSI calibration much be checked and the results of this check recorded in the logbook.
2. Collect a full-suite of pre-discharge samples from pond, if discharge is not immediately required to avoid overflow.
3. If pre-discharge sample results are compliant, notify applicable regulators of planned discharge.
4. The sampling date for the monthly acute lethality sample must be selected and recorded not less than 30 days in advance of collecting the sample.
5. Obtain approval from the Environmental Superintendent or Manager to begin discharging.
6. Prior to pumping, record flow meter totalizer values and the time of pump start-up, in the appropriate logbook. This is the standard requirement before any pumping occurs (Note: Baffinland is required to report the total volume of effluent discharged daily and monthly from containment ponds as per the Water Licence and the MDMER).
7. Effluent sampling frequencies must adhere to the MDMER and Water Licence criteria utilizing accredited laboratory analysis, with accompanying field parameters, while discharging.
    a. All discharge samples must be taken from the FDP for the pond.
    b. YSI readings must accompany all samples, and the BIM assigned YSI equipment number must be recorded in the field log.
    c. All acute lethality samples must be collected with a MDMER-FDP sample set.
8. The containment pond must be inspected daily during the discharge period.
9. Ensure the required discharge data and notes are recorded in the appropriate field log daily during the discharge period. All discharge data and notes must be recorded in the field logbook designated for the specific pond.
10. After sample collection, the following actions must be completed as soon as possible:
    a. Photographs of discharge activities and scans of field notes must be documented and the discharge log updated.
    b. Samples are to be stored in the lab refrigerator or in a cooler with ice until the samples are shipped to the lab.

6.2 ENSURING NO DISCHARGE OF NON-COMPLIANT EFFLUENT

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Effluent discharged to the receiving environment from containment ponds must adhere to MDMER and Baffinland's Water License discharge limits (Table 4). Historically, the WRF Pond has contained low pH (acidic) water as the result of impacted runoff from the Waste Rock Stockpile. In cases where effluent contained in the MDMER regulated ponds is determined to be non-compliant with applicable discharge limits, the effluent must be treated as per Baffinland's Waste Rock Management Plan (BIM-5200-PLA-0029) and Waste Pond Water Treatment Plant Operations Procedure (BAF-PH1-340-PRO-048) to ensure compliance with the applicable discharge limits.

It is the responsibility of both the supervisor and the worker to discontinue discharging from the pond(s) and to notify their supervisor immediately, for any of the reasons listed below. A re-evaluation of the effluent quality is required prior to restarting discharge.

Reasons to discontinue discharging:

1. If external lab results for any MDMER regulated pond effluent are received that exceed the maximum concentrations listed in the 'BIM Internal Limits' column in Table 2. These limits are a threshold of conservatism to ensure regulated discharge limits are not exceeded (Table 4).
2. If field pH measurements (i.e. YSI) fall outside the allowable range outlined in the 'BIM Internal Limits' column of Table 2. These field readings are real-time measurements that characterize the quality of effluent being discharged at that instance. As such, if measured field parameters fall outside of the 'BIM Internal Limits' outlined in Table 2, the discharge of effluent to the receiving environment must cease and the worker's supervisor must be immediately notified.
3. If effluent quality conditions change during or after a precipitation even, increased internal monitoring may be required unless advised otherwise by the Environmental Superintendent.

TABLE 2 BIM STANDARDS FOR EFFLUENT QUALITY DISCHARGE LIMITS FOR MDMER REGULATED PONDS

Parameter	Maximum Authorized Monthly Mean Concentration, as per MDMER (Schedule 4, Table 2)	Maximum Authorized Monthly Concentration in a Grab Sample, as per MDMER (Schedule 4, Table 2)	Maximum Concentration In A Grab Sample, as per BIM Internal Limits
Total Arsenic	0.30 mg/L	0.60 mg/L	0.30 mg/L
Total Copper	0.30 mg/L	0.60 mg/L	0.30 mg/L
Total Lead	0.10 mg/L	0.20 mg/L	0.10 mg/L
Total Nickel	0.50 mg/L	1.00 mg/L	0.50 mg/L
Total Zinc	0.50 mg/L	1.00 mg/L	0.50 mg/L
TSS	15.0 mg/L	30.0 mg/L	15.0 mg/L
Cyanide	n/a	n/a	n/a
Radium 226	0.37 Bq/L	1.11 Bq/L	0.37 Bq/L

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pH	Between 6.0 and 9.5	Between 6.0 and 9.5	Between 6.5 and 9.0
Un-ionized Ammonia	0.50 mg/L expressed as nitrogen (N)	1.00 mg/L expressed as nitrogen (N)	0.50 mg/L
Rainbow Trout	Not acutely toxic (<50% mortality)		
Daphnia Magna	Not acutely toxic (<50% mortality)		

If non-compliant effluent is accidently discharged to the receiving environment, Operations and Environment Departments will work collaboratively to mitigate, evaluate and document potential effects. In the case of the accidental release of non-compliant effluent, pumping of effluent to the receiving environment must cease immediately and the Environmental Manager, Mine Manager and the Environmental Superintendent must be notified immediately. In the event of a release of non-compliant effluent to the receiving environment, all notes, photographs, pumping/ discharge times, rates, and totalizer data, and effluent quality data must be compiled for the investigation and the scene of the incident shut down until further instruction.

In the occurrence of an acute lethality test determining the effluent to be acutely lethal, Baffinland will cease discharge immediately. The inspector will be notified of the non-compliance without delay. Effluent quality data collected when the acute lethality sample was collected will be reviewed, and an additional MDMER-FDP and acute lethality sample set may be collected with the discharge pump set in recirculation mode to obtain additional information. Additionally, reference and exposure area samples will be collected to monitor any impacts on the receiving environment. The reference area sample site for MS-06, MS-07, MS-08 is MS-08-US, and CLT-REF4 for MS-11; and the exposure area sample sites are MS-08-DS for the WRF Pond, MS-06-DS for the CF Pond, MS-07-DS for the KM106 Stockpile Pond, and D1-05 for the KM105 Pond. These requirements are outlined in Section 15 of the MDMER. If discharge is not ceased, increased frequency of acute lethality testing will occur as per Section 15 of the MDMER. In most cases, the pond will be recirculated until effluent quality is confirmed to be compliant before discharge to the receiving environment resumes.

7. RESPONSIBILITIES

In the event of an emergency associated with the MDMER regulated ponds it will be necessary for multiple departments to work in conjunction with each other. The following outlines the specific responsibilities of those departments.

Role	Responsibility
General Manager	• Approve the content of the MDMER ERP • Ensure each departmental manager and superintendent understands the contents of the plan and follows its requirements. • Responsible for ensuring departments contact the appropriate external authorities as per this Plan and the Baffinland Emergency Response Plan (BIM-5000-PLA-0005). • Responsible for ensuring Operations Managers adhere to relevent OMS schedules and procedures

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Operations Superintendents	• Approve the content of the MDMER ERP • Responsible for implementing the Plan within their departments and areas of operation. • Ensure that their personnel understand the contents of this Plan and follow its requirements. • Ensure that their personnel understand the contents of all OMS manuals relevant to their work areas follow the requirements. • Responsible for implementing an inspection program to ensure that the Plan is being fully implemented and to apply corrective actions in the event of identified non-compliances, non-conformances, and/or issues of concern. • Participate in an annual spill response training drill/ exercise
Operations Supervisors	• The health and safety of all persons while managing and directing activities associated with working around the Water Containment Facilities • Ensuring all workers and operators are trained and understand this Plan. • Assist in approved effluent discharging activities. • Schedule and verify that inspections of the water containment faciliteis are completed as part of the OMS manuals • Participate in an annual spill response training drill/ exercise

Operations WTPOperators	• Report all spills and/or non-compliances to their supervisor.
	• Understand and follow detailed instructions when assisting with discharging effluent and working around all Ponds.
	• Follow procedures outlined in area specific SOPs and OMS Manuals in regards to water treatment.
	• Ensure the plant process parameters and field effluent parameters are recorded in the log book daily
	• Inspecting the MDMER regulated ponds and surrounding tundra for the following:
	  ○ Signs of instability (i.e. collapsing berm, settlement, erosion, cracks, seepage, movement, settlement).
	  ○ Damage to the liner (i.e. tears).
	  ○ Ditch obstructions and issues preventing effective functioning as per design.
	• Participate in an annual spill response training drill/ exercise

Environmental Manager/ Superintendent	• Responsible for implementing the Plan within their department. • Ensure that their personnel understand the contents of the Plan and follow its requirements. • Implementing an inspection program to ensure that the Plan is being fully implemented and advise on how best to evaluate, contain and remediate and/or recover any spill associated with MDMER regulated ponds.

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	• Responsible for all required reporting to regulators regarding MDMER regulated pond water quality, effluent discharging, and spills (Section 5) (ECCC, 2022). • Responsible for coordinating the development of, and assisting in conducting, drills and exercises annually, in conjunction with the ERT Trainers

Environmental Coordinator and Technicians	• Reviewing and understanding all the applicable plans and procedures associated with environmental aspects of the MDMER regulated ponds.
	• Contacting their immediate supervisor if uncertain about any of their assigned tasks.
	• Inspecting the MDMER regulated ponds and surrounding tundra for the following:
	  ○ Signs of instability (i.e. collapsing berm, settlement, erosion, cracks, seepage, movement, settlement).
	  ○ Damage to the liner (i.e. tears).
	  ○ Ditch obstructions and issues preventing effective functioning as per design.
	• Monitoring and sampling of the FDPs during effluent discharge from the MDMER regulated ponds as per Environment's Water Sampling Procedure (BIM-5200-SOP-0009) and Working Near Water Containment Facilities Procedure.
	• Respond to spills that are associated with the MDMER regulated ponds in conjunction with the ERT and the Department responsible for the facility.
	• Participate in an annual spill response training drill/ exercise

ERT Trainers	• Identify training and resource requirements for personnel involved with emergency spill responses, in conjunction with the Environment department • Ensure emergency responders can operate spill response equipment and are trained in plausible spill response emergencies that could occur on site • Responsible for coordinating the development of, and assisting in conducting, drills and exercises annually, in conjunction with the Environment department

8. PRE-REQUISITE SKILLS

8.1 TRAINING FOR SPILL RESPONSE

Emergency spill responses often occur in conjunction with other emergency responses (i.e. an overturned fuel tanker on the Tote Road). To facilitate an efficient response to an emergency, personnel trained to respond to health and safety emergencies shall be trained in spill response. Baffinland's ERT Trainer, with support from the Environmental Superintendents, will identify training and resource requirements for personnel involved with emergency spill responses. Emergency spill response training required by this Plan shall be reviewed in conjunction with Baffinland's ERP. Emergency and spill response training shall be updated throughout the lifecycle of Project to ensure the following requirements are fulfilled:

- The requirements of NWT/ Nunavut Mines Health and Safety Regulations are met or exceeded.

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- Emergency responders can competently operate the equipment employed for spill responses and other emergencies.
- Emergency responders will undertake practices, drills, and full-scale exercises, for responding to emergencies that are plausible on site.

8.1.1 Drills and Exercises

While drills and exercises can be used for training purposes, their primary function for this Plan is to provide the means of testing the adequacy of the Plan's provisions and the level of readiness of response personnel. The ERT Trainer and Environmental Superintendents are responsible for coordinating the development of and assisting in conducting drills and exercises annually. The following section outlines the types of drills and exercises that can be practiced:

8.1.1.1 Table Top Exercises

Tabletop exercises involve presenting a simulated emergency to key emergency response personnel in informal settings to elicit constructive discussions as the participants examine and resolve problems based on this Plan. These exercises shall be performed during ERT training sessions conducted throughout the year.

8.1.1.2 Functional Drills

Functional drills are practical exercises designed to evaluate the capability of personnel to perform a specific function (i.e. communications, first aid, and spill response). Deficiencies and competencies identified during functional drills are documented as per Section 30(4) of the MDMER, and are used as effective development tools in the preparation of response procedures required for full-scale exercises.

8.1.1.3 Full-Scale Exercises

Full-scale exercises are intended to evaluate the operational capability of Baffinland's emergency response and preparedness. Full-scale exercises require sufficient notice to allow for the preparation of effective emergency response procedures and to identify and correct deficiencies in advance. Examples of mock full-scale exercises at Baffinland include: non-compliant water discharge, berm breach, controlled discharge, seepage observed, and migratory waterfowl landing in ponds. Deficiencies and competencies identified during full-scale exercises are documented as per Section 30(4) of the MDMER, and used as effective development tools in the preparation of response procedures required for full-scale exercises.

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9. RELATED DOCUMENTS

BAF-PH1-340-PRO-048 - Waste Pond Water Treatment Plant Operations.

BIM-5000-PLA-0005 - Emergency Response Plan

BIM-5200-SOP-0009 - Water Sampling Procedure

BIM-5100-SOP-0021 - Incident Investigation and Reporting Procedure

BIM-5200-PLA-0003 - Environmental Protection Plan

BIM-5200-PLA-0012 - Spill Contingency Plan

BIM-5200-PLA-0029 - Phase 1 Waste Rock Management Plan

Environment and Climate Change Canada (ECCC), 2022. Metal and Diamond Mining Effluent Regulations, SOR/2002-222.

Environment and Climate Change Canada (ECCC), 1994. Migratory Birds Convention Act, 1994. (S.C. 1994, c. 22).

Minister of Justice, 1985. Fisheries Act. (R.S.C., 1985, c. F-14).

Nunavut Impact Review Board (NIRB), 2020. In the matter of the Nunavut Land Claims Agreement, Nunavut Land Claims Agreement Act, S.C., 1993, c. 29 Article 12, Part 5 and In the matter of an application by Baffinland Iron Mines Corporation for development of the Mary River Project Proposal in the Qikiqtani Region of Nunavut, NIRB Project Certificate No. 005. Amendment No. 3 dated June 18, 2020.

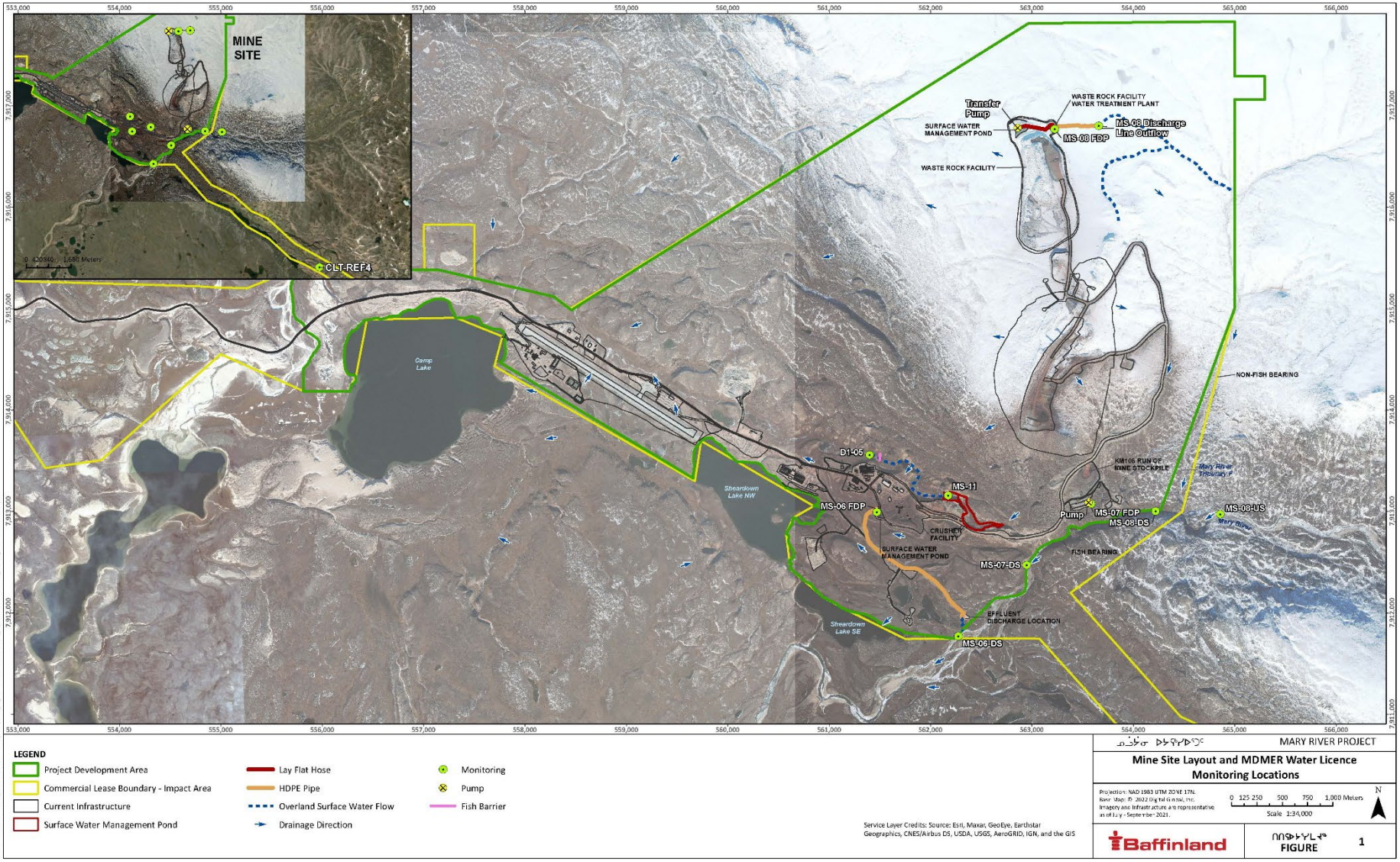
Nunavut Water Board (NWB), 2015. Nunavut Water Board Licence No. 2AM-MRY1325 – Amendment No. 1. Issued by the Nunavut Water Board, July 2015.

Qikiqtani Inuit Association (QIA) and Baffinland Iron Mines Corporation (QIA and Baffinland), 2013. The Mary River Project, Commercial Lease – Q13C301 between Qikiqtani Inuit Association and Baffinland Iron Mines Corporation. September 6, 2013.

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APPENDIX A – SITE LAYOUT AND WATER LICENCE/ MDMER MONITORING LOCATIONS

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APPENDIX B – MDMER REGULATIONS

Current regulations can be found at https://laws-lois.justice.gc.ca/eng/regulations/sor-2002-222/FullText.html

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CANADA

CONSOLIDATION

CODIFICATION

Metal and Diamond Mining Effluent Regulations

Règlement sur les effluents des mines de métaux et des mines de diamants

SOR/2002-222

DORS/2002-222

Current to April 16, 2024

Last amended on June 9, 2023

À jour au 16 avril 2024

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OFFICIAL STATUS OF CONSOLIDATIONS

Subsections 31(1) and (3) of the *Legislation Revision and Consolidation Act*, in force on June 1, 2009, provide as follows:

Published consolidation is evidence
31 (1) Every copy of a consolidated statute or consolidated regulation published by the Minister under this Act in either print or electronic form is evidence of that statute or regulation and of its contents and every copy purporting to be published by the Minister is deemed to be so published, unless the contrary is shown.

...

Inconsistencies in regulations
(3) In the event of an inconsistency between a consolidated regulation published by the Minister under this Act and the original regulation or a subsequent amendment as registered by the Clerk of the Privy Council under the *Statutory Instruments Act*, the original regulation or amendment prevails to the extent of the inconsistency.

CARACTÈRE OFFICIEL DES CODIFICATIONS

Les paragraphes 31(1) et (3) de la *Loi sur la révision et la codification des textes législatifs*, en vigueur le 1er juin 2009, prévoient ce qui suit :

Codifications comme élément de preuve
31 (1) Tout exemplaire d'une loi codifiée ou d'un règlement codifié, publié par le ministre en vertu de la présente loi sur support papier ou sur support électronique, fait foi de cette loi ou de ce règlement et de son contenu. Tout exemplaire donné comme publié par le ministre est réputé avoir été ainsi publié, sauf preuve contraire.

[...]

Incompatibilité — règlements
(3) Les dispositions du règlement d'origine avec ses modifications subséquentes enregistrées par le greffier du Conseil privé en vertu de la *Loi sur les textes réglementaires* l'emportent sur les dispositions incompatibles du règlement codifié publié par le ministre en vertu de la présente loi.

LAYOUT

The notes that appeared in the left or right margins are now in boldface text directly above the provisions to which they relate. They form no part of the enactment, but are inserted for convenience of reference only.

MISE EN PAGE

Les notes apparaissant auparavant dans les marges de droite ou de gauche se retrouvent maintenant en caractères gras juste au-dessus de la disposition à laquelle elles se rattachent. Elles ne font pas partie du texte, n'y figurant qu'à titre de repère ou d'information.

NOTE

This consolidation is current to April 16, 2024. The last amendments came into force on June 9, 2023. Any amendments that were not in force as of April 16, 2024 are set out at the end of this document under the heading "Amendments Not in Force".

NOTE

Cette codification est à jour au 16 avril 2024. Les dernières modifications sont entrées en vigueur le 9 juin 2023. Toutes modifications qui n'étaient pas en vigueur au 16 avril 2024 sont énoncées à la fin de ce document sous le titre « Modifications non en vigueur ».

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SOR/2002-222 June 6, 2002

FISHERIES ACT

Metal and Diamond Mining Effluent Regulations

P.C. 2002-987 June 6, 2002

Her Excellency the Governor General in Council, on the recommendation of the Minister of Fisheries and Oceans, pursuant to subsections 34(2), 36(5) and 38(9) of the *Fisheries Act*, hereby makes the annexed *Metal Mining Effluent Regulations*.

Enregistrement
DORS/2002-222 Le 6 juin 2002

LOI SUR LES PÊCHES

Règlement sur les effluents des mines de métaux et des mines de diamants

C.P. 2002-987 Le 6 juin 2002

Sur recommandation du ministre des Pêches et des Océans et en vertu des paragraphes 34(2), 36(5) et 38(9) de la *Loi sur les pêches*, Son Excellence la Gouverneure générale en conseil prend le *Règlement sur les effluents des mines de métaux*, ci-après.

PART 1

General

Interpretation

1 (1) The following definitions apply in these Regulations.

Act means the *Fisheries Act*. (*Loi*)

acute lethality test [Repealed, SOR/2018-99, s. 2]

acutely lethal, in respect of an effluent, means that the effluent at 100% concentration kills

(a) more than 50% of the rainbow trout subjected to it for a period of 96 hours, when tested in accordance with the acute lethality test set out in section 14.1;

(b) more than 50% of the threespine stickleback subjected to it for a period of 96 hours, when tested in accordance with the acute lethality test set out in section 14.2;

(c) more than 50% of the *Daphnia magna* subjected to it for a period of 48 hours, when tested in accordance with the acute lethality test set out in section 14.3; or

(d) more than 50% of the *Acartia tonsa* subjected to it for a period of 48 hours, when tested in accordance with the acute lethality test set out in section 14.4. (*létalité aiguë*)

acutely lethal effluent [Repealed, SOR/2018-99, s. 2]

authorization officer [Repealed, SOR/2018-99, s. 2]

commercial operation, in respect of a mine, means an average rate of production equal to or greater than 10% of the design-rated capacity of the mine over a period of 90 consecutive days. (*exploitation commerciale*)

composite sample means

(a) a quantity of effluent consisting of not less than three equal volumes or three volumes proportionate to flow that have been collected at approximately equal time intervals over a sampling period of not less than seven hours and not more than 24 hours; or

(b) a quantity of effluent collected continuously at a constant rate or at a rate proportionate to the rate of

PARTIE I

Dispositions générales

Définitions et interprétation

1 (1) Les définitions qui suivent s'appliquent au présent règlement.

agent d'autorisation [Abrogée, DORS/2018-99, art. 2]

autorisation transitoire [Abrogée, DORS/2018-99, art. 2]

chantier [Abrogée, DORS/2018-99, art. 2]

concentration moyenne mensuelle La valeur moyenne des concentrations mesurées dans les échantillons composites ou instantanés prélevés de chaque point de rejet final chaque mois où il y a rejet de substances nocives. (*monthly mean concentration*)

dépôt de résidus miniers [Abrogée, DORS/2006-239, art. 1]

eau de drainage superficiel [Abrogée, DORS/2018-99, art. 2]

échantillon composite

a) Soit le volume d'effluent composé d'au moins trois parties égales ou de trois parties proportionnelles au débit, prélevées à intervalles sensiblement égaux, pendant une période d'échantillonnage d'au moins sept heures et d'au plus vingt-quatre heures;

b) soit le volume d'effluent prélevé de façon continue à un débit constant ou à un débit proportionnel à celui de l'effluent, pendant une période d'échantillonnage d'au moins sept heures et d'au plus vingt-quatre heures. (*composite sample*)

échantillon instantané [Abrogée, DORS/2018-99, art. 2]

effluent S'entend, selon le cas :

a) de l'effluent de bassins de traitement, de l'effluent d'eau de mine, de l'effluent des dépôts de résidus miniers, de l'effluent d'installations de préparation du minerai, de l'effluent d'installations d'hydrométallurgie ou de l'effluent d'installations de traitement à l'exclusion de l'effluent d'installations de traitement d'eaux résiduaires;

flow of the effluent over a sampling period of not less than seven hours and not more than 24 hours. (*échantillon composite*)

Daphnia magna monitoring test [Repealed, SOR/2018-99, s. 2]

deleterious substance [Repealed, SOR/2018-99, s. 2]

diamond mine means any work or undertaking that is designed or is used, or has been used, in connection with a mining or milling activity to produce a diamond or an ore from which a diamond may be produced. It includes any cleared or disturbed area that is adjacent to such a work or undertaking. (*mine de diamants*)

effluent means any of the following:

(a) hydrometallurgical facility effluent, milling facility effluent, mine water effluent, tailings impoundment area effluent, treatment pond effluent or treatment facility effluent other than effluent from a sewage treatment facility; or

(b) any seepage or surface runoff containing any deleterious substance that flows over, through or out of the site of a mine. (*effluent*)

final discharge point, in respect of an effluent, means an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent. (*point de rejet final*)

grab sample [Repealed, SOR/2018-99, s. 2]

hydrometallurgical facility effluent means effluent from the acidic leaching, solution concentration and recovery of metals by means of aqueous chemical methods, tailings slurries, and all other effluents deposited from a hydrometallurgical facility. (*effluent d'installations d'hydrométallurgie*)

hydrometallurgy means the production of a metal by means of aqueous chemical methods for acidic leaching, solution concentration and recovery of metals from metal-bearing minerals other than metal-bearing minerals that have been thermally pre-treated or blended with metal-bearing minerals that have been thermally pre-treated. (*hydrométallurgie*)

metal mine means any work or undertaking that is designed or is used, or has been used, in connection with a mining, milling or hydrometallurgical activity to produce a metal or a metal concentrate or an ore from which a metal or a metal concentrate may be produced, as well as any cleared or disturbed area that is adjacent to such a

b) des eaux d'exfiltration et des eaux de ruissellement qui contiennent une substance nocive et qui coulent sur le site d'une mine ou en proviennent. (*effluent*)

effluent à létalité aiguë [Abrogée, DORS/2018-99, art. 2]

effluent d'eau de mine Dans le cadre d'activités minières, l'eau pompée d'ouvrages souterrains, de compartiments d'extraction par solution ou de mines à ciel ouvert ou l'eau s'écoulant de ceux-ci. (*mine water effluent*)

effluent d'installations de préparation du minerai Boues de stériles, effluent des lixiviats de terrils, effluent de l'extraction par solution et tout autre effluent rejeté à partir d'une installation de préparation du minerai. (*milling facility effluent*)

effluent d'installations de traitement Eau des bassins de polissage, des bassins de traitement, des bassins de décantation, des stations de traitement de l'eau et de toute installation de traitement des effluents miniers. (*treatment facility effluent*)

effluent d'installations d'hydrométallurgie Effluent rejeté à partir d'une installation d'hydrométallurgie, notamment effluent de lixiviation acide, de concentration de solution et de récupération de métal par procédés chimiques aqueux et boues de résidus miniers. (*hydrometallurgical facility effluent*)

essai de détermination de la létalité aiguë [Abrogée, DORS/2018-99, art. 2]

essai de suivi avec bioessais sur la Daphnia magna [Abrogée, DORS/2018-99, art. 2]

exploitant Personne qui exploite une mine, qui en a le contrôle ou la garde, ou qui en est responsable. (*operator*)

exploitation commerciale Le taux de production moyen d'une mine qui, au cours d'une période de quatre-vingt-dix jours consécutifs, est égal ou supérieur à 10 % de la capacité nominale de la mine. (*commercial operation*)

exploitation des placers Exploitation minière où le minerai ou les métaux sont extraits de sédiments de cours d'eau par gravité ou par séparation magnétique. (*placer mining*)

hydrométallurgie La production d'un métal par des procédés chimiques aqueux de lixiviation acide, concentration de solution et récupération de métal à partir de

work or undertaking. It includes any work or undertaking, such as a smelter, pelletizing plant, sintering plant, refinery or acid plant, if its effluent is combined with the effluent from a mining, milling or hydrometallurgical activity whose purpose is to produce a metal or a metal concentrate or an ore from which a metal or a metal concentrate may be produced. (*mine de métaux*)

milling means any of the following activities for the purpose of producing a diamond, metal or metal concentrate:

(a) the crushing or grinding of ore or kimberlite;

(b) the processing of uranium ore or uranium enriched solution; or

(c) the processing of tailings. (*préparation du minerai*)

milling facility effluent means tailing slurries, heap leaching effluent, solution mining effluent and all other effluent deposited from a milling facility. (*effluent d'installations de préparation du minerai*)

mine [Repealed, SOR/2018-99, s. 2]

mine under development [Repealed, SOR/2018-99, s. 2]

mine water effluent means, in respect of mining activities, water that is pumped from or flows out of any underground works, solution chambers or open pits. (*effluent d'eau de mine*)

monthly mean concentration means the average value of the concentrations measured in all composite or grab samples collected from each final discharge point during each month when a deleterious substance is deposited. (*concentration moyenne mensuelle*)

new mine [Repealed, SOR/2018-99, s. 2]

operations area [Repealed, SOR/2018-99, s. 2]

operator means any person who operates, has control or custody of or is in charge of a mine. (*exploitant*)

placer mining means a mining operation that extracts minerals or metals from stream sediments by gravity or magnetic separation. (*exploitation des placers*)

recognized closed mine [Repealed, SOR/2018-99, s. 2]

Reference Method EPS 1/RM/10 means *Biological Test Method: Reference Method for Determining Acute Lethality Using Threespine Stickleback*, published in minéraux métallifères n'ayant pas subi de prétraitement thermique ou n'ayant pas été mélangés à des minéraux métallifères qui ont subi un prétraitement thermique. (*hydrometallurgy*)

létalité aiguë S'agissant d'un effluent à l'état non dilué, la capacité de provoquer, selon le cas, la mort de :

a) plus de 50 % des truites arc-en-ciel qui y sont exposées pendant une période de quatre-vingt-seize heures au cours de l'essai de détermination de la létalité aiguë visé à l'article 14.1;

b) plus de 50 % des épinoches à trois épines qui y sont exposés pendant une période de quatre-vingt-seize heures au cours de l'essai de détermination de la létalité aiguë visé à l'article 14.2;

c) plus de 50 % des *Daphnia magna* qui y sont exposées pendant une période de quarante-huit heures au cours de l'essai de détermination de la létalité aiguë visé à l'article 14.3;

d) plus de 50 % des *Acartia tonsa* qui y sont exposés pendant une période de quarante-huit heures au cours de l'essai de détermination de la létalité aiguë visé à l'article 14.4. (*acutely lethal*)

Loi La *Loi sur les pêches*. (*Act*)

matières en suspension Toutes matières solides présentes dans un effluent et retenues sur un papier-filtre dont les pores mesurent 1,5 micron lorsque l'effluent est soumis à un essai conforme aux exigences analytiques prévues au tableau 1 de l'annexe 3. (*suspended solids*)

méthode de référence DGST 1/RM/60 La publication intitulée *Méthode d'essai biologique : méthode de référence pour la détermination de la létalité aiguë chez le copépode Acartia tonsa*, publiée en juin 2019 par le ministère de l'Environnement, avec ses modifications successives. (*Reference Method STB 1/RM/60*)

méthode de référence SPE 1/RM/10 La publication intitulée *Méthode d'essai biologique : méthode de référence pour la détermination de la létalité aiguë à l'aide de l'épinoche à trois épines*, publiée en décembre 2017 par le ministère de l'Environnement, avec ses modifications successives. (*Reference Method EPS 1/RM/10*)

méthode de référence SPE 1/RM/13 La publication intitulée *Méthode d'essai biologique : méthode de référence pour la détermination de la létalité aiguë d'effluents chez la truite arc-en-ciel* (Méthode de référence SPE 1/RM/13), publiée en juillet 1990 par le ministère de l'Environnement, dans sa version modifiée en décembre

December 2017 by the Department of the Environment, as amended from time to time. (*méthode de référence SPE 1/RM/10*)

Reference Method EPS 1/RM/13 means *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout* (Reference Method EPS 1/RM/13), July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time. (*méthode de référence SPE 1/RM/13*)

Reference Method EPS 1/RM/14 means *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna* (Reference Method EPS 1/RM/14), July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time. (*méthode de référence SPE 1/RM/14*)

Reference Method STB 1/RM/60 means *Biological Test Method: Reference Method for Determining Acute Lethality Using Acartia tonsa*, published in June 2019 by the Department of the Environment, as amended from time to time. (*méthode de référence DGST 1/RM/60*)

reopened mine [Repealed, SOR/2018-99, s. 2]

surface drainage [Repealed, SOR/2018-99, s. 2]

suspended solids means any solid matter contained in an effluent that is retained on a 1.5 micron pore filter paper when the effluent is tested in compliance with the analytical requirements set out in Table 1 of Schedule 3. (*matières en suspension*)

tailings impoundment area [Repealed, SOR/2006-239, s. 1]

total suspended solids [Repealed, SOR/2018-99, s. 2]

transitional authorization [Repealed, SOR/2018-99, s. 2]

treatment facility effluent means water from a polishing pond, treatment pond, settling pond or water treatment plant or from any mine effluent treatment facility. (*effluent d'installations de traitement*)

2000 et avec ses modifications successives. (*Reference Method EPS 1/RM/13*)

méthode de référence SPE 1/RM/14 La publication intitulée *Méthode d'essai biologique : méthode de référence pour la détermination de la létalité aiguë d'effluents chez Daphnia magna* (Méthode de référence SPE 1/RM/14), publiée en juillet 1990 par le ministère de l'Environnement, dans sa version modifiée en décembre 2000 et avec ses modifications successives. (*Reference Method EPS 1/RM/14*)

mine [Abrogée, DORS/2018-99, art. 2]

mine de diamants Ouvrage ou entreprise qui est conçu ou qui est ou a été utilisé dans le cadre d'activités d'extraction ou de préparation du minerai visant à produire un diamant ou un minerai à partir duquel un diamant peut être produit ainsi que toute zone déboisée ou perturbée qui y est adjacente. (*diamond mine*)

mine de métaux Ouvrage ou entreprise qui est conçu ou qui est ou a été utilisé dans le cadre d'activités d'extraction, d'hydrométallurgie ou de préparation du minerai visant à produire un métal, un concentré de métal ou un minerai à partir duquel un métal ou un concentré de métal peut être produit ainsi que toute zone déboisée ou perturbée qui y est adjacente. La présente définition comprend tout ouvrage ou entreprise, telles les fonderies, usines de bouletage, usines de frittage, affineries et usines d'acide, dont l'effluent est combiné aux effluents provenant d'activités d'extraction, d'hydrométallurgie ou de préparation du minerai visant à produire un métal, un concentré de métal ou un minerai à partir duquel un métal ou un concentré de métal peut être produit. (*metal mine*)

mine en développement [Abrogée, DORS/2018-99, art. 2]

mine fermée reconnue [Abrogée, DORS/2018-99, art. 2]

mine remise en exploitation [Abrogée, DORS/2018-99, art. 2]

nouvelle mine [Abrogée, DORS/2018-99, art. 2]

point de rejet final Le point de rejet de l'effluent d'une mine qui est repérable et au-delà duquel l'exploitant de la mine n'agit plus quant à la qualité de l'effluent. (*final discharge point*)

préparation du minerai S'entend des activités ci-après effectuées en vue de la production d'un diamant, d'un métal ou d'un concentré de métal :

(2) Every reference in these Regulations to column 1, 2, 3 or 4 of Schedule 4 shall be read as

(a) a reference to column 1, 2, 3 or 4 of Table 1 of Schedule 4, in the case of a mine to which subparagraph 4(1)(a)(i) applies; or

(b) a reference to column 1, 2, 3 or 4 of Table 2 of Schedule 4, in the case of a mine to which subparagraph 4(1)(a)(ii) applies.

SOR/2006-239, s. 1; SOR/2009-156, s. 1; SOR/2012-22, s. 1; SOR/2018-99, s. 2; SOR/2021-125, s. 1.

Application

2 (1) These Regulations apply in respect of the following mines:

(a) metal mines that, at any time on or after June 6, 2002,

(i) exceed an effluent flow rate of 50 m^3 per day, based on the effluent deposited from all the final discharge points of the mine, and

(ii) deposit a deleterious substance in any water or place referred to in subsection 36(3) of the Act; and

(b) diamond mines that, at any time on or after June 1, 2018,

(i) exceed an effluent flow rate of 50 m^3 per day, based on the effluent deposited from all the final discharge points of the mine, and

(ii) deposit a deleterious substance in any water or place referred to in subsection 36(3) of the Act.

a) le concassage ou le broyage d'un minerai ou de kimberlite;

b) le traitement du minerai d'uranium ou de solutions uranifères;

c) le traitement de résidus miniers. (*milling*)

rejet Est assimilée au rejet l'immersion au sens du paragraphe 34(1) de la Loi. (*French version only*)

substance nocive [Abrogée, DORS/2018-99, art. 2]

total des solides en suspension [Abrogée, DORS/2018-99, art. 2]

(2) Tout renvoi à la colonne 1, 2, 3 ou 4 de l'annexe 4 dans le présent règlement constitue un renvoi :

a) dans le cas d'une mine à laquelle s'applique le sous-alinéa 4(1)a)(i), à la colonne 1, 2, 3 ou 4 du tableau 1 de l'annexe 4;

b) dans le cas d'une mine à laquelle s'applique le sous-alinéa 4(1)a)(ii), à la colonne 1, 2, 3 ou 4 du tableau 2 de l'annexe 4.

DORS/2006-239, art. 1; DORS/2009-156, art. 1; DORS/2012-22, art. 1; DORS/2018-99, art. 2; DORS/2021-125, art. 1.

Champ d'application

2 (1) Le présent règlement s'applique à l'égard des mines suivantes :

a) les mines de métaux qui, à un moment quelconque, le 6 juin 2002 ou après cette date :

(i) d'une part, ont un débit d'effluent supérieur à 50 m^3 par jour, déterminé d'après les rejets d'effluent à partir de tous leurs points de rejet final,

(ii) d'autre part, rejettent une substance nocive dans les eaux ou les lieux visés au paragraphe 36(3) de la Loi;

b) les mines de diamants qui, à un moment quelconque, le 1er juin 2018 ou après cette date :

(i) d'une part, ont un débit d'effluent supérieur à 50 m^3 par jour, déterminé d'après les rejets d'effluent à partir de tous leurs points de rejet final,

(ii) d'autre part, rejettent une substance nocive dans les eaux ou les lieux visés au paragraphe 36(3) de la Loi.

(2) However, these Regulations do not apply in respect of

(a) placer mining;

(b) a metal mine that stopped commercial operation before June 6, 2002, unless it returns to commercial operation on or after that date; and

(c) a diamond mine that stopped commercial operation before June 1, 2018, unless it returns to commercial operation on or after that date.

(3) Despite subsection (1), sections 4 to 31 do not apply in respect of a mine that is a recognized closed mine under subsection 32(2) unless it returns to commercial operation, in which case it ceases to be a recognized closed mine.

SOR/2012-22, s. 2; SOR/2018-99, s. 3.

(2) Toutefois, le présent règlement ne s'applique pas à l'égard :

a) des exploitations des placers;

b) des mines de métaux dont l'exploitation commerciale a pris fin avant le 6 juin 2002, à moins que l'exploitation commerciale ne reprenne le 6 juin 2002 ou après cette date;

c) des mines de diamants dont l'exploitation commerciale a pris fin avant le 1er juin 2018, à moins que l'exploitation commerciale ne reprenne le 1er juin 2018 ou après cette date.

(3) Malgré le paragraphe (1), les articles 4 à 31 ne s'appliquent pas à l'égard d'une mine qui est une mine fermée reconnue en application du paragraphe 32(2), à moins que l'exploitation commerciale ne reprenne, auquel cas elle cesse d'être une mine fermée reconnue.

DORS/2012-22, art. 2; DORS/2018-99, art. 3.

Prescribed Deleterious Substances

3 For the purpose of the definition *deleterious substance* in subsection 34(1) of the Act, the following substances or classes of substances are prescribed as deleterious substances:

(a) arsenic;

(b) copper;

(c) cyanide;

(d) lead;

(e) nickel;

(f) zinc;

(g) suspended solids;

(h) radium 226; and

(i) un-ionized ammonia.

SOR/2018-99, s. 3.

Substances nocives désignées

3 Pour l'application de la définition de *substance nocive* au paragraphe 34(1) de la Loi, sont désignées comme substances nocives et les substances ou les catégories de substance suivantes :

a) l'arsenic;

b) le cuivre;

c) le cyanure;

d) le plomb;

e) le nickel;

f) le zinc;

g) les matières en suspension;

h) le radium 226;

i) l'ammoniac non ionisé.

DORS/2018-99, art. 3.

Authority to Deposit in Water or Place Referred to in Subsection 36(3) of Act

4 (1) For the purposes of paragraph 36(4)(b) of the Act, the owner or operator of a mine is authorized to deposit, or to permit the deposit of, an effluent containing any deleterious substance that is prescribed in section 3 in

Rejet autorisé dans les eaux ou lieux visés au paragraphe 36(3) de la Loi

4 (1) Pour l'application de l'alinéa 36(4)b) de la Loi, le propriétaire ou l'exploitant d'une mine est autorisé à rejeter ou à permettre que soit rejeté un effluent contenant

any water or place referred to in subsection 36(3) of the Act if

(a) the concentration of the deleterious substance in the effluent does not exceed the maximum authorized concentrations that are set out in columns 2, 3 and 4 of

(i) Table 1 of Schedule 4, in the case of a mine in respect of which these Regulations apply for the first time on or after June 1, 2021 or in the case of a recognized closed mine that returns to commercial operation on or after June 1, 2021, or

(ii) Table 2 of Schedule 4, in any other case;

(b) the pH of the effluent is equal to or greater than 6.0 but is not greater than 9.5; and

(c) the effluent is not acutely lethal.

(2) The authority in subsection (1) is conditional on the owner or operator complying with sections 6 to 27.

SOR/2018-99, s. 3.

4.1 Paragraph 4(1)(c) does not apply in the case where the effluent is determined to be acutely lethal in accordance with the procedures set out in section 5 or 6 of Reference Method EPS 1/RM/14 when the owner or operator of a mine is testing at the frequency prescribed in subsection 14(1), unless the effluent is determined to be acutely lethal in accordance with any other acute lethality test.

SOR/2018-99, s. 4.

Authority to Deposit in Tailings Impoundment Areas

5 (1) Despite section 4, the owner or operator of a mine may deposit or permit the deposit of waste rock, acutely lethal effluent or effluent of any pH and containing any concentration of a deleterious substance that is prescribed in section 3 into a tailings impoundment area that is either

(a) a water or place set out in Schedule 2; or

(b) a disposal area that is confined by anthropogenic or natural structures or by both, other than a disposal area that is, or is part of, a natural water body that is frequented by fish.

l'une ou l'autre des substances nocives désignées à l'article 3 dans les eaux ou les lieux visés au paragraphe 36(3) de la Loi, si les conditions suivantes sont réunies :

a) la concentration de la substance nocive dans l'effluent ne dépasse pas les concentrations maximales permises qui sont établies aux colonnes 2, 3 et 4 :

(i) du tableau 1 de l'annexe 4, dans le cas d'une mine à l'égard de laquelle le présent règlement s'applique pour la première fois le 1er juin 2021 ou après cette date ou d'une une mine reconnue fermée dont l'exploitation commerciale a repris le 1er juin 2021 ou après cette date,

(ii) du tableau 2 de l'annexe 4, dans tous les autres cas;

b) le pH de l'effluent est égal ou supérieur à 6,0 mais ne dépasse pas 9,5;

c) l'effluent ne présente pas de létalité aiguë.

(2) Le propriétaire ou l'exploitant d'une mine ne peut se prévaloir de l'autorisation que lui confère le paragraphe (1) que s'il respecte les conditions prévues aux articles 6 à 27.

DORS/2018-99, art. 3.

4.1 L'alinéa 4(1)c) ne s'applique pas s'il est déterminé que l'effluent présente une létalité aiguë conformément aux modes opératoires visés aux sections 5 ou 6 de la méthode de référence SPE 1/RM/14, lorsque le propriétaire ou l'exploitant d'une mine effectue l'essai à la fréquence prévue au paragraphe 14(1) à moins qu'un autre essai de détermination de la létalité aiguë indique que l'effluent présente une létalité aiguë.

DORS/2018-99, art. 4.

Autorisation de rejeter dans un dépôt de résidus miniers

5 (1) Malgré l'article 4, le propriétaire ou l'exploitant d'une mine peut rejeter — ou permettre que soient rejetés — des stériles, un effluent à létalité aiguë ou tout autre effluent, quel que soit le pH de l'effluent ou sa concentration en substances nocives désignées à l'article 3, dans l'un ou l'autre des dépôts de résidus miniers suivants :

a) les eaux et lieux mentionnés à l'annexe 2;

b) toute aire de décharge circonscrite par une formation naturelle ou un ouvrage artificiel, ou les deux, à l'exclusion d'une aire de décharge qui est un plan

(2) The authority in subsection (1) is conditional on the owner or operator complying with sections 7 to 28.

(3) For the purposes of this section, any acutely lethal effluent is prescribed as a deleterious substance.

SOR/2006-239, s. 2; SOR/2018-99, s. 5.

d'eau naturel où vivent des poissons ou qui en fait partie.

(2) Le propriétaire ou l'exploitant d'une mine ne peut se prévaloir de l'autorisation que lui confère le paragraphe (1) que s'il respecte les conditions prévues aux articles 7 à 28.

(3) Pour l'application du présent article, tout effluent à létalité aiguë est désigné comme une substance nocive.

DORS/2006-239, art. 2; DORS/2018-99, art. 5.

PART 2

Conditions Governing Authority to Deposit

DIVISION 1

General

Prohibition on Diluting Effluent

6 The owner or operator of a mine shall not combine effluent with water or any other effluent for the purpose of diluting effluent before it is deposited.

Environmental Effects Monitoring

7 (1) The owner or operator of a mine shall conduct environmental effects monitoring studies in accordance with the requirements and within the periods set out in Schedule 5.

(2) The studies shall be conducted using documented and validated methods, and their results interpreted and reported on in accordance with generally accepted standards of good scientific practice at the time that the studies are conducted.

(3) The owner or operator shall record the results of the studies and submit to the Minister of the Environment, in accordance with the requirements set out in Schedule 5, the reports and information required by that Schedule.

SOR/2006-239, s. 3; SOR/2018-99, s. 6.

Identifying Information

8 (1) The owner or operator of a mine shall submit in writing to the Minister of the Environment the information referred to in subsection (2) not later than 60 days after the day on which any of the following occur:

PARTIE 2

Conditions régissant l'autorisation de rejeter

SECTION 1

Dispositions générales

Interdiction de diluer

6 Il est interdit au propriétaire ou à l'exploitant d'une mine de combiner un effluent avec de l'eau ou avec tout autre effluent dans le but de le diluer avant son rejet.

Études de suivi des effets sur l'environnement

7 (1) Le propriétaire ou l'exploitant d'une mine effectue des études de suivi des effets sur l'environnement selon les exigences et dans les délais prévus à l'annexe 5.

(2) Il effectue les études selon des méthodes éprouvées et validées et évalue et présente leurs résultats conformément aux normes généralement reconnues régissant les bonnes pratiques scientifiques au moment de l'étude.

(3) Il enregistre les résultats des études et présente au ministre de l'Environnement, selon les exigences prévues à l'annexe 5, les rapports et les renseignements visés à cette annexe.

DORS/2006-239, art. 3; DORS/2018-99, art. 6.

Renseignements d'identification

8 (1) Le propriétaire ou l'exploitant d'une mine présente par écrit au ministre de l'Environnement les renseignements mentionnés au paragraphe (2) :

(a) the mine becomes subject to these Regulations;

(b) ownership of the mine is transferred; and

(c) the mine returns to commercial operation after it has become a recognized closed mine.

(2) The information that shall be submitted is

(a) the name and address of both the owner and the operator of the mine;

(b) the name and address of any parent company of the owner and the operator; and

(c) the design-rated capacity of the mine, expressed as tonnes per year, and a description and rationale of how the design-rated capacity was determined.

(3) The owner or operator shall submit in writing to the Minister of the Environment any change in the information not later than 60 days after the change occurs.

SOR/2018-99, ss. 7, 36.

Final Discharge Points

9 The owner or operator of a mine shall identify each final discharge point and submit in writing to the Minister of the Environment, not later than 60 days after the day on which the mine becomes subject to these Regulations, the following information:

(a) plans, specifications and a general description of each final discharge point together with its location by latitude and longitude;

(b) a description of how each final discharge point is designed and maintained in respect of the deposit of deleterious substances; and

(c) the name of the receiving body of water, if there is a name.

SOR/2006-239, s. 4; SOR/2018-99, ss. 8, 36.

10 (1) The owner or operator of a mine shall submit in writing to the Minister of the Environment the information required by section 9, for

(a) any final discharge point that is identified by an inspector, and that was not identified as required by section 9, within 30 days after the discharge point is identified; and

a) dans les soixante jours suivant la date à laquelle la mine devient assujettie au présent règlement;

b) dans les soixante jours suivant le transfert de la propriété de la mine;

c) s'agissant d'une mine fermée reconnue, dans les soixante jours suivant la date à laquelle l'exploitation commerciale reprend.

(2) Les renseignements à présenter sont :

a) les nom et adresse du propriétaire et de l'exploitant;

b) les nom et adresse de toute société mère du propriétaire et de l'exploitant;

c) la capacité nominale de la mine, exprimée en tonne par année, ainsi qu'une description et une explication de la façon dont elle a été établie.

(3) Le propriétaire ou l'exploitant présente par écrit au ministre de l'Environnement des précisions sur tout changement des renseignements dans les soixante jours suivant le changement.

DORS/2018-99, art. 7 et 36.

Points de rejet final

9 Le propriétaire ou l'exploitant d'une mine détermine chaque point de rejet final et fournit par écrit au ministre de l'Environnement, dans les soixante jours suivant la date à laquelle la mine devient assujettie au présent règlement, les renseignements suivants :

a) les plans, les spécifications et une description générale de chaque point de rejet final, ainsi que la latitude et la longitude de son emplacement;

b) la façon dont chacun des points de rejet final est conçu et entretenu en ce qui a trait au rejet de substances nocives;

c) le nom du milieu aquatique récepteur, si ce nom existe.

DORS/2006-239, art. 4; DORS/2018-99, art. 8 et 36.

10 (1) Le propriétaire ou l'exploitant d'une mine présente par écrit au ministre de l'Environnement les renseignements visés à l'article 9 relativement à :

a) tous les points de rejet final que désigne l'inspecteur et qui n'ont pas été déterminés en application de l'article 9, dans les trente jours suivant leur désignation;

(b) each new final discharge point, at least 60 days before depositing effluent from that new final discharge point.

(2) The owner or operator shall submit in writing to the Minister of the Environment the information on any proposed change to a final discharge point at least 60 days before the change is to be made.

SOR/2018-99, s. 36.

Monitoring Equipment Information

11 The owner or operator of a mine shall keep records relating to effluent monitoring equipment that contain

(a) a description of the equipment and, if applicable, the manufacturer's specifications and the year and model number of the equipment; and

(b) the results of the calibration tests of the equipment.

b) tout nouveau point de rejet final, au moins soixante jours avant qu'un effluent en soit rejeté.

(2) Il présente par écrit au ministre de l'Environnement des précisions sur toute modification proposée d'un point de rejet final au moins soixante jours avant que la modification soit apportée.

DORS/2018-99, art. 36.

Renseignements sur l'équipement de surveillance

11 Le propriétaire ou l'exploitant d'une mine tient un registre concernant l'équipement de surveillance des effluents et y consigne :

a) la description de l'équipement et, le cas échéant, les spécifications du fabricant ainsi que l'année et le numéro du modèle de l'équipement;

b) les résultats des essais d'étalonnage de l'équipement.

DIVISION 2

Effluent Monitoring Conditions

Deleterious Substance and pH Testing

12 (1) The owner or operator of a mine shall, not less than once per week and at least 24 hours apart, collect from each final discharge point

(a) a grab sample or composite sample of effluent and record the pH of the sample at the time of its collection and record, without delay after collecting the sample, the concentrations of the deleterious substances prescribed in section 3 except un-ionized ammonia; and

(b) a grab sample of effluent and record the temperature and the pH of the sample at the time of its collection and record, without delay after collecting the sample, the concentrations of total ammonia expressed as nitrogen (N).

(2) Testing conducted under subsection (1) shall comply with the analytical requirements set out in Table 1 of Schedule 3 and shall be done in accordance with generally accepted standards of good scientific practice at the

SECTION 2

Conditions portant sur le suivi de l'effluent

Essais concernant le pH et les substances nocives

12 (1) Au moins une fois par semaine et à au moins vingt-quatre heures d'intervalle, le propriétaire ou l'exploitant d'une mine prélève, à partir de chaque point de rejet final :

a) un échantillon instantané ou un échantillon composite d'effluent dont il enregistre le pH au moment du prélèvement, ainsi que, sans délai après celui-ci, les concentrations des substances nocives désignées à l'article 3, à l'exception de l'ammoniac non ionisé;

b) un échantillon instantané d'effluent dont il enregistre la température et le pH au moment du prélèvement, ainsi que, sans délai après celui-ci, la concentration d'ammoniac total sous forme d'azote (N).

(2) Les essais effectués en application du paragraphe (1) doivent satisfaire aux exigences analytiques prévues au tableau 1 de l'annexe 3 et doivent être effectués conformément aux normes généralement reconnues régissant les bonnes pratiques scientifiques au moment de

time of the sampling using documented and validated methods.

(3) Despite subsection (1), the owner or operator of a mine is not required to collect samples for the purpose of recording the concentrations of cyanide if cyanide has never been used as a process reagent at the mine.

(4) The owner or operator of a mine shall determine and record the concentration of un-ionized ammonia, using the temperature, pH and concentration of total ammonia recorded under paragraph (1)(b), in accordance with the following formula:

$$A\ (1/(1 + 10^{pKa-pH}))$$

where

A is the concentration of total ammonia — which is the sum of un-ionized ammonia (NH_3) and ionized ammonia (NH_4^+) — expressed in mg/L as nitrogen (N);

pH is the pH of the effluent sample; and

pKa is a dissociation constant calculated in accordance with the following formula:

$$0.09018 + 2729.92/T$$

where

T is the temperature of the effluent sample in kelvin.

SOR/2006-239, s. 5; SOR/2018-99, s. 9.

13 (1) The owner or operator of a mine may reduce the frequency of conducting tests relating to the concentrations of arsenic, copper, cyanide, lead, nickel, zinc or un-ionized ammonia at a final discharge point to not less than once in each calendar quarter, each test being conducted at least one month apart, if that substance's monthly mean concentration at that final discharge point is less than 10% of the value set out in column 2 of Schedule 4 for 12 consecutive months.

(2) The owner or operator of a mine, other than an uranium mine, may reduce the frequency of conducting tests relating to the concentration of radium 226 at a final discharge point to not less than once in each calendar quarter, each test being conducted at least one month apart, if the concentration of radium 226 at that final discharge point is less than 0.037 Bq/L for 10 consecutive weeks.

(3) The owner or operator of a mine shall increase the frequency of conducting tests relating to the concentration of a deleterious substance at a final discharge point to the frequency prescribed in section 12

l'échantillonnage et selon des méthodes éprouvées et validées.

(3) Malgré le paragraphe (1), le propriétaire ou l'exploitant d'une mine n'a pas à prélever d'échantillon afin d'enregistrer la concentration de cyanure si cette substance n'a jamais été utilisée comme réactif de procédé à la mine.

(4) Le propriétaire ou l'exploitant d'une mine calcule et enregistre la concentration d'ammoniac non ionisé selon la formule ci-après, en utilisant la température, le pH et la concentration d'ammoniac total enregistré en application de l'alinéa (1)b) :

$$A\ (1/(1 + 10^{\ pKa-pH}))$$

où :

A représente la concentration d'ammoniac total — soit l'ammoniac non ionisé (NH_3) et l'ammoniac ionisé (NH_4^+) — exprimée en mg/L et sous forme d'azote (N);

pH le pH de l'échantillon d'effluent;

pKa la constante de dissociation calculée selon la formule suivante :

$$0,09018 + 2729,92/T$$

où :

T représente la température de l'échantillon d'effluent en kelvin.

DORS/2006-239, art. 5; DORS/2018-99, art. 9.

13 (1) Le propriétaire ou l'exploitant d'une mine peut, à un point de rejet final, réduire la fréquence des essais concernant la concentration d'arsenic, de cuivre, de cyanure, de plomb, de nickel, de zinc ou d'ammoniac non ionisé à au moins une fois par trimestre civil, chaque essai étant effectué à au moins un mois d'intervalle, si la concentration moyenne mensuelle de la substance à ce point de rejet final est inférieure à 10 % de la valeur établie à la colonne 2 de l'annexe 4 pendant douze mois consécutifs.

(2) Le propriétaire ou l'exploitant d'une mine autre qu'une mine d'uranium peut, à un point de rejet final, réduire la fréquence des essais concernant la concentration de radium 226 à au moins une fois par trimestre civil, chaque essai étant effectué à au moins un mois d'intervalle, si la concentration à ce point de rejet final est inférieure à 0,037 Bq/L pendant dix semaines consécutives.

(3) Le propriétaire ou l'exploitant d'une mine porte la fréquence des essais concernant la concentration des substances nocives ci-après à celle prévue à l'article 12, à un point de rejet final, si :

(a) in the case of a deleterious substance mentioned in subsection (1), if that substance's monthly mean concentration at that final discharge point is equal to or greater than 10% of the value set out in column 2 of Schedule 4; and

(b) in the case of radium 226, if the concentration of radium 226 at that final discharge point is equal to or greater than 0.037 Bq/L.

(4) The owner or operator of a mine shall increase the frequency of conducting tests relating to the concentration of a deleterious substance at all final discharge points to the frequency prescribed in section 12 for all the substances mentioned in subsections (1) and (2) if the owner or operator

(a) fails to perform a test required under those subsections in accordance with the prescribed frequency; or

(b) fails to submit a report required under subsection 21(1) or section 22 within the prescribed time.

(5) If the owner or operator of a mine changes the location of a final discharge point, the owner or operator shall increase the frequency of conducting tests relating to the concentration of a deleterious substance at that final discharge point to the frequency prescribed in section 12 for all the deleterious substances mentioned in subsections (1) and (2).

(6) The owner or operator of a mine who reduces the frequency of conducting tests under subsection (1) or (2) shall

(a) notify the Minister of the Environment, in writing, at least 30 days in advance, of that fact;

(b) select and record the sampling dates not less than 30 days in advance of collecting the samples of effluent; and

(c) collect the sample on the selected day except if, owing to unforeseen circumstances, they cannot sample on that day, in which case, they shall do so as soon as practicable after that day.

SOR/2006-239, s. 6; SOR/2018-99, s. 9.

a) dans le cas d'une substance nocive énumérée au paragraphe (1), la concentration moyenne mensuelle de cette substance, à ce point de rejet final, est égale ou supérieure à 10 % de la valeur établie à la colonne 2 de l'annexe 4;

b) dans le cas du radium 226, la concentration de cette substance, à ce point de rejet final, est égale ou supérieure à 0,037 Bq/L.

(4) Le propriétaire ou l'exploitant d'une mine porte la fréquence des essais concernant la concentration des substances nocives énumérées aux paragraphes (1) et (2) à celle prévue à l'article 12, à tous les points de rejet final, s'il omet :

a) soit d'effectuer les essais visés à ces paragraphes selon la fréquence requise;

b) soit de présenter le rapport visé au paragraphe 21(1) ou à l'article 22 dans les délais prescrits.

(5) Si un point de rejet final est déplacé, le propriétaire ou l'exploitant d'une mine porte la fréquence des essais concernant la concentration des substances nocives, à ce point de rejet final, à celle prévue à l'article 12 pour toutes les substances nocives énumérées aux paragraphes (1) et (2).

(6) Le propriétaire ou l'exploitant d'une mine qui réduit la fréquence des essais en vertu des paragraphes (1) ou (2) prend les mesures suivantes :

a) il avise par écrit le ministre de l'Environnement de la réduction de la fréquence des essais, au moins trente jours avant celle-ci;

b) il choisit et enregistre, au moins trente jours à l'avance, la date de l'échantillonnage;

c) il prélève l'échantillon ce jour-là ou, si des circonstances imprévues l'en empêchent, le plus tôt possible après ce jour.

DORS/2006-239, art. 6; DORS/2018-99, art. 9.

Acute Lethality Testing

General

14 (1) Subject to section 15, the owner or operator of a mine shall collect, once a month, a grab sample of

Essai de détermination de la létalité aiguë

Généralités

14 (1) Sous réserve de l'article 15, le propriétaire ou l'exploitant d'une mine prélève une fois par mois un

effluent from each final discharge point and determine whether the effluent is acutely lethal by conducting acute lethality tests on aliquots of each effluent sample in accordance with sections 14.1 to 14.4.

échantillon instantané d'effluent à chaque point de rejet final et détermine si cet effluent présente une létalité aiguë en effectuant des essais de détermination de la létalité aiguë sur des aliquotes de chaque échantillon conformément aux articles 14.1 à 14.4.

(2) For the purposes of subsection (1), the owner or operator of a mine

(a) shall select and record the sampling date not less than 30 days in advance of collecting the grab sample;

(b) shall collect the sample on the selected day except if, owing to unforeseen circumstances, they cannot sample on that day, in which case, they shall do so as soon as practicable after that day; and

(c) shall collect the grab samples not less than 15 days apart.

(2) Pour l'application du paragraphe (1), le propriétaire ou l'exploitant d'une mine :

a) choisit et enregistre, au moins trente jours à l'avance, la date de l'échantillonnage;

b) prélève l'échantillon ce jour-là ou, si des circonstances imprévues l'en empêchent, le plus tôt possible après ce jour;

c) prélève les échantillons instantanés à au moins quinze jours d'intervalle.

(3) When collecting a grab sample of effluent for the purposes of subsection (1), the owner or operator of a mine shall

(a) collect a sufficient volume of effluent to enable the owner or operator to comply with paragraph 15(1)(a); and

(b) record the temperature and the pH of each grab sample of effluent at the time of the sample's collection.

(3) Lors du prélèvement des échantillons instantanés en application du paragraphe (1), le propriétaire ou l'exploitant d'une mine :

a) prélève un volume d'effluent suffisant pour lui permettre de se conformer à l'alinéa 15(1)a);

b) enregistre, au moment du prélèvement, la température et le pH de chaque échantillon.

SOR/2006-239, s. 7; SOR/2011-92, s. 4; SOR/2012-22, s. 3; SOR/2018-99, s. 10; SOR/2021-125, s. 2.

DORS/2006-239, art. 7; DORS/2011-92, art. 4; DORS/2012-22, art. 3; DORS/2018-99, art. 10; DORS/2021-125, art. 2.

Acute Lethality Test — Rainbow Trout

[SOR/2022-159, s. 1]

14.1 Unless the salinity value of the effluent is greater than ten parts per thousand and the effluent is deposited into marine waters, the owner or operator of a mine shall determine whether the effluent is acutely lethal by conducting an acute lethality test in accordance with the procedures set out in section 5 or 6 of Reference Method EPS 1/RM/13.

SOR/2018-99, s. 10; SOR/2021-125, s. 3.

Essai de détermination de la létalité aiguë — truite arc-en-ciel

[DORS/2022-159, art. 1]

14.1 Sauf dans le cas où la salinité de l'effluent est supérieure à dix parties par millier et que l'effluent est rejeté dans l'eau de mer, le propriétaire ou l'exploitant d'une mine détermine si l'effluent présente une létalité aiguë en effectuant un essai de détermination de la létalité aiguë conformément aux modes opératoires prévus aux sections 5 ou 6 de la méthode de référence SPE 1/RM/13.

DORS/2018-99, art. 10; DORS/2021-125, art. 3.

Acute Lethality Test — Threespine Stickleback

14.2 If the salinity value of the effluent is greater than ten parts per thousand and the effluent is deposited into

Essai de détermination de la létalité aiguë — épinoche à trois épines

14.2 Si la salinité de l'effluent est supérieure à dix parties par millier et que l'effluent est rejeté dans l'eau de mer, le propriétaire ou l'exploitant d'une mine détermine si l'effluent présente une létalité aiguë en effectuant un essai de détermination de la létalité aiguë conformément

marine waters, the owner or operator of a mine shall determine whether the effluent is acutely lethal by conducting an acute lethality test in accordance with the procedures set out in section 5 or 6 of Reference Method EPS 1/RM/10.

SOR/2018-99, s. 10; SOR/2021-125, s. 3.

aux modes opératoires prévus aux sections 5 ou 6 de la méthode de référence SPE 1/RM/10.

DORS/2018-99, art. 10; DORS/2021-125, art. 3.

Acute Lethality Test — *Daphnia magna*

14.3 Unless the salinity value of the effluent is greater than four parts per thousand and the effluent is deposited into marine waters, the owner or operator of a mine shall, in addition to conducting the acute lethality test set out in section 14.1, determine whether the effluent is acutely lethal by conducting an acute lethality test in accordance with the procedures set out in section 5 or 6 of Reference Method EPS 1/RM/14.

SOR/2018-99, s. 11; SOR/2021-125, s. 3.

Essai de détermination de la létalité aiguë — *Daphnia magna*

14.3 Sauf dans le cas où la salinité de l'effluent est supérieure à quatre parties par millier et que l'effluent est rejeté dans l'eau de mer, le propriétaire ou l'exploitant d'une mine détermine si l'effluent présente une létalité aiguë en effectuant, en plus de l'essai de détermination de la létalité aiguë prévu à l'article 14.1, un essai de détermination de la létalité aiguë conformément aux modes opératoires prévus aux sections 5 ou 6 de la méthode de référence SPE 1/RM/14.

DORS/2018-99, art. 11; DORS/2021-125, art. 3.

Acute Lethality Test — *Acartia tonsa*

14.4 If the salinity value of the effluent is greater than four parts per thousand and the effluent is deposited into marine waters, the owner or operator of a mine shall, in addition to conducting the acute lethality test set out in either section 14.1 or 14.2, determine whether the effluent is acutely lethal by conducting an acute lethality test in accordance with the procedures set out in section 5 or 6 of Reference Method STB 1/RM/60.

SOR/2021-125, s. 4.

Essai de détermination de la létalité aiguë — *Acartia tonsa*

14.4 Si la salinité de l'effluent est supérieure à quatre parties par millier et que l'effluent est rejeté dans l'eau de mer, le propriétaire ou l'exploitant d'une mine détermine si l'effluent présente une létalité aiguë en effectuant, en plus de l'essai de détermination de la létalité aiguë prévu à l'article 14.1 ou 14.2, un essai de détermination de la létalité aiguë conformément aux modes opératoires prévus aux sections 5 ou 6 de la méthode de référence DGST 1/RM/60.

DORS/2021-125, art. 4.

Increased Frequency of Acute Lethality Testing

15 (1) If an effluent sample is determined to be acutely lethal by an acute lethality test, the owner or operator of a mine shall

(a) without delay,

(i) conduct the effluent characterization set out in subsection 4(1) of Schedule 5 on the aliquot of each grab sample collected under subsection 14(1),

(ii) record the concentration of total ammonia and, using that concentration and using the temperature and pH recorded under paragraph 14(3)(b), determine the concentration of un-ionized ammonia in accordance with the formula set out in subsection 12(4), and

(iii) record the concentrations of the deleterious substances prescribed in section 3;

Fréquence accrue des essais de détermination de la létalité aiguë

15 (1) S'il est établi qu'un échantillon d'effluent présente une létalité aiguë après un essai de détermination de la létalité aiguë, le propriétaire ou l'exploitant d'une mine :

a) sans délai :

(i) effectue la caractérisation de l'effluent conformément au paragraphe 4(1) de l'annexe 5 sur une aliquote de chaque échantillon instantané prélevé en application du paragraphe 14(1),

(ii) enregistre la concentration d'ammoniac total et, au moyen de cette concentration et de la température et du pH enregistrés en application de l'alinéa 14(3)b), calcule la concentration d'ammoniac non ionisé selon la formule prévue au paragraphe 12(4),

(b) collect a grab sample twice a month from the final discharge point from which the effluent sample determined to be acutely lethal was collected, record the temperature and the pH of each sample at the time of its collection and, without delay, conduct the acute lethality test that determined the effluent sample to be acutely lethal on each grab sample in accordance with the procedure set out in section 6 of the applicable reference method and, if the sample is determined to be acutely lethal, without delay,

(i) conduct the effluent characterization set out in subsection 4(1) of Schedule 5 on the aliquot of each grab sample,

(ii) record the concentration of total ammonia and, using that concentration and using the temperature and pH recorded under this paragraph, determine the concentration of un-ionized ammonia in accordance with the formula set out in subsection 12(4), and

(iii) record the concentrations of the deleterious substances prescribed in section 3; and

(c) collect the grab samples not less than seven days apart.

(2) The owner or operator may resume sampling and testing at the frequency prescribed in section 14 if the effluent is determined not to be acutely lethal in three consecutive tests conducted under paragraph (1)(b).

SOR/2006-239, s. 8; SOR/2018-99, s. 12; SOR/2021-125, s. 14(F).

15.1 Despite paragraph 15(1)(c), if an effluent sample is determined to be acutely lethal when tested using the acute lethality test set out in section 14.3, the owner or operator of a mine shall, without delay, collect the first grab sample required by paragraph 15(1)(b) and comply with the requirements of that paragraph.

SOR/2018-99, s. 13.

Reduced Frequency of Acute Lethality Testing

16 (1) The owner or operator of a mine may reduce the frequency of conducting an acute lethality test at a final discharge point to once in each calendar quarter if the effluent from that final discharge point is determined not to be acutely lethal by that acute lethality test for 12 consecutive months.

(iii) enregistre les concentrations des substances nocives désignées à l'article 3;

b) deux fois par mois, prélève un échantillon instantané à partir du point de rejet final d'où l'échantillon d'effluent qui présente une létalité aiguë a été prélevé, enregistre, au moment du prélèvement, la température et le pH de chaque échantillon, et effectue sans délai après le prélèvement, sur chacun de ces échantillons, selon le mode opératoire prévu à la section 6 de la méthode de référence, l'essai de détermination de la létalité aiguë à partir duquel la létalité aiguë de l'échantillon a été établie. S'il est ainsi établi que l'échantillon présente une létalité aiguë, le propriétaire ou l'exploitant d'une mine, sans délai :

(i) effectue la caractérisation de l'effluent conformément au paragraphe 4(1) de l'annexe 5 sur une aliquote de chaque échantillon instantané,

(ii) enregistre la concentration d'ammoniac total et, au moyen de cette concentration et de la température et du pH enregistrés en application du présent alinéa, calcule la concentration d'ammoniac non ionisé selon la formule prévue au paragraphe 12(4),

(iii) enregistre les concentrations des substances nocives désignées à l'article 3;

c) prélève les échantillons instantanés à au moins sept jours d'intervalle.

(2) Il peut recommencer à effectuer l'échantillonnage et les essais à la fréquence fixée à l'article 14 si l'effluent ne présente pas de létalité aiguë dans trois essais consécutifs effectués selon l'alinéa (1)b).

DORS/2006-239, art. 8; DORS/2018-99, art. 12; DORS/2021-125, art. 14(F).

15.1 Malgré l'alinéa 15(1)c), s'il est établi qu'un échantillon d'effluent présente une létalité aiguë après l'essai de détermination de la létalité aiguë prévu à l'article 14.3, le propriétaire ou l'exploitant d'une mine prélève sans délai le premier échantillon instantané exigé par l'alinéa 15(1)b) et se conforme aux exigences de cet alinéa.

DORS/2018-99, art. 13.

Fréquence réduite des essais de détermination de la létalité aiguë

16 (1) Le propriétaire ou l'exploitant d'une mine peut réduire à une fois par trimestre civil la fréquence d'un essai de détermination de la létalité aiguë à un point de rejet final si, pendant douze mois consécutifs, l'effluent à ce point de rejet final ne présente pas de létalité aiguë selon cet essai.

(2) For the purpose of determining whether that effluent is acutely lethal for the 12-month period referred to in subsection (1), the owner or operator of a mine shall use the results of the acute lethality tests conducted under subsection 14(1).

(3) The owner or operator of a mine shall notify the Minister of the Environment in writing at least 30 days before the reduction of the frequency of acute lethality testing.

(4) The owner or operator who reduces the frequency of conducting acute lethality testing under subsection (1) shall

(a) select and record the sampling date not less than 30 days in advance of collecting the grab samples; and

(b) collect the grab samples not less than 45 days apart.

(5) If a grab sample is determined to be acutely lethal by an acute lethality test when the owner or operator of a mine is testing at the frequency prescribed in subsection (1), the owner or operator shall increase the frequency of conducting that test to the frequency prescribed in section 15 and conduct that test in accordance with that section.

(6) If the location of a final discharge point is changed, the owner or operator of a mine shall, at that final discharge point, increase the frequency of conducting all the acute lethality tests to the frequency prescribed in subsection 14(1) and conduct those tests in accordance with that subsection.

SOR/2012-22, s. 4; SOR/2018-99, s. 14.

17 [Repealed, SOR/2018-99, s. 15]

Obligation to Record All Test Results

18 The owner or operator of a mine shall record without delay the data referred to in section 9.1 of Reference Method EPS 1/RM/10, section 8.1 of Reference Method EPS 1/RM/13, section 8.1 of Reference Method EPS 1/RM/14 and section 9.1 of Reference Method STB 1/RM/60 for each acute lethality test.

SOR/2018-99, s. 16; SOR/2021-125, s. 5.

Volume of Effluent

19 (1) The owner or operator of a mine shall record, in cubic metres, the total monthly volume of effluent deposited from each final discharge point for each month during which there was a deposit.

(2) Pour établir si l'effluent présente une létalité aiguë pendant la période de douze mois visée au paragraphe (1), le propriétaire ou l'exploitant d'une mine se fonde sur les résultats obtenus aux termes du paragraphe 14(1).

(3) Le propriétaire ou l'exploitant d'une mine avise par écrit le ministre de l'Environnement de la réduction de la fréquence des essais au moins trente jours avant celle-ci.

(4) Le propriétaire ou l'exploitant qui réduit la fréquence des essais en application du paragraphe (1) prend les mesures suivantes :

a) il choisit et enregistre, au moins trente jours à l'avance, la date de l'échantillonnage;

b) il prélève les échantillons instantanés à au moins quarante-cinq jours d'intervalle.

(5) S'il est établi qu'un échantillon instantané d'effluent présente une létalité aiguë selon un essai de détermination de la létalité aiguë alors que cet essai est effectué à la fréquence prévue au paragraphe (1), le propriétaire ou l'exploitant d'une mine porte la fréquence de cet essai à celle prévue à l'article 15 et effectue cet essai conformément à cet article.

(6) Si l'emplacement d'un point de rejet final est déplacé, le propriétaire ou l'exploitant d'une mine porte la fréquence de tous les essais de détermination de la létalité aiguë à ce point de rejet final à celle prévue au paragraphe 14(1) et effectue ces essais conformément à ce paragraphe.

DORS/2012-22, art. 4; DORS/2018-99, art. 14.

17 [Abrogé, DORS/2018-99, art. 15]

Enregistrement des renseignements

18 Le propriétaire ou l'exploitant d'une mine enregistre sans délai les données visées à la section 9.1 de la méthode de référence SPE 1/RM/10, à la section 8.1 de la méthode de référence SPE 1/RM/13, à la section 8.1 de la méthode de référence SPE 1/RM/14 et à la section 9.1 de la méthode de référence DGST 1/RM/60 pour chaque essai de détermination de la létalité aiguë.

DORS/2018-99, art. 16; DORS/2021-125, art. 5.

Volume d'effluent

19 (1) Le propriétaire ou l'exploitant d'une mine enregistre, en mètres cubes, le volume mensuel total d'effluent rejeté à partir de chaque point de rejet final, pour chaque mois au cours duquel un effluent a été rejeté.

(2) The total monthly volume of effluent deposited shall be either

(a) determined on the basis of the average of the flow rates, expressed in cubic metres per day, measured and calculated as follows:

(i) by measuring the flow rate at the same time as samples are collected under section 12,

(ii) by calculating the average monthly flow rate by adding the flow rate measurements taken during the month and dividing the total by the number of times the flow rate was measured, and

(iii) by multiplying the average monthly flow rate by the number of days during the month that effluent was deposited; or

(b) determined by using a monitoring system that provides a continuous measure of the volume of effluent deposited.

(3) The owner or operator shall

(a) measure the flow rate or volume of effluent deposited by using a monitoring system that is accurate to within 15% of measured flow rate or volume; and

(b) maintain and calibrate the monitoring system at least once in each year and record the results, as well as the date on which and the manner in which the requirement to maintain and calibrate has been met.

SOR/2006-239, s. 9; SOR/2012-22, s. 5; SOR/2018-99, s. 17.

Calculation of Monthly Mean Concentration and Loading

19.1 (1) With respect to the deleterious substances that are contained in the effluent deposited from each final discharge point, the owner or operator of a mine shall, for each month during which there is a deposit and during which samples are collected, record the monthly mean concentration

(a) in mg/L for deleterious substances referred to in paragraphs 3(a) to (g) and (i); and

(b) in Bq/L for a deleterious substance referred to in paragraph 3(h).

(2) If the analytical result from any test conducted under section 12 or 13 is less than the method detection limit used for that test, the test result shall be considered to be

(2) Le volume mensuel total d'effluent rejeté est :

a) soit fondé sur la moyenne des débits, exprimée en mètres cubes par jour, auquel cas il est déterminé de la façon suivante :

(i) le débit est mesuré au moment où les échantillons sont prélevés en application de l'article 12,

(ii) la moyenne mensuelle des débits est calculée par la division du total des mesures de débit enregistrées au cours du mois par le nombre de mesures prises,

(iii) la moyenne mensuelle des débits est multipliée par le nombre de jours où l'effluent a été rejeté;

b) soit déterminé à l'aide d'un système de surveillance à mesure continue.

(3) Le propriétaire ou l'exploitant mesure le volume ou le débit d'effluent rejeté en tenant compte des exigences suivantes :

a) il utilise à cette fin un système de surveillance donnant des mesures exactes à 15 % près;

b) il entretient et étalonne le système de surveillance au moins une fois par année et enregistre les résultats, la date à laquelle il s'est conformé à cette exigence ainsi que la manière dont il s'y est pris.

DORS/2006-239, art. 9; DORS/2012-22, art. 5; DORS/2018-99, art. 17.

Calcul de la concentration moyenne mensuelle et de la charge

19.1 (1) À l'égard des substances nocives désignées à l'article 3 se trouvant dans l'effluent rejeté à partir de chaque point de rejet final, le propriétaire ou l'exploitant d'une mine enregistre, pour chaque mois au cours duquel un effluent est rejeté et des prélèvements sont effectués :

a) la concentration moyenne mensuelle en mg/L des substances nocives énumérées aux alinéas 3a) à g) et i);

b) la concentration moyenne mensuelle en Bq/L de la substance nocive figurant à l'alinéa 3h).

(2) Si le résultat analytique de tout essai effectué en application des articles 12 ou 13 est inférieur à la limite de détection de la méthode utilisée pour l'essai, il est considéré comme égal à la moitié de la limite de détection de

equal to one half of the detection limit used for the purpose of calculating the monthly mean concentration.

SOR/2006-239, s. 9; SOR/2018-99, s. 18.

20 (1) With respect to the deleterious substances that are contained in the effluent deposited from each final discharge point, the owner or operator of a mine shall, for each month and for each calendar quarter during which there was a deposit and during which a sample is collected, record the loading

(a) in kg for deleterious substances referred to paragraphs 3(a) to (g) and (i); and

(b) in MBq for a deleterious substance referred to in paragraph 3(h).

(2) The owner or operator shall determine the loading for each month using the following formula:

ML = C × V / 1,000

where

ML is the loading for a month;

C is the monthly mean concentration of the deleterious substance, recorded under section 19.1; and

V is the total monthly volume of effluent deposited from each final discharge point, recorded under section 19.

(3) The owner or operator shall determine the loading for each calendar quarter using the following formula:

QL = C × V / 1,000

where

QL is the loading for a calendar quarter;

C is the mean of the monthly mean concentrations of the deleterious substance for that calendar quarter, recorded under section 19.1; and

V is the total volume of effluent deposited from each final discharge point during that calendar quarter, based on the sum of the total monthly volumes of effluent deposited from each final discharge point, recorded under section 19.

SOR/2006-239, s. 9; SOR/2018-99, s. 19.

Reporting Monitoring Results

21 (1) The owner or operator of a mine shall submit to the Minister of the Environment an effluent monitoring report for all tests and monitoring conducted during each calendar quarter not later than 45 days after the end of the quarter.

la méthode utilisée pour le calcul de la concentration moyenne mensuelle.

DORS/2006-239, art. 9; DORS/2018-99, art. 18.

20 (1) À l'égard des substances nocives désignées à l'article 3 se trouvant dans l'effluent rejeté à partir de chaque point de rejet final, le propriétaire ou l'exploitant d'une mine enregistre, pour chaque mois et pour chaque trimestre civil au cours duquel un effluent a été rejeté et des prélèvements ont été effectués :

a) la charge en kg des substances nocives énumérées aux alinéas 3a) à g) et i);

b) la charge en MBq de la substance nocive figurant l'alinéa 3h).

(2) Il détermine la charge pour chaque mois civil selon la formule suivante :

CM = C × V / 1 000

où :

CM représente la charge pour un mois;

C la concentration moyenne mensuelle de la substance nocive enregistrée en application de l'article 19.1;

V le volume total d'effluent rejeté à partir de chaque point de rejet final au cours du mois et enregistré en application de l'article 19.

(3) Il détermine la charge pour le trimestre civil selon la formule suivante :

CT = C × V / 1 000

où :

CT représente la charge pour un trimestre;

C la moyenne des concentrations moyennes mensuelles de la substance nocive enregistrées au cours du trimestre en application de l'article 19.1;

V le volume total d'effluent rejeté à partir de chaque point de rejet final au cours du trimestre, fondé sur la somme des volumes mensuels d'effluent rejeté à partir de chaque point de rejet final et enregistrés en application de l'article 19.

DORS/2006-239, art. 9; DORS/2018-99, art. 19.

Rapports sur les résultats de suivi

21 (1) Le propriétaire ou l'exploitant d'une mine présente au ministre de l'Environnement un rapport sur le suivi de l'effluent pour tout essai ou mesure de suivi effectué au cours de chaque trimestre civil, dans les quarante-cinq jours suivant la fin du trimestre.

(2) Subject to subsection (3), the effluent monitoring report shall include

(a) the data referred to in section 9.1 of Reference Method EPS 1/RM/10, section 8.1 of Reference Method EPS 1/RM/13 and section 8.1 of Reference Method EPS 1/RM/14 as required by section 18;

(a.1) for each acute lethality test that is conducted under section 14.4,

(i) the date and time when the effluent sample was collected,

(ii) the location of the final discharge point from which the sample was collected, and

(iii) the percentage mortality in 100% effluent test concentration;

(b) the concentration and monthly mean concentration of each deleterious substance prescribed in section 3 that is contained in the effluent samples collected under subsection 12(1) and the concentrations of such deleterious substances contained in the effluent samples collected under subsection 13(1) or (2);

(c) the pH of the effluent samples as required by subsection 12(1);

(d) whether a composite or grab sample collection method was used for each effluent sample as required by subsection 12(1);

(d.1) for each month of the calendar quarter, the number of days that effluent was deposited;

(e) the total volume of effluent deposited during each month of the reporting quarter as recorded under section 19;

(f) the mass loading of the deleterious substances prescribed in section 3 as recorded under section 20; and

(g) the results of the effluent characterization conducted under paragraph 15(1)(a).

(3) If no effluent is deposited in a calendar quarter, the report shall only include a statement to that effect.

SOR/2006-239, s. 10; SOR/2018-99, ss. 20, 36; SOR/2021-125, s. 6.

22 The owner or operator of a mine shall submit to the Minister of the Environment, not later than March 31 in each year, a report that shall include

(2) Sous réserve du paragraphe (3), le rapport comporte ce qui suit :

a) les données visées à la section 9.1 de la méthode de référence SPE 1/RM/10, à la section 8.1 de la méthode de référence SPE 1/RM/13 et à la section 8.1 de la méthode de référence SPE 1/RM/14, qu'exige l'article 18;

a.1) pour chaque essai de détermination de la létalité aiguë effectué en application de l'article 14.4, les renseignements suivants :

(i) les date et heure auxquelles l'échantillon d'effluent a été prélevé,

(ii) l'emplacement du point de rejet final où l'échantillon a été prélevé,

(iii) le pourcentage de mortalité dans l'effluent non dilué;

b) la concentration et la concentration moyenne mensuelle des substances nocives désignées à l'article 3 se trouvant dans les échantillons d'effluent prélevés en application du paragraphe 12(1) de même que la concentration de ces substances nocives dans les échantillons d'effluent prélevés au titre des paragraphes 13(1) ou (2);

c) le pH des échantillons, exigé par le paragraphe 12(1);

d) pour chaque échantillon d'effluent prélevé en application du paragraphe 12(1), s'il s'agit d'un échantillon composite ou instantané;

d.1) pour chaque mois du trimestre civil, le nombre de jours où il y a eu rejet d'effluent;

e) le volume total d'effluent rejeté pour chaque mois du trimestre, enregistré en application de l'article 19;

f) la charge des substances nocives désignées à l'article 3 enregistrée en application de l'article 20;

g) les résultats des essais de caractérisation de l'effluent effectués conformément à l'alinéa 15(1)a).

(3) Si au cours d'un trimestre civil aucun effluent n'a été rejeté, le rapport ne comporte qu'une mention à cet effet.

DORS/2006-239, art. 10; DORS/2018-99, art. 20 et 36; DORS/2021-125, art. 6.

22 Le propriétaire ou l'exploitant d'une mine présente au ministre de l'Environnement, au plus tard le 31 mars chaque année, un rapport comportant les renseignements suivants :

(a) the identifying information set out in Part 1 of Schedule 6;

(b) the effluent monitoring results for the previous calendar year for each final discharge point, including

(i) for test results respecting the prescribed deleterious substances and the pH, the information set out in Part 2 of Schedule 6, and

(ii) for each acute lethality test,

(A) the date when the sample was collected,

(B) the location of the final discharge point from which the sample was collected, and

(C) the percentage mortality in 100% effluent test concentration; and

(c) the following information regarding non-compliance:

(i) if the results of any effluent monitoring tests indicate that the maximum authorized concentrations set out in Schedule 4 were exceeded or that the pH of the effluent is less than 6.0 or greater than 9.5, the causes of that non-compliance and the remedial measures that are planned or that have been implemented, and

(ii) if the results of any acute lethality tests indicate that an effluent sample was determined to be acutely lethal, the remedial measures that are planned or that have been implemented.

SOR/2006-239, s. 11; SOR/2018-99, s. 21; SOR/2021-125, s. 7.

23 Any report or information referred to in sections 7, 21 and 22 shall be submitted electronically in the format provided by the Department of the Environment, but the report or information shall be submitted in writing if

(a) no such format has been provided; or

(b) it is, owing to circumstances beyond the control of either the owner or the operator, impracticable to submit the report or information electronically in the format provided.

SOR/2006-239, s. 11; SOR/2018-99, s. 22.

24 (1) The owner or operator of a mine shall notify an inspector without delay if the results of the effluent monitoring tests conducted under section 12 or 13, subsection 14(1) or section 15 or 16 indicate that

a) les renseignements identificatoires prévus à la partie 1 de l'annexe 6;

b) les renseignements ci-après relatifs aux résultats du suivi de l'effluent pour chaque point de rejet final, au cours de l'année civile précédente :

(i) en ce qui concerne les résultats des essais sur les substances nocives désignées et le pH, les renseignements prévus à la partie 2 de l'annexe 6,

(ii) pour chaque essai de détermination de la létalité aiguë :

(A) la date à laquelle l'échantillon a été prélevé,

(B) l'emplacement du point de rejet final où l'échantillon a été prélevé,

(C) le pourcentage de mortalité dans l'effluent non dilué;

c) les renseignements suivants sur la non-conformité :

(i) si les résultats des essais de suivi de l'effluent montrent que les concentrations maximales permises prévues à l'annexe 4 ont été dépassées ou que le pH de l'effluent est inférieur à 6,0 ou supérieur à 9,5, les causes ainsi que les mesures correctives projetées ou mises en œuvre,

(ii) si les résultats des essais de détermination de la létalité aiguë montrent qu'un échantillon d'effluent présente une létalité aiguë, les mesures correctives projetées ou mises en œuvre.

DORS/2006-239, art. 11; DORS/2018-99, art. 21; DORS/2021-125, art. 7.

23 Les rapports et renseignements visés aux articles 7, 21 et 22 sont présentés sous forme électronique selon le modèle fourni par le ministère de l'Environnement. Ils sont toutefois présentés par écrit dans l'un ou l'autre des cas suivants :

a) aucun modèle n'est fourni;

b) il est pratiquement impossible, pour des raisons indépendantes de la volonté du propriétaire ou de l'exploitant, selon le cas, de les présenter sous forme électronique selon le modèle fourni.

DORS/2006-239, art. 11; DORS/2018-99, art. 22.

24 (1) Le propriétaire ou l'exploitant d'une mine avise sans délai l'inspecteur si les résultats des essais de suivi de l'effluent effectués au titre des articles 12 ou 13, du paragraphe 14(1) ou des articles 15 ou 16 montrent que :

(a) the limits set out in Schedule 4 are being or have been exceeded;

(b) the pH of the effluent is less than 6.0 or greater than 9.5; or

(c) an effluent is acutely lethal.

(2) The owner or operator shall provide a written report of the test results to the inspector within 30 days after the tests have been completed.

(3) [Repealed, SOR/2018-99, s. 23]

SOR/2006-239, s. 12; SOR/2018-99, s. 23.

Relief

25 (1) Any time period specified for collecting samples of effluent referred to in this Division may be extended if

(a) unforeseen circumstances cause safety concerns or access problems and render the collection of samples of effluent impracticable; and

(b) the owner or operator of a mine notifies an inspector, without delay, of the circumstances and indicates when they expect to be able to collect the samples.

(2) The owner or operator shall collect the samples of effluent without delay when the circumstances permit.

SOR/2006-239, s. 13.

a) les limites prévues à l'annexe 4 sont ou ont été dépassées;

b) le pH de l'effluent est inférieur à 6,0 ou supérieur à 9,5;

c) l'effluent est un effluent à létalité aiguë.

(2) Il présente à l'inspecteur un rapport écrit des résultats des essais dans les trente jours suivant la fin de ceux-ci.

(3) [Abrogé, DORS/2018-99, art. 23]

DORS/2006-239, art. 12; DORS/2018-99, art. 23.

Dispense

25 (1) Les délais prévus dans la présente section à l'égard du prélèvement des échantillons d'effluent peuvent être prorogés si les conditions suivantes sont réunies :

a) des circonstances imprévues provoquent des problèmes de sécurité ou d'accessibilité et rendent le prélèvement d'échantillons d'effluent pratiquement impossible;

b) le propriétaire ou l'exploitant d'une mine a avisé l'inspecteur sans délai des circonstances et lui a indiqué le moment où il croit pouvoir procéder au prélèvement des échantillons.

(2) Le propriétaire ou l'exploitant prélève les échantillons d'effluent sans délai dès que les circonstances le permettent.

DORS/2006-239, art. 13.

DIVISION 3

Notice, Records and Other Documents

End of Commercial Operation Notice

26 (1) The owner or operator of a mine shall notify the Minister of the Environment in writing of the day on which the mine has stopped commercial operation not later than 90 days after the end of commercial operation.

(2) The owner or operator shall notify the Minister of the Environment in writing without delay if the mine returns to commercial operation.

SOR/2018-99, s. 36.

SECTION 3

Avis, registres et autres documents

Avis de la fin de l'exploitation commerciale

26 (1) Le propriétaire ou l'exploitant d'une mine avise le ministre de l'Environnement par écrit de la date où l'exploitation commerciale de la mine a cessé, dans les quatre-vingt-dix jours suivant la cessation.

(2) Il avise le ministre de l'Environnement, par écrit et sans délai, de la reprise de l'exploitation commerciale.

DORS/2018-99, art. 36.

Records, Books of Account or Other Documents

27 The owner or operator of a mine shall keep all records, books of account or other documents required by these Regulations at the mine for a period of not less than five years, beginning on the day on which they are made, including

(a) records relating to all final discharge points, including any changes to those records;

(b) records relating to effluent monitoring equipment, including the calibration of that equipment;

(c) records relating to the data referred to in section 9.1 of Reference Method EPS 1/RM/10, section 8.1 of Reference Method EPS 1/RM/13, section 8.1 of Reference Method EPS 1/RM/14 and section 9.1 of Reference Method STB 1/RM/60;

(d) compensation plans;

(e) emergency response plans, including each update to the plan;

(f) reports on any unauthorized deposits;

(g) reports or other documents prepared and data collected for the purposes of environmental effects monitoring studies; and

(h) records and reports of measurements with respect to the pH, temperature and concentration of any deleterious substance prescribed in section 3.

SOR/2018-99, s. 24; SOR/2021-125, s. 8.

Registres, livres comptables ou autres documents

27 Le propriétaire ou l'exploitant d'une mine conserve à la mine, pendant au moins cinq ans à compter de leur établissement, tous les registres, livres comptables ou autres documents exigés par le présent règlement, soit, notamment :

a) les registres concernant les points de rejet final et tout changement à ces registres;

b) les registres concernant les équipements de surveillance des effluents, y compris les registres de calibration de ces équipements;

c) les registres concernant les données visées à la section 9.1 de la méthode de référence SPE 1/RM/10, à la section 8.1 de la méthode de référence SPE 1/RM/13, à la section 8.1 de la méthode de référence SPE 1/RM/14 et à la section 9.1 de la méthode de référence DGST 1/RM/60;

d) les plans compensatoires;

e) les plans d'intervention d'urgence et chacune de leurs mises à jour;

f) tout rapport sur le rejet non autorisé;

g) tous les rapports ou autres documents préparés et toutes les données recueillies pour une étude de suivi des effets sur l'environnement;

h) registres et rapports concernant toutes les mesures de pH, de la température et des concentrations des substances nocives énumérées à l'article 3.

DORS/2018-99, art. 24; DORS/2021-125, art. 8.

DIVISION 4

Tailings Impoundment Areas

Compensation Plan

27.1 (1) The owner or operator of a mine shall, before depositing a deleterious substance into a tailings impoundment area that is set out in Schedule 2, submit to the Minister of the Environment a compensation plan that includes the information described in subsection (2) and obtain that Minister's approval of the plan.

SECTION 4

Dépôts de résidus miniers

Plan compensatoire

27.1 (1) Avant de rejeter des substances nocives dans tout dépôt de résidus miniers qui figure à l'annexe 2, le propriétaire ou l'exploitant d'une mine présente au ministre de l'Environnement un plan compensatoire qui comporte les renseignements énumérés au paragraphe (2) et obtient son approbation.

(2) The purpose of the compensation plan is to offset the loss of fish habitat resulting from the deposit of any deleterious substance into the tailings impoundment area. It shall contain the following information:

(a) a description of the location of the tailings impoundment area and of fish habitat that will be affected by the deposit;

(b) a quantitative impact assessment of the deposit on fish habitat;

(c) a description of the measures to be taken to offset the loss of fish habitat;

(d) a description of the measures to be taken during the planning and implementation of the compensation plan to mitigate any potential adverse effects on fish habitat that could result from the plan's implementation;

(e) a description of the measures to be taken to monitor the plan's implementation;

(f) a description of the measures to be taken to verify the extent to which the plan's purpose has been achieved;

(g) the time required to implement the plan that allows for the achievement of the plan's purpose within a reasonable time; and

(h) an estimate of the cost of implementing each element of the plan.

(3) The owner or operator of a mine shall submit with the compensation plan an irrevocable letter of credit issued by a recognized Canadian financial institution, or another equivalent financial guarantee, including a performance bond, to cover the costs of implementing the plan.

(4) The Minister of the Environment shall approve the compensation plan if it meets the requirements of subsection (2) and the owner or operator of a mine has complied with subsection (3).

(5) The owner or operator of a mine shall ensure that the compensation plan approved by the Minister of the Environment is implemented and, if the compensation plan's purpose is not being achieved, the owner or operator shall inform the Minister of the Environment.

(2) Le plan compensatoire a pour objectif de contrebalancer la perte d'habitat du poisson consécutive au rejet de substances nocives dans le dépôt de résidus miniers. Il comporte les renseignements suivants :

a) une description de l'emplacement du dépôt de résidus miniers et de l'habitat du poisson qui sera affecté par le rejet;

b) l'analyse quantitative de l'incidence du rejet sur l'habitat du poisson;

c) une description des mesures visant à contrebalancer la perte d'habitat du poisson;

d) une description des mesures envisagées durant la planification et la mise en œuvre du plan pour atténuer les effets défavorables sur l'habitat du poisson qui pourraient résulter de cette mise en œuvre;

e) une description des mesures de surveillance de la mise en œuvre du plan;

f) une description des mécanismes permettant de mesurer l'atteinte de l'objectif du plan;

g) le délai de la mise en œuvre du plan qui permet l'atteinte de son objectif dans un délai raisonnable;

h) l'estimation du coût de mise en œuvre de chacun des éléments du plan.

(3) Le propriétaire ou l'exploitant d'une mine présente, avec le plan compensatoire, une lettre de crédit irrévocable délivrée par une institution financière canadienne reconnue ou une autre garantie financière équivalente, notamment un cautionnement de bonne exécution, pour couvrir les coûts de mise en œuvre du plan.

(4) Le ministre de l'Environnement approuve le plan compensatoire si celui-ci satisfait aux exigences visées au paragraphe (2) et si le propriétaire ou l'exploitant de la mine s'est conformé au paragraphe (3).

(5) Le propriétaire ou l'exploitant d'une mine veille à ce que le plan compensatoire qui a été approuvé par le ministre de l'Environnement soit mis en œuvre et informe ce dernier si l'objectif du plan n'a pas été atteint.

(6) If the compensation plan's purpose is not being achieved, the owner or operator of a mine shall, as soon as practicable in the circumstances, identify and implement all necessary remedial measures to ensure that the purpose is achieved.

SOR/2006-239, s. 14; SOR/2018-99, s. 24; SOR/2022-23, s. 1.

(6) Si l'objectif du plan compensatoire n'est pas atteint, le propriétaire ou l'exploitant d'une mine prend les mesures correctives nécessaires le plus tôt possible, eu égard aux circonstances.

DORS/2006-239, art. 14; DORS/2018-99, art. 24; DORS/2022-23, art. 1.

Deposits from Tailings Impoundment Areas

28 (1) The owner or operator of a mine shall deposit effluent from a tailings impoundment area only through a final discharge point that is monitored and reported on in accordance with the requirements of these Regulations.

(2) The owner or operator of a mine shall comply with section 6 and the conditions prescribed in paragraphs 4(1)(a) to (c) for all effluent that exits a tailing impoundment area.

Rejets à partir de dépôts de résidus miniers

28 (1) Le propriétaire ou l'exploitant d'une mine ne rejette l'effluent provenant d'un dépôt de résidus miniers qu'à un point de rejet final faisant l'objet d'un suivi et de rapports conformément aux exigences du présent règlement.

(2) Il remplit les conditions prévues aux alinéas 4(1)a) à c) et se conforme à l'article 6 lorsqu'il rejette un tel effluent.

PART 3

Unauthorized Deposits

29 [Repealed, SOR/2018-99, s. 25]

Emergency Response Plan

30 (1) The owner or operator of a mine shall prepare an emergency response plan that describes the measures to be taken in respect of a deleterious substance within the meaning of subsection 34(1) of the Act to prevent any unauthorized deposit of such a substance or to mitigate the effects of such a deposit.

(2) The emergency response plan shall include the following elements:

(a) the identification of any unauthorized deposit that can reasonably be expected to occur at the mine and that can reasonably be expected to result in damage or danger to fish habitat or fish or the use by man of fish, and the identification of the damage or danger;

(b) a description of the measures to be used to prevent, prepare for, respond to and recover from a deposit identified under paragraph (a);

(c) a list of the individuals who are to implement the plan in the event of an unauthorized deposit, and a description of their roles and responsibilities;

PARTIE 3

Rejets non autorisés

29 [Abrogé, DORS/2018-99, art. 25]

Plan d'intervention d'urgence

30 (1) Le propriétaire ou l'exploitant d'une mine dresse un plan d'intervention d'urgence qui énonce, à l'égard d'une substance nocive au sens du paragraphe 34(1) de la Loi, les mesures à prendre pour prévenir tout rejet non autorisé d'une telle substance ou pour en atténuer les effets.

(2) Le plan d'intervention d'urgence comporte en outre les éléments suivants :

a) la mention de tout rejet non autorisé qui pourrait se produire à la mine et entraîner des dommages ou des risques réels de dommages pour le poisson ou son habitat ou pour l'utilisation par l'homme du poisson, ainsi que l'identification de ces risques ou dommages;

b) le détail des mesures de prévention, de préparation, d'intervention et de réparation applicable à l'égard du rejet non autorisé mentionné au titre de l'alinéa a);

c) la liste des personnes chargées de mettre à exécution le plan en cas de rejet non autorisé ainsi qu'une description de leurs rôles et responsabilités;

(d) the identification of the emergency response training required for each of the individuals listed under paragraph (c);

(e) a list of the emergency response equipment included as part of the plan, and the equipment's location; and

(f) alerting and notification procedures including the measures to be taken to notify members of the public who may be adversely affected by a deposit identified under paragraph (a).

(3) The owner or operator shall complete the emergency response plan and have it available for inspection no later than 60 days after the mine becomes subject to this section.

(4) The owner or operator shall update and test the emergency response plan at least once each year to ensure that the plan continues to meet the requirements of subsection (2).

(4.1) The owner or operator of a mine shall, each time the emergency response plan is tested, record the following information and keep the record for at least five years:

(a) a summary of the test;

(b) the test results; and

(c) any modifications that are made to the plan as a consequence of the test.

(4.2) The owner or operator of a mine shall ensure that a copy of the most recent version of the emergency response plan is kept at the mine in a location that is readily available to the individuals who are responsible for implementing the plan.

(5) If a mine has not been subject to the requirements of this section for more than one year, a new emergency response plan shall be prepared and completed no later than 60 days after the day on which the mine again becomes subject to this section.

SOR/2006-239, s. 16; SOR/2012-22, s. 6(F); SOR/2018-99, s. 26; SOR/2021-125, s. 9(F).

Reporting

31 A report required by subsection 38(7) of the Act in respect of the unauthorized deposit of a deleterious substance shall contain the following information:

(a) the name, description and concentration of the deleterious substance deposited;

d) la mention de la formation en intervention d'urgence exigée des personnes visées à l'alinéa c);

e) la liste de l'équipement d'intervention d'urgence prévu dans le plan et l'emplacement de cet équipement;

f) les procédures d'alerte et de notification, notamment les mesures prévues pour avertir les membres du public auxquels le rejet mentionné en application de l'alinéa a) pourrait causer un préjudice.

(3) Le propriétaire ou l'exploitant termine le plan d'intervention d'urgence, lequel doit être disponible pour inspection, dans les soixante jours suivant la date à laquelle la mine devient assujettie au présent article.

(4) Il tient à jour et met à l'essai le plan d'intervention d'urgence au moins une fois par année afin de veiller à ce que celui-ci satisfasse aux exigences du paragraphe (2).

(4.1) Chaque fois que le plan d'intervention est mis à l'essai, le propriétaire ou l'exploitant d'une mine consigne dans un registre les renseignements ci-après qu'il conserve pendant au moins cinq ans :

a) un résumé de l'essai;

b) les résultats de cet essai;

c) les modifications apportées au plan à la suite de cet essai.

(4.2) Il veille à ce qu'une copie du plan d'intervention d'urgence à jour soit conservée à la mine, à un endroit facilement accessible aux personnes chargées de mettre à exécution le plan.

(5) Si la mine n'a pas été assujettie au présent article pendant plus d'un an, un nouveau plan d'intervention d'urgence est dressé — et doit être terminé — dans les soixante jours suivant la date à laquelle elle le redevient.

DORS/2006-239, art. 16; DORS/2012-22, art. 6(F); DORS/2018-99, art. 26; DORS/2021-125, art. 9(F).

Rapport

31 Le rapport exigé au paragraphe 38(7) de la Loi, à l'égard du rejet non autorisé d'une substance nocive, comporte les renseignements suivants :

a) le nom, la description et la concentration de la substance nocive rejetée;

(b) the estimated quantity of the deposit and how the estimate was achieved;

(c) the day on which, and hour at which, the deposit occurred;

(d) the quantity of the deleterious substance that was deposited at a place other than through a final discharge point and the identification of that place, including the location by latitude and longitude and, if applicable, the civic address;

(e) the quantity of the deleterious substance that was deposited through a final discharge point and the identification of that discharge point;

(f) the name of the receiving body of water, if there is a name, and the location by latitude and longitude where the deleterious substance entered the receiving body of water;

(g) the results of the acute lethality tests conducted under subsection 31.1(1) or a statement indicating that acute lethality tests were not conducted but that notification was given under subsection 31.1(2);

(h) the circumstances of the deposit, the measures that were taken to mitigate the effects of the deposit and, if the emergency response plan was implemented, details concerning its implementation; and

(i) the measures that were taken, or that are intended to be taken, to prevent any similar occurrence of an unauthorized deposit.

SOR/2006-239, s. 17; SOR/2011-92, s. 6; SOR/2018-99, s. 27.

b) la quantité estimative du rejet ainsi que la méthode d'estimation utilisée;

c) la date et l'heure du rejet;

d) la quantité de la substance nocive qui a été rejetée à partir d'un lieu autre qu'un point de rejet final et la mention de ce lieu ainsi que sa latitude et sa longitude et, le cas échéant, l'adresse municipale;

e) la quantité de la substance nocive qui a été rejetée à partir d'un point de rejet final, et la mention de celui-ci;

f) le nom du milieu aquatique récepteur, si ce nom existe, et la latitude et la longitude du point de pénétration de la substance nocive dans le milieu aquatique;

g) les résultats des essais de détermination de la létalité aiguë effectués en application du paragraphe 31.1(1) ou une attestation indiquant qu'aucun essai de détermination de la létalité aiguë n'a été effectué mais que l'avis visé au paragraphe 31.1(2) a été donné;

h) les circonstances du rejet, les mesures d'atténuation prises et, le cas échéant, le détail de l'exécution du plan d'intervention d'urgence;

i) les mesures prises ou planifiées afin d'éviter d'autres rejets semblables à l'avenir.

DORS/2006-239, art. 17; DORS/2011-92, art. 6; DORS/2018-99, art. 27.

Acute Lethality Testing

31.1 (1) If an unauthorized deposit of a deleterious substance occurs, the owner or operator of a mine shall, without delay, collect a grab sample of effluent at the place where the deposit occurred and determine whether the effluent is acutely lethal by conducting tests on aliquots of each effluent sample in accordance with sections 14.1 to 14.4.

(2) Despite subsection (1), the owner or operator of a mine is not required to conduct those tests if they notify an inspector, without delay, that the deposit is an acutely lethal effluent.

SOR/2018-99, s. 27; SOR/2021-125, s. 10.

Essai de détermination de la létalité aiguë

31.1 (1) En cas de rejet non autorisé d'une substance nocive, le propriétaire ou l'exploitant d'une mine prélève sans délai un échantillon instantané d'effluent sur les lieux du rejet non autorisé et détermine si cet effluent présente une létalité aiguë en effectuant des essais conformément aux articles 14.1 à 14.4 sur des aliquotes de chaque échantillon d'effluent prélevé.

(2) Malgré le paragraphe (1), le propriétaire ou l'exploitant d'une mine n'est pas tenu d'effectuer les essais s'il avise sans délai l'inspecteur que le rejet est un effluent à létalité aiguë.

DORS/2018-99, art. 27; DORS/2021-125, art. 10.

PART 4

Recognized Closed Mines

Requirements

32 (1) An owner or operator who intends to close a mine shall

(a) provide written notice of that intention to the Minister of the Environment;

(b) maintain the mine's rate of production at less than 10% of its design-rated capacity for a continuous period of three years starting on the day on which the written notice is received by the Minister of the Environment; and

(c) conduct a biological monitoring study during the three-year period referred to in paragraph (b) in accordance with Division 3 of Part 2 of Schedule 5.

(2) If the owner or operator has complied with all of the requirements set out in paragraphs (1)(a) to (c), the mine becomes a recognized closed mine after the expiry of the three-year period referred to in subsection (1).

(3) The owner or operator shall notify the Minister of the Environment in writing at least 60 days before reopening the recognized closed mine.

(4) The owner or operator referred to in this section shall keep at any place in Canada all records, books of account or other documents required by these Regulations for a period of not less than five years beginning on the day they are made, and shall notify the Minister of the Environment in writing of their location.

SOR/2006-239, s. 18; SOR/2018-99, ss. 28, 36.

Identifying Information

33 (1) The owner or operator of a recognized closed mine shall submit in writing to the Minister of the Environment the information referred to in subsection (2) not later than 60 days after the day on which

(a) the recognized closed mine becomes subject to these Regulations; or

(b) ownership of the recognized closed mine is transferred.

(2) The information that shall be submitted is the name and address of

PARTIE 4

Mines fermées reconnues

Exigences

32 (1) Le propriétaire ou l'exploitant qui souhaite fermer sa mine :

a) en avise le ministre de l'Environnement par écrit;

b) maintient le taux de production de la mine à moins de 10 % de sa capacité nominale durant une période continue de trois ans commençant à la date à laquelle le ministre de l'Environnement reçoit l'avis;

c) effectue, durant la période prévue à l'alinéa b), une étude de suivi biologique conformément à la section 3 de la partie 2 de l'annexe 5.

(2) La mine devient une mine fermée reconnue à l'expiration de la période de trois ans prévue au paragraphe (1) si le propriétaire ou l'exploitant s'est conformé aux exigences visées aux alinéas (1)a) à c).

(3) Le propriétaire ou l'exploitant avise par écrit le ministre de l'Environnement de la réouverture de la mine fermée reconnue au moins soixante jours avant la réouverture.

(4) Le propriétaire ou l'exploitant visé par le présent article conserve n'importe où au Canada tous les registres, livres comptables ou autres documents exigés par le présent règlement pendant au moins cinq ans à compter de leur établissement et avise le ministre de l'Environnement par écrit du lieu où ils se trouvent.

DORS/2006-239, art. 18; DORS/2018-99, art. 28 et 36.

Renseignements d'identification

33 (1) Le propriétaire ou l'exploitant d'une mine fermée reconnue présente par écrit au ministre de l'Environnement les renseignements mentionnés au paragraphe (2) :

a) dans les soixante jours suivant la date à laquelle la mine fermée reconnue devient assujettie au présent règlement;

b) dans les soixante jours suivant le transfert de propriété de la mine fermée reconnue.

(2) Les renseignements à présenter sont :

(a) both the owner and the operator of the recognized closed mine; and

(b) any parent company of the owner or the operator.

(3) The owner or operator shall notify the Minister of the Environment of any change in the information not later than 60 days after the change occurs.

SOR/2018-99, s. 36.

34 [Repealed, SOR/2018-99, s. 29]

35 [Repealed, SOR/2018-99, s. 29]

36 [Repealed, SOR/2018-99, s. 29]

37 [Repealed, SOR/2018-99, s. 29]

38 [Repealed, SOR/2018-99, s. 29]

39 [Repealed, SOR/2018-99, s. 29]

40 [Repealed, SOR/2018-99, s. 29]

41 [Repealed, SOR/2018-99, s. 29]

42 [Repealed, SOR/2018-99, s. 29]

a) les nom et adresse du propriétaire et de l'exploitant;

b) les nom et adresse de toute société mère du propriétaire ou de l'exploitant.

(3) Le propriétaire ou l'exploitant avise le ministre de l'Environnement de tout changement des renseignements dans les soixante jours suivant le changement.

DORS/2018-99, art. 36.

34 [Abrogé, DORS/2018-99, art. 29]

35 [Abrogé, DORS/2018-99, art. 29]

36 [Abrogé, DORS/2018-99, art. 29]

37 [Abrogé, DORS/2018-99, art. 29]

38 [Abrogé, DORS/2018-99, art. 29]

39 [Abrogé, DORS/2018-99, art. 29]

40 [Abrogé, DORS/2018-99, art. 29]

41 [Abrogé, DORS/2018-99, art. 29]

42 [Abrogé, DORS/2018-99, art. 29]

SCHEDULE 1
[Repealed, SOR/2018-99, s. 30]

ANNEXE 1
[Abrogée, DORS/2018-99, art. 30]

SCHEDULE 2

(Subsections 5(1) and 27.1(1))

Tailings Impoundment Areas

Item	Column 1 Water or Place	Column 2 Description
1	Anderson Lake, Manitoba	Anderson Lake located at 54°51′ north latitude and 100°0′ west longitude near the town of Snow Lake, Manitoba. More precisely, the area bounded by (a) the contour of elevation around Anderson Lake at the 285-m level, and (b) the control dam built at the east end of Anderson Lake.
2	Garrow Lake, Nunavut	Garrow Lake located at 75°23′ north latitude and 97°48′ west longitude near the south end of Little Cornwallis Island, Nunavut.
3	South Kemess Creek, British Columbia	That part of South Kemess Creek being within the watershed of that tributary of South Kemess Creek (a) extending eastwards and upstream from the centre of a tailings dam constructed at 57°1′ north latitude and 126°41′ west longitude, and (b) below the crest of the dam at an elevation of 1515 m.
4	Albino Lake, British Columbia	Albino Lake located at 56°39.4′ north latitude and 130°29.4′ west longitude near the Eskay Creek Mine in British Columbia. More precisely, the area bounded by (a) the contour of elevation around Albino Lake at the 1040-m level, and (b) the outlet of Albino Lake.
5	Tom MacKay Lake, British Columbia	Tom MacKay Lake located at 56°39′ north latitude and 130°34′ west longitude near the Eskay Creek Mine in British Columbia. More precisely, the area bounded by (a) the contour of elevation around Tom MacKay Lake at the 1078-m level, and (b) the outlet of Tom MacKay Lake.
6	Trout Pond, Newfoundland and Labrador	Trout Pond located at 48°39′0.81882″ north latitude and 56°29′19.704984″ west longitude in west-central Newfoundland. More precisely, the area bounded by (a) the contour of elevation around Trout Pond at the 270 m level, and (b) the outlet of Trout Pond.
7	The headwater pond of a tributary to Gill's Pond Brook, Newfoundland and Labrador	The headwater pond of a tributary to Gill's Pond Brook, located at 48°38′29.599584″ north latitude and 56°30′15.560676″ west longitude in west-central Newfoundland. More precisely, the area bounded by (a) the contour of elevation around the pond at the 260 m level, and (b) the outlet of the pond.

ANNEXE 2

(paragraphes 5(1) et 27.1(1))

Dépôts de résidus miniers

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
1	Lac Anderson, Manitoba	Le lac Anderson, situé par 54°51′ de latitude N. et 100°0′ de longitude O., près de la ville de Snow Lake, au Manitoba. Plus précisément, le lieu délimité par : a) la courbe de niveau à 285 m autour du lac Anderson; b) le barrage de régulation à l'extrémité est du lac Anderson.
2	Lac Garrow, Nunavut	Le lac Garrow, situé par 75°23′ de latitude N. et 97°48′ de longitude O., près de l'extrémité sud de la petite île Cornwallis, au Nunavut.
3	Ruisseau South Kemess, Colombie-Britannique	La partie du ruisseau South Kemess située dans le bassin hydrographique du tributaire du ruisseau South Kemess : a) qui s'étend vers l'est et en amont du centre d'un barrage de retenue des stériles situé par 57°1′ de latitude N. et 126°41′ de longitude O.; b) qui se trouve en dessous de la crête du barrage, à une altitude de 1515 m.
4	Lac Albino, Colombie-Britannique	Le lac Albino, situé par 56°39,4′ de latitude N. et 130°29,4′ de longitude O., près de la mine Eskay Creek, en Colombie-Britannique. Plus précisément, la région délimitée par : a) la courbe de niveau à 1040 m autour du lac Albino; b) la décharge du lac Albino.
5	Lac Tom MacKay, Colombie-Britannique	Le lac Tom MacKay, situé par 56°39′ de latitude N. et 130°34′ de longitude O., près de la mine Eskay Creek, en Colombie-Britannique. Plus précisément, la région délimitée par : a) la courbe de niveau à 1078 m autour du lac Tom MacKay; b) la décharge du lac Tom Mackay.
6	Trout Pond, Terre-Neuve-et-Labrador	L'étang Trout Pond, situé par 48°39′0,818 82″ de latitude N. et 56°29′19,704 984″ de longitude O., dans la partie centrale ouest de Terre-Neuve et, plus précisément, la région délimitée par : a) la courbe de niveau à 270 m autour de l'étang Trout Pond; b) la décharge de l'étang Trout Pond.

Item	Column 1 Water or Place	Column 2 Description
8	The northwest arm of Second Portage Lake, Nunavut	That portion of the northwest arm of Second Portage Lake, located at 65°1′39.29″ north latitude and 96°3′43″ west longitude, approximately 80 km north of the town of Baker Lake, Nunavut. More precisely, the area bounded by (a) the contour of elevation around the arm at the 146 m level, and (b) the dam built at the southeast end of the arm.
9	Tail Lake, Nunavut	Tail Lake, located at 68°7′25.8″ north latitude and 106°33′31.2″ west longitude, approximately 125 km southwest of the Hamlet of Cambridge Bay, Nunavut. More precisely, the area bounded by (a) the contour of elevation around Tail Lake at the 33.5 m level, and (b) the dams built at the south and north ends of the lake.
10	A portion of Wabush Lake, Newfoundland and Labrador	That portion of Wabush Lake near the towns of Labrador City and Wabush in western Labrador. More precisely, the area bounded by (a) the southern limit, extending from 53° north latitude, 66°50′24″ west longitude to 53° north latitude, 66°52′57″ west longitude, and (b) the outlet of Wabush Lake, extending from 53°09′4.7″ north latitude, 66°47′3.5″ west longitude to 53°08′57.5″ north latitude, 66°47′2.9″ west longitude.
11	Flora Lake, Newfoundland and Labrador	Flora Lake located at 52°55′ north latitude, 66°49′ west longitude, near the towns of Labrador City and Wabush in western Labrador.
12	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador. More precisely, an area extending from the mouth of the stream (52°52′9.94″ north latitude, 66°47′14.26″ west longitude) for a distance of 75 m upstream from Flora Lake.
13	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador. More precisely, an area extending from the mouth of the stream (52°52′10.70″ north latitude, 66°47′6.49″ west longitude) for a distance of 580 m upstream from Flora Lake.
14	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador	A portion of an unnamed tributary stream to Flora Lake, Newfoundland and Labrador. More precisely, an area extending from the mouth of the stream (52°52′57.45″ north latitude, 66°47′25.23″ west longitude) for a distance of 256 m upstream from Flora Lake.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
7	L'étang d'amont d'un tributaire du ruisseau Gill, Terre-Neuve-et-Labrador	L'étang d'amont d'un tributaire du ruisseau Gill, situé par 48°38′29,599 584″ de latitude N. et 56°30′15,560 676″ de longitude O., dans la partie centrale ouest de Terre-Neuve et, plus précisément, la région délimitée par : a) la courbe de niveau à 260 m autour de l'étang; b) la décharge de l'étang.
8	Le nord-ouest du bras du lac Second Portage, Nunavut	La partie du nord-ouest du bras du lac Second Portage, située par 65°1′39,29″ de latitude N. et 96°3′43″ de longitude O., à environ 80 km au nord de la ville de Baker Lake, au Nunavut et, plus précisément, la région délimitée par : a) la courbe de niveau à 146 m autour du bras; b) la digue construite à l'extrémité sud-est du bras.
9	Lac Tail, Nunavut	Le lac Tail, situé par 68°7′25,8″ de latitude N. et 106°33′31,2″ de longitude O., à environ 125 km au sud-ouest du hameau de Cambridge Bay, au Nunavut, et, plus précisément, la région délimitée par : a) la courbe de niveau à 33,5 m autour du lac; b) les digues construites aux extrémités sud et nord du lac.
10	Une partie du lac Wabush, Terre-Neuve-et-Labrador	La partie du lac Wabush, située près des villes de Labrador City et de Wabush dans la partie ouest du Labrador, et, plus précisément, la région délimitée par : a) la limite sud s'étendant de 53° de latitude N. et 66°50′24″ de longitude O., à 53° de latitude N. et 66°52′57″ de longitude O.; b) la décharge du lac Wabush, s'étendant de 53°09′4,7″ de latitude N. et 66°47′3,5″ de longitude O., à 53°08′57,5″ de latitude N. et 66°47′2,9″ de longitude O.
11	Lac Flora, Terre-Neuve-et-Labrador	Le lac Flora, situé par 52°55′ de latitude N. et 66°49′ de longitude O., près des villes de Labrador City et de Wabush dans la partie ouest du Labrador.
12	Une partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador	La partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador, et, plus précisément, la région s'étendant de l'embouchure du ruisseau (52°52′9,94″ de latitude N., 66°47′14,26″ de longitude O.) sur une distance de 75 m en amont du lac Flora.
13	Une partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador	La partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador, et, plus précisément, la région s'étendant de l'embouchure du ruisseau (52°52′10,70″ de latitude N., 66°47′6,49″ de longitude O.) sur une distance de 580 m en amont du lac Flora.

Item	Column 1 Water or Place	Column 2 Description
15	Sandy Pond, Newfoundland and Labrador	Sandy Pond, located at 47°25′33″ north latitude and 53°46′52″ west longitude, on the Avalon Peninsula, approximately 3 km east southeast of the town of Long Harbour-Mount Arlington Heights, Newfoundland and Labrador. More precisely, the area bounded by (a) the contour of elevation around Sandy Pond at the 137 m level, and (b) the dams built at the north end of Sandy Pond.
16	A portion of King Richard Creek, British Columbia	A portion of King Richard Creek, located approximately 60 km southwest of the town of Mackenzie, British Columbia. More precisely, a 3.3 km portion of the creek extending northwards and upstream from the centre of a dam constructed at 55°06′42″ north latitude and 123°59′29″ west longitude, to the centre of a dam constructed at 55°07′52″ north latitude and 124°00′50″ west longitude.
17	A portion of an unnamed tributary to Alpine Lake, British Columbia	A portion of an unnamed tributary to Alpine Lake, located approximately 60 km southwest of the town of Mackenzie, British Columbia. More precisely, a 900 m portion of the tributary extending southwards and upstream from the centre of a dam constructed at 55°08′19″ north latitude and 124°00′27″ west longitude, to the centre of a dam constructed at 55°07′59″ north latitude and 124°01′00″ west longitude.
18	A portion of an unnamed tributary to Alpine Lake, British Columbia	A portion of an unnamed tributary to Alpine Lake, located approximately 60 km southwest of the town of Mackenzie, British Columbia. More precisely, a 590 m portion of the tributary extending southwards and upstream from the centre of a dam constructed at 55°08′18″ north latitude and 124°00′41″ west longitude, to the centre of a dam constructed at 55°08′09″ north latitude and 124°01′08″ west longitude.
19	Mallard Lake, Saskatchewan	Mallard Lake, located at 56°00′32″ north latitude and 104°16′38″ west longitude, approximately 120 km northeast of the town of La Ronge, Saskatchewan. More precisely, the area bounded by (a) the contour of elevation around Mallard Lake at the 490 m level, and (b) the dam built at the south end of Mallard Lake.
20	The unnamed headwater pond of an unnamed tributary of East Creek, Ontario	An unnamed headwater pond of an unnamed tributary of East Creek, located at 50°02′17″ north latitude and 79°40′57″ west longitude, approximately 145 km northeast of the town of Cochrane, Ontario.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
14	Une partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador	La partie d'un ruisseau sans nom tributaire du lac Flora, Terre-Neuve-et-Labrador, et, plus précisément, la région s'étendant de l'embouchure du ruisseau (52°52′57,45″ de latitude N., 66°47′25,23″ de longitude O.) sur une distance de 256 m en amont du lac Flora.
15	Sandy Pond, Terre-Neuve-et-Labrador	L'étang Sandy Pond, situé par 47°25′33″ de latitude N. et 53°46′52″ de longitude O., dans la péninsule Avalon, à environ 3 km est-sud-est de la ville de Long Harbour-Mount Arlington Heights, Terre-Neuve-et-Labrador, et, plus précisément, la région délimitée par : a) la courbe de niveau à 137 m autour de l'étang Sandy Pond; b) les digues construites à l'extrémité nord de l'étang Sandy Pond.
16	Une partie du ruisseau King Richard, Colombie-Britannique	La partie du ruisseau King Richard située à environ 60 km au sud-ouest de la ville de Mackenzie en Colombie-Britannique, et, plus précisément, la partie du ruisseau qui s'étend sur 3,3 km vers le nord et en amont du centre du barrage situé par 55°06′42″ de latitude N. et 123°59′29″ de longitude O. jusqu'au centre du barrage situé par 55°07′52″ de latitude N. et 124°00′50″ de longitude O.
17	Une partie d'un affluent sans nom tributaire du lac Alpine, Colombie-Britannique	La partie d'un affluent sans nom tributaire du lac Alpine située à environ 60 km au sud-ouest de la ville de Mackenzie en Colombie-Britannique, et, plus précisément, la partie de l'affluent qui s'étend sur 900 m vers le sud et en amont du centre du barrage situé par 55°08′19″ de latitude N. et 124°00′27″ de longitude O. jusqu'au centre du barrage situé par 55°07′59″ de latitude N. et 124°01′00″ de longitude O.
18	Une partie d'un affluent sans nom tributaire du lac Alpine, Colombie-Britannique	La partie d'un affluent sans nom tributaire du lac Alpine située à environ 60 km au sud-ouest de la ville de Mackenzie en Colombie-Britannique, et, plus précisément, la partie de l'affluent qui s'étend sur 590 m vers le sud et en amont du centre du barrage situé par 55°08′18″ de latitude N. et 124°00′41″ de longitude O. jusqu'au centre du barrage situé par 55°08′09″ de latitude N. et 124°01′08″ de longitude O.
19	Lac Mallard, Saskatchewan	Le lac Mallard, situé par 56°00′32″ de latitude N. et 104°16′38″ de longitude O., à environ 120 km au nord-est de la ville de La Ronge en Saskatchewan et, plus précisément, la région délimitée par : a) la courbe de niveau à 490 m autour du lac Mallard; b) le barrage construit à l'extrémité sud du lac Mallard.
20	L'étang d'amont sans nom d'un tributaire sans nom du ruisseau East, Ontario	L'étang d'amont sans nom d'un tributaire sans nom du ruisseau East situé par 50°02′17″ de latitude N. et 79°40′57″ de longitude O., à environ 145 km au nord-est de la ville de Cochrane, en Ontario.

Item	Column 1 Water or Place	Column 2 Description
21	A portion of an unnamed tributary to East Creek, Ontario	A portion of an unnamed tributary to East Creek, Ontario, located approximately 145 km northeast of the town of Cochrane, Ontario. More precisely, a 2.3-km portion of the tributary extending northwards and downstream from the outlet of the unnamed headwater pond referred to in item 20, to the centre of a dam constructed at 50°02′43″ north latitude and 79°40′20″ west longitude.
22	A portion of an unnamed tributary to Linden Creek, Ontario	A portion of an unnamed tributary to Linden Creek, Ontario, located approximately 145 km northeast of the town of Cochrane, Ontario. More precisely, a 1.8-km portion of the tributary extending southwards and downstream from the northern perimeter of a waste rock disposal area at 50°00′17″ north latitude and 79°43′37″ west longitude to the southern perimeter of the waste rock disposal area at 49°59′30″ north latitude and 79°43′07″ west longitude.
23	A portion of an unnamed tributary to an unnamed lake in the Linden Creek watershed, Ontario	A portion of an unnamed tributary to an unnamed lake in the Linden Creek watershed, Ontario, located approximately 145 km northeast of the town of Cochrane, Ontario. More precisely, a 1.4-km portion of the tributary extending southwards and downstream from the headwaters of the tributary at 50°00′17″ north latitude and 79°42′39″ west longitude to the southern perimeter of a waste rock disposal area at 49°59′25″ north latitude and 79°42′27″ west longitude.
24	A portion of Trail Creek, British Columbia	A portion of Trail Creek, located approximately 20 km southeast of the community of Iskut, British Columbia. More precisely, a 0.6 km portion of the creek extending southwards and downstream from a natural barrier located at 57°42′59″ north latitude and 129°44′10″ west longitude, to the centre of a dam constructed at 57°42′43″ north latitude and 129°44′20″ west longitude.
25	Lake Hesse, Quebec	Lake Hesse, located at 52°46′21″ north latitude and 67°20′58″ west longitude, approximately 15 km west of the town of Fermont, Quebec. More precisely, the area bounded by (a) the contour of elevation around Lake Hesse at the 620 m level, (b) the dam built at the north end of Lake Hesse, and (c) the control dam built at the south end of Lake Hesse.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
21	Une partie d'un tributaire sans nom du ruisseau East, Ontario	La partie d'un tributaire sans nom du ruisseau East située à environ 145 km au nord-est de la ville de Cochrane, en Ontario et, plus précisément, la partie du tributaire qui s'étend sur 2,3 km vers le nord et en aval de la décharge de l'étang d'amont sans nom visé à l'article 20 de la présente annexe, jusqu'au centre du barrage situé par 50°02′43″ de latitude N. et 79°40′20″ de longitude O.
22	Une partie d'un tributaire sans nom du ruisseau Linden, Ontario	La partie d'un tributaire sans nom du ruisseau Linden situé à environ 145 km au nord-est de la ville de Cochrane, en Ontario et, plus précisément, la partie du tributaire qui s'étend sur 1,8 km vers le sud et en aval du périmètre nord d'une aire de décharge de stériles située par 50°00′17″ de latitude N. et 79°43′37″ de longitude O., jusqu'au périmètre sud de l'aire de décharge de stériles située par 49°59′30″ de latitude N. et 79°43′07″ de longitude O.
23	Une partie d'un tributaire sans nom d'un lac sans nom du bassin hydrographique du ruisseau Linden, Ontario	La partie d'un tributaire sans nom d'un lac sans nom du bassin hydrographique du ruisseau Linden située à environ 145 km au nord-est de la ville de Cochrane, en Ontario et, plus précisément, la partie du tributaire qui s'étend sur 1,4 km vers le sud et en aval des eaux d'amont du tributaire située par 50°00′17″ de latitude N. et 79°42′39″ de longitude O., jusqu'au périmètre sud d'une aire de décharge de stériles située par 49°59′25″ de latitude N. et 79°42′27″ de longitude O.
24	Une partie du ruisseau Trail, Colombie-Britannique	Une partie du ruisseau Trail situé en Colombie-Britannique à environ 20 km au sud-est de la communauté d'Iskut et, plus précisément, la partie du ruisseau qui s'étend sur 0,6 km vers le sud et en aval de la barrière naturelle située par 57°42′59″ de latitude N. et 129°44′10″ de longitude O. jusqu'au centre du barrage situé par 57°42′43″ de latitude N. et 129°44′20″ de longitude O.
25	Le lac Hesse, Québec	Le lac Hesse, situé par 52°46′21″ de latitude N. et 67°20′58″ de longitude O., à environ 15 km à l'ouest de la ville de Fermont, au Québec, et, plus précisément, la région délimitée par : a) la courbe de niveau à 620 m autour du lac Hesse; b) le barrage construit à l'extrémité nord du lac Hesse; c) le barrage de régulation construit à l'extrémité sud du lac Hesse.

Item	Column 1 Water or Place	Column 2 Description
26	An unnamed lake approximately 20 km west of Fermont, Quebec and a portion of its outlet	An unnamed lake, located at 52°49′43″ north latitude and 67°22′23″ west longitude, approximately 20 km west of the town of Fermont, Quebec, and a portion of its outlet. More precisely, the area bounded by (a) the contour of elevation around the lake at the 660 m level, and (b) the outlet of the lake extending from the mouth of an outlet stream at 52°49′33″ north latitude and 67°22′18″ west longitude for a distance of 30 m downstream from that mouth.
27	A portion of an unnamed stream discharging waters from an unnamed lake, other than the one referred to in item 26, approximately 20 km west of Fermont, Quebec	A portion of an unnamed stream discharging waters from an unnamed lake, other than the one referred to in item 26, approximately 20 km west of the town of Fermont, Quebec. More precisely, the 1815 m portion of the stream that extends southwards and downstream from the point located at 52°50′02″ north latitude and 67°21′29″ west longitude to the point located at 52°49′20″ north latitude and 67°21′39″ west longitude.
28	A portion of South Teigen Creek, British Columbia	A portion of South Teigen Creek, located approximately 65 km northwest of Stewart, British Columbia. More precisely, an 8.1-km portion of the creek extending northwestwards and downstream from the point located at 56°37′53″ north latitude and 129°54′44″ west longitude to the centre of a dam located at 56°40′11.57″ north latitude and 129°58′20.92″ west longitude.
29	A portion of North Treaty Creek, British Columbia	A portion of North Treaty Creek, located approximately 65 km northwest of Stewart, British Columbia. More precisely, a 3.3-km portion of the creek extending southwards and downstream from the headwaters of the creek located at 56°37′34″ north latitude and 129°54′50″ west longitude to the centre of a dam located at 56°35′54.24″ north latitude and 129°51′25.31″ west longitude.
30	An unnamed watercourse that is a tributary to Lake Jean, located approximately 25 km southeast of Chibougamau, Quebec	The unnamed watercourse that is a tributary to Lake Jean, located approximately 25 km southeast of the town of Chibougamau, Quebec, beginning at the unnamed pond located at 49°47′58″ north latitude and 74°01′38″ west longitude and extending northwards and downstream for a distance of 6.4 km to the centre of the dam constructed at 49°49′29″ north latitude and 74°03′07″ west longitude.
31	A portion of an unnamed watercourse that is a tributary to the watercourse referred to in item 30	A portion of an unnamed watercourse beginning at that watercourse's point of confluence with the watercourse referred to in item 30, which confluence is located at 49°47′57″ north latitude and 74°03′25″ west longitude, and extending for a distance of 1 km northwards and upstream from that point.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
26	Un lac sans nom situé à environ 20 km à l'ouest de Fermont, Québec et une partie de sa décharge	Un lac sans nom, situé par 52°49′43″ de latitude N. et 67°22′23″ de longitude O., à environ 20 km à l'ouest de la ville de Fermont, au Québec, et une partie de sa décharge, et, plus précisément, la région délimitée par : a) la courbe de niveau à 660 m autour du lac; b) la décharge du lac s'étendant de l'embouchure de l'émissaire situé par 52°49′33″ de latitude N. et 67°22′18″ de longitude O., sur une distance de 30 m en aval de son embouchure.
27	Une partie d'un ruisseau sans nom évacuant les eaux d'un lac sans nom, autre que celui mentionné à l'article 26, situé à environ 20 km à l'ouest de Fermont, Québec	Une partie d'un ruisseau sans nom évacuant les eaux d'un lac sans nom, autre que celui mentionné à l'article 26, situé à environ 20 km à l'ouest de la ville de Fermont, au Québec, et, plus précisément, la partie du ruisseau s'étendant sur une distance de 1815 m, au sud et en aval à partir du point situé par 52°50′02″ de latitude N. et 67°21′29″ de longitude O. jusqu'au point situé par 52°49′20″ de latitude N. et 67°21′39″ de longitude O.
28	Une partie du ruisseau South Teigen, Colombie-Britannique	La partie du ruisseau South Teigen située à environ 65 km au nord-ouest de Stewart, en Colombie-Britannique, et, plus précisément, la partie du ruisseau qui s'étend sur 8,1 km vers le nord-ouest et en aval d'un point situé par 56°37′53″ de latitude N. et 129°54′44″ de longitude O. jusqu'au centre d'un barrage situé par 56°40′11,57″ de latitude N. et 129°58′20,92″ de longitude O.
29	Une partie du ruisseau North Treaty, Colombie-Britannique	La partie du ruisseau North Treaty située à environ 65 km au nord-ouest de Stewart, en Colombie-Britannique, et, plus précisément, la partie du ruisseau qui s'étend sur 3,3 km vers le sud et en aval des eaux d'amont du ruisseau situé par 56°37′34″ de latitude N. et 129°54′50″ de longitude O. jusqu'au centre d'un barrage situé par 56°35′54,24″ de latitude N. et 129°51′25,31″ de longitude O.
30	Un cours d'eau sans nom tributaire du lac Jean, situé à environ 25 km au sud-est de Chibougamau, Québec	Le cours d'eau sans nom tributaire du lac Jean, situé à environ 25 km au sud-est de la ville de Chibougamau, au Québec, débutant à l'étang sans nom situé par 49°47′58″ de latitude N. et 74°01′38″ de longitude O. et s'étendant vers le nord et en aval sur une distance de 6,4 km jusqu'au centre du barrage situé par 49°49′29″ de latitude N. et 74°03′07″ de longitude O.
31	Une partie d'un cours d'eau sans nom tributaire du cours d'eau visé à l'article 30	La partie d'un cours d'eau sans nom débutant au point de confluence de celui-ci avec le cours d'eau visé à l'article 30 situé par 49°47′57″ de latitude N. et 74°03′25″ de longitude O. et s'étendant vers le nord et en amont de ce point sur une distance de 1 km.
32	Une partie d'un cours d'eau sans nom tributaire du cours d'eau visé à l'article 30	La partie du cours d'eau sans nom débutant au point situé par 49°48′06″ de latitude N. et 74°03′41″ de longitude O. et s'étendant vers le nord et en aval de ce point sur une distance de 740 m jusqu'au point de confluence avec le cours d'eau visé à l'article 30 situé par 49°48′25″ de latitude N. et 74°03′25″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
32	A portion of an unnamed watercourse that is a tributary to the watercourse referred to in item 30	A portion of an unnamed watercourse beginning at a point located at 49°48′06″ north latitude and 74°03′41″ west longitude and extending for a distance of 740 m northwards and downstream from that point to the point of confluence with the watercourse referred to in item 30, which confluence is located at 49°48′25″ north latitude and 74°03′25″ west longitude.
33	An unnamed pond east of Lake Bernadette, Quebec, and a portion of its outlet	An unnamed pond located at 49°48′43″ north latitude and 74°04′01″ west longitude and a portion of its outlet extending from the mouth of the outlet located at 49°48′47″ north latitude and 74°03′59″ west longitude for a distance of 190 m northwards and downstream from that mouth.
34	A portion of an unnamed creek (locally known as Loslo Creek), and of its unnamed tributaries, that is tributary to Pinewood River, Ontario	A portion of an unnamed creek (locally known as Loslo Creek), and of its unnamed tributaries, that is tributary to Pinewood River, located approximately 65 km northwest of the town of Fort Frances, Ontario. More precisely, the portion extending southwards and downstream from the northernmost point of the creek at 48°53′6″ north latitude and 94°2′43″ west longitude to the point located at 48°50′24″ north latitude and 94°3′36″ west longitude.
35	A portion of an unnamed creek (locally known as Marr Creek), and of its unnamed tributaries, that is tributary to Pinewood River, Ontario	A portion of an unnamed creek (locally known as Marr Creek), and of its unnamed tributaries, that is tributary to Pinewood River, located approximately 65 km northwest of the town of Fort Frances, Ontario. More precisely, the portion extending southwards and downstream from the northernmost point of the creek at 48°52′12″ north latitude and 94°1′49″ west longitude to the point located at 48°51′18″ north latitude and 94°2′25″ west longitude.
36	A portion of an unnamed creek (locally known as Marr Creek), other than the portion referred to in item 35, that is tributary to Pinewood River, Ontario	A portion of an unnamed creek (locally known as Marr Creek), other than the portion referred to in item 35, that is tributary to Pinewood River, located approximately 65 km northwest of the town of Fort Frances, Ontario. More precisely, the portion extending southwards and downstream from the point located at 48°50′52″ north latitude and 94°2′11″ west longitude, for a distance of 1.85 km, to the point located at 48°49′53″ north latitude and 94°2′24″ west longitude.
37	A portion of an unnamed stream and its unnamed tributaries located approximately 25 km northwest of the town of Amos, Quebec	A portion of an unnamed stream and its unnamed tributaries located approximately 25 km northwest of the town of Amos, Quebec. More precisely, the 4.6 km portion of the stream extending from the point located at 48°40′44.00″ north latitude and 78°29′12.68″ west longitude to the point located at 48°40′7.19″north latitude and 78°28′1.52″ west longitude and covering an area of 3.4 ha.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
33	Un étang sans nom à l'est du lac Bernadette, Québec, et une partie de sa décharge	Un étang sans nom situé par 49°48′43″ de latitude N. et 74°04′01″ de longitude O. et une partie de sa décharge s'étendant de l'embouchure de celle-ci située par 49°48′47″ de latitude N. et 74°03′59″ de longitude O. sur une distance de 190 m vers le nord en aval de son embouchure.
34	Une partie d'un ruisseau sans nom (connu localement sous le nom de ruisseau Loslo) et de ses tributaires sans nom, qui est tributaire de la rivière Pinewood, Ontario	La partie d'un ruisseau sans nom (connu localement sous le nom de ruisseau Loslo) et de ses tributaires sans nom, qui est tributaire de la rivière Pinewood, située à environ 65 km au nord-ouest de la ville de Fort Frances, en Ontario, et, plus précisément, la partie qui s'étend vers le sud et en aval du point le plus au nord du ruisseau situé par 48°53′6″ de latitude N. et 94°2′43″ de longitude O., jusqu'au point situé par 48°50′24″ de latitude N. et 94°3′36″ de longitude O.
35	Une partie d'un ruisseau sans nom (connu localement sous le nom de ruisseau Marr) et de ses tributaires sans nom, qui est tributaire de la rivière Pinewood, Ontario	La partie d'un ruisseau sans nom (connu localement sous le nom de ruisseau Marr) et de ses tributaires sans nom, qui est tributaire de la rivière Pinewood, située à environ 65 km au nord-ouest de la ville de Fort Frances, en Ontario, et, plus précisément, la partie qui s'étend vers le sud et en aval du point le plus au nord du ruisseau situé par 48°52′12″ de latitude N. et 94°1′49″ de longitude O., jusqu'au point situé par 48°51′18″ de latitude N. et 94°2′25″ de longitude O.
36	Une partie d'un ruisseau sans nom (connu localement sous le nom de ruisseau Marr), autre que la partie mentionnée à l'article 35, qui est tributaire de la rivière Pinewood, Ontario	La partie d'un ruisseau sans nom (connu localement sous le nom de ruisseau Marr), autre que la partie mentionnée à l'article 35, qui est tributaire de la rivière Pinewood, située à environ 65 km au nord-ouest de la ville de Fort Frances, en Ontario, et, plus précisément, la partie qui s'étend vers le sud et en aval du point situé par 48°50′52″ de latitude N. et 94°2′11″ de longitude O., sur une distance de 1,85 km, jusqu'au point situé par 48°49′53″ de latitude N. et 94°2′24″ de longitude O.
37	Une partie d'un ruisseau sans nom, et ses tributaires sans nom, située à environ 25 km au nord-ouest de la ville d'Amos, Québec	La partie d'un ruisseau sans nom, et ses tributaires sans nom, située à environ 25 km au nord-ouest de la ville d'Amos, au Québec, et, plus précisément, la partie du ruisseau qui s'étend sur 4,6 km à partir du point situé par 48°40′44,00″ de latitude N. et 78°29′12,68″ de longitude O. jusqu'au point situé par 48°40′7,19″ de latitude N. et 78°28′1,52″ de longitude O. et qui couvre une superficie de 3,4 ha.
38	Une partie d'un tributaire sans nom du Petit lac du Portage, Québec	La partie d'un tributaire sans nom du Petit lac du Portage située à environ 15 km au nord-ouest de la ville de Sept-Îles, au Québec. Plus précisément, la partie qui s'étend sur 465 m vers le sud-ouest et en amont du point situé par 50°16′00,90″ de latitude N. et 66°33′42,71″ de longitude O. jusqu'au point situé par 50°16′06,00″ de latitude N. et 66°33′31,55″ de longitude O. et qui couvre une superficie de 0,233 ha.

Item	Column 1 Water or Place	Column 2 Description
38	A portion of an unnamed tributary to Petit lac du Portage, Quebec	A portion of an unnamed tributary to Petit lac du Portage located approximately 15 km northwest of the town of Sept-Îles, Quebec. More precisely, the 465 m portion of the tributary to Petit lac du Portage extending southwest and upstream from the point located at 50°16′00.90″ north latitude and 66°33′42.71″ west longitude to the point located at 50°16′06.00″ north latitude and 66°33′31.55″ west longitude and covering an area of 0.233 ha.
39	An unnamed headwater pond of ruisseau Clet and its unnamed tributaries, Quebec	An unnamed headwater pond of ruisseau Clet located at 50°15′15.82″ north latitude and 66°33′13.6″ west longitude and covering an area of 2.486 ha, approximately 15 km northwest of the town of Sept-Îles, Quebec, and (a) a 471 m portion of its unnamed tributary extending upstream from the point located at 50°15′18.37″ north latitude and 66°33′24.01″ west longitude to the point located at 50°15′20.27″ north latitude and 66°33′13.51″ west longitude and covering an area of 0.117 ha; and (b) a 76 m portion of its unnamed tributary extending upstream from the point located at 50°15′11.97″ north latitude and 66°33′22.57″ west longitude to the point located at 50°15′12.82″ north latitude and 66°33′20.66″ west longitude and covering an area of 0.033 ha.
40	A portion of ruisseau Clet and its unnamed tributaries, Quebec	A portion of ruisseau Clet, and its unnamed tributaries, located approximately 15 km northwest of the town of Sept-Îles, Quebec. More precisely, the 1897 m portion of ruisseau Clet extending southeast and downstream from the outlet of the unnamed headwater pond referred to in item 39 to the point on ruisseau Clet located at 50°15′11.26″ north latitude and 66°32′15.99″ west longitude and covering an area of 0.850 ha.
41	An unnamed watercourse that is a tributary to Rivière Hall, Quebec	An unnamed watercourse that is composed of interconnected streams and ponds and is a tributary to Rivière Hall and located approximately 15 km northwest of the town of Sept-Îles, Quebec. More precisely, the 910 m portion of the unnamed watercourse extending downstream from the point located at 50°14′52.33″ north latitude and 66°33′27.75″ west longitude to the point located at 50°14′39.67″ north latitude and 66°32′45.74″ west longitude and covering an area of 3.619 ha.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
39	Un étang d'amont sans nom du ruisseau Clet et ses tributaires sans nom, Québec	L'étang d'amont sans nom du ruisseau Clet qui est situé par 50°15′15,82″ de latitude N. et 66°33′13,6″ de longitude O. et qui couvre une superficie de 2,486 ha, à environ 15 km au nord-ouest de la ville de Sept-Îles, au Québec, et : a) la partie de son tributaire sans nom qui s'étend sur 471 m en amont du point situé par 50°15′18,37″ de latitude N. et 66°33′24,01″ de longitude O. jusqu'au point situé par 50°15′20,27″ de latitude N. et 66°33′13,51″ de longitude O. et qui couvre une superficie de 0,117 ha; b) la partie de son tributaire sans nom qui s'étend sur 76 m en amont du point situé par 50°15′11,97″ de latitude N. et 66°33′22,57″ de longitude O. jusqu'au point situé par 50°15′12,82″ de latitude N. et 66°33′20,66″ de longitude O. et qui couvre une superficie de 0,033 ha.
40	Une partie du ruisseau Clet et ses tributaires sans nom, Québec	La partie du ruisseau Clet, et ses tributaires sans nom, située à environ 15 km au nord-ouest de la ville de Sept-Îles, au Québec, et, plus précisément, la partie du ruisseau qui s'étend sur 1 897 m vers le sud-est et en aval de la décharge de l'étang d'amont sans nom visé à l'article 39 jusqu'au point du ruisseau situé par 50°15′11,26″ de latitude N. et 66°32′15,99″ de longitude O. et qui couvre une superficie de 0,850 ha.
41	Un cours d'eau sans nom tributaire de la rivière Hall, Québec	Le cours d'eau sans nom qui est composé de ruisseaux et d'étangs interconnectés, qui est tributaire de la rivière Hall et qui est situé à environ 15 km au nord-ouest de la ville de Sept-Îles, au Québec. Plus précisément, la partie du cours d'eau sans nom qui s'étend sur 910 m en aval du point situé par 50°14′52,33″ de latitude N. et 66°33′27,75″ de longitude O. jusqu'au point situé par 50°14′39,67″ de latitude N. et 66°32′45,74″ de longitude O. et qui couvre une superficie de 3,619 ha.
42	Des parties d'un ruisseau sans nom, Québec	Les deux parties d'un ruisseau sans nom situées à environ 15 km au nord-ouest de la ville de Sept-Îles, au Québec, et, plus précisément : a) la partie ouest du ruisseau qui s'étend sur 253 m du point situé par 50°15′18,78″ de latitude N. et 66°29′52,43″ de longitude O. jusqu'au point situé par 50°15′13,76″ de latitude N. et 66°29′46,60″ de longitude O. et qui couvre une superficie de 0,0585 ha; b) la partie est du ruisseau qui s'étend sur 267 m du point situé par 50°15′19,58″ de latitude N. et 66°29′45,99″ de longitude O. jusqu'au point situé par 50°15′14,18″ de latitude N. et 66°29′45,19″ de longitude O. et qui couvre une superficie de 0,0555 ha.
43	Lac Davidson, Ontario	Le lac Davidson, situé par 47°56′0,3″ de latitude N. et 80°42′52,68″ de longitude O., à environ 3 km à l'ouest du canton de Matachewan, en Ontario.

Item	Column 1 Water or Place	Column 2 Description
42	Portions of an unnamed creek, Quebec	Two portions of an unnamed creek located approximately 15 km northwest of the town of Sept-Îles, Quebec. More precisely, (a) the west portion of the creek extending for a distance of 253 m from the point located at 50°15′18.78″ north latitude and 66°29′52.43″ west longitude to the point located at 50°15′13.76″ north latitude and 66°29′46.60″ west longitude and covering 0.0585 ha; and (b) the east portion of the creek extending for a distance of 267 m from the point located at 50°15′19.58″ north latitude and 66°29′45.99″ west longitude to the point located at 50°15′14.18″ north latitude and 66°29′45.19″ west longitude and covering 0.0555 ha.
43	Davidson Lake, Ontario	Davidson Lake, located at 47°56′0.3″ north latitude and 80°42′52.68″ west longitude, approximately 3 km west of the township of Matachewan, Ontario.
44	All waters located within the area described in column 2, located approximately 15 km west of Fermont, Quebec	The waters located within an area located approximately 15 km west of the town of Fermont, Quebec. More precisely, the area bounded by 12 straight lines connecting 12 points starting at the point located at 52°50′7.003″ north latitude and 67°24′37.670″ west longitude to the point located 1663.7 m to the southeast at 52°50′0.527″ north latitude and 67°23′9.420″ west longitude to the point located 99.8 m southeast at 52°49′58.858″ north latitude and 67°23′4.849″ west longitude to the point located 1041.6 m northeast at 52°50′16.401″ north latitude and 67°22′17.322″ west longitude to the point located 2931.3 m southeast at 52°49′14.652″ north latitude and 67°20′18.454″ west longitude to the point located 1116.2 m southwest at 52°48′54.699″ north latitude and 67°21′8.259″ west longitude to the point located 2600 m northwest at 52°49′28.689″ north latitude and 67°23′15.237″ west longitude to the point located 1332 m southwest at 52°49′22.360″ north latitude and 67°24′25.623″ west longitude to the point located 2752.5 m southeast at 52°48′0.645″ north latitude and 67°23′27.147″ west longitude to the point located 640 m southwest at 52°47′48.090″ north latitude and 67°23′54.322″ west longitude to the point located 2267.36 m northwest at 52°47′54.530″ north latitude and 67°25′54.901″ west longitude to the point located 1142.3 m northwest at 52°48′31.230″ north latitude and 67°26′2.164″ west longitude and ending at the point located 3355.9 m northeast at 52°50′7.003″ north latitude and 67°24′37.670″ west longitude.
45	A portion of an unnamed canal located approximately 15 km west of Fermont, Quebec	A portion of an unnamed canal located approximately 15 km west of the town of Fermont, Quebec. More precisely, the 1383 m portion of the canal extending southeast from the point located at 52°47′48.090″ north latitude and 67°23′54.322″ west longitude to the point located at 52°47′20.635″ north latitude and 67°22′56.004″ west longitude.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
44	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 15 km à l'ouest de Fermont, Québec	Les eaux comprises dans une région située à environ 15 km à l'ouest de la ville de Fermont, au Québec. Plus précisément, la région délimitée par douze lignes droites reliant douze points, à partir du point situé par 52°50′7,003″ de latitude N. et 67°24′37,670″ de longitude O., de là, allant vers le sud-est sur une distance de 1663,7 m jusqu'au point situé par 52°50′0,527″ de latitude N. et 67°23′9,420″ de longitude O., de là, allant vers le sud-est sur une distance de 99,8 m jusqu'au point situé par 52°49′58,858″ de latitude N. et 67°23′4,849″ de longitude O., de là, allant vers le nord-est sur une distance de 1041,6 m jusqu'au point situé par 52°50′16,401″ de latitude N. et 67°22′17,322″ de longitude O., de là, allant vers le sud-est sur une distance de 2931,3 m jusqu'au point situé par 52°49′14,652″ de latitude N. et 67°20′18,454″ de longitude O., de là, allant vers le sud-ouest sur une distance de 1116,2 m jusqu'au point situé par 52°48′54,699″de latitude N. et 67°21′8,259″ de longitude O., de là, allant vers le nord-ouest sur une distance de 2600 m jusqu'au point situé par 52°49′28,689″ de latitude N. et 67°23′15,237″ de longitude O., de là, allant vers le sud-ouest sur une distance de 1332 m jusqu'au point situé par 52°49′22,360″ de latitude N. et 67°24′25,623″ de longitude O., de là, allant vers le sud-est sur une distance de 2752,5 m jusqu'au point situé par 52°48′0,645″ de latitude N. et 67°23′27,147″ de longitude O., de là, allant vers le sud-ouest sur une distance de 640 m jusqu'au point situé par 52°47′48,090″ de latitude N. et 67°23′54,322″ de longitude O., de là, allant vers le nord-ouest sur une distance de 2267,36 m jusqu'au point situé par 52°47′54,530″ de latitude N. et 67°25′54,901″ de longitude O., de là, allant vers le nord-ouest sur une distance de 1142,3 m jusqu'au point situé par 52°48′31,230″ de latitude N. et 67°26′2,164″ de longitude O., de là, allant vers le nord-est sur une distance de 3355,9 m jusqu'au point situé par 52°50′7,003″ de latitude N. et 67°24′37,670″ de longitude O.
45	Une partie d'un canal sans nom, situé à environ 15 km à l'ouest de Fermont, Québec	La partie d'un canal sans nom situé à environ 15 km à l'ouest de la ville de Fermont, au Québec. Plus précisément, la partie du canal s'étendant sur une distance de 1383 m vers le sud-est à partir du point situé par 52°47′48,090″ de latitude N. et 67°23′54,322″ de longitude O. jusqu'au point situé par 52°47′20,635″ de latitude N. et 67°22′56,004″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
46	All waters located within the area described in column 2, located approximately 15 km west of Fermont, Quebec	The waters located within an area located approximately 15 km west of the town of Fermont, Quebec. More precisely, the area bounded by 10 straight lines connecting 10 points starting at the point located at 52°44′14.968″ north latitude and 67°18′31.354″ west longitude to the point located 939.5 m northeast at 52°44′30.414″ north latitude and 67°17′48.213″ west longitude to the point located 1953.6 m northeast at 52°44′52.900″ north latitude and 67°16′10.857″ west longitude to the point located 441.38 m southeast at 52°44′39.901″ north latitude and 67°16′1.106″ west longitude to the point located 1547.48 m southwest at 52°43′55.611″ north latitude and 67°16′39.714″ west longitude to the point located 769.69 m southwest at 52°43′53.983″ north latitude and 67°17′20.688″ west longitude to the point located 778.84 m southwest at 52°43′32.957″ north latitude and 67°17′43.574″ west longitude to the point located 76.9 m northwest at 52°43′33.669″ north latitude and 67°17′47.500″ west longitude to the point located 667.76 m southwest at 52°43′12.872″ north latitude and 67°17′57.155″ west longitude to the point located 195.7 m northwest at 52°43′14.311″ north latitude and 67°18′7.310″ west longitude to the point located 1928 m northwest and ending at the point located at 52°44′14.968″ north latitude and 67°18′31.354″ west longitude.
47	A portion of Bird Brook and its tributaries, New Brunswick	A portion of Bird Brook and its tributaries, located approximately 60 km northwest of the town of Fredericton, New Brunswick. More precisely, the 8.4 km portion of the brook and tributaries extending from the point located at 46°23′36.89″ north latitude and 67°04′56.42″ west longitude and the point located at 46°22′59.28″ north latitude and 67°04′07.28″ west longitude to the point located eastwards and downstream at 46°23′09.94″ north latitude and 67°02′45.29″ west longitude and covering an area of 1.72 ha.
48	A portion of an unnamed tributary to West Branch Napadogan Brook, New Brunswick	A portion of an unnamed tributary to West Branch Napadogan Brook, located approximately 60 km northwest of the town of Fredericton, New Brunswick. More precisely, the 155 m portion of the tributary extending from the point located at 46°24′01.62″ north latitude and 67°03′39.14″ west longitude to the point located eastwards and downstream at 46°23′58.12″ north latitude and 67°03′34.44″ west longitude and covering an area of 0.02 ha.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
46	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 15 km à l'ouest de Fermont, Québec	Les eaux comprises dans une région située à environ 15 km à l'ouest de la ville de Fermont, au Québec. Plus précisément, la région délimitée par dix lignes droites reliant dix points, à partir du point situé par 52°44′14,968″ de latitude N. et 67°18′31,354″ de longitude O., de là, allant vers le nord-est sur une distance de 939,5 m jusqu'au point situé par 52°44′30,414″de latitude N. et 67°17′48,213″ de longitude O., de là, allant vers le nord-est sur une distance de 1953,6 m jusqu'au point situé par 52°44′52,900″ de latitude N. et 67°16′10,857″ de longitude O., de là, allant vers le sud-est sur une distance de 441,38 m jusqu'au point situé par 52°44′39,901″ de latitude N. et 67°16′1,106″ de longitude O., de là, allant vers le sud-ouest sur une distance de 1547,48 m jusqu'au point situé par 52°43′55,611″ de latitude N. et 67°16′39,714″ de longitude O., de là, allant vers le sud-ouest sur une distance de 769,69 m jusqu'au point situé par 52°43′53,983″ de latitude N. et 67°17′20,688″ de longitude O., de là, allant vers le sud-ouest sur une distance de 778,84 m jusqu'au point situé par 52°43′32,957″ de latitude N. et 67°17′43,574″ de longitude O., de là, allant vers le nord-ouest sur une distance de 76,9 m jusqu'au point situé par 52°43′33,669″ de latitude N. et 67°17′47,500″ de longitude O., de là, allant vers le sud-ouest sur une distance de 667,76 m jusqu'au point situé par 52°43′12,872″ de latitude N. et 67°17′57,155″ de longitude O., de là, allant vers le nord-ouest sur une distance de 195,7 m jusqu'au point situé par 52°43′14,311″ de latitude N. et 67°18′7,310″ de longitude O., de là, allant vers le nord-ouest sur une distance de 1928 m jusqu'au point situé par 52°44′14,968″ de latitude N. et 67°18′31,354″ de longitude O.
47	Une partie du ruisseau Bird et ses tributaires, Nouveau-Brunswick	La partie du ruisseau Bird, et ses tributaires, située à environ 60 km au nord-ouest de la ville de Fredericton au Nouveau-Brunswick. Plus précisément, la partie qui s'étend sur 8,4 km du point situé par 46°23′36,89″ de latitude N. et 67°04′56,42″ de longitude O. et du point situé par 46°22′59,28″ de latitude N. et 67°04′07,28″ de longitude O. vers un point situé à l'est et en aval par 46°23′09,94″ de latitude N. et 67°02′45,29″ de longitude O. et qui couvre une superficie de 1,72 ha.
48	Une partie du tributaire sans nom du ruisseau West Branch Napadogan, Nouveau-Brunswick	La partie du tributaire sans nom du ruisseau West Branch Napadogan, située à environ 60 km au nord-ouest de la ville de Fredericton au Nouveau-Brunswick. Plus précisément, la partie qui s'étend sur 155 m du point situé par 46°24′01,62″ de latitude N. et 67°03′39,14″ de longitude O. vers un point situé à l'est et en aval par 46°23′58,12″ de latitude N. et 67°03′34,44″ de longitude O. et qui couvre une superficie de 0,02 ha.

Item	Column 1 Water or Place	Column 2 Description
49	All waters located within the area described in column 2, located approximately 9 km southeast of the township of Dubreuilville, Ontario	The waters located within an area located approximately 9 km southeast of the township of Dubreuilville, Ontario. More precisely, the area bounded by five straight lines connecting five points starting at the point located at 48°17′49.226″ north latitude and 84°29′53.100″ west longitude to the point located 528.5 m to the northeast at 48°17′54.428″ north latitude and 84°29′28.669″ west longitude to the point located 941 m southwest at 48°17′30.407″ north latitude and 84°29′56.752″ west longitude to the point located 315 m southwest at 48°17′25.646″ north latitude and 84°30′10.300″ west longitude to the point located 420.5 m southwest at 48°17′21.475″ north latitude and 84°30′29.717″ west longitude and ending at the point located 1142.1 m northeast at 48°17′49.226″ north latitude and 84°29′53.100″ west longitude.
50	All waters located within the area described in column 2, located approximately 9 km southeast of the township of Dubreuilville, Ontario	The waters located within an area located approximately 9 km southeast of the township of Dubreuilville, Ontario. More precisely, the area bounded by five straight lines connecting five points starting at the point located at 48°17′27.821″ north latitude and 84°29′29.968″ west longitude to the point located 981.6 m to the southeast at 48°16′56.049″ north latitude and 84°29′28.918″ west longitude to the point located 221.7 m southwest at 48°16′48.986″ north latitude and 84°29′30.841″ west longitude to the point located 1062.4 m northwest at 48°16′50.640″ north latitude and 84°30′22.311″ west longitude to the point located 1146.3 m northeast at 48°17′22.053″ north latitude and 84°29′52.707″ west longitude and ending at the point located 501.4 m northeast at 48°17′27.821″ north latitude and 84°29′29.968″ west longitude.
51	All waters located within the area described in column 2, located approximately 9 km southeast of the township of Dubreuilville, Ontario	The waters located within an area located approximately 9 km southeast of the township of Dubreuilville, Ontario. More precisely, the area bounded by four straight lines connecting four points starting at the point located at 48°17′5.633″ north latitude and 84°29′5.605″ west longitude to the point located 306.5 m southeast at 48°16′55.717″ north latitude and 84°29′5.083″ west longitude to the point located 245.7 m northwest at 48°16′58.236″ north latitude and 84°29′16.385″ west longitude to the point located 196.7 m northwest at 48°17′4.263″ north latitude and 84°29′19.471″ west longitude and ending at the point located 289 m northeast at 48°17′5.633″ north latitude and 84°29′5.605″ west longitude.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
49	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 9 km au sud-est du canton de Dubreuilville, Ontario	Les eaux comprises dans une région située à environ 9 km au sud-est du canton de Dubreuilville, en Ontario. Plus précisément, la région délimitée par cinq lignes droites reliant cinq points, à partir du point situé par 48°17′49,226″ de latitude N. et 84°29′53,100″ de longitude O., de là, allant vers le nord-est sur une distance de 528,5 m jusqu'au point situé par 48°17′54,428″ de latitude N. et 84°29′28,669″ de longitude O., de là, allant vers le sud-ouest sur une distance de 941 m jusqu'au point situé par 48°17′30,407″ de latitude N. et 84°29′56,752″ de longitude O., de là, allant vers le sud-ouest sur une distance de 315 m jusqu'au point situé par 48°17′25,646″ de latitude N. et 84°30′10,300″ de longitude O., de là, allant vers le sud-ouest sur une distance de 420,5 m jusqu'au point situé par 48°17′21,475″ de latitude N. et 84°30′29,717″ de longitude O., de là, allant vers le nord-est sur une distance de 1 142,1 m jusqu'au point situé par 48°17′49,226″ de latitude N. et 84°29′53,100″ de longitude O.
50	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 9 km au sud-est du canton de Dubreuilville, Ontario	Les eaux comprises dans une région située à environ 9 km au sud-est du canton de Dubreuilville, en Ontario. Plus précisément, la région délimitée par cinq lignes droites reliant cinq points, à partir du point situé par 48°17′27,821″ de latitude N. et 84°29′29,968″ de longitude O., de là, allant vers le sud-est sur une distance de 981,6 m jusqu'au point situé par 48°16′56,049″ de latitude N. et 84°29′28,918″ de longitude O., de là, allant vers le sud-ouest sur une distance de 221,7 m jusqu'au point situé par 48°16′48,986″ de latitude N. et 84°29′30,841″ de longitude O., de là, allant vers le nord-ouest sur une distance de 1 062,4 m jusqu'au point situé par 48°16′50,640″ de latitude N. et 84°30′22,311″ de longitude O., de là, allant vers le nord-est sur une distance de 1 146,3 m jusqu'au point situé par 48°17′22,053″ de latitude N. et 84°29′52,707″ de longitude O., de là, allant vers le nord-est sur une distance de 501,4 m jusqu'au point situé par 48°17′27,821″ de latitude N. et 84°29′29,968″ de longitude O.
51	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 9 km au sud-est du canton de Dubreuilville, Ontario	Les eaux comprises dans une région située à environ 9 km au sud-est du canton de Dubreuilville, en Ontario. Plus précisément, la région délimitée par quatre lignes droites reliant quatre points, à partir du point situé par 48°17′5,633″ de latitude N. et 84°29′5,605″ de longitude O., de là, allant vers le sud-est sur une distance de 306,5 m jusqu'au point situé par 48°16′55,717″ de latitude N. et 84°29′5,083″ de longitude O., de là, allant vers le nord-ouest sur une distance de 245,7 m jusqu'au point situé par 48°16′58,236″ de latitude N. et 84°29′16,385″ de longitude O., de là, allant vers le nord-ouest sur une distance de 196,7 m jusqu'au point situé par 48°17′4,263″ de latitude N. et 84°29′19,471″ de longitude O., de là, allant vers le nord-est sur une distance de 289 m jusqu'au point situé par 48°17′5,633″ de latitude N. et 84°29′5,605″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
52	All waters located within the area described in column 2, located approximately 9 km southeast of the township of Dubreuilville, Ontario	The waters located within an area located approximately 9 km southeast of the township of Dubreuilville, Ontario. More precisely, the area bounded by eight straight lines connecting eight points starting at the point located at 48°17′55.528″ north latitude and 84°27′49.712″ west longitude to the point located 581.3 m southeast at 48°17′50.542″ north latitude and 84°27′22.518″ west longitude to the point located 915.2 m southwest at 48°17′21.168″ north latitude and 84°27′28.342″ west longitude to the point located 1039.1 m southwest at 48°16′55.207″ north latitude and 84°28′0.398″ west longitude to the point located 458 m southwest at 48°16′48.549″ north latitude and 84°28′20.249″ west longitude to the point located 575.5 m northwest at 48°16′56.999″ north latitude and 84°28′45.128″ west longitude to the point located 439.2 m northeast at 48°17′11.207″ north latitude and 84°28′44.376″ west longitude to the point located 1158.6 m northeast at 48°17′42.340″ north latitude and 84°28′13.026″ west longitude and ending at the point located 629.9 m northeast at 48°17′55.528″ north latitude and 84°27′49.712″ west longitude.
53	All waters located within the area described in column 2, located approximately 400 km southwest of the Hamlet of Cambridge Bay, Nunavut	The waters located within an area located approximately 400 km southwest of the Hamlet of Cambridge Bay, Nunavut. More precisely, the area bounded by six straight lines connecting six points starting at the point located at 65°31′34.856″ north latitude and 106°22′58.657″ west longitude to the point located 307 m southeast at 65°31′26.609″ north latitude and 106°22′45.370″ west longitude to the point located 954 m southwest at 65°31′1.982″ north latitude and 106°23′29.979″ west longitude to the point located 586 m southwest at 65°30′44.708″ north latitude and 106°23′48.582″ west longitude to the point located 1675 m northwest at 65°31′32.307″ north latitude and 106°24′50.478″ west longitude and ending at the point located 631 m northeast at 65°31′36.267″ north latitude and 106°24′2.267″ west longitude.
54	A portion of Goldfield Creek, Ontario	A portion of Goldfield Creek that is a tributary to the Southwest Arm of Kenogamisis Lake, located approximately 6.5 km southwest of the town of Geraldton, Ontario. More precisely, the portion extending southwards for a distance of 4,250 m from a point located at 49°39′16.51″ north latitude and 87°0′48.57″ west longitude to a point located at 49°38′5.70″ north latitude and 86°59′54.66″ west longitude.
55	A portion of an unnamed watercourse that is a tributary to Kenogamisis Lake, Ontario	A portion of an unnamed watercourse that is a tributary to Kenogamisis Lake, located approximately 2 km south of the town of Geraldton, Ontario. More precisely, the portion extending northwards for a distance of 520 m from a point located at 49°41′25.74″ north latitude and 86°56′29.62″ west longitude to a point located at 49°41′9.76″ north latitude and 86°56′31.19″ west longitude.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
52	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 9 km au sud-est du canton de Dubreuilville, Ontario	Les eaux comprises dans une région située à environ 9 km au sud-est du canton de Dubreuilville, en Ontario. Plus précisément, la région délimitée par huit lignes droites reliant huit points, à partir du point situé par 48°17′55,528″ de latitude N. et 84°27′49,712″ de longitude O., de là, allant vers le sud-est sur une distance de 581,3 m jusqu'au point situé par 48°17′50,542″ de latitude N. et 84°27′22,518″ de longitude O., de là, allant vers le sud-ouest sur une distance de 915,2 m jusqu'au point situé par 48°17′21,168″ de latitude N. et 84°27′28,342″ de longitude O., de là, allant vers le sud-ouest sur une distance de 1 039,1 m jusqu'au point situé par 48°16′55,207″ de latitude N. et 84°28′0,398″ de longitude O., de là, allant vers le sud-ouest sur une distance de 458 m jusqu'au point situé par 48°16′48,549″ de latitude N. et 84°28′20,249″ de longitude O., de là, allant vers le nord-ouest sur une distance de 575,5 m jusqu'au point situé par 48°16′56,999″ de latitude N. et 84°28′45,128″ de longitude O, de là, allant vers le nord-est sur une distance de 439,2 m jusqu'au point situé par 48°17′11,207″ de latitude N. et 84°28′44,376″ de longitude O., de là, allant vers le nord-est sur une distance de 1 158,6 m jusqu'au point situé par 48°17′42,340″ de latitude N. et 84°28′13,026″ de longitude O., de là, allant vers le nord-est sur une distance de 629,9 m jusqu'au point situé par 48°17′55,528″ de latitude N. et 84°27′49,712″ de longitude O.
53	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 400 km au sud-ouest du hameau de Cambridge Bay, Nunavut	Les eaux comprises dans une région située à environ 400 km au sud-ouest du hameau de Cambridge Bay, au Nunavut. Plus précisément, la région délimitée par six lignes droites reliant six points, à partir du point situé par 65°31′34,856″ de latitude N. et 106°22′58,657″ de longitude O., de là, allant vers le sud-est sur une distance de 307 m jusqu'au point situé par 65°31′26,609″ de latitude N. et 106°22′45,370″ de longitude O., de là, allant vers le sud-ouest sur une distance de 954 m jusqu'au point situé par 65°31′1,982″ de latitude N. et 106°23′29,979″ de longitude O., de là, allant vers le sud-ouest sur une distance de 586 m jusqu'au point situé par 65°30′44,708″ de latitude N. et 106°23′48,582″ de longitude O., de là, allant vers le nord-ouest sur une distance de 1675 m jusqu'au point situé par 65°31′32,307″ de latitude N. et 106°24′50,478″ de longitude O., de là, allant vers le nord-est sur une distance de 631 m jusqu'au point situé par 65°31′36,267″ de latitude N. et 106°24′2,267″ de longitude O.
54	Une partie du ruisseau Goldfield, Ontario	La partie du ruisseau Goldfield, qui est tributaire du bras sud-ouest du lac Kenogamisis, située à environ 6,5 km au sud-ouest de la ville de Geraldton, en Ontario. Plus précisément, la partie qui s'étend vers le sud sur une distance de 4,250 m du point situé par 49°39′16,51″ de latitude N. et 87°0′48,57″ de longitude O. jusqu'au point situé par 49°38′5,70″ de latitude N. et 86°59′ 54,66″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
56	A portion of an unnamed watercourse that is a tributary to Kenogamisis Lake, Ontario	A portion of an unnamed watercourse that is a tributary to Kenogamisis Lake located approximately 3 km southeast of the town of Geraldton, Ontario. More precisely, the portion extending northwards for a distance of 480 m from a point located at 49°41′8.93″ north latitude and 86°55′34.64″ west longitude to a point located at 49°40′58.24″ north latitude and 86°55′51.01″ west longitude.
57	A portion of the Southwest Arm tributary to Kenogamisis Lake, Ontario	A portion of the Southwest Arm that is tributary to Kenogamisis Lake located approximately 3 km southwest of the town of Geraldton, Ontario. More precisely, the portion extending southwards for a distance of 260 m from a point located at 49°40′26.86″ north latitude and 86°58′26.73″ west longitude to a point located at 49°40′19.55″ north latitude and 86°58′31.95″ west longitude.
58	A portion of an unnamed watercourse tributary to the Southwest Arm of Kenogamisis Lake, Ontario	A portion of an unnamed watercourse tributary to the Southwest Arm of Kenogamisis Lake, located approximately 5.5 km southwest of the town of Geraldton, Ontario. More precisely, the portion extending eastwards for a distance of 730 m from a point located at 49°39′8.51″ north latitude and 86°58′43.19″ west longitude to a point located at 49°39′8.28″ north latitude and 86°58′22.54″ west longitude.
59	An unnamed pond located approximately 2 km south of Geraldton, Ontario	The unnamed pond located approximately 2 km south of the town of Geraldton, Ontario. More precisely, the unnamed pond located at 49°41′6.55″ north latitude and 86°56′33.77″ west longitude, and covering an area of 3.14 ha.
60	All waters located within the area described in column 2, located approximately 150 km north of Baker Lake, Nunavut	The waters located within an area located approximately 150 km north of Baker Lake, Nunavut. More precisely, the area bounded by five straight lines connecting five points starting at the point located at 65°24′16.24″ north latitude and 96°40′33.05″ west longitude to the point located 778 m northwest at 65°24′38.00″ north latitude and 96°41′03.20″ west longitude to the point located 173 m northeast at 65°24′41.83″ north latitude and 96°40′53.49″ west longitude to the point located 1050 m southeast at 65°24′21.82″ north latitude and 96°39′47.77″ west longitude to the point located 168 m southeast at 65°24′16.47″ north latitude and 96°39′45.69″ west longitude and ending at the point located 611 m west at 65°24′16.24″ north latitude and 96°40′33.05″ west longitude.
61	East Beaver Pond, Ontario	East Beaver Pond, located at 47°32′19.24″ north latitude and 81°55′14.03″ west longitude, approximately 20 km from the community of Gogama, Ontario.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
55	Une partie d'un cours d'eau sans nom tributaire du lac Kenogamisis, Ontario	La partie d'un cours d'eau sans nom, qui est tributaire du lac Kenogamisis, située à environ 2 km au sud de la ville de Geraldton, en Ontario. Plus précisément, la partie qui s'étend vers le nord sur une distance de 520 m du point situé par 49°41′25,74″ de latitude N. et 86°56′29,62″ de longitude O. jusqu'au point situé par 49°41′9,76″ de latitude N. et 86°56′31,19″ de longitude O.
56	Une partie d'un cours d'eau sans nom tributaire du lac Kenogamisis, Ontario	La partie d'un cours d'eau sans nom, qui est tributaire du lac Kenogamisis, située à environ 3 km au sud-est de la ville de Geraldton, en Ontario. Plus précisément, la partie qui s'étend vers le nord sur une distance de 480 m du point situé par 49°41′8,93″ de latitude N. et 86°55′34,64″ de longitude O. jusqu'au point situé par 49°40′58,24″ de latitude N. et 86°55′51,01″ de longitude O.
57	Une partie du bras sud-ouest tributaire du lac Kenogamisis, Ontario	La partie du bras sud-ouest qui est tributaire du lac Kenogamisis, située à environ 3 km au sud-ouest de la ville de Geraldton, en Ontario. Plus précisément, la partie qui s'étend vers le sud sur une distance de 260 m du point situé par 49°40′26,86″ de latitude N. et 86°58′26,73″ de longitude O. jusqu'au point situé par 49°40′19,55″ de latitude N. et 86°58′31,95″ de longitude O.
58	Une partie d'un cours d'eau sans nom tributaire du bras sud-ouest du lac Kenogamisis, Ontario	La partie d'un cours d'eau sans nom qui est tributaire du bras sud-ouest du lac Kenogamisis, située à environ 5,5 km au sud-ouest de la ville de Geraldton, en Ontario. Plus précisément, la partie qui s'étend vers l'est sur une distance de 730 m du point situé par 49°39′8,51″ de latitude N. et 86°58′43,19″ de longitude O. jusqu'au point situé par 49°39′8,28″ de latitude N. et 86°58′22,54″ de longitude O.
59	Un étang sans nom situé à environ 2 km au sud de Geraldton, Ontario	L'étang sans nom situé à environ 2 km au sud de la ville de Geraldton, en Ontario. Plus précisément, l'étang sans nom situé par 49°41′6,55″ de latitude N. et 86°56′33,77″ de longitude O. et qui couvre une superficie de 3,14 ha.
60	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 150 km au nord du lac Baker, Nunavut	Les eaux comprises dans une région située à environ 150 km au nord du lac Baker, au Nunavut. Plus précisément, la région délimitée par cinq lignes droites reliant cinq points, à partir du point situé par 65°24′16,24″ de latitude N. et 96°40′33,05″ de longitude O., de là, allant vers le nord-ouest sur une distance de 778 m jusqu'au point situé par 65°24′38,00″ de latitude N. et 96°41′03,20″ de longitude O., de là, allant vers le nord-est sur une distance de 173 m jusqu'au point situé par 65°24′41,83″ de latitude N. et 96°40′53,49″ de longitude O., de là, allant vers le sud-est sur une distance de 1 050 m jusqu'au point situé par 65°24′21,82″ de latitude N. et 96°39′47,77″ de longitude O., de là, allant vers le sud-est sur une distance de 168 m jusqu'au point situé par 65°24′16,47″ de latitude N. et 96°39′45,69″ de longitude O., de là, allant vers l'ouest sur une distance de 611 m jusqu'au point situé par 65°24′16,24″ de latitude N. et 96°40′33,05″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
62	A tributary of an unnamed lake, located approximately 20 km from Gogama, Ontario	A tributary of an unnamed lake, located approximately 20 km from the community of Gogama, Ontario. More precisely, the portion of the tributary extending southeast from the point located at 47°31′31.54″ north latitude and 81°54′57.84″ west longitude extending downstream to the point located at 47°31′20.35″ north latitude and 81°54′43.63″ west longitude.
63	An unnamed creek from West Beaver Pond to Bagsverd Lake, Ontario	An unnamed creek from West Beaver Pond to Bagsverd Lake, located approximately 20 km from the community of Gogama, Ontario. More precisely, the portion of the creek extending northeast from the point located at 47°33′48.23″ north latitude and 81°57′18.64″ west longitude to the point located at 47°33′55.72″ north latitude and 81°56′49.69″ west longitude.
64	All waters located within the area described in column 2, located approximately 20 km from Gogama, Ontario	The waters located within an area located approximately 20 km southwest of the community of Gogama, Ontario. More precisely, the area bounded by ten straight lines connecting ten points starting at the point located at 47°33′32.74″ north latitude and 81°58′47.71″ west longitude to the point located 835 m to the southeast at 47°33′27.93″ north latitude and 81°58′08.34″ west longitude to the point located 310 m southeast at 47°33′26.15″ north latitude and 81°57′53.72″ west longitude to the point located 273 m northeast at 47°33′32.33″ north latitude and 81°57′44.38″ west longitude to the point located 164 m northwest at 47°33′35.43″ north latitude and 81°57′50.65″ west longitude to the point located 213 m northeast at 47°33′41.03″ north latitude and 81°57′44.71″ west longitude to the point located 134 m southeast at 47°33′38.74″ north latitude and 81°57′39.26″ west longitude to the point located 176 m northeast at 47°33′43.18″ north latitude and 81°57′33.94″ west longitude to the point located 574 m northwest at 47°33′43.36″ north latitude and 81°58′01.41″ west longitude to the point located 444 m northwest at 47°33′45.86″ north latitude and 81°58′22.35″ west longitude to the point located 667 m southwest at 47°33′32.74″ north latitude and 81°58′47.71″ west longitude.
65	A portion of Long Lake, located approximately 310 km northeast of Yellowknife, Northwest Territories	A portion of Long Lake, also known as Cell D of the Long Lake Containment Facility, located approximately 310 km northeast of Yellowknife, Northwest Territories. More precisely, the portion of Long Lake located at 64°41′54.00″ north latitude and 110°40′56.99″ west longitude, covering an area of 279.68 ha and bounded by (a) the dike located at 64°42′39.1″ north latitude and 110°40′27.5″ west longitude, and (b) the dike located at 64°41′31.1″ north latitude and 110°43′19.7″ west longitude.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
61	Étang East Beaver, Ontario	L'étang East Beaver, situé par 47°32′19,24″ de latitude N. et 81°55′14,03″ de longitude O., à environ 20 km de la collectivité de Gogama, en Ontario.
62	Un tributaire d'un lac sans nom, situé à environ 20 km de Gogama, Ontario	Le tributaire d'un lac sans nom, situé à environ 20 km de la collectivité de Gogama, en Ontario. Plus précisément, la partie du tributaire qui s'étend vers le sud-est à partir du point situé par 47°31′31,54″ de latitude N. et 81°54′57,84″ de longitude O. qui s'étend en aval jusqu'au point situé par 47°31′20,35″ de latitude N. et 81°54′43,63″ de longitude O.
63	Un ruisseau sans nom s'étendant de l'étang West Beaver jusqu'au lac Bagsverd, Ontario	Le ruisseau sans nom s'étendant de l'étang West Beaver jusqu'au lac Bagsverd, situé à environ 20 km de la collectivité de Gogama, en Ontario. Plus précisément, la partie du ruisseau qui s'étend vers le nord-est à partir du point situé par 47°33′48,23″ de latitude N. et 81°57′18,64″ de longitude O., jusqu'au point situé par 47°33′55,72″ de latitude N. et 81°56′49,69″ de longitude O.
64	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 20 km de Gogama, Ontario	Les eaux comprises dans une région située à environ 20 km au sud-ouest de la collectivité de Gogama, en Ontario. Plus précisément, la région délimitée par dix lignes droites reliant dix points à partir du point situé par 47°33′32,74″ de latitude N. et 81°58′47,71″ de longitude O., de là, allant vers le sud-est sur une distance de 835 m jusqu'au point situé par 47°33′27,93″ de latitude N. et 81°58′08,34″ de longitude O., de là, allant vers le sud-est sur une distance de 310 m jusqu'au point situé par 47°33′26,15″ de latitude N. et 81°57′53,72″ de longitude O., de là, allant vers le nord-est sur une distance de 273 m jusqu'au point situé par 47°33′32,33″ de latitude N. et 81°57′44,38″ de longitude O., de là, allant vers le nord-ouest sur une distance de 164 m jusqu'au point situé par 47°33′35,43″ de latitude N. et 81°57′50,65″ de longitude O., de là, allant vers le nord-est sur une distance de 213 m jusqu'au point situé par 47°33′41,03″ de latitude N. et 81°57′44,71″ de longitude O., de là, allant vers le sud-est sur une distance de 134 m jusqu'au point situé par 47°33′38,74″ de latitude N. et 81°57′39,26″ de longitude O., de là, allant vers le nord-est sur une distance de 176 m jusqu'au point situé par 47°33′43,18″ de latitude N. et 81°57′33,94″ de longitude O., de là, allant vers le nord-ouest sur une distance de 574 m jusqu'au point situé par 47°33′43,36″ de latitude N. et 81°58′01,41″ de longitude O., de là, allant vers le nord-ouest sur une distance de 444 m jusqu'au point situé par 47°33′45,86″ de latitude N. et 81°58′22,35″ de longitude O., de là, allant vers le sud-ouest sur une distance de 667 m jusqu'au point situé par 47°33′32,74″ de latitude N. et 81°58′47,71″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
66	A portion of Long Lake, located approximately 307 km northeast of Yellowknife, Northwest Territories	A portion of Long Lake, also known as Cell E of the Long Lake Containment Facility, located approximately 307 km northeast of Yellowknife, Northwest Territories. More precisely, the portion of Long Lake located at 64°41′21.99″ north latitude and 110°43′08.98″ west longitude, covering an area of 144.19 ha and bounded by (a) the dike located at 64°41′31.1″ north latitude and 110°43′19.7″ west longitude, and (b) the outlet dam located at 64°40′57.4″ north latitude and 110°42′05.2″ west longitude.
67	Two Rock Lake, located approximately 328 km northeast of Yellowknife, Northwest Territories	Two Rock Lake, also known as Two Rock Sedimentation Pond, located at 64°51′33.01″ north latitude and 110°32′10.03″ west longitude, approximately 328 km northeast of Yellowknife, Northwest Territories, and covering an area of 29.29 ha.
68	Dyno Basin, located approximately 19 km west of Fermont, Quebec	Dyno Basin, located at 52°46'23.020" north latitude and 67°22'01.303" west longitude, approximately 19 km west of the town of Fermont, Quebec, and covering an area of 5.7 ha.
69	All waters located within the area described in column 2, located approximately 112 km southwest of Vanderhoof, British Columbia	The waters located within an area located approximately 112 km southwest of Vanderhoof, British Columbia. More precisely, the area bounded by four straight lines connecting four points starting at the point located at 53°11′10.048″ north latitude and 124°52′40.603″ west longitude to the point located 1344 m southeast at 53°10′27.330″ north latitude and 124°52′27.145″ west longitude to the point located 1548 m southwest at 53°09′42.169″ north latitude and 124°53′03.144″ west longitude to the point located 2330 m northwest at 53°10′50.110″ north latitude and 124°53′57.514″ west longitude to the point located 1555 m northeast at 53°11′10.048″ north latitude and 124°52′40.603″ west longitude.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
65	Une partie du lac Long, située à environ 310 km au nord-est de Yellowknife, Territoires du Nord-Ouest	La partie du lac Long, aussi appelée la cellule D de l'installation de confinement du lac Long et située à environ 310 km au nord-est de Yellowknife, Territoires du Nord-Ouest. Plus précisément, la partie du lac Long située par 64°41′54,00″ de latitude N. et 110°40′56,99″ de longitude O. Elle couvre une superficie de 279,68 ha et est délimitée par : a) la digue située par 64°42′39,1″ de latitude N. et 110°40′27,5″ de longitude O.; b) la digue située par 64°41′31,1″ de latitude N. et 110°43′19,7″ de longitude O.
66	Une partie du lac Long, située à environ 307 km au nord-est de Yellowknife, Territoires du Nord-Ouest	La partie du lac Long, aussi appelée la cellule E de l'installation de confinement du lac Long et située à environ 307 km au nord-est de Yellowknife, Territoires du Nord-Ouest. Plus précisément, la partie du lac Long située par 64°41′21,99″ de latitude N. et 110°43′08,98″ de longitude O. Elle couvre une superficie de 144,19 ha et est délimitée par : a) la digue située par 64°41′31,1″ de latitude N. et 110°43′19,7″ de longitude O.; b) le barrage de l'exutoire situé par 64°40′57,4″ de latitude N. et 110°42′05,2″ de longitude O.
67	Lac Two Rock, situé à environ 328 km au nord-est de Yellowknife, Territoires du Nord-Ouest	Le Lac Two Rock, aussi appelé le bassin de décantation de Two Rock, qui est situé par 64°51′33,01″ de latitude N. et 110°32′10,03″ de longitude O., à environ 328 km au nord-est de Yellowknife, Territoires du Nord-Ouest, et qui couvre une superficie de 29,29 ha.
68	Bassin Dyno, situé à environ 19 km à l'ouest de Fermont, Québec	Bassin Dyno, situé par 52°46′23,020″ de latitude N. et 67°22′01,303″ de longitude O., à environ 19 km à l'ouest de la ville de Fermont, au Québec, et qui couvre une superficie de 5,7 ha.
69	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 112 km au sud-ouest de Vanderhoof, Colombie-Britannique	Les eaux comprises dans une région située à environ 112 km au sud-ouest de Vanderhoof, en Colombie-Britannique. Plus précisément, la région délimitée par quatre lignes droites reliant quatre points, à partir du point situé par 53°11′10,048″ de latitude N. et 124°52′40,603″ de longitude O., de là, allant vers le sud-est sur une distance de 1344 m jusqu'au point situé par 53°10′27,330″ de latitude N. et 124°52′27,145″ de longitude O., de là, allant vers le sud-ouest sur une distance de 1548 m jusqu'au point situé par 53°09′42,169″ de latitude N. et 124°53′03,144″ de longitude O., de là, allant vers le nord-ouest sur une distance de 2330 m jusqu'au point situé par 53°10′50,110″ de latitude N. et 124°53′57,514″ de longitude O., de là, allant vers le nord-est sur une distance de 1555 m jusqu'au point situé par 53°11′10,048″ de latitude N. et 124°52′40,603″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
70	All waters located within the area described in column 2, located approximately 112 km southwest of Vanderhoof, British Columbia	The waters located within an area located approximately 112 km southwest of Vanderhoof, British Columbia. More precisely, the area bounded by seven straight lines connecting seven points starting at the point located at 53°12′48.783″ north latitude and 124°51′39.703″ west longitude to the point located 1454 m southeast at 53°12′14.326″ north latitude and 124°50′46.321″ west longitude to the point located 1183 m southwest at 53°11′36.558″ north latitude and 124°50′56.658″ west longitude to the point located 1291 m northwest at 53°11′49.763″ north latitude and 124°52′02.643″ west longitude to the point located 3532 m southwest at 53°11′18.766″ north latitude and 124°55′05.803″ west longitude to the point located 445 m northwest at 53°11′27.921″ north latitude and 124°55′24.316″ west longitude to the point located 3097 m northeast at 53°12′32.992″ north latitude and 124°53′17.433″ west longitude to the point located 1878 m northeast at 53°12′48.783″ north latitude and 124°51′39.703″ west longitude.
71	All waters located within the area described in column 2, located approximately 112 km southwest of Vanderhoof, British Columbia	The waters located within an area located approximately 112 km southwest of Vanderhoof, British Columbia. More precisely, the area bounded by nine straight lines connecting nine points starting at the point located at 53°13′37.192″ north latitude and 124°51′41.053″ west longitude to the point located 876 m southeast at 53°13′11.869″ north latitude and 124°51′19.811″ west longitude to the point located 179 m southeast at 53°13′06.625″ north latitude and 124°51′15.738″ west longitude to the point located 213 m southeast at 53°13′00.422″ north latitude and 124°51′10.687″ west longitude to the point located 1161 m southeast at 53°12′29.352″ north latitude and 124°50′35.542″ west longitude to the point located 204 m southwest at 53°12′24.850″ north latitude and 124°50′43.608″ west longitude to the point located 1272 m northwest at 53°12′55.148″ north latitude and 124°51′30.005″ west longitude to the point located 2136 m northwest at 53°13′01.658″ north latitude and 124°53′24.651″ west longitude to the point located 1169 m northwest at 53°13′36.291″ north latitude and 124°53′50.010″ west longitude to the point located 2392 m northeast at 53°13′37.192″ north latitude and 124°51′41.053″ west longitude.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
70	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 112 km au sud-ouest de Vanderhoof, en Colombie-Britannique	Les eaux comprises dans une région située à environ 112 km au sud-ouest de Vanderhoof, en Colombie-Britannique. Plus précisément, la région délimitée par sept lignes droites reliant sept points, à partir du point situé par 53°12′48,783″ de latitude N. et 124°51′39,703″ de longitude O., de là, allant vers le sud-est sur une distance de 1454 m jusqu'au point situé par 53°12′14,326″ de latitude N. et 124°50′46,321″ de longitude O., de là, allant vers le sud-ouest sur une distance de 1183 m jusqu'au point situé par 53°11′36,558″ de latitude N. et 124°50′56,658″ de longitude O., de là, allant vers le nord-ouest sur une distance de 1291 m jusqu'au point situé par 53°11′49,763″ de latitude N. et 124°52′02,643″ de longitude O., de là, allant vers le sud-ouest sur une distance de 3532 m jusqu'au point situé par 53°11′18,766″ de latitude N. et 124°55′05,803″ de longitude O., de là, allant vers le nord-ouest sur une distance de 445 m jusqu'au point situé par 53°11′27,921″ de latitude N. et 124°55′24,316″ de longitude O., de là, allant vers le nord-est sur une distance de 3097 m jusqu'au point situé par 53°12′32,992″ de latitude N. et 124°53′17,433″ de longitude O., de là, allant vers le nord-est sur une distance de 1878 m jusqu'au point situé par 53°12′48,783″ de latitude N. et 124°51′39,703″ de longitude O.
71	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 112 km au sud-ouest de Vanderhoof, en Colombie-Britannique	Les eaux comprises dans une région située à environ 112 km au sud-ouest de Vanderhoof, en Colombie-Britannique. Plus précisément, la région délimitée par neuf lignes droites reliant neuf points, à partir du point situé par 53°13′37,192″ de latitude N. et 124°51′41,053″ de longitude O., de là, allant vers le sud-est sur une distance de 876 m jusqu'au point situé par 53°13′11,869″ de latitude N. et 124°51′19,811″ de longitude O., de là, allant vers le sud-est sur une distance de 179 m jusqu'au point situé par 53°13′06,625″ de latitude N. et 124°51′15,738″ de longitude O., de là, allant vers le sud-est sur une distance de 213 m jusqu'au point situé par 53°13′00,422″ de latitude N. et 124°51′10,687″ de longitude O., de là, allant vers le sud-est sur une distance de 1161 m jusqu'au point situé par 53°12′29,352″ de latitude N. et 124°50′35,542″ de longitude O., de là, allant vers le sud-ouest sur une distance de 204 m jusqu'au point situé par 53°12′24,850″ de latitude N. et 124°50′43,608″ de longitude O., de là, allant vers le nord-ouest sur une distance de 1272 m jusqu'au point situé par 53°12′55,148″ de latitude N. et 124°51′30,005″ de longitude O., de là, allant vers le nord-ouest sur une distance de 2136 m jusqu'au point situé par 53°13′01,658″ de latitude N. et 124°53′24,651″ de longitude O., de là, allant vers le nord-ouest sur une distance de 1169 m jusqu'au point situé par 53°13′36,291″ de latitude N. et 124°53′50,010″ de longitude O., de là, allant vers le nord-est sur une distance de 2392 m jusqu'au point situé par 53°13′37,192″ de latitude N. et 124°51′41,053″ de longitude O.

Item	Column 1 Water or Place	Column 2 Description
72	All waters located within the area described in column 2, located approximately 112 km southwest of Vanderhoof, British Colombia	The waters located within an area located approximately 112 km southwest of Vanderhoof, British Columbia. More precisely, the area bounded by four straight lines connecting four points starting at the point located at 53°13′21.584″ north latitude and 124°50′03.866″ west longitude to the point located 111 m southeast at 53°13′18.235″ north latitude and 124°50′01.694″ west longitude to the point located 428 m southwest at 53°13′13.331″ north latitude and 124°50′23.252″ west longitude to the point located 83 m northwest at 53°13′15.500″ north latitude and 124°50′25.850″ west longitude to the point located 449 m northeast at 53°13′21.584″ north latitude and 124°50′03.866″ west longitude.

SOR/2006-239, ss. 21 to 23; SOR/2008-216, s. 1; SOR/2009-27, s. 1; SOR/2009-156, s. 2; SOR/2010-250, s. 1; SOR/2011-202, s. 1; SOR/2015-45, s. 1; SOR/2016-87, s. 1; SOR/2016-196, s. 1; SOR/2017-128, s. 1; SOR/2017-129, s. 1; SOR/2017-197, s. 1; SOR/2017-272, s. 1; SOR/2018-100, s. 1; SOR/2018-219, ss. 1(F), 2; SOR/2018-280, s. 1; SOR/2019-245, s. 1; SOR/2020-108, s. 1; SOR/2020-109, s. 1; SOR/2020-110, s. 1; SOR/2020-131, s. 1; SOR/2020-132, s. 1; SOR/2021-125, s. 11; SOR/2021-125, s. 12; SOR/2022-23, s. 2; SOR/2022-23, s. 3; SOR/2022-159, s. 2; SOR/2023-122, s. 1.

Article	Colonne 1 Eaux ou lieux	Colonne 2 Description
72	Toutes les eaux comprises dans la région décrite à la colonne 2, située à environ 112 km au sud-ouest de Vanderhoof, en Colombie-Britannique	Les eaux comprises dans une région située à environ 112 km au sud-ouest de Vanderhoof, en Colombie-Britannique. Plus précisément, la région délimitée par quatre lignes droites reliant quatre points, à partir du point situé par 53°13′21,584″ de latitude N. et 124°50′03,866″ de longitude O., de là, allant vers le sud-est sur une distance de 111 m jusqu'au point situé par 53°13′18,235″ de latitude N. et 124°50′01,694″ de longitude O., de là, allant vers le sud-ouest sur une distance de 428 m jusqu'au point situé par 53°13′13,331″ de latitude N. et 124°50′23,252″ de longitude O., de là, allant vers le nord-ouest sur une distance de 83 m jusqu'au point situé par 53°13′15,500″ de latitude N. et 124°50′25,850″ de longitude O., de là, allant vers le nord-est sur une distance de 449 m jusqu'au point situé par 53°13′21,584″ de latitude N. et 124°50′03,866″ de longitude O.

DORS/2006-239, art. 21 à 23; DORS/2008-216, art. 1; DORS/2009-27, art. 1; DORS/2009-156, art. 2; DORS/2010-250, art. 1; DORS/2011-202, art. 1; DORS/2015-45, art. 1; DORS/2016-87, art. 1; DORS/2016-196, art. 1; DORS/2017-128, art. 1; DORS/2017-129, art. 1; DORS/2017-197, art. 1; DORS/2017-272, art. 1; DORS/2018-100, art. 1; DORS/2018-219, art. 1(F) et 2; DORS/2018-280, art. 1; DORS/2019-245, art. 1; DORS/2020-108, art. 1; DORS/2020-109, art. 1; DORS/2020-110, art. 1; DORS/2020-131, art. 1; DORS/2020-132, art. 1; DORS/2021-125, art. 11; DORS/2021-125, art. 12; DORS/2022-23, art. 2; DORS/2022-23, art. 3; DORS/2022-159, art. 2; DORS/2023-122, art. 1.

SCHEDULE 3

(Subsections 1(1) and 12(2) and subsection 4(2) of Schedule 5)

Analytical Requirements for Metal or Diamond Mining Effluent

TABLE 1

Item	Column 1 Deleterious Substance/pH/ temperature	Column 2 Precision[1]	Column 3 Accuracy[2]	Column 4 Method Detection Limit (MDL)
1	Arsenic	10%	100 ± 10%	0.0025 mg/L
2	Copper	10%	100 ± 10%	0.001 mg/L
3	Cyanide	10%	100 ± 10%	0.005 mg/L
4	Lead	10%	100 ± 10%	0.0005 mg/L
5	Nickel	10%	100 ± 10%	0.0125 mg/L
6	Zinc	10%	100 ± 10%	0.010 mg/L
7	Suspended Solids	15%	100 ± 15%	2.000 mg/L
8	Radium 226	10%	100 ± 10%	0.01 Bq/L
9	Total ammonia	10%	100 ± 10%	0.05 mg/L expressed as nitrogen (N)
10	pH	0.1 pH unit	0.1 pH unit	Not Applicable
11	Temperature	10%	± 0.5 °C	Not Applicable

[1] Relative standard deviation at concentrations 10 times above the MDL.

[2] Analyte recovery at concentrations above 10 times the MDL.

TABLE 2

Item	Column 1 Substances/ hardness/ alkalinity/ electrical conductivity	Column 2 Precision[1]	Column 3 Accuracy[2]	Column 4 Method Detection Limit (MDL)
1	Aluminum	10%	100 ± 10%	0.005 mg/L
2	Cadmium	10%	100 ± 10%	0.000045 mg/L
3	Chloride	10%	100 ± 10%	60 mg/L

ANNEXE 3

(paragraphes 1(1) et 12(2) et paragraphe 4(2) de l'annexe 5)

Exigences analytiques pour les effluents des mines de métaux et des mines de diamants

TABLEAU 1

Article	Colonne 1 Substance nocive/pH/ température	Colonne 2 Précision[1]	Colonne 3 Exactitude[2]	Colonne 4 Limite de détection de la méthode (LDM)
1	Arsenic	10 %	100 ± 10 %	0,0025 mg/L
2	Cuivre	10 %	100 ± 10 %	0,001 mg/L
3	Cyanure	10 %	100 ± 10 %	0,005 mg/L
4	Plomb	10 %	100 ± 10 %	0,0005 mg/L
5	Nickel	10 %	100 ± 10 %	0,0125 mg/L
6	Zinc	10 %	100 ± 10 %	0,010 mg/L
7	Matières en suspension	15 %	100 ± 15 %	2,000 mg/L
8	Radium 226	10 %	100 ± 10 %	0,01 Bq/L
9	Ammoniac total	10 %	100 ± 10 %	0,05 mg/L sous forme d'azote (N)
10	pH	0,1 unité pH	0,1 unité pH	Sans objet
11	Température	10 %	± 0,5 °C	Sans objet

[1] Écart-type relatif à des concentrations dix fois supérieures à la LDM.

[2] Récupération de l'analyte à des concentrations de plus de dix fois la LDM.

TABLEAU 2

Article	Colonne 1 Substance/ dureté/ alcalinité/ conductivité électrique	Colonne 2 Précision[1]	Colonne 3 Exactitude[2]	Colonne 4 Limite de détection de la méthode (LDM)
1	Aluminium	10 %	100 ± 10 %	0,005 mg/L
2	Cadmium	10 %	100 ± 10 %	0,000045 mg/L
3	Chlorure	10 %	100 ± 10 %	60 mg/L

Item	Column 1 Substances/ hardness/ alkalinity/ electrical conductivity	Column 2 Precision[1]	Column 3 Accuracy[2]	Column 4 Method Detection Limit (MDL)
4	Chromium	10%	100 ± 10%	0.00445 mg/L
5	Cobalt	10%	100 ± 10%	0.00125 mg/L
6	Iron	10%	100 ± 10%	0.15 mg/L
7	Manganese	10%	100 ± 10%	0.005 mg/L
8	Mercury	10%	100 ± 10%	0.00001 mg/L
9	Molybdenum	10%	100 ± 10%	0.0365 mg/L
10	Nitrate	10%	100 ± 10%	1.46835 mg/L, expressed as nitrogen (N)
11	Phosphorus	10%	100 ± 10%	0.05 mg/L
12	Selenium	10%	100 ± 10%	0.0005 mg/L
13	Sulphate	10%	100 ± 10%	0.6 mg/L
14	Thallium	10%	100 ± 10%	0.0004 mg/L
15	Uranium	10%	100 ± 10%	0.0075 mg/L
16	Total ammonia	10%	100 ± 10%	0.05 mg/L expressed as nitrogen (N)
17	Hardness	10%	100 ± 10%	1 mg/L
18	Alkalinity	10%	100 ± 10%	2 mg/L
19	Electrical Conductivity	10%	100 ± 10%	1 µS/cm

[1] Relative standard deviation at concentrations 10 times above the MDL.

[2] Analyte recovery at concentrations above 10 times the MDL.

SOR/2006-239, s. 24; SOR/2018-99, s. 31.

Article	Colonne 1 Substance/ dureté/ alcalinité/ conductivité électrique	Colonne 2 Précision[1]	Colonne 3 Exactitude[2]	Colonne 4 Limite de détection de la méthode (LDM)
4	Chrome	10 %	100 ± 10 %	0,00445 mg/L
5	Cobalt	10 %	100 ± 10 %	0,00125 mg/L
6	Fer	10 %	100 ± 10 %	0,15 mg/L
7	Manganèse	10 %	100 ± 10 %	0,005 mg/L
8	Mercure	10 %	100 ± 10 %	0,00001 mg/L
9	Molybdène	10 %	100 ± 10 %	0,0365 mg/L
10	Nitrate	10 %	100 ± 10 %	1,46835 mg/L sous forme d'azote (N)
11	Phosphore	10 %	100 ± 10 %	0,05 mg/L
12	Sélénium	10 %	100 ± 10 %	0,0005 mg/L
13	Sulfate	10 %	100 ± 10 %	0,6 mg/L
14	Thallium	10 %	100 ± 10 %	0,0004 mg/L
15	Uranium	10 %	100 ± 10 %	0,0075 mg/L
16	Ammoniac total	10 %	100 ± 10 %	0,05 mg/L sous forme d'azote (N)
17	Dureté	10 %	100 ± 10 %	1 mg/L
18	Alcalinité	10 %	100 ± 10 %	2 mg/L
19	Conductivité électrique	10 %	100 ± 10 %	1 µS/cm

[1] Écart-type relatif à des concentrations dix fois supérieures à la LDM.

[2] Récupération de l'analyte à des concentrations de plus de dix fois la LDM.

DORS/2006-239, art. 24; DORS/2018-99, art. 31.

SCHEDULE 4

(Subsection 1(2), subparagraphs 4(1)(a)(i) and (ii), subsection 13(1), paragraph 13(3)(a), subparagraph 22(c)(i) and paragraph 24(1)(a))

Maximum Authorized Concentrations of Prescribed Deleterious Substances

TABLE 1

Item	Column 1 Deleterious Substance	Column 2 Maximum Authorized Monthly Mean Concentration	Column 3 Maximum Authorized Concentration in a Composite Sample	Column 4 Maximum Authorized Concentration in a Grab Sample
1	Arsenic	0.10 mg/L	0.15 mg/L	0.20 mg/L
2	Copper	0.10 mg/L	0.15 mg/L	0.20 mg/L
3	Cyanide	0.50 mg/L	0.75 mg/L	1.00 mg/L
4	Lead	0.08 mg/L	0.12 mg/L	0.16 mg/L
5	Nickel	0.25 mg/L	0.38 mg/L	0.50 mg/L
6	Zinc	0.40 mg/L	0.60 mg/L	0.80 mg/L
7	Suspended Solids	15.00 mg/L	22.50 mg/L	30.00 mg/L
8	Radium 226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L
9	Un-ionized ammonia	0.50 mg/L expressed as nitrogen (N)	Not applicable	1.00 mg/L expressed as nitrogen (N)

ANNEXE 4

(paragraphe 1(2), sous-alinéas 4(1)a)(i) et (ii), paragraphe 13(1), alinéa 13(3)a), sous-alinéa 22c)(i) et alinéa 24(1)a))

Concentrations maximales permises des substances nocives désignées

TABLEAU 1

Article	Colonne 1 Substance nocive	Colonne 2 Concentration moyenne mensuelle maximale permise	Colonne 3 Concentration maximale permise dans un échantillon composite	Colonne 4 Concentration maximale permise dans un échantillon instantané
1	Arsenic	0,10 mg/L	0,15 mg/L	0,20 mg/L
2	Cuivre	0,10 mg/L	0,15 mg/L	0,20 mg/L
3	Cyanure	0,50 mg/L	0,75 mg/L	1,00 mg/L
4	Plomb	0,08 mg/L	0,12 mg/L	0,16 mg/L
5	Nickel	0,25 mg/L	0,38 mg/L	0,50 mg/L
6	Zinc	0,40 mg/L	0,60 mg/L	0,80 mg/L
7	Matières en suspension	15,00 mg/L	22,50 mg/L	30,00 mg/L
8	Radium 226	0,37 Bq/L	0,74 Bq/L	1,11 Bq/L
9	Ammoniac non ionisé	0,50 mg/L sous forme d’azote (N)	Sans objet	1,00 mg/L sous forme d’azote (N)

NOTE: The concentrations for items 1 to 8 are total values.

NOTE : Les concentrations pour les articles 1 à 8 sont des valeurs totales.

TABLE 2

Item	Column 1 Deleterious Substance	Column 2 Maximum Authorized Monthly Mean Concentration	Column 3 Maximum Authorized Concentration in a Composite Sample	Column 4 Maximum Authorized Concentration in a Grab Sample
1	Arsenic	0.30 mg/L	0.45 mg/L	0.60 mg/L
2	Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
3	Cyanide	0.50 mg/L	0.75 mg/L	1.00 mg/L
4	Lead	0.10 mg/L	0.15 mg/L	0.20 mg/L
5	Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
6	Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
7	Suspended Solids	15.00 mg/L	22.50 mg/L	30.00 mg/L
8	Radium 226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L
9	Un-ionized ammonia	0.50 mg/L expressed as nitrogen (N)	Not applicable	1.00 mg/L expressed as nitrogen (N)

TABLEAU 2

Article	Colonne 1 Substance nocive	Colonne 2 Concentration moyenne mensuelle maximale permise	Colonne 3 Concentration maximale permise dans un échantillon composite	Colonne 4 Concentration maximale permise dans un échantillon instantané
1	Arsenic	0,30 mg/L	0,45 mg/L	0,60 mg/L
2	Cuivre	0,30 mg/L	0,45 mg/L	0,60 mg/L
3	Cyanure	0,50 mg/L	0,75 mg/L	1,00 mg/L
4	Plomb	0,10 mg/L	0,15 mg/L	0,20 mg/L
5	Nickel	0,50 mg/L	0,75 mg/L	1,00 mg/L
6	Zinc	0,50 mg/L	0,75 mg/L	1,00 mg/L
7	Matières en suspension	15,00 mg/L	22,50 mg/L	30,00 mg/L
8	Radium 226	0,37 Bq/L	0,74 Bq/L	1,11 Bq/L
9	Ammoniac non ionisé	0,50 mg/L sous forme d'azote (N)	Sans objet	1,00 mg/L sous forme d'azote (N)

NOTE: The concentrations for items 1 to 8 are total values.

SOR/2006-239, s. 25; SOR/2018-99, s. 32.

NOTE : Les concentrations pour les articles 1 à 8 sont des valeurs totales.

DORS/2006-239, art. 25; DORS/2018-99, art. 32.

SCHEDULE 5

(Subsections 7(1) and (3), subparagraphs 15(1)(a)(i) and (b)(i) and paragraph 32(1)(c))

Environmental Effects Monitoring Studies

Interpretation

1 (1) The following definitions apply in this Schedule.

biological monitoring study means a study referred to in section 9. (*étude de suivi biologique*)

effect on fish tissue from mercury means a concentration of total mercury that exceeds 0.5 µg/g wet weight in fish tissue that is taken in an exposure area and that is statistically different from and higher than the concentration of total mercury in fish tissue that is taken in a reference area. (*effet du mercure sur les tissus de poissons*)

effect on the benthic invertebrate community means a statistical difference between data referred to in subparagraph 12(1)(e)(ii) and paragraph 12(1)(f) from a study respecting the benthic invertebrate community conducted in

(a) an exposure area and a reference area; or

(b) sampling areas within an exposure area where there are gradually decreasing effluent concentrations. (*effet sur la communauté d'invertébrés benthiques*)

effect on the fish population means a statistical difference between data relating to the indicators referred to in subparagraph 12(1)(e)(i) from a study respecting fish population conducted in

(a) an exposure area and a reference area; or

(b) sampling areas within an exposure area where there are gradually decreasing effluent concentrations. (*effet sur la population de poissons*)

exposure area means all fish habitat and waters frequented by fish that are exposed to effluent. (*zone exposée*)

fish has the same meaning as in section 2 of the Act but does not include parts of fish, parts of shellfish, parts of crustaceans or parts of marine animals. (*poisson*)

ANNEXE 5

(paragraphes 7(1) et (3), sous-alinéas 15(1)a)(i) et b)(i) et alinéa 32(1)c))

Études de suivi des effets sur l'environnement

Définitions et interprétation

1 (1) Les définitions qui suivent s'appliquent à la présente annexe.

effet du mercure sur les tissus de poissons Concentration du mercure total dans les tissus de poissons pris dans la zone exposée, supérieure à 0,5 µg/g (poids humide), présentant une différence statistique et ayant une concentration plus élevée par rapport à la concentration du mercure total dans les tissus de poissons pris dans la zone de référence. (*effect on fish tissue from mercury*)

effet sur la communauté d'invertébrés benthiques Différence statistique entre les données visées au sous-alinéa 12(1)e)(ii) et à l'alinéa 12(1)f) d'une étude sur la communauté d'invertébrés benthiques effectuée :

a) soit dans la zone exposée et dans la zone de référence;

b) soit dans les zones d'échantillonnage de la zone exposée qui présentent un gradient décroissant de concentration d'effluent. (*effect on the benthic invertebrate community*)

effet sur la population de poissons Différence statistique entre les données portant sur les indicateurs visés au sous-alinéa 12(1)e)(i) d'une étude sur la population de poissons effectuée :

a) soit dans la zone exposée et dans la zone de référence;

b) soit dans les zones d'échantillonnage de la zone exposée qui présentent un gradient décroissant de concentration d'effluent. (*effect on the fish population*)

étude de suivi biologique Étude visée à l'article 9. (*biological monitoring study*)

poisson S'entend au sens de l'article 2 de la Loi, à l'exclusion des parties de poissons, de mollusques, de crustacés et d'animaux marins. (*fish*)

reference area means water frequented by fish that is not exposed to effluent and that has fish habitat that, as far as practicable, is most similar to that of the exposure area. (*zone de référence*)

sampling area means the area within an exposure or reference area where representative samples are collected. (*zone d'échantillonnage*)

zone d'échantillonnage Partie de la zone exposée ou de la zone de référence où les échantillons représentatifs sont prélevés. (*sampling area*)

zone de référence Les eaux où vivent des poissons et où se trouve un habitat du poisson, qui ne sont pas exposées à un effluent et qui présentent, dans la mesure du possible, les caractéristiques les plus semblables à celles de la zone exposée. (*reference area*)

zone exposée Les eaux où vivent des poissons et l'habitat du poisson qui sont exposés à un effluent. (*exposure area*)

(2) For the purpose of this schedule, ***critical effect size***, in relation to an effect indicator set out in column 1 of the following table, means the critical effect size set out in column 2:

Item	Column 1 Effect Indicator	Column 2 Critical Effect Size
	For Fish Population	(% of reference mean)
1	Total body weight at age	± 25%
2	Gonad weight at total body weight	± 25%
3	Liver weight at total body weight	± 25%
4	Total body weight at length (condition)	± 10%
5	Age	± 25%
	For Benthic Invertebrate Community	(Standard Deviation Units)
6	Density	± 2 SD
7	Simpson's Evenness Index	± 2 SD
8	Taxa Richness	± 2 SD

(2) Pour l'application de la présente annexe, ***seuil critique d'effet*** s'entend, à l'égard d'un indicateur d'effet qui figure dans la colonne 1 du tableau ci-après, du seuil critique d'effet correspondant de la colonne 2 :

Article	Colonne 1 Indicateur d'effet	Colonne 2 Seuil critique d'effet
	Pour la population de poissons	(% par rapport à la moyenne de référence)
1	Poids corporel total selon l'âge	± 25 %
2	Poids des gonades par rapport au poids corporel total	± 25 %
3	Poids du foie par rapport au poids corporel total	± 25 %
4	Poids corporel total par rapport à la longueur (condition)	± 10 %
5	Âge	± 25 %
	Pour la communauté d'invertébrés benthiques	(multiple d'écart type)
6	Densité	± 2 ET
7	Indice de régularité de Simpson	± 2 ET
8	Richesse des taxons	± 2 ET

2 Environmental effects monitoring studies consist of the effluent and water quality monitoring studies set out in Part 1 and the biological monitoring studies set out in Part 2.

2 Les études de suivi des effets sur l'environnement se composent des études de suivi de l'effluent et de la qualité de l'eau prévues à la partie 1 et des études de suivi biologique prévues à la partie 2.

PART 1

Effluent and Water Quality Monitoring Studies

Required Studies

3 Effluent and water quality monitoring studies consist of effluent characterization, sublethal toxicity testing and water quality monitoring.

Effluent Characterization

4 (1) Effluent characterization is conducted by analyzing a sample of effluent and recording the hardness, alkalinity, electrical conductivity and temperature of the sample and the concentrations, in total values, of the following substances:

(a) aluminum;

(b) cadmium;

(c) iron;

(d) subject to subsection (4), mercury;

(e) molybdenum;

(f) selenium;

(g) nitrate (concentration in units of nitrogen);

(h) chloride;

(i) chromium;

(j) cobalt;

(k) sulphate;

(l) thallium;

(m) uranium;

(n) phosphorus (concentration in units of phosphorus); and

(o) manganese.

(p) [Repealed, SOR/2018-99, s. 33]

(2) The analysis shall comply with the analytical requirements set out in Table 2 of Schedule 3.

PARTIE 1

Études de suivi de l'effluent et de la qualité de l'eau

Composition des études

3 Les études de suivi de l'effluent et de la qualité de l'eau se composent de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau.

Caractérisation de l'effluent

4 (1) La caractérisation de l'effluent est effectuée par l'analyse d'un échantillon d'effluent et par l'enregistrement de sa dureté, de son alcalinité, de sa conductivité électrique, de sa température et des concentrations, exprimées en valeurs totales, des substances suivantes :

a) l'aluminium;

b) le cadmium;

c) le fer;

d) sous réserve du paragraphe (4), le mercure;

e) le molybdène;

f) le sélénium;

g) le nitrate (la concentration en unités d'azote);

h) le chlorure;

i) le chrome;

j) le cobalt;

k) le sulfate;

l) le thallium;

m) l'uranium;

n) le phosphore (la concentration en unités de phosphore);

o) le manganèse.

p) [Abrogé, DORS/2018-99, art. 33]

(2) Les analyses doivent satisfaire aux exigences analytiques prévues au tableau 2 de l'annexe 3.

(3) The effluent characterization shall be conducted once per calendar quarter on an aliquot of effluent sample collected under sections 12 and 13 of these Regulations from each final discharge point at least one month after the sample on which the previous characterization was conducted.

(4) The recording of the concentration of mercury in effluent referred to in paragraph (1)(d) may be discontinued if that concentration is less than 0.10 µg/L in 12 consecutive samples collected under subsection (3).

(5) Quality assurance and quality control measures shall be implemented that will ensure the accuracy of the effluent characterization data.

Sublethal Toxicity Testing

5 (1) Sublethal toxicity testing shall, in the case of effluent deposited into fresh waters, be conducted using the following test methodologies, as amended from time to time:

(a) in the case of a fish species,

(i) *Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows* (Report EPS 1/RM/22), published by the Department of the Environment, or

(ii) *Biological Test Method: Toxicity Tests Using Early Life Stages of Salmonid Fish (Rainbow Trout)* (Reference Method EPS 1/RM/28), published by the Department of the Environment;

(b) in the case of an invertebrate species, *Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia* (Report EPS 1/RM/21), published by the Department of the Environment;

(c) in the case of a plant species, *Biological Test Method: Test for Measuring the Inhibition of Growth Using the Freshwater Macrophyte, Lemna minor* (Reference Method EPS 1/RM/37), published by the Department of the Environment, as it applies to the biological endpoint based on the number of fronds; and

(d) in the case of an algal species,

(i) *Biological Test Method: Growth Inhibition Test Using a Freshwater Alga* (Report EPS 1/RM/25), published by the Department of the Environment, or

(3) La caractérisation de l'effluent est effectuée, une fois par trimestre civil, sur une aliquote de l'échantillon d'effluent prélevé à chaque point de rejet final en application des articles 12 et 13 du présent règlement au moins un mois après la caractérisation précédente.

(4) La concentration en mercure n'a plus à être enregistrée aux termes de l'alinéa (1)d) si la concentration de mercure de douze échantillons consécutifs prélevés selon le paragraphe (3) est inférieure à 0,10 µg/L.

(5) Des mesures d'assurance de la qualité et de contrôle de la qualité sont prises pour garantir l'exactitude des données visant la caractérisation de l'effluent.

Essais de toxicité sublétale

5 (1) Dans le cas d'effluent rejeté dans l'eau douce, les essais de toxicité sublétale sont effectués en conformité avec les méthodes ci-après, avec leurs modifications successives :

a) dans le cas d'une espèce de poissons :

(i) soit la *Méthode d'essai biologique : essai de croissance et de survie sur des larves de tête-de-boule* (Rapport SPE 1/RM/22), publiée par le ministère de l'Environnement,

(ii) soit la *Méthode d'essai biologique : essais toxicologiques sur des salmonidés (truite arc-en-ciel) aux premiers stades de leur cycle biologique* (Méthode de référence SPE 1/RM/28), publiée par le ministère de l'Environnement;

b) dans le cas d'une espèce d'invertébré, la *Méthode d'essai biologique : essai de reproduction et de survie du cladocère Ceriodaphnia dubia* (Rapport SPE 1/RM/21), publiée par le ministère de l'Environnement;

c) dans le cas d'une espèce de plante, la *Méthode d'essai biologique : essai de mesure de l'inhibition de la croissance de la plante macroscopique dulcicole Lemna minor* (Méthode de référence SPE 1/RM/37), publiée par le ministère de l'Environnement et appliquée au paramètre biologique en fonction du nombre de thalles;

d) dans le cas d'une espèce d'algue :

(i) soit la *Méthode d'essai biologique : essai d'inhibition de la croissance d'une algue d'eau douce* (Rapport SPE 1/RM/25), publiée par le ministère de l'Environnement,

(ii) *Détermination de la toxicité : inhibition de la croissance chez l'algue Pseudokirchneriella subcapitata*, (Méthode de référence MA 500 – P. sub. 1.0, rév. 3), published by the Centre d'expertise en analyse environnementale du Québec du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec.

(2) Sublethal toxicity testing shall, in the case of effluent deposited into marine or estuarine waters, be conducted for fish species, invertebrate species and algal species using the following test methodologies, as amended from time to time, as applicable to each species:

(a) *Biological Test Method: Fertilization Assay Using Echinoids (Sea Urchins and Sand Dollars)* (Report EPS 1/RM/27), published by the Department of the Environment;

(b) *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms* (Reference Method EPA/821/R-02/014), published by the U.S. Environmental Protection Agency; and

(c) *Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to West Coast Marine and Estuarine Organisms* (Reference Method EPA/600/R-95-136), published by the U.S. Environmental Protection Agency.

(3) The sublethal toxicity tests shall be conducted on aliquots of the same effluent sample collected for effluent characterization collected from the mine's final discharge point that has potentially the most adverse environmental impact on the environment, taking into account

(a) the loading of the deleterious substances contained in the effluent as determined under subsection 20(2) of these Regulations; and

(b) the manner in which the effluent mixes within the exposure area.

6 (1) The sublethal toxicity tests shall be conducted on the species referred to in subsections 5(1) and (2) two times each calendar year for three years and each test shall be conducted on an aliquot of effluent sample collected at least one month after the collection of the sample used in the previous tests.

(ii) soit la méthode intitulée *Détermination de la toxicité : inhibition de la croissance chez l'algue Pseudokirchneriella subcapitata,* (Méthode de référence MA 500 – P. sub. 1.0, rév. 3), publiée par le Centre d'expertise en analyse environnementale du Québec du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec.

(2) Dans le cas d'effluent rejeté dans l'eau de mer ou d'estuaire, les essais de toxicité sublétale sont effectués conformément aux méthodes ci-après, avec leurs modifications successives, à l'égard d'une espèce, selon le cas, de poisson, d'invertébré et d'algue :

a) la *Méthode d'essai biologique : essai sur la fécondation chez les échinides (oursins globuleux et oursins plats)* (Rapport SPE/1/RM/27), publiée par le ministère de l'Environnement;

b) les méthodes intitulées *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms* (Méthode de référence EPA/821/R-02/014), publiées par l'Environmental Protection Agency des États-Unis;

c) les méthodes intitulées *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms* (Méthode de référence EPA/600/R-95-136), publiées par l'Environmental Protection Agency des États-Unis.

(3) Les essais de toxicité sublétale sont effectués sur des aliquotes d'un même échantillon d'effluent prélevé pour la caractérisation de l'effluent au point de rejet final de la mine qui représente le plus grand risque de répercussions néfastes sur l'environnement, compte tenu :

a) de la charge des substances nocives se trouvant dans l'effluent, déterminée conformément au paragraphe 20(2) du présent règlement;

b) de la façon dont l'effluent se mélange dans la zone exposée.

6 (1) Les essais de toxicité sublétale sont effectués, à l'égard de chaque espèce visée aux paragraphes 5(1) et (2), à raison de deux fois par année civile pendant trois ans et chaque essai est effectué sur une aliquote de l'échantillon d'effluent prélevé au moins un mois après le prélèvement de l'échantillon utilisé pour les essais précédents.

(2) However, if effluent is discharged for 31 consecutive days or less in a calendar year, the tests may be conducted only once in that year.

(3) After three years, the tests shall be conducted once per calendar quarter on the species referred to in subsection 5(1) or (2), as the case may be, whose results for all the tests conducted in accordance with subsections (1) and (2) — including such tests conducted in addition to the number required by those subsections — produce the lowest geometric mean, taking into account the inhibition concentration that produces a 25% effect or an effective concentration of 25%.

Water Quality Monitoring

7 (1) Water quality monitoring is conducted by

(a) collecting samples of water from

(i) the exposure area surrounding the point of entry of effluent into water from each final discharge point and from the related reference areas, and

(ii) the sampling areas that are selected under clauses 10(b)(i)(B) and 10(c)(i)(A);

(b) recording the temperature of the water and the dissolved oxygen concentration in the water in the exposure and reference areas where the samples are collected;

(c) recording the concentration of the substances set out in paragraphs 4(1)(a) to (p) and,

(i) in the case of effluent that is deposited into fresh water, recording the pH, hardness, alkalinity and electrical conductivity of the water samples,

(ii) in the case of effluent that is deposited into estuarine waters, recording the pH, hardness, alkalinity, electrical conductivity and salinity of the water samples, and

(iii) in the case of effluent that is deposited into marine waters, recording the salinity of the water samples;

(d) recording the concentration of the deleterious substances prescribed in section 3 of these Regulations, but

(i) not recording the concentrations of cyanide if that substance is not used as a process reagent within the operations area, and

(2) Toutefois, dans le cas de l'effluent rejeté pendant trente et un jours consécutifs ou moins dans une année civile, ces essais peuvent être effectués une fois pour cette année.

(3) Après trois ans, les essais sont effectués une fois par trimestre civil pour l'espèce visée au paragraphe 5(1) ou (2), selon le cas, à l'égard de laquelle les résultats de tous les essais effectués conformément aux paragraphes (1) ou (2) — y compris ceux excédant le nombre d'essais exigés par ces paragraphes — révèlent la moyenne géométrique la plus faible, compte tenu d'une concentration inhibitrice qui produit un effet de 25 % ou d'une concentration effective de 25 %.

Suivi de la qualité de l'eau

7 (1) Le suivi de la qualité de l'eau s'effectue :

a) par prélèvement d'échantillons d'eau :

(i) dans la zone exposée entourant l'endroit où l'effluent rejeté par chaque point de rejet final se mélange à l'eau, et dans les zones de référence connexes,

(ii) dans les zones d'échantillonnage choisies aux termes des divisions 10b)(i)(B) et 10c)(i)(A);

b) par enregistrement de la température de l'eau et de la concentration d'oxygène dissous dans l'eau des zones exposées et des zones de référence où les échantillons sont prélevés;

c) par enregistrement de la concentration des substances énumérées aux alinéas 4(1)a) à p) et :

(i) dans le cas où l'effluent est rejeté dans l'eau douce, par enregistrement du pH, de la dureté, de l'alcalinité et de la conductivité électrique des échantillons d'eau,

(ii) dans le cas où il est rejeté dans l'eau d'estuaire, par enregistrement du pH, de la dureté, de l'alcalinité, de la conductivité électrique et de la salinité des échantillons d'eau,

(iii) dans le cas où il est rejeté dans l'eau de mer, par enregistrement de la salinité des échantillons d'eau;

d) par enregistrement de la concentration des substances nocives désignées à l'article 3 du présent règlement, sous réserve de ce qui suit :

(ii) not recording the concentrations of radium 226 if the conditions of subsection 13(2) of these Regulations are met; and

(e) implementing quality assurance and quality control measures that will ensure the accuracy of water quality monitoring data.

(2) The water quality monitoring shall be conducted

(a) four times per calendar year and at least one month apart on the samples of water collected, while the mine is depositing effluent, from the areas referred to in subparagraph (1)(a)(i); and

(b) at the same time that the biological monitoring studies are conducted on samples of water collected in the areas referred to in subparagraph (1)(a)(ii).

Information Related to Effluent and Water Quality Monitoring Studies

8 The following information in relation to the effluent and water quality monitoring studies conducted during a calendar year under sections 4 to 7 shall be submitted to the Minister of the Environment not later than March 31 of the following year:

(a) the dates on which samples were collected for effluent characterization, sublethal toxicity testing and water quality monitoring;

(b) for each sample collected for effluent characterization, the location of the final discharge point from which samples were collected for effluent characterization;

(c) the location of the final discharge point from which samples were collected for sublethal toxicity testing and the data used in selecting the final discharge point in accordance with subsection 5(3);

(d) the latitude and longitude of sampling areas for water quality monitoring and a description that is sufficient to identify the location of the sampling areas;

(e) the results of effluent characterization, sublethal toxicity testing and water quality monitoring;

(i) la concentration de cyanure n'est enregistrée que si cette substance est utilisée comme réactif de procédé sur le chantier,

(ii) la concentration de radium 226 n'est pas enregistrée si les conditions mentionnées au paragraphe 13(2) du présent règlement sont remplies;

e) par la prise des mesures d'assurance de la qualité et de contrôle de la qualité pour garantir l'exactitude des données visant le suivi de la qualité de l'eau.

(2) Le suivi de la qualité de l'eau est effectué :

a) quatre fois par année civile et à au moins un mois d'intervalle sur les échantillons d'eau prélevés, lorsque la mine rejette de l'effluent, dans les zones visées au sous-alinéa (1)a)(i);

b) en même temps que les études de suivi biologique, sur les échantillons d'eau prélevés dans les zones visées au sous-alinéa (1)a)(ii).

Renseignements relatifs aux études de suivi de l'effluent et de la qualité de l'eau

8 Les renseignements ci-après, relatifs aux études de suivi de l'effluent et de la qualité de l'eau effectuées au cours d'une année civile en application des articles 4 à 7, sont présentés au ministre de l'Environnement au plus tard le 31 mars de l'année suivante :

a) les dates de prélèvement des échantillons pour la caractérisation de l'effluent, les essais de toxicité sublétale et le suivi de la qualité de l'eau;

b) l'emplacement des points de rejet final où les échantillons sont prélevés pour la caractérisation de l'effluent;

c) l'emplacement du point de rejet final où les échantillons ont été prélevés pour les essais de toxicité sublétale et les données qui ont servi à le sélectionner conformément au paragraphe 5(3);

d) la latitude et la longitude des zones d'échantillonnage utilisées pour le suivi de la qualité de l'eau et une description qui permet de reconnaître l'emplacement de ces zones;

e) les résultats de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau;

(f) the methodologies used to conduct effluent characterization and water quality monitoring, and the related method detection limits;

(g) a description of the quality assurance and quality control measures that were implemented and the data related to the implementation of those measures; and

(h) with respect to every effluent sample collected at each final discharge point, the annual mean concentration of mercury and selenium.

f) les méthodes utilisées pour la caractérisation de l'effluent et le suivi de la qualité de l'eau, ainsi que les limites de détection de celles-ci;

g) la description des mesures d'assurance de la qualité et de contrôle de la qualité qui ont été prises ainsi que les données associées à leur mise en œuvre;

h) à l'égard de chaque échantillon d'effluent prélevé à tout point final de rejet, les concentrations moyennes annuelles de mercure et de sélénium.

PART 2

Biological Monitoring Studies

Required Studies

9 (1) Biological monitoring studies shall include

(a) a study respecting fish population, if the highest concentration of effluent in the exposure area, during a period in which there are deposits, is greater than 1% at any location that is 250 m from a point at which the effluent enters the area from a final discharge point, unless the results of the previous two biological monitoring studies indicate

(i) for all effect indicators with no assigned critical effect size, no effect on the fish population, and

(ii) for all effect indicators with an assigned critical effect size, no effect on the fish population or an effect on the fish population the absolute value of the magnitude of which is less than the absolute value of its assigned critical effect size;

(b) a study respecting the benthic invertebrate community, if the highest concentration of effluent in the exposure area, during a period in which there are deposits, is greater than 1% at any location that is 100 m from a point at which the effluent enters the area from a final discharge point, unless the results of the previous two biological monitoring studies indicate

(i) for all effect indicators with no assigned critical effect size, no effect on the benthic invertebrate community, and

(ii) for all effect indicators with an assigned critical effect size, no effect on the benthic invertebrate community or an effect on the benthic invertebrate community the absolute value of the magnitude of which is less than the absolute value of its assigned critical effect size;

PARTIE 2

Études de suivi biologique

Composition des études

9 (1) Les études de suivi biologique comportent :

a) une étude sur la population de poissons, si la concentration de l'effluent la plus élevée dans une zone exposée, lors d'une période pendant laquelle il y a des rejets, est supérieure à 1 % à tout endroit situé à 250 m du point où l'effluent entre dans la zone depuis un point de rejet final, à moins que les résultats des deux études de suivi biologique précédentes révèlent, à la fois :

(i) à l'égard des indicateurs d'effet pour lesquels il n'y a pas de seuil critique d'effet, qu'il n'y a aucun effet sur la population de poissons,

(ii) à l'égard des indicateurs d'effet pour lesquels il y a un seuil critique d'effet, qu'il n'y a aucun effet sur la population de poissons ou qu'il y a un effet sur la population de poissons, dont la valeur absolue de l'ampleur est inférieure à la valeur absolue du seuil critique d'effet;

b) une étude sur la communauté d'invertébrés benthiques, si la concentration de l'effluent la plus élevée dans une zone exposée, lors d'une période pendant laquelle il y a des rejets, est supérieure à 1 % à tout endroit situé à 100 m d'un point où l'effluent entre dans la zone depuis un point de rejet final, sauf si les résultats des deux études de suivi biologique précédentes révèlent à la fois :

(i) à l'égard des indicateurs d'effet pour lesquels il n'y a pas de seuil critique d'effet, qu'il n'y a aucun effet sur la communauté d'invertébrés benthiques,

(ii) à l'égard des indicateurs pour lesquels il y a un seuil critique d'effet, qu'il n'y a aucun effet sur la

(c) a study respecting fish tissue mercury, if

(i) effluent characterization reveals an annual mean concentration of total mercury in the effluent that is equal to or greater than 0.10 µg/L, based on a calendar year, unless the results of the previous two biological monitoring studies indicate no effect on fish tissue from mercury, or

(ii) the method detection limit used in respect of mercury for the analysis of at least two of four effluent samples in a calendar year is equal to or greater than 0.10 µg/L;

(d) a study respecting fish tissue selenium, if

(i) effluent characterization reveals a concentration of total selenium in the effluent that is equal to or greater than 10 µg/L,

(ii) effluent characterization reveals an annual mean concentration of total selenium in the effluent that is equal to or greater than 5 µg/L, based on a calendar year, or

(iii) the method detection limit used in respect of selenium for the analysis of any effluent sample is equal to or greater than 10 µg/L, or the method detection limit used in respect of selenium for the analysis of at least two of four effluent samples in a calendar year is equal to or greater than 5 µg/L; and

(e) if the cause of any effect on the fish population, on fish tissue from mercury or on the benthic invertebrate community is not known, a study that will be used to determine the cause of the effect if

(i) the results of the previous two biological monitoring studies indicate a similar type of effect, and

(ii) for an effect indicator with an assigned critical effect size, the absolute value of the magnitude of the effect is equal to or greater than the absolute value of its critical effect size in either of those studies.

communauté d'invertébrés benthiques ou il y a un effet sur la communauté d'invertébrés benthiques, dont la valeur absolue de l'ampleur est inférieure à la valeur absolue du seuil critique d'effet;

c) une étude sur le mercure dans les tissus de poissons, si :

(i) soit la caractérisation de l'effluent révèle une concentration annuelle moyenne de mercure total égale ou supérieure à 0,10 µg/L pour une année civile donnée, sauf si les résultats des deux études de suivi biologique précédentes révèlent qu'il n'y a aucun effet du mercure sur les tissus de poissons,

(ii) soit la limite de détection de la méthode utilisée, à l'égard du mercure, pour l'analyse d'au moins deux échantillons d'effluent sur quatre pour une année civile donnée est égale ou supérieure à 0,10 µg/L;

d) une étude sur le sélénium dans les tissus de poissons, si :

(i) soit la caractérisation de l'effluent révèle une concentration de sélénium total égale ou supérieure à 10 µg/L,

(ii) soit la caractérisation de l'effluent révèle une concentration annuelle moyenne de sélénium total égale ou supérieure à 5 µg/L pour une année civile donnée,

(iii) soit la limite de détection de la méthode utilisée, à l'égard du sélénium, pour l'analyse de tout échantillon d'effluent est égale ou supérieure à 10 µg/L ou la limite de détection de la méthode utilisée, à l'égard du sélénium, pour l'analyse d'au moins deux échantillons d'effluent sur quatre pour une année civile donnée est égale ou supérieure à 5 µg/L;

e) si la cause d'un effet sur la population de poissons, d'un effet du mercure sur les tissus de poissons ou d'un effet sur la communauté d'invertébrés benthiques n'est pas connue, une étude qui sera utilisée pour établir la cause de l'effet si, à la fois :

(i) les résultats des deux études de suivi biologique précédentes indiquent un type d'effet semblable,

(ii) à l'égard de tout indicateur d'effet pour lequel un seuil critique d'effet est prévu, la valeur absolue de l'ampleur de l'effet est égale ou supérieure à la valeur absolue du seuil critique d'effet, dans l'une ou l'autre de ces deux études précédentes.

(2) If the results of the previous two biological monitoring studies are used to lift the requirement to conduct a study under any of paragraphs (1)(a), (b), (c) or (e), the earlier of those two studies shall not be used to lift a requirement to conduct a subsequent study.

(3) For the purposes of subsection (1), the concentration of effluent shall be determined or the effluent characterization shall be carried out, as the case may be,

(a) in the case of the first biological monitoring studies, beginning on the day on which the mine becomes subject to section 7 of these Regulations and ending on the day before the day on which the first study design is required to be submitted; and

(b) for any subsequent biological monitoring studies, beginning on the day on which the previous study design was required to be submitted and ending on the day before the day on which the subsequent study design is required to be submitted.

(2) Si les résultats des deux études de suivi biologique précédentes sont utilisés pour lever l'obligation de présenter une étude en application des alinéas (1)a), b), c) ou e), celle qui est antérieure à l'autre ne peut être utilisée pour lever l'obligation de présenter une étude subséquente.

(3) Pour l'application du paragraphe (1), la concentration de l'effluent est déterminée — et la caractérisation de l'effluent est effectuée — selon les périodes suivantes :

a) dans le cas des premières études de suivi biologique, à partir de la date à laquelle la mine est assujettie à l'article 7 du présent règlement et jusqu'au jour qui précède la date à laquelle le premier plan d'étude doit être présenté;

b) pour les études de suivi biologique subséquentes, à partir de la date à laquelle le plan d'étude précédent devait être présenté et jusqu'au jour qui précède la date à laquelle le plan d'étude subséquent doit être présenté.

DIVISION 1

First Biological Monitoring Studies

First Study Design

10 A first study design shall be submitted to the Minister of the Environment not later than 12 months after the day on which a mine becomes subject to section 7 of these Regulations. It shall contain

(a) a site characterization that includes

(i) a description of the manner in which the effluent mixes within each exposure area, during a period in which there are deposits, including an estimate of the concentration of effluent in the exposure area at 100 m and 250 m from every point at which the effluent enters the area from a final discharge point and — in respect of each calendar year — any supporting data, including raw data, for the estimate,

(ii) a description of the exposure and reference areas where the biological monitoring studies would be conducted — whether or not they are required — that includes information on the geological, hydrological, oceanographical, limnological, chemical and biological features of those areas,

SECTION 1

Premières études de suivi biologique

Premier plan d'étude

10 Un premier plan d'étude est présenté au ministre de l'Environnement au plus tard douze mois après la date à laquelle la mine devient assujettie à l'article 7 du présent règlement et comporte :

a) la caractérisation du site comportant :

(i) une description de la façon dont l'effluent se mélange dans chaque zone exposée, lors d'une période pendant laquelle il y a des rejets, notamment une estimation de la concentration de l'effluent à 100 m et à 250 m de chaque point où l'effluent entre dans la zone depuis un point de rejet final ainsi que, à l'égard de toute année civile, toute donnée justificative à l'appui de l'estimation, y compris les données brutes,

(ii) une description des zones exposées et des zones de référence, si une étude de suivi biologique serait menée, qu'elle soit exigée ou non, y compris les renseignements sur les caractéristiques géologiques, hydrologiques, océanographiques, limnologiques, chimiques et biologiques de ces zones,

(iii) the type of production process used by the mine and the environmental protection practices in place at the mine,

(iv) a description of any anthropogenic, natural or other factors that are not related to the effluent but that may reasonably be expected to affect the results of any biological monitoring study, whether or not it is required, and

(v) any additional information that would enable a determination as to whether studies would be conducted in accordance with generally accepted standards of good scientific practice;

(b) a description of how any required study respecting fish population, fish tissue mercury and fish tissue selenium will be conducted that includes

(i) a description of and the scientific rationale for

(A) the fish species selected, taking into account the abundance of the species most exposed to effluent,

(B) the sampling areas selected within the exposure area and the reference area,

(C) the sampling period selected,

(D) the sample size selected, and

(E) the field and laboratory methodologies selected, and

(ii) an explanation as to how, in the case of the study respecting fish population or fish tissue mercury, the study will provide the information necessary to determine if the effluent has an effect on fish population or on fish tissue from mercury;

(c) a description of how any required study respecting the benthic invertebrate community will be conducted that includes

(i) a description of and the scientific rationale for

(A) the sampling areas selected, taking into account the benthic invertebrate diversity and the area most exposed to effluent,

(B) the sampling period selected,

(C) the sample size selected, and

(D) the field and laboratory methodologies selected, and

(iii) le type de procédé de production utilisé par la mine et les pratiques de protection de l'environnement appliquées à la mine,

(iv) les facteurs anthropiques, naturels ou autres non liés à l'effluent, mais dont on peut raisonnablement s'attendre à ce qu'ils affectent les résultats de toute étude de suivi biologique, qu'elle soit exigée ou non,

(v) tout renseignement supplémentaire qui permet de déterminer si des études seraient effectuées conformément aux normes généralement reconnues régissant les bonnes pratiques scientifiques;

b) la description du déroulement de l'étude portant sur la population de poissons, sur le mercure dans les tissus de poissons ou sur le sélénium dans les tissus de poissons, si une telle étude est exigée :

(i) les éléments ci-après, y compris les motifs scientifiques à l'appui :

(A) les espèces de poissons choisies, compte tenu de l'abondance des espèces les plus exposées à l'effluent,

(B) les zones d'échantillonnage choisies de la zone exposée et de la zone de référence,

(C) la période d'échantillonnage choisie,

(D) la taille des échantillons choisie,

(E) les méthodes choisies sur le terrain et en laboratoire,

(ii) dans le cas de l'étude sur la population de poissons ou de l'étude sur le mercure dans les tissus de poissons, la façon dont l'étude fournira les renseignements permettant de déterminer si l'effluent a un effet sur la population de poissons ou un effet du mercure sur les tissus de poissons;

c) la description du déroulement de toute étude sur la communauté d'invertébrés benthiques exigée, notamment :

(i) une description des éléments ci-après, y compris les motifs scientifiques à l'appui :

(A) les zones d'échantillonnage choisies, compte tenu de la diversité des invertébrés benthiques et de la zone la plus exposée à l'effluent,

(B) la période d'échantillonnage choisie,

(ii) an explanation as to how the study will provide the information necessary to determine if the effluent has an effect on the benthic invertebrate community;

(d) the month in which the samples will be collected for each required biological monitoring study;

(e) a description of the quality assurance and quality control measures that will be implemented for each required biological monitoring study to ensure the validity of the data that is collected; and

(f) a summary of the results of any studies to determine whether the effluent was causing an effect on the fish population, fish tissue from mercury or the benthic invertebrate community and of any studies in the exposure and reference areas respecting fish tissue selenium completed before the mine becomes subject to section 7 of these Regulations and any scientific data to support the results.

First Biological Monitoring Studies

11 (1) Subject to subsection (2), the first biological monitoring studies shall start not earlier than six months after the day on which the first study design is submitted under section 10, and shall be conducted in accordance with that study design.

(2) If the owner or operator is unable to follow the study design due to circumstances beyond their control, the owner or operator shall inform the Minister of the Environment without delay of those circumstances and of the changes that are made to the study.

First Interpretative Report

12 (1) A first interpretative report shall be submitted to the Minister of the Environment not later than 36 months after the day on which the mine becomes subject to section 7 of these Regulations. It shall contain

(a) a description of any deviation from the study design that occurred while the biological monitoring studies were being conducted and any impact that the deviation had on the studies;

(C) la taille des échantillons choisie,

(D) les méthodes choisies sur le terrain et en laboratoire,

(ii) la façon dont l'étude fournira les renseignements permettant de déterminer si l'effluent a un effet sur la communauté d'invertébrés benthiques;

d) le mois pendant lequel les échantillons seront prélevés pour toute étude de suivi biologique exigée;

e) la description des mesures d'assurance de la qualité et de contrôle de la qualité pour toute étude de suivi biologique exigée qui seront prises pour garantir la validité des données recueillies;

f) un résumé des résultats de toute étude qui indique si l'effluent produit un effet sur les populations de poissons, un effet du mercure sur les tissus de poissons ou un effet sur la communauté d'invertébrés benthiques et de toute étude sur le sélénium dans les tissus de poissons dans la zone exposée et de référence, effectuées avant la date à laquelle la mine devient assujettie à l'article 7 du présent règlement, ainsi que toutes données scientifiques justificatives.

Premières études de suivi biologique

11 (1) Les premières études de suivi biologique débutent au plus tôt six mois après la date à laquelle le premier plan d'étude a été présenté en application de l'article 10 et sont effectuées conformément à ce plan.

(2) Toutefois, si le propriétaire ou l'exploitant est incapable de suivre le plan d'étude pour des raisons indépendantes de sa volonté, il en avise sans délai le ministre de l'Environnement et l'informe des modifications à apporter aux modalités du déroulement de l'étude.

Premier rapport d'interprétation

12 (1) Un premier rapport d'interprétation est présenté au ministre de l'Environnement au plus tard trente-six mois après la date à laquelle la mine devient assujettie à l'article 7 du présent règlement et comporte :

a) la description de tout écart par rapport au plan d'étude qui s'est produit durant les études de suivi biologique et l'incidence de ces écarts sur les études;

b) la latitude et la longitude des zones d'échantillonnage et une description qui permet de reconnaître l'emplacement de ces zones;

(b) the latitude and longitude of sampling areas and a description of the sampling areas sufficient to identify the location of the sampling areas;

(c) the dates and times when samples were collected;

(d) the sample sizes;

(e) the mean, median, standard deviation, standard error and minimum and maximum values in the sampling areas for

(i) in the case of the study respecting fish population, effect indicators of growth, reproduction, condition and survival that include, if practicable, the length, total body weight and age of the fish, the weight of its liver or hepatopancreas and, if the fish are sexually mature, the egg weight, fecundity and gonad weight of the fish,

(ii) in the case of the study respecting the benthic invertebrate community, effect indicators of the total benthic invertebrate density, evenness index, taxa richness and, if the study is conducted in an area where it is possible to sample sediment, total organic carbon content of sediment and particle size distribution of sediment,

(iii) in the case of the study respecting fish tissue mercury, the effect indicator of the concentration of total mercury (wet weight) in the fish tissue, and

(iv) in the case of the study respecting fish tissue selenium, the concentration — in the muscle or whole body and, if practicable, in the ovaries or eggs — of total selenium (dry weight) reported in µg/g and the percentage of the moisture content of the sample;

(f) in the case of the study respecting the benthic invertebrate community, a calculation of the similarity index effect indicator;

(g) an identification of the sex of the fish sampled and of the presence of any lesions, tumours, parasites or other abnormalities and, in the case of the study respecting fish tissue selenium, the type of fish tissue studied and the scientific rationale for the selection of that tissue;

(h) a determination as to whether there is a statistically significant difference between the sampling areas for the calculations under subparagraphs (e)(i) to (iii) and paragraph (f) taking into consideration the information identified under paragraph (g), with the statistical comparison made separately and independently for each effect indicator;

c) les dates et heures de prélèvement des échantillons;

d) la taille des échantillons;

e) la moyenne, la médiane, l'écart-type, l'erreur-type ainsi que les valeurs minimales et maximales dans les zones d'échantillonnage quant aux éléments suivants :

(i) dans le cas de l'étude sur la population de poissons, les indicateurs d'effet qui portent sur la croissance des poissons, leur reproduction, leur condition et leur survie qui comprennent, dans la mesure du possible, la longueur, le poids corporel total, l'âge, le poids du foie ou de l'hépatopancréas et, si les poissons ont atteint la maturité sexuelle, le poids des œufs, le taux de fécondité et le poids des gonades,

(ii) dans le cas de l'étude sur la communauté d'invertébrés benthiques, les indicateurs d'effet qui portent sur la densité totale des invertébrés benthiques, l'indice de régularité, la richesse des taxons et, si des sédiments peuvent être prélevés à l'endroit où s'effectue l'étude, la teneur en carbone organique total des sédiments et la distribution granulométrique de ceux-ci,

(iii) dans le cas de l'étude sur le mercure dans les tissus de poissons, l'indicateur d'effet portant sur la concentration de mercure total (poids humide) dans les tissus,

(iv) dans le cas de l'étude sur le sélénium dans les tissus de poissons, la concentration — dans les muscles ou le corps et, dans la mesure du possible, les ovaires ou les œufs — de sélénium total (poids sec), rapportée en µg/g, et le pourcentage d'humidité de l'échantillon;

f) dans le cas de l'étude sur la communauté d'invertébrés benthiques, le calcul de l'indicateur d'effet portant sur l'indice de similitude;

g) l'identification du sexe des poissons pris et la présence de lésions, de tumeurs, de parasites et d'autres anomalies et, dans le cas de l'étude sur le sélénium dans les tissus de poissons, le type de tissu étudié ainsi que les motifs scientifiques à l'appui du choix de tissu;

h) l'établissement à savoir s'il existe une différence statistique significative entre les zones d'échantillonnage pour les calculs effectués en application des sous-alinéas e)(i) à (iii) et de l'alinéa f) et eu égard aux renseignements visés à l'alinéa g), selon une comparaison statistique séparée et indépendante pour chaque indicateur d'effet;

(i) a statistical analysis of the results of the calculations under subparagraphs (e)(i) to (iii) and paragraph (g) that indicates the probability of correctly detecting an effect of a pre-defined size and the degree of confidence that can be placed in the calculations;

(j) for an effect indicator referred to in paragraph (e) with an assigned critical effect size, a comparison of the magnitude of the effect — calculated in accordance with subsection (2) or (3), as the case may be — to its critical effect size;

(k) any supporting data, including raw data, for the information provided under paragraphs (e) to (j);

(l) a description of any quality assurance or quality control measures that were implemented and the data related to the implementation of those measures;

(m) based on the information referred to in paragraphs (e) to (k), the identification of

(i) any effect on the fish population,

(ii) any effect on the benthic invertebrate community, and

(iii) any effect on fish tissue from mercury;

(n) for an effect indicator with an assigned critical effect size, a statement as to whether the absolute value of the magnitude of the effect is equal to or greater than the absolute value of its critical effect size;

(o) a summary of the results of effluent characterization, sublethal toxicity testing and water quality monitoring reported under paragraph 8(e) beginning on the day on which the mine becomes subject to section 7 of these Regulations;

(p) the conclusions of the biological monitoring studies, and a description of how those conclusions will impact the study design for subsequent biological monitoring studies, taking into account

(i) the results of any studies referred to in paragraph 10(f),

(ii) the presence of anthropogenic, natural or other factors that are not related to the effluent under study and that may reasonably be expected to contribute to any observed effect,

(iii) the results of the statistical analysis conducted under paragraphs (h) and (i), and

(iv) the data referred to in paragraph (l);

i) une analyse statistique des résultats des calculs effectués en application des sous-alinéas e)(i) à (iii) et de l'alinéa g) qui indique la probabilité de détection correcte d'un effet d'une ampleur prédéterminée ainsi que le degré de confiance pouvant être accordé aux calculs;

j) une comparaison de l'ampleur de l'effet — calculée conformément aux paragraphes (2) ou (3) — par rapport au seuil critique d'effet d'un indicateur d'effet visé par l'alinéa e) et pour lequel il y a un seuil critique d'effet;

k) toute donnée justificative à l'appui, y compris les données brutes, relatives aux renseignements visés aux alinéas e) à j);

l) la description des mesures d'assurance de la qualité et de contrôle de la qualité qui ont été prises ainsi que les données associées à leur mise en œuvre;

m) selon les renseignements visés aux alinéas e) à k), l'indication de tout :

(i) effet sur la population de poissons,

(ii) effet sur la communauté d'invertébrés benthiques,

(iii) effet du mercure sur les tissus de poissons;

n) à l'égard de tout indicateur d'effet, un énoncé à savoir si la valeur absolue de l'ampleur de l'effet est égale ou supérieure à la valeur absolue du seuil critique d'effet prévu pour cet indicateur d'effet;

o) un résumé des résultats de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau visés à l'alinéa 8e) à partir de la date où la mine devient assujettie à l'article 7 du présent règlement;

p) les conclusions des études de suivi biologique et l'incidence de ces conclusions sur le plan d'étude pour les études de suivi biologique subséquentes, compte tenu des éléments suivants :

(i) les résultats de toute étude visée à l'alinéa 10f),

(ii) la présence de facteurs anthropiques, naturels ou autres non liés à l'effluent à l'étude et dont on peut raisonnablement s'attendre à ce qu'ils contribuent à tout effet observé,

(iii) les résultats de l'analyse statistique effectuée en application des alinéas h) et i),

(q) the month in which the next biological monitoring studies will start, if any biological monitoring studies are required; and

(r) the date when the next interpretative report is required to be submitted or would be required to be submitted but for the application of subsection 16(3).

(2) For the purpose of the study respecting fish population, the magnitude of the effect for an effect indicator is to be calculated using the following formula:

(A – B)/B × 100

where

A is

(a) for the purpose of the age indicator, the mean value for the indicator in the exposure area, and

(b) for the purpose of the indicators other than age, the adjusted mean value — obtained using the analysis of covariance (ANCOVA) statistical test method — for the indicator in the exposure area; and

B is

(a) for the purpose of the age indicator, the mean value for the indicator in the reference area, and

(b) for the purpose of the indicators other than age, the adjusted mean value — obtained using the analysis of covariance (ANCOVA) statistical test method — for the indicator in the reference area.

(3) For the purposes of the study respecting the benthic invertebrate community, the magnitude of the effect for an effect indicator is to be calculated using the following formula:

(A – B)/C

where

A is the mean value for the indicator in the exposure area;

B is the mean value for the indicator in the reference area; and

C is the standard deviation for the indicator in the reference area.

(iv) les données visées à l'alinéa l);

q) le mois pendant lequel les prochaines études de suivi biologique débuteront, si des études de suivi biologique sont exigées;

r) la date à laquelle le prochain rapport d'interprétation doit être présenté ou devrait être présenté si ce n'était l'application du paragraphe 16(3).

(2) Pour l'étude sur la population de poissons, l'ampleur de l'effet d'un indicateur d'effet se calcule selon la formule suivante :

(A – B)/B × 100

où :

A représente :

a) dans le cas de l'âge, la moyenne pour l'indicateur dans la zone exposée;

b) dans le cas des autres indicateurs d'effet, la moyenne ajustée — obtenue en application de la méthode statistique de l'analyse de covariance (ANCOVA) — pour l'indicateur dans la zone exposée;

B selon le cas :

a) dans le cas de l'âge, la moyenne pour l'indicateur dans la zone de référence;

b) dans le cas des autres indicateurs d'effet, la moyenne ajustée — obtenue en application de la méthode statistique de l'analyse de covariance (ANCOVA) — pour l'indicateur dans la zone de référence.

(3) Pour l'étude sur la communauté d'invertébrés benthiques, l'ampleur de l'effet d'un indicateur se calcule selon la formule suivante :

(A – B)/C

où :

A représente la moyenne pour l'indicateur dans la zone exposée;

B la moyenne pour l'indicateur dans la zone de référence;

C l'écart-type pour l'indicateur dans la zone de référence.

DIVISION 2

Subsequent Biological Monitoring Studies

Subsequent Study Designs

13 (1) Each subsequent study design shall be submitted to the Minister of the Environment

(a) at least six months before the start of the biological monitoring studies that are set out in that study design; or

(b) if no biological monitoring studies are required, not later than 12 months after the day on which the previous interpretative report was required to be submitted or would have been required to be submitted but for the application of subsection 16(3).

(2) Each subsequent study design shall include

(a) a summary of the information referred to in paragraph 10(a) and a description of any changes to that information since the submission of the most recent study design, as well as — in respect of each calendar year — any supporting data, including raw data, for the estimate referred to in subparagraph 10(a)(i), whether or not the estimate has changed;

(b) the information referred to in paragraphs 10(b) to (e);

(c) a summary of the results of any biological monitoring studies conducted after June 6, 2002;

(d) if the study referred to in paragraph 9(1)(e) is required,

(i) the month in which the study will start, and

(ii) a description of how the study will be conducted that includes any field and laboratory methodologies that will be used to determine the cause of the effect; and

(e) if the cause of an effect on the fish population, on fish tissue from mercury or on the benthic invertebrate community is known, the cause of the effect and any supporting data, including raw data.

SECTION 2

Études de suivi biologique subséquentes

Plans d'étude subséquents

13 (1) Tout plan d'étude de suivi biologique subséquent est présenté au ministre de l'Environnement :

a) au moins six mois avant le début des études de suivi biologique visées dans ce plan d'étude;

b) si aucune étude de suivi biologique n'est exigée, au plus douze mois après la date à laquelle le rapport d'interprétation précédent devait être présenté ou aurait dû être présenté si ce n'était l'application du paragraphe 16(3).

(2) Tout plan d'étude de suivi biologique subséquent comporte :

a) un résumé des renseignements visés à l'alinéa 10a) et une description de toute modification à ces renseignements apportée depuis la présentation du dernier plan d'étude ainsi que, à l'égard de toute année civile, toute donnée justificative à l'appui de l'estimation visée au sous-alinéa 10a)(i), y compris les données brutes, que cette estimation ait changé ou non;

b) les renseignements visés aux alinéas 10b) à e);

c) un résumé des résultats de toute étude de suivi biologique effectuée depuis le 6 juin 2002;

d) si une étude visée à l'alinéa 9(1)e) est requise :

(i) le mois pendant lequel l'étude débutera,

(ii) une description de la façon dont l'étude sera effectuée, y compris toute méthode sur le terrain et en laboratoire, pour établir la cause de l'effet;

e) si la cause d'un effet sur la population de poissons, d'un effet du mercure sur les tissus de poissons ou d'un effet sur la communauté d'invertébrés benthiques est connue, la cause de l'effet ainsi que toute donnée justificative à l'appui, y compris les données brutes.

Conduct of Subsequent Biological Monitoring Studies

14 (1) Subject to subsection (2), the subsequent biological monitoring studies shall be conducted in accordance with the study design submitted under section 13.

(2) If the owner or operator is unable to follow the study design due to circumstances beyond their control, the owner or operator shall inform the Minister of the Environment without delay of those circumstances and the changes that are made to the study.

Content of Subsequent Interpretative Reports

15 Subject to subsection 16(3), each subsequent study design shall be followed by a subsequent interpretative report that includes

(a) for a study referred to in paragraphs 9(1)(a) to (d), the information referred to in paragraphs 12(1)(a) to (n) and (p) to (r);

(b) a summary of the results of effluent characterization, sublethal toxicity testing and water quality monitoring reported under paragraph 8(e) after the day on which the previous interpretative report was required to be submitted or would have been required to be submitted but for the application of subsection 16(3); and

(c) if the study design includes the description required under paragraph 13(2)(d),

(i) the cause of the effect, if determined, and any supporting data, including raw data, or

(ii) if the cause of the effect was not determined, an explanation of why and a description of any steps that need to be taken in the next study to determine that cause.

Submission of Subsequent Interpretative Reports

16 (1) Subject to subsection (2), each subsequent interpretative report shall be submitted to the Minister of the Environment not later than 36 months after the day on which the previous interpretative report was required to be submitted or would have been required to be submitted but for the application of subsection 16(3).

(2) The interpretative report following a resumption of effluent discharge referred to in subsection 17(2) shall be

Déroulement des études de suivi biologique subséquentes

14 (1) Toute étude de suivi biologique subséquente est effectuée conformément au plan d'étude présenté en application de l'article 13.

(2) Toutefois, si le propriétaire ou l'exploitant est incapable de suivre le plan d'étude pour des raisons indépendantes de sa volonté, il en avise sans délai le ministre de l'Environnement et l'informe des modifications à apporter aux modalités du déroulement de l'étude.

Contenu des rapports d'interprétation subséquents

15 Sous réserve du paragraphe 16(3), tout plan d'étude subséquent est suivi d'un rapport d'interprétation subséquent qui comporte :

a) dans le cas des études visées aux alinéas 9(1)a) à d), les renseignements visés aux alinéas 12(1)a) à n) et p) à r);

b) un résumé des résultats de la caractérisation de l'effluent, des essais de toxicité sublétale et du suivi de la qualité de l'eau visés à l'alinéa 8e) à partir de la date à laquelle le rapport d'interprétation précédent devait être présenté ou aurait dû être présenté si ce n'était l'application du paragraphe 16(3);

c) si le plan d'étude comprend une description exigée par l'alinéa 13(2)d) :

(i) la cause de l'effet, si elle a été déterminée, ainsi que toutes données justificatives à l'appui, y compris les données brutes,

(ii) si la cause n'a pas été déterminée, les raisons de l'échec ainsi que les mesures nécessaires pour déterminer cette cause lors de la prochaine étude.

Présentation des rapports d'interprétation subséquents

16 (1) Tout rapport d'interprétation subséquent est présenté au ministre de l'Environnement au plus tard trente-six mois après la date à laquelle le rapport d'interprétation précédent devait être présenté ou aurait dû être présenté si ce n'était l'application du paragraphe 16(3).

(2) Toutefois, le rapport d'interprétation suivant la reprise du rejet d'effluents visée au paragraphe 17(2) est

submitted not later than 36 months after the day on which effluent discharge resumes.

(3) An interpretative report is not required in respect of a 36-month period if no biological monitoring studies are required in respect of that period.

Cessation of Discharge

17 (1) The owner or operator of a mine that has ceased discharging effluent for a period of at least 36 months is not required to conduct environmental effects monitoring studies so long as the period of cessation continues.

(2) The requirement to conduct environmental effects monitoring studies shall resume, as the case may be, on

(a) the day on which effluent discharge resumes; or

(b) the day on which a notice referred to in paragraph 32(1)(a) of these Regulations is received by the Minister of the Environment.

(3) The owner or operator shall notify the Minister of the Environment in writing without delay

(a) when the period of cessation begins; and

(b) when the mine resumes effluent discharge.

(4) Any biological monitoring study that began before the end of the 36-month period shall be completed and followed by an interpretative report in accordance with section 15.

DIVISION 3

Final Studies

General

18 (1) If an owner or operator of a mine has provided a notice referred to in paragraph 32(1)(a) of these Regulations to the Minister of the Environment, the owner or operator shall

(a) if the notice is received before biological monitoring studies have started, conduct the biological monitoring studies and submit any interpretative report that is required in respect of those studies; and

(b) if the notice is received after biological monitoring studies have started, in addition to submitting any

présenté au plus tard trente-six mois après la date de cette reprise.

(3) Aucun rapport d'interprétation n'est exigé à l'égard d'une période de trente-six mois à l'égard de laquelle aucune étude de suivi biologique n'est exigée.

Cessation du rejet d'effluent

17 (1) Le propriétaire ou l'exploitant d'une mine dont les rejets d'effluent ont cessé pour une période d'au moins trente-six mois n'a pas l'obligation de mener des études de suivi des effets sur l'environnement tant que l'absence de rejets se poursuit.

(2) L'obligation de mener des études de suivi des effets sur l'environnement reprend, selon le cas :

a) à la date de reprise du rejet d'effluents;

b) à la date à laquelle l'avis visé à l'alinéa 32(1)a) du présent règlement est reçu par le ministre de l'Environnement.

(3) Le propriétaire ou l'exploitant d'une mine avise le ministre de l'Environnement par écrit sans délai :

a) au début de la période d'absence de rejet d'effluents;

b) à la reprise du rejet d'effluents.

(4) Toute étude de suivi biologique débutée avant la fin de la période de trente-six mois est complétée et suivie d'un rapport d'interprétation conformément à l'article 15.

SECTION 3

Études finales

Généralités

18 (1) S'il a présenté au ministre de l'Environnement un avis visé à l'alinéa 32(1)a) du présent règlement, le propriétaire ou l'exploitant d'une mine :

a) dans le cas où l'avis est reçu avant le début des études de suivi biologique, effectue les études de suivi biologique et présente tout rapport d'interprétation requis à l'égard de ces études;

b) dans le cas où l'avis est reçu après le début des études de suivi biologique, en plus d'effectuer les études de suivi biologique et de présenter tout rapport

interpretative report that is required in respect of those studies, submit a final study design in accordance with subsection (2), conduct final biological monitoring studies in accordance with section 19 and submit a final interpretative report in accordance with section 20.

d'interprétation exigé à l'égard de ces études, présente un plan d'étude final conformément au paragraphe (2), effectue une étude de suivi biologique finale conformément à l'article 19 et présente un rapport d'interprétation final conformément à l'article 20.

(2) The final study design shall be submitted to the Minister of the Environment not later than six months after the day on which the notice referred to in paragraph 32(1)(a) of these Regulations is received. It shall include the information required under subsection 13(2).

(2) Le plan d'étude final est présenté au ministre de l'Environnement au plus tard six mois après la date de réception de l'avis visé à l'alinéa 32(1)a) du présent règlement et comporte les renseignements exigés par le paragraphe 13(2).

Conduct of Final Biological Monitoring Studies

19 (1) Subject to subsection (2), the final biological monitoring studies shall be conducted in accordance with the study design submitted under subsection 18(2) not earlier than six months after the day on which the final study design has been submitted.

(2) If the owner or operator is unable to follow the study design due to circumstances beyond their control, the owner or operator shall inform the Minister of the Environment without delay of those circumstances and the changes that are made to the study.

Déroulement des études de suivi biologique finales

19 (1) Les études de suivi biologique finales sont effectuées conformément au plan d'étude présenté en application du paragraphe 18(2), au plus tôt six mois après la date de présentation du plan d'étude final.

(2) Toutefois, si le propriétaire ou l'exploitant est incapable de suivre le plan d'étude pour des raisons indépendantes de sa volonté, il en avise sans délai le ministre de l'Environnement et l'informe des modifications à apporter aux modalités du déroulement de l'étude.

Content of Final Interpretative Report

20 The final interpretative report shall be submitted to the Minister of the Environment not later than three years after the day on which the notice referred to in paragraph 32(1)(a) of these Regulations is received and shall include the information referred to in paragraphs 15(a) to (c).

SOR/2006-239, ss. 26 to 33, 34(F); SOR/2012-22, ss. 10 to 17; SOR/2018-99, s. 33; SOR/2021-125, s. 14(F).

Contenu du rapport d'interprétation final

20 Le rapport d'interprétation final est présenté au ministre de l'Environnement au plus tard trois ans après la date de réception de l'avis visé à l'alinéa 32(1)a) du présent règlement et comporte les renseignements visés aux alinéas 15a) à c).

DORS/2006-239, art. 26 à 33 et 34(F); DORS/2012-22, art. 10 à 17; DORS/2018-99, art. 33; DORS/2021-125, art. 14(F).

SCHEDULE 6

(Section 22)

Annual Report Summarizing Effluent Monitoring Results

PART 1

Identifying Information

1 Name of the mine

2 Address of the mine

3 Name of the operator of the mine

4 Operator's telephone number and e-mail address, if any

5 Reporting period

6 Date of report

PART 2

Test Results Respecting Each Final Discharge Point

1 Complete the following table with the monthly mean concentration for the deleterious substances set out in the table for each final discharge point and identify the location of the final discharge point.

2 Any measurement not taken because there was no deposit from the final discharge point shall be identified by the letters "NDEP" (No Deposit).

3 Any measurement not taken because no measurement was required in accordance with the conditions set out in section 12 or 13 of these Regulations shall be identified by the letters "NMR" (No Measurement Required).

ANNEXE 6

(article 22)

Rapport annuel résumant les résultats du suivi de l'effluent

PARTIE 1

Renseignements identificatoires

1 Nom de la mine

2 Adresse de la mine

3 Nom de l'exploitant de la mine

4 Numéro de téléphone de l'exploitant et adresse électronique, le cas échéant

5 Période visée

6 Date du rapport

PARTIE 2

Résultats des essais à chacun des points de rejet final

1 Remplir le tableau suivant pour chaque point de rejet final, identifier son emplacement et indiquer la moyenne mensuelle de la concentration des substances nocives.

2 S'il n'y a pas eu de résultats parce qu'il n'y avait pas de rejet à partir du point de rejet final, inscrire « A.R. » (aucun rejet).

3 S'il n'y a pas eu de mesure parce que l'article 12 ou 13 du présent règlement n'en exigeait aucune, inscrire « A.M.E. » (aucune mesure exigée).

Location of final discharge point:

Month	As (mg/L)	Cu (mg/L)	CN (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	SS (mg/L)	Ra 226 (Bq/L)	Un-ionized ammonia (mg/L, expressed as Nitrogen (N))	Lowest pH	Highest pH	Effluent Volume (m^3)
Jan.												
Feb.												
Mar.												
Apr.												
May												
June												
July												
Aug.												
Sept.												
Oct.												
Nov.												
Dec.												

Emplacement du point de rejet final :

Mois	As (mg/L)	Cu (mg/L)	CN (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	SS (mg/L)	Ra 226 (Bq/L)	Ammoniac non ionisé (mg/L sous forme d'azote (N))	pH le plus bas	pH le plus haut	Volume d'effluent (m^3)
Janv.												
Févr.												
Mars												
Avr.												
Mai												
Juin												
Juil.												
Août												
Sept.												
Oct.												
Nov.												
Déc.												

PART 3

[Repealed, SOR/2021-125, s. 13]

PART 4

[Repealed, SOR/2018-99, s. 34]

SOR/2006-239, s. 35; SOR/2018-99, s. 34; SOR/2021-125, s. 13.

PARTIE 3

[Abrogée, DORS/2021-125, art. 13]

PARTIE 4

[Abrogée, DORS/2018-99, art. 34]

DORS/2006-239, art. 35; DORS/2018-99, art. 34; DORS/2021-125, art. 13.

SCHEDULE 6.1
[Repealed, SOR/2018-99, s. 35]

ANNEXE 6.1
[Abrogée, DORS/2018-99, art. 35]

SCHEDULE 7
[Repealed, SOR/2018-99, s. 35]

ANNEXE 7
[Abrogée, DORS/2018-99, art. 35]

SCHEDULE 8
[Repealed, SOR/2018-99, s. 35]

ANNEXE 8
[Abrogée, DORS/2018-99, art. 35]

RELATED PROVISIONS

— SOR/2018-99, s. 37

37 (1) Despite subsection 8(1) of the *Metal and Diamond Mining Effluent Regulations*, the owner or operator of a mine that is subject to those Regulations on the day on which this section comes into force shall submit in writing to the Minister of the Environment the information referred to in paragraph 8(2)(c) of those Regulations not later than 60 days after the day on which this section comes into force.

(2) During the 12-month period beginning on the day on which this section comes into force, despite subsection 16(2) of the *Metal and Diamond Mining Effluent Regulations*, the owner or operator of a diamond mine may, for the purposes of determining whether effluent is acutely lethal for the 12-month period referred to in subsection 16(1) of those Regulations, use acute lethality data that was collected during any period of 12 consecutive months before the day on which this section comes into force, if the owner or operator submits a report to the Minister of the Environment that indicates that

(a) the tests to determine acute lethality have been conducted in accordance with the procedures set out in section 5 or 6 of Reference Method EPS 1/RM/10 or section 5 or 6 of Reference Method EPS 1/RM/13;

(b) the data relates to effluent generated after the start of commercial operation by the mine; and

(c) the data was collected not more than 36 months before the day on which this section comes into force.

(3) During the 12-month period beginning on the day on which section 14.3 of the *Metal and Diamond Mining Effluent Regulations* comes into force, despite subsection 16(2) of those Regulations, the owner or operator of a metal mine or diamond mine may, for the purposes of determining whether effluent is acutely lethal for the 12-month period referred to in subsection 16(1) of those Regulations, use acute lethality data that was collected during any period of 12 consecutive months before the day on which that section 14.3 comes into force, if the owner or operator submits a report to the Minister of the Environment that indicates that

(a) the tests to determine acute lethality have been conducted in accordance with the procedures set out in section 5 or 6 of Reference Method EPS 1/RM/14;

DISPOSITIONS CONNEXES

— DORS/2018-99, art. 37

37 (1) Malgré le paragraphe 8(1) du *Règlement sur les effluents des mines de métaux et des mines de diamants*, le propriétaire ou l'exploitant d'une mine qui est assujettie à ce règlement, à la date d'entrée en vigueur du présent article, présente par écrit au ministre de l'Environnement les renseignements visés à l'alinéa 8(2)c) de ce règlement dans les soixante jours suivant la date d'entrée en vigueur du présent article.

(2) Pendant la période de douze mois commençant à la date d'entrée en vigueur du présent article, malgré le paragraphe 16(2) de ce règlement, le propriétaire ou l'exploitant d'une mine de diamants peut se fonder sur les données d'essai de détermination de la létalité aiguë recueillies pendant toute période de douze mois consécutifs précédant la date d'entrée en vigueur du présent article pour établir si l'effluent présente une létalité aiguë pendant la période de douze mois visée au paragraphe 16(1) de ce règlement, s'il présente au ministre de l'Environnement un rapport indiquant que :

a) les essais de détermination de la létalité aiguë ont été effectués conformément aux modes opératoires prévus aux sections 5 ou 6 de la méthode de référence SPE 1/RM/10 ou aux sections 5 ou 6 de la méthode de référence SPE 1/RM/13;

b) les données se rapportent à l'effluent émanant de la mine depuis le début de son exploitation commerciale;

c) les données ont été recueillies au cours des trente-six mois précédant la date d'entrée en vigueur du présent article.

(3) Pendant la période de douze mois commençant à la date d'entrée en vigueur de l'article 14.3 de ce règlement, malgré le paragraphe 16(2) de ce règlement, le propriétaire ou l'exploitant d'une mine de métal ou d'une mine de diamants peut se fonder sur les données d'essai de détermination de la létalité aiguë recueillies pendant toute période de douze mois consécutifs précédant la date d'entrée en vigueur de l'article 14.3 de ce règlement pour établir si l'effluent présente une létalité aiguë pendant la période de douze mois visée au paragraphe 16(1) de ce règlement, s'il présente au ministre de l'Environnement un rapport indiquant que :

a) les essais de détermination de la létalité aiguë ont été effectués conformément aux modes opératoires prévus aux sections 5 ou 6 de la méthode de référence SPE 1/RM/14;

(b) the data relates to effluent generated after the start of commercial operation by the mine; and

(c) the data was collected not more than 36 months before the day on which that section 14.3 comes into force.

b) les données se rapportent à l'effluent émanant de la mine depuis le début de son exploitation commerciale;

c) les données ont été recueillies au cours des trente-six mois précédant l'entrée en vigueur de l'article 14.3 de ce règlement.

— SOR/2018-99, s. 38

— DORS/2018-99, art. 38

38 (1) Despite section 10 of Schedule 5 to the *Metal and Diamond Mining Effluent Regulations*, the first study design of a diamond mine that is subject to those Regulations on June 1, 2018 may be submitted not later than the earlier of June 1, 2021 and the day on which a document that is equivalent to a study design is required to be submitted under provincial or territorial laws.

38 (1) Malgré l'article 10 de l'annexe 5 du *Règlement sur les effluents des mines de métaux et des mines de diamants*, le premier plan d'étude concernant une mine de diamants assujettie à ce règlement le 1er juin 2018 peut être présenté, au plus tard, le 1er juin 2021 ou, si elle est antérieure, à la date à laquelle un document équivalent à un plan d'étude doit être présenté aux termes de règles de droit provinciales ou territoriales.

(2) In the case of a diamond mine in respect of which the first study design is submitted under subsection (1), the period referred to in subsection 11(1) of Schedule 5 to the *Metal and Diamond Mining Effluent Regulations* does not apply.

(2) Dans le cas d'une mine de diamants à l'égard de laquelle le premier plan d'étude est présenté en application du paragraphe (1), la période visée au paragraphe 11(1) de cette annexe ne s'applique pas.

(3) In the case of a diamond mine that is subject to the *Metal and Diamond Mining Effluent Regulations* on June 1, 2018, the results of any studies conducted before the day on which the first study design is submitted may be used for the purpose of determining which biological monitoring studies are required to be conducted under section 9 of Schedule 5 to those Regulations if those results can be used for the purpose of meeting the requirements of section 12 of that Schedule.

(3) Dans le cas d'une mine de diamants assujettie à ce règlement le 1er juin 2018, les résultats d'études effectuées avant la date à laquelle le premier plan d'étude est présenté peuvent être utilisés pour déterminer quelles études de suivi biologique doivent être effectuées en application de l'article 9 de cette annexe, à condition que ces résultats puissent être utilisés pour satisfaire aux exigences prévues à l'article 12 de cette annexe.

(4) However, only information gathered — for the purpose of meeting the requirements of provincial or territorial laws — during the three-year period before the day on which the first study design is submitted may be used to determine the concentration of effluent, mercury and selenium for the application of subsections 9(1) and (2) of Schedule 5 to the *Metal and Diamond Mining Effluent Regulations*. If that information is used, paragraph 9(3)(a) of that Schedule does not apply.

(4) Toutefois, seuls les renseignements recueillis — pour satisfaire aux règles de droit provinciales ou territoriales — dans les trois ans qui précèdent la date de présentation du premier plan d'étude peuvent être utilisés pour déterminer la concentration de l'effluent, de mercure et de sélénium pour l'application des paragraphes 9(1) et (2) de cette annexe. Si ces renseignements sont utilisés, l'alinéa 9(3)a) de cette annexe ne s'applique pas.

(5) If the results of studies referred to in subsection (3) and the information referred to in subsection (4) are used in accordance with those subsections, the first study design shall include, in addition to the information referred to in section 10 of Schedule 5 to the *Metal and Diamond Mining Effluent Regulations*, the information referred to in paragraph 13(2)(d) or (e), as the case may be, of that Schedule, copies of and a summary of the results of the studies and an explanation — that includes supporting information — as to how the results and information can be used for the purposes of meeting the requirements of sections 9 and 12 of that Schedule.

(5) Si les résultats d'études visés au paragraphe (3) et les renseignements visés au paragraphe (4) sont utilisés conformément à ces paragraphes, le premier plan d'étude comprend, en plus des renseignements visés à l'article 10 de cette annexe, les renseignements visés, selon le cas, à l'alinéa 13(2)d) ou e) de cette annexe, des copies et un résumé des résultats des études et une explication — y compris les renseignements à l'appui — quant à la manière dont les résultats et les renseignements peuvent être utilisées pour satisfaire aux exigences des articles 9 et 12 de cette annexe.

(6) In the case of a diamond mine that is subject to the *Metal and Diamond Mining Effluent Regulations* on June 1, 2018, the effluent and water quality monitoring studies set out in Part 1 of Schedule 5 to those Regulations shall be started on the day on which the first study design is submitted.

(7) In the case of a diamond mine that is subject to the *Metal and Diamond Mining Effluent Regulations* on June 1, 2018, the results of sublethal toxicity tests conducted — for the purpose of meeting the requirements of provincial or territorial laws — during the three-year period before the day on which the first study design is submitted may be used for the application of subsection 6(3) of Schedule 5 to those Regulations, as if three years had elapsed, if those tests meet the requirements of subsection 5(1) of that Schedule. If those results are used, subsections 6(1) and (2) of that Schedule do not apply.

(8) If the results of sublethal toxicity tests are used in accordance with subsection (7), the information referred to in paragraphs 8(a), (c), (e) and (g) of Schedule 5 to the *Metal and Diamond Mining Effluent Regulations*, in relation to those tests, shall be submitted to the Minister of the Environment not later than the day on which the first study design is submitted and shall be accompanied by a summary of the results of the tests and an explanation — that includes supporting information — as to how the results can be used for the purposes of meeting the requirements of subsection 5(1) of that Schedule.

(9) In the case of a diamond mine that is subject to the *Metal and Diamond Mining Effluent Regulations* on June 1, 2018, the first interpretative report shall, despite subsection 12(1) of Schedule 5 to those Regulations, be submitted not later than 24 months after the day on which the first study design is submitted and shall contain, in addition to the information referred to in section 12 of that Schedule, the information referred to in paragraph 15(c) of that Schedule.

(6) Dans le cas d'une mine de diamants assujettie à ce règlement le 1er juin 2018, les études de suivi de l'effluent et de la qualité de l'eau prévues à la partie 1 de cette annexe débutent à la date de présentation du premier plan d'étude.

(7) Dans le cas d'une mine de diamants assujettie à ce règlement le 1er juin 2018, les résultats d'essais de toxicité sublétale effectués — pour satisfaire aux règles de droit provinciales ou territoriales — dans les trois ans qui précèdent la date de présentation du premier plan d'étude peuvent être utilisés pour l'application du paragraphe 6(3) de cette annexe, comme s'il s'était écoulé trois ans, si ces essais satisfont aux exigences du paragraphe 5(1) de cette annexe. Si ces résultats sont utilisés, les paragraphes 6(1) et (2) de cette annexe ne s'appliquent pas.

(8) Si les résultats d'essais de toxicité sublétale sont utilisés conformément au paragraphe (7), les renseignements relatifs à ces essais visés aux alinéas 8a), c), e) et g) de cette annexe sont présentés au ministre de l'Environnement au plus tard à la date de présentation du premier plan d'étude et ils sont accompagnés d'un résumé des résultats des essais ainsi qu'une explication — y compris les renseignements à l'appui — quant à la manière dont les résultats peuvent être utilisées pour satisfaire aux exigences du paragraphe 5(1) de cette annexe.

(9) Dans le cas d'une mine de diamants assujettie à ce règlement le 1er juin 2018, le premier rapport d'interprétation est présenté, malgré le paragraphe 12(1) de cette annexe, au plus tard vingt-quatre mois après la date de présentation du premier plan d'étude et il comprend, en plus des renseignements visés à l'article 12 de cette annexe, les renseignements visés à l'alinéa 15c) de l'annexe.

— SOR/2018-99, s. 39

39 In the case of a metal mine that is subject to the *Metal and Diamond Mining Effluent Regulations* on June 1, 2018,

(a) sections 4 to 8 of Schedule 5 to those Regulations apply beginning on January 1, 2019 and, until that day, the *Metal Mining Effluent Regulations*, as they read immediately before June 1, 2018, continue to apply to the matters referred to in those sections;

(b) subsections 6(1) and (2) of Schedule 5 to those Regulations do not apply and the results of sublethal toxicity tests conducted under the *Metal Mining*

— DORS/2018-99, art. 39

39 Dans le cas d'une mine de métaux assujettie au *Règlement sur les effluents des mines de métaux et des mines de diamants* le 1er juin 2018 :

a) les articles 4 à 8 de l'annexe 5 de ce règlement s'appliquent à partir du 1er janvier 2019 et, jusqu'à cette date, les dispositions du *Règlement sur les effluents des mines de métaux*, dans leur version antérieure au 1er juin 2018, continuent de régir les matières visées par ces articles;

b) les paragraphes 6(1) et (2) de cette annexe ne s'appliquent pas et les résultats des essais de toxicité

Effluent Regulations during the three-year period before January 1, 2019 shall be used for the application of subsection 6(3) of that Schedule, as if three years had elapsed; and

(c) biological monitoring studies started on or before June 1, 2018 shall be completed, and the corresponding interpretative report shall be submitted, in accordance with the *Metal Mining Effluent Regulations*, as they read immediately before June 1, 2018.

sublétale effectués au titre du *Règlement sur les effluents des mines de métaux* dans les trois années qui précèdent le 1er janvier 2019 sont utilisés pour l'application du paragraphe 6(3) de cette annexe, comme s'il s'était écoulé trois ans;

c) les études de suivi biologique débutées le 1er juin 2018 ou avant cette date sont menées à terme conformément aux dispositions du *Règlement sur les effluents des mines de métaux*, dans leur version antérieure au 1er juin 2018, et le rapport d'interprétation qui s'y rapporte est présenté selon les modalités prévues à cette version du même règlement.

APPENDIX C – EMERGENCY RESPONSE TRUCK INVENTORY

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Compartment	Amount	Items
Cabin	**1**	Safety Glasses clear box
	1	Safety glasses Darks box
	1	Binoculars
	1	Rolls of duct tape
	1	Emergency Road kit
	1	First Aid kit
	2	Care Flare
	1	Thermal Imaging Camera
	2	Caution Tape
	1	2.5 pound fire extinguisher
1 Left Compartment	**7**	SCBA
	18	SCBA Cylinder
	25	SCBA Face masks
	1	RIT pack
	2	Wheel Chock
2 Left Compartment	**2**	Shovel (Spade, Shovel)
	2	Rakes
	1	Cable power puller
	1	Saws all (reciprocating saw)
	2	Saws all blades (kits)
	3	Drill bit set
	2	Cordless drill
	1	Socket set
	1	Tool box
	2	bolt cutters (Large/Small)
	1	D size 12 pack batteries
	1	C Size 12 pack Batteries
	3	9 Volt Batteries
	1	4 AAA Batteries
	6	Led head liters with 4AAA Batt
	1	4 AA batteries
	1	sledge hammer
	1	Haligan bar
	3	Big axe
	4	Winter Gloves
	1	Steel jerry can (gas)
	1	Plastic jerry can (gas)
	1	Portable fan
	1	Power pack for jaws of life
	1	Miscellaneous oils
	1	Airstar Light
	2PG	Balaclava
	1	Standard set wrenches
		work gloves
	1	Portable fan (electric)

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3 Left Compartment	**4**	Tarps
	3	Various Valves and adaptors
	1	hydraulic air hammer
	1	Spreader
	1	Cutter
	1	Pincher
	1	Brace bar (hydraulic brace)
	2	Air Bags Hoses
	1	Chainsaw
	1	Chop saw
	1	1/2 Impact gun
	1	Gloves
	1	Grizzly Struts
	3	Hydraulic Hoses
4 Left Compartment	**2**	1.5 inch hose (yellow)
	4	1.5 inch hose (red)
	2	2.5 inch hose (white)
	2	Pistol Grip 2.5 hose nozzle
	1	Rubber hose
	1	Splitter 2.5" to 1.5"
	1	Y valve with adaptor
	3	Pistol Grip 1.5 inch nozzle
	4	Mustang Suits
	4	Rollgliss R550 Kit
	4	1.5 inch portable spray nozzle
	1	Victaulic coupler
		Wood (cribbing)
5 Left Compartment	**2**	Black Mustang Survivor Vest
	1	Pulley's carabineers, bag
	1	Prusik
	2	Mini 4:1
	3	Bag Carbineer
	4	Climbing harness
	1	Bag webbing &slings
	4	Beam Clamps
	8	Helmets & Gloves
	2	400' Rope Bags
	5	HH Life Vests
	2	Mustang Survival Suits
	3	Mustang Self Inflatable
	6	Orange PFD Vest
	3	Petzl AVAO Harness
	4	Boots (pairs)
	2	Rescue rope (200 foot bags)

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	1	Rescue Rope 4:1 (200')
	2	Rope abrasion protection
	3	Teraphrene Boots
	2	Rescue ring
	4	"Confined space" SCBA
	2	Telescopic reach pole
1 Right Compartment	2	Back Boards
	2	Ferno Head Immobilizers
	2	Ked Extrication Kits

	1	Trauma Kit
	3	Blankets
	6	Insulated Coveralls
	4	Raguler Coveralls
	6	High-viz Vests
	4	Granola bars Box
	5	Ferno spider straps
	3	Ferno CPR masks
	1	IC Command Center Board
	2	Box Safety Glasses
	1	Misc. rigid splints
	1	RsQmax Kit
	2	Padded Split Kits
	7	Folding stretchers
	2	Basket Stretcher kits
2 Right Compartment	6	Pylons
	2	padded splint
	5	Pails
3 Right Compartment	3	Grey Spill Pads (Bag)
	3	White Spill Pads (Bag)
	3	Box Absorbent Socks
	1	Plug & dyke
	1	20L Pail Gap Seal
	2	Lithium fire extinguisher
	2	15000 liter Onion bladder
	1	Ferno Stair chair
	4	Magnesium fire extinguisher
4 Right Compartment	1	15000 VSG Bladder
	4	Quatrex bags (white)
	1	Stair Chair
	3	Bladder repair kits
	3	Bladder fitting kit
	1	Mazar Rescue Board
5 Right Compartment	5	Quatrex Bags(white)
	1	spill response generator

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	2	Medical disaster kits
	2	Arctic soft extension cords
	2	Chicken wire (roll)
	3	Tarps
	2	2X2 Duck Pond
	5	EXO Fit Harness
	1	Helmet Face Shield
	15	Long gloves (pair)
	1	Honda GX 270 trash pump
	4	hip wader steel toe
		Tyvek coveralls suits
	1	Funnel
	3	rubber suits
	2	mag Lite Flash lights

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Right Side:



Left Side:



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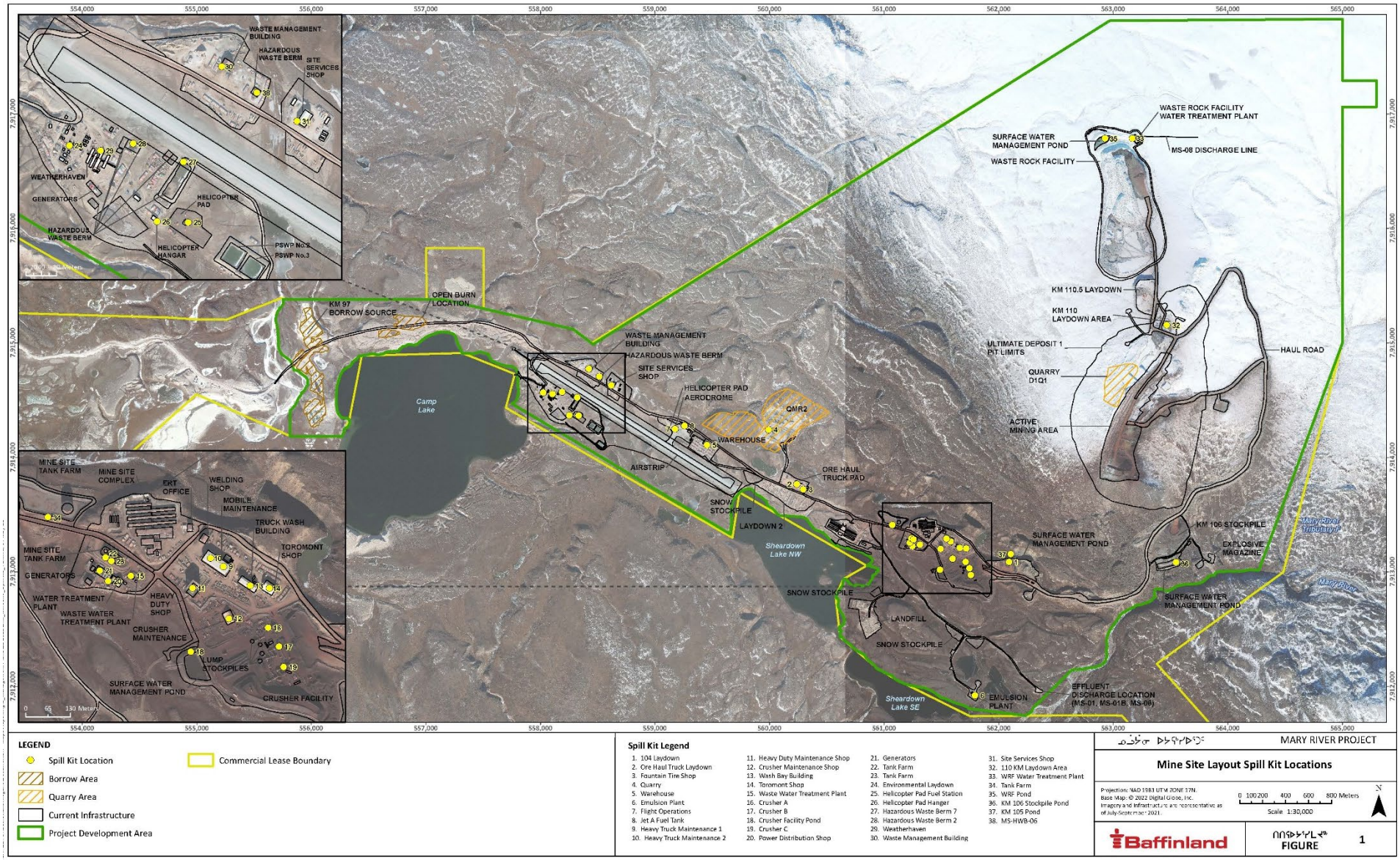
APPENDIX D – MINE SITE SPILL KIT INVENTORY AND LOCATIONS

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Inventory of Typical Spill Kits

Amount	Description
1	30 gallon drum with lid
50	Sorbent pads
4	Sorbent socks
2	Sorbent booms
1	Shaker of safety sorb
1	Neoprene drain cover
1	Disposable bag
2 pairs	Safety goggles
2 pairs	Nitrile gloves

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LEGEND

- Spill Kit Location
- Borrow Area
- Quarry Area
- Current Infrastructure
- Project Development Area
- Commercial Lease Boundary

Spill Kit Legend

1. 104 Laydown
2. Ore Haul Truck Laydown
3. Fountain Tire Shop
4. Quarry
5. Warehouse
6. Emulsion Plant
7. Flight Operations
8. Jet A Fuel Tank
9. Heavy Truck Maintenance 1
10. Heavy Truck Maintenance 2
11. Heavy Duty Maintenance Shop
12. Crusher Maintenance Shop
13. Wash Bay Building
14. Toromont Shop
15. Waste Water Treatment Plant
16. Crusher A
17. Crusher B
18. Crusher Facility Pond
19. Crusher C
20. Power Distribution Shop
21. Generators
22. Tank Farm
23. Tank Farm
24. Environmental Laydown
25. Helicopter Pad Fuel Station
26. Helicopter Pad Hanger
27. Hazardous Waste Berm 7
28. Hazardous Waste Berm 2
29. Weatherhaven
30. Waste Management Building
31. Site Services Shop
32. 110 KM Laydown Area
33. WRF Water Treatment Plant
34. Tank Farm
35. WRF Pond
36. KM 106 Stockpile Pond
37. KM 105 Pond
38. MS-HWB-06

MARY RIVER PROJECT

Mine Site Layout Spill Kit Locations

Projection: NAD 1983 UTM ZONE 17N.
Base Map: © 2022 Digital Globe, Inc.
Imagery and infrastructure are representative as of July-September 2021.

0 100 200 400 600 800 Meters
Scale 1:30,000

N

Baffinland

FIGURE 1

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APPENDIX E – NT-NU SPILL REPORT FORM

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Northwest Territories | Nunavut | Canada

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME	☐ UPDATE # TO THE ORIGINAL SPILL REPORT	
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS		
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION		
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT	
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS			

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ LA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

PAGE 1 OF _____

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APPENDIX F - EXTERNAL CONTACT LIST FOR NOTIFICATION OF A RELEASE

Department of Environment - Environmental Protection Division PO Box 1000 Station 200 Iqaluit, Nunavut X0A 0H0 Tel: (877) 212-6638, (867) 975-6000 Environmental Dept. (877) 212 6438	**Environment and Climate Change Canada** Enforcement Officer 933 Mivvik Street, Suite 301-Qiliaut Building P.O. Box 1870 Iqaluit, Nunavut X0A 0H0 Tel: (867)-979-7041 (Enforcement Officer) Cell: (867)-975-1874
Qikiqtani Inuit Association Igluvut Building, 2nd Floor PO Box 1340 Iqaluit, Nunavut X0A 0H0 Tel: (867) 975-8400, 1-800-667-2742	**Crown-Indigenous Relations and Northern Affairs Canada - Field Operations Division** PO Box 2200 Iqaluit, Nunavut X0A 0H0 Tel: (867) 975-4295 (Field Operations Manager) Tel: (867) 975-4284
Crown-Indigenous Relations and Northern Affairs Canada – Water Resources Division Building 918, PO BOX 100 Iqaluit, Nunavut X0A 0H0 Tel: (867) 975-4517 (Water Resources Manager) (867) 975 4284	**Mittimatalik Hunters and Trappers Organization** PO Box 189 Pond Inlet, Nunavut X0A 0S0 Tel: (867) 899-8856
Nunavut Impact Review Board 29 Mitik Street PO Box 1360 Cambridge Bay, Nunavut X0B 0C0 Tel: 1-866-233-3033	**Nunavut Water Board** PO Box 119 Gjoa Haven, Nunavut X0B 1J0 Tel: (867) 360-6338
Hamlet of Pond Inlet PO Box 180 Pond Inlet, Nunavut X0A 0S0 Tel: (867) 899-8934, (867) 899-893	**Department of Fisheries and Oceans** Central and Arctic Region 520 Exmouth Street Sarnia, Ontario N7T 8B1 Tel: (519) 383-1813, 1-866-290-3731 Environmental Response: (519) 383 1954 (Regional Manager)

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