APPENDIX 8-B

Addendums for Waste, Domestic Waste and Operational Infrastructure Management Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-B.3: Water Quality and Flow Monitoring Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Water Quality and Flow Monitoring Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part I, Item 3

Addendum:		
Section Change	**Specify: Update or New**	**Details**
1	Update	Change made in red text
1	Update	Update made in red text
1	Update	Update made in red text
2.1	Update	Update made in red text
2.1	Update	Update made in red text
2.3.6	New	Addition made in red text
2.3.6.1	New	Addition made in red text
2.3.6.2	New	Addition made in red text
2.3.6.3	New	Addition made in red text
2.3.6.4	New	Addition made in red text
3.1	Update	Update made in red text
3.1.1	Update	Update made in red text
3.1.1	Update	Update made in red text
3.1.2.1	Update	Update made in red text
3.1.2.2	New	Addition made in red text
3.1.2.2	New	Addition made in red text
3.1.2.2	Update	Update made in red text
3.1.2.3	Update	Update made in red text
	New	Addition made in red text
3.1.2.4	New	Addition made in red text
3.1.2.5	New	Addition made in red text
3.1.2.7	Update	Update made in red text
3.1.2.8	Update and new	Update and Additions made in red text
3.2	Update	Update made in red text
4	New	Additions made in red text
	Update	Update made in red text

MEADOWBANK GOLD PROJECT

Water Quality and Flow Monitoring Plan

In Accordance with Water License 2AM-MEA1525

Prepared by:
Golder and Agnico Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEA0815 and updated as per the renewed Water License 2AM-MEA1525. The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Report and Plan*.

Section 2 in this Plan includes an overview of the monitoring programs and mine development schedule. Section 3 provides specific details (including sampling locations and parameters to be measured) for the compliance monitoring program, along with general guidance for the event monitoring program. An adaptive management program is described for both regulated discharges and non-regulated discharges in Section 3 as well. Requirements of the flow monitoring program are described in Section 4, and an overview of the reporting requirements in Section 5.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA1525, Part B, Item 11, the proposed implementation schedule for this Plan is outlined below.

This Plan will be implemented immediately (March 2016) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Environmental Superintendent
Environmental Coordinators
Environmental Technicians

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/08/10			Comprehensive plan for Meadowbank project.
2	09/05/02	3; 5	11-41; 44-45	Revised to incorporate regulatory comments; revised AWPAR monitoring section; deleted QAQC section
3	07/16/2014	all		Revised in support of the Type A License Renewal
4	01/30/2015	2.3.2 and 2.3.3	3-4	Updated information related to early operation phase and late operation phase: - Change in tailings deposition and reclaim water intake (North Cell vs South Cell) - Change in Portage Attenuation Pond Discharge
		Figure 2-1 to 2-4	5-8	Added sampling stations
		Table 2-1	10	Updated completion data for most of the components and start data for the flooding activities and dewatering of Phaser Lake.
		Table 3-1	14	Added sampling stations: - ST-24 Vault Rock Storage Facility Monitoring (Late and Closure phase) - ST-26 Vault Pit Lake monitoring (Closure phase)
		Table 3-2	16	Modified Monitoring Parameters: - Group 1 – remove ammonia, add nitrite, add CN Free and CN Wad if CN Total is detect. - Group 2 – add CN Wad if CN Total is detect for monitoring station in receiving environment. - Group 4 – delete ammonia, CN total, Oil and Grease - MMER – change wording regarding Rainbow Trout and daphnia toxicity. - Full Suite – add note regarding the non-acutely lethal toxicity for discharge only.
		3.2.1 and 3.2.2	27 -28	Add a section on RSF Seepage and Assay Road Seepage
5	03/01/2016	All	All	2016 Comprehensive update
WT	06/15/2016			Refer to Plan for updates shown in Red text

Prepared by:

Golder Associates & Agnico Eagle Mines Limited - Meadowbank Division

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SECTION 1. INTRODUCTION

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEA0815 and updated as per the renewed Water License 2AM-MEA1525. The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Report and Plan*. The implementation and periodic updates to this Plan are the responsibility of the Meadowbank Environment Department under the guidance of the Meadowbank Environment Superintendent.

The Plan summarizes the monitoring locations, sampling frequency, monitoring parameters, compliance discharge criteria and an adaptive management plan for water quality at the Meadowbank Gold Project.

The purpose of this Water Quality and Flow Monitoring Plan is to establish the program to be implemented and followed by AEM's Meadowbank environmental management team to monitor the performance of the waste and water management systems at the Meadowbank Gold Project. The program includes:

- Verifying and validating the predicted water quality values with empirical measurements of the mine site water quality and flows;
- A comparison of measured water quality data to compliance requirements stipulated in the Nunavut Water Board Type A water license 2AM-MEA1525; and
- A framework for adaptive management that allows the identification and rectification, where necessary, of unexpected trends or non-compliance in water quality and flows.

The Plan provides information on the locations of the monitoring stations at the various stages of mining. These monitoring locations are used to evaluate the performance of the mine waste and water management system.

The objectives of the monitoring program are:

1) to track the chemistry of the contact and non-contact water prior to and during discharge;
2) to assist in identifying if water treatment is required prior to discharge; and
3) to minimize the potential impacts of mining activities on the surrounding environment.

Additional locations outside the footprint of the mine (and outside the scope of this Plan) will be monitored under the *Meadowbank Gold Project Aquatic Effects Management Program* and the *Core Receiving Environmental Monitoring Plan (November 2015*) and the Whale Tail Pit Addendum (June 2016).

SECTION 2. OVERVIEW

2.1 OVERVIEW OF SITE WATER MANAGEMENT PLAN

Details of overall water management are discussed in the *Meadowbank Water Management Report and Plan* and the Addendum to the plan entitled Whale Tail Pit Project Water Management Plan which is updated annually. All contact water from the mine facilities including the Portage and Vault and Whale Tail Pit rock storage facilities, open pits, and other disturbed areas will be directed by pumping or berms and other surface diversions to either of the following:

- Sumps from which the water will be pumped to either the Vault Attenuation Pond, or the Whale Tail Pit Attenuation Pond, or the South Cell Reclaim Pond if required; or

- The open pits during re-flooding and after mining activity has ceased.

As specified in the *Water Management Report and Plan*:

> *"All contact water will be intercepted, contained, analysed, treated, if required, and discharged to the receiving environment only when water quality meets the discharge criteria."*

2.2 MONITORING PROGRAMS

This Plan has been divided into two levels of monitoring to characterize the range of impacts between the sources of contact water in the individual mine facilities and the point of discharge or release to the receiving environment. The two levels of monitoring include:

1) compliance monitoring; and

2) event monitoring.

2.2.1 Compliance Monitoring Program (CM)

The CM sites are those stipulated in the water license; these sites vary from contact water collection ditches and attenuation ponds to sampling in areas prior to discharge to the receiving environment. The requirements of the water license including water quality limits will be applied at the applicable mine discharge points identified in the CM program.

The CM program provides a mechanism to assess water quality at specified sites, to confirm and to document compliance of discharge with regulatory requirements. As part of adaptive water management, these internal monitoring stations provide protection to the receiving water environment, provide data to predict pit re-flooding water quality and ensure exceedances of predicted or regulated levels are appropriately managed or mitigated to reduce impacts.

2.2.2 Event Monitoring Program (EM)

The EM sites result from unexpected events such as spills, accidents, and malfunctions. The response programs for such events are discussed in greater detail in the following four (4) documents:

- Meadowbank Gold Project Spill Contingency Plan (September 2015);
- Meadowbank Gold Project Emergency Response Plan (February 2016);
- Meadowbank Gold Project 2015 Freshet Action Plan (March 2016); and
- Meadowbank Gold Project 2015 Water Management Report and Plan (March 2016).

Each accidental release will require mobilization of site equipment to stabilize the release, procedures to contain, neutralize, and dispose of the discharge, and recommendations for monitoring the site following the incident.

2.3 OVERVIEW OF MINE DEVELOPMENT SCHEDULE

The Meadowbank Gold Mine consists of several gold-bearing deposits within reasonably close proximity to each other. The three main deposits are: Vault (including Phaser and BB Phaser), Portage (South, Center and North Portage deposits), and Goose. Mining activity progressed from the south, in the area of the Goose (Years 3 to 6) and Portage pits (Years 1 to 9) early in the mine life, then northward to the Vault (Years 5 to 9), Phaser and BB Phaser Pits (Years 7 to 9). The staged mine development has resulted in Goose Pit being completely mined out and undergoing re-flooding during the operational phase of the remaining pits, while the mill and tailings storage facility will operate throughout the mine life. It is for this reason that the monitoring sites change with time as the mining operations progress. Figures 2-1, 2-2, 2-3 and 2-4 show the sequence of staged development of the mine, from the early operations to the late operations, closure and post-closure phases, respectively. The actual configuration of the pits is changing as mining progresses. As a result, the monitoring program (Section 3.0) accommodates changes in the pit designs which may include one or more ponds during the re-filling phase before the single Portage Pit Lake develops from the Portage Pits. Figure 2-5 depicts the Meadowbank Gold Project facilities in the Hamlet of Baker Lake.

The staged development of the mine facilities has been divided into five phases for monitoring purposes. The five phases include:

- Pre-development and Construction phase;
- Early operations phase;
- Late operations phase;
- Closure phase; and
- Post-closure phase.

As the mine is now entering the late operations phase, monitoring associated with pre-development/construction and early operations are completed. A summary of site activities and water quality monitoring issues during these phases is provided below.

2.3.1 Pre-development and Construction Phase

The principal impacts resulting from construction activities has been the increase in turbidity and TSS in Second Portage and Third Portage lakes from the release of particulates during dike construction, surface runoff, the disturbance of lake sediments and the dewatering of future mining zones. Management and monitoring of these impacts are discussed in the AEMP.

2.3.2 Early Operations Phase

During the early operations phase, mining occurred in the Goose and Portage pits. Most of the waste rock generated from the pits was deposited at the Portage rock storage facility (PRSF), however some waste rock was used for construction of mine infrastructure (roads, dikes), and some has been used to backfill Portage Pit for fish habitat structures. Mill tailings are directed into the tailings storage facilities (North Cell (now closed) and South Cell TSF's) for final disposal. Tailings deposition was moved from the North Cell in November 2014 to the TSF South Cell. During the early operations phase, mine water from the individual pit sumps including dike seepage was pumped to the Portage Attenuation Pond (became South Cell TSF in 2014). Water from the Portage Attenuation Pond was discharged to Third Portage Lake during open water season on an annual basis thru a diffusor (Years 1 to 5). This water was treated for TSS removal prior to being discharged. Process water for the Process Plant is recycled from the Reclaim Pond in the TSF's and is not discharged to the receiving environment. Since November 2014, the Portage Attenuation Pond became the South Cell Reclaim Pond, as tailings are now deposited in the South Cell TSF. During the closure period, any remaining reclaim water will be discharged to either the Portage or Goose Island pit lakes. Water quality modelling for this has been ongoing yearly since 2012 (see *2015 Meadowbank Water Quality Forecasting Update* in Appendix C of the *Water Management Report and Plan)*.

2.3.3 Late Operations Phase

Mining in the Goose pit was completed in April 2015 (Year 6) and will be completed in Portage pit in 2018 (Year 9). The pits will be flooded by natural inflows and water transferred on a controlled basis from Third Portage Lake. Current mine plans estimate that the Portage and Goose pits entire flooding sequence will be completed by 2029.

Mining will take place in the Vault, Phaser and BB Phaser pits during the late operations phase with waste rock delivered to the Vault RSF and ore to the mill in the Portage area. Vault area tailings will be deposited in the Portage TSF. Runoff and infiltration drainage from the Vault RSF, dike seepage and Vault area contact water will be collected in the Vault Attenuation Pond prior to discharge to Wally Lake.

2.3.4 Closure Phase

During the closure phase, mining will have ceased in the Vault, Phaser and BB Phaser Pits. The Vault pit will be allowed to flood using natural inflows and water transferred on a controlled basis from Wally Lake. Current estimates are that it will take about seven (7) years for the Vault Pit to be completely flooded by which time the Vault Attenuation Pond and the Pit Lake will have merged. Phaser Pit Lake is planned to be flooded exclusively from watershed run off inflows until the target elevation of Wally is reached in summer 2027. There are currently no plans to cap the Vault RSF as it is not expected to generate acid rock drainage.

By the end of the late operations phase or early in the closure phase the Goose pit will be completely flooded, the Portage pit will be partially flooded, and the remaining portions of the North Cell TSF capped.

2.3.5 Post Closure Phase

Activities during the post-closure phase are primarily monitoring of selected mine facilities including flooded pit lakes and the reclaimed TSF area. The Goose and Vault Dikes will be breached once water quality within the pit lakes meets discharge criteria – CCME guideline for the Protection of Aquatic Life and background levels for parameters not listed in the CCME guideline.

2.3.6 Whale Tail Pit Mine Development Schedule

Figures 2-6, 2-7, 2-8, and 2-9 show the water quality monitoring locations by mine phase.

2.3.6.1 *Pre-development and Construction Phase*

Construction of the Whale Tail Pit site will begin as soon as approval and permits are received (anticipated for early 2018).

2.3.6.2 *Operations Phase*

The operations phase will span three to four years, from Year 1 (2019) to Year 4 (2022).

2.3.6.3 *Closure Phase*

Mining activities are currently expected to end in Year 3 (2021) and ore processing is expected to end during Year 4 (2022). Closure will occur from Year 4 (2022) to Year 11 (2029) after the completion of mining and will include removal of the non-essential site infrastructure and flooding of the mined-out open pit, as well as reestablishment of the natural Whale Tail Lake water level.

2.3.6.4 *Post-closure Phase*

Post-closure monitoring to confirm physical and chemical stability is planned until 2038.

Figure 2-1: Early Operations Phase

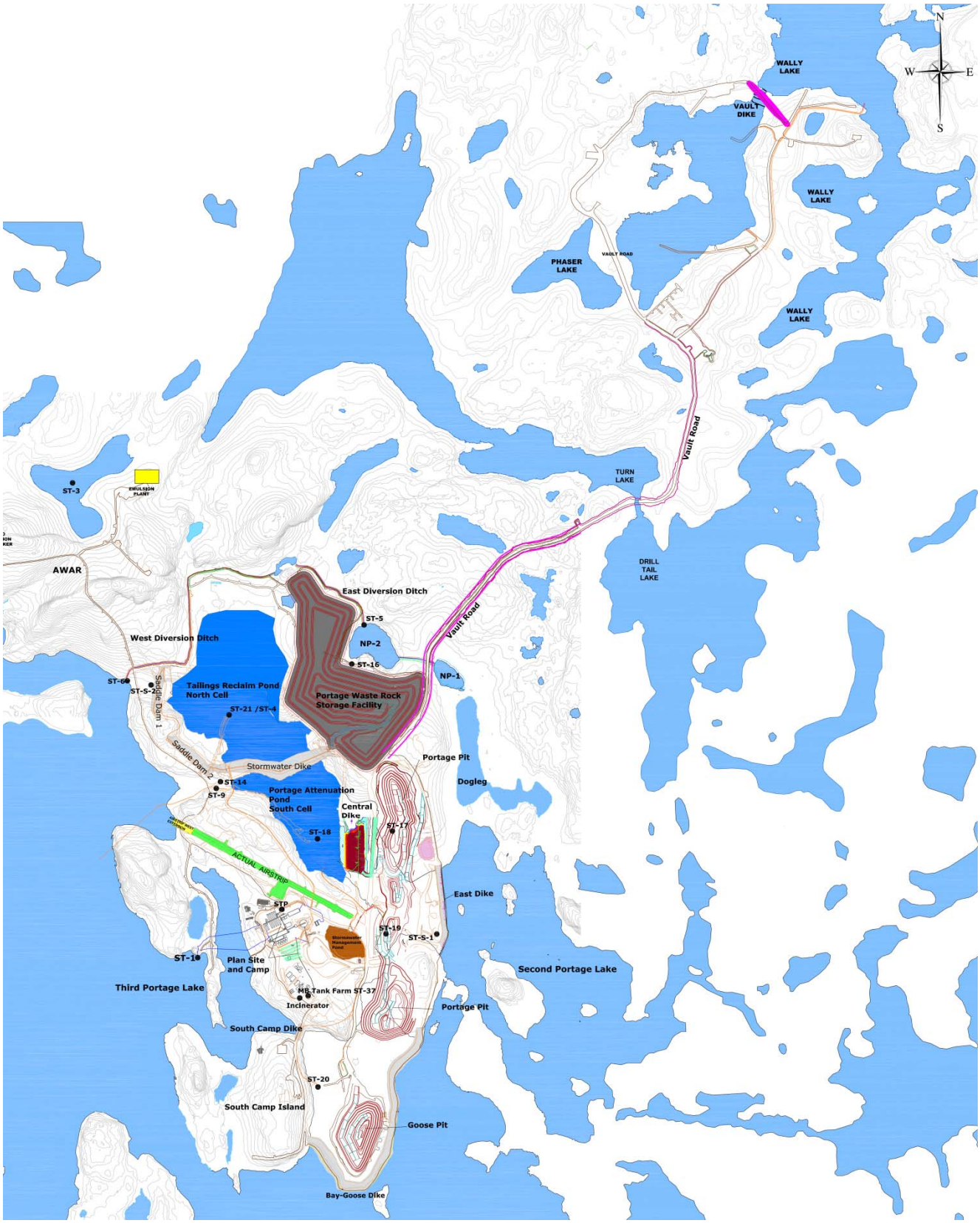


Figure 2-2: Late Operations Phase

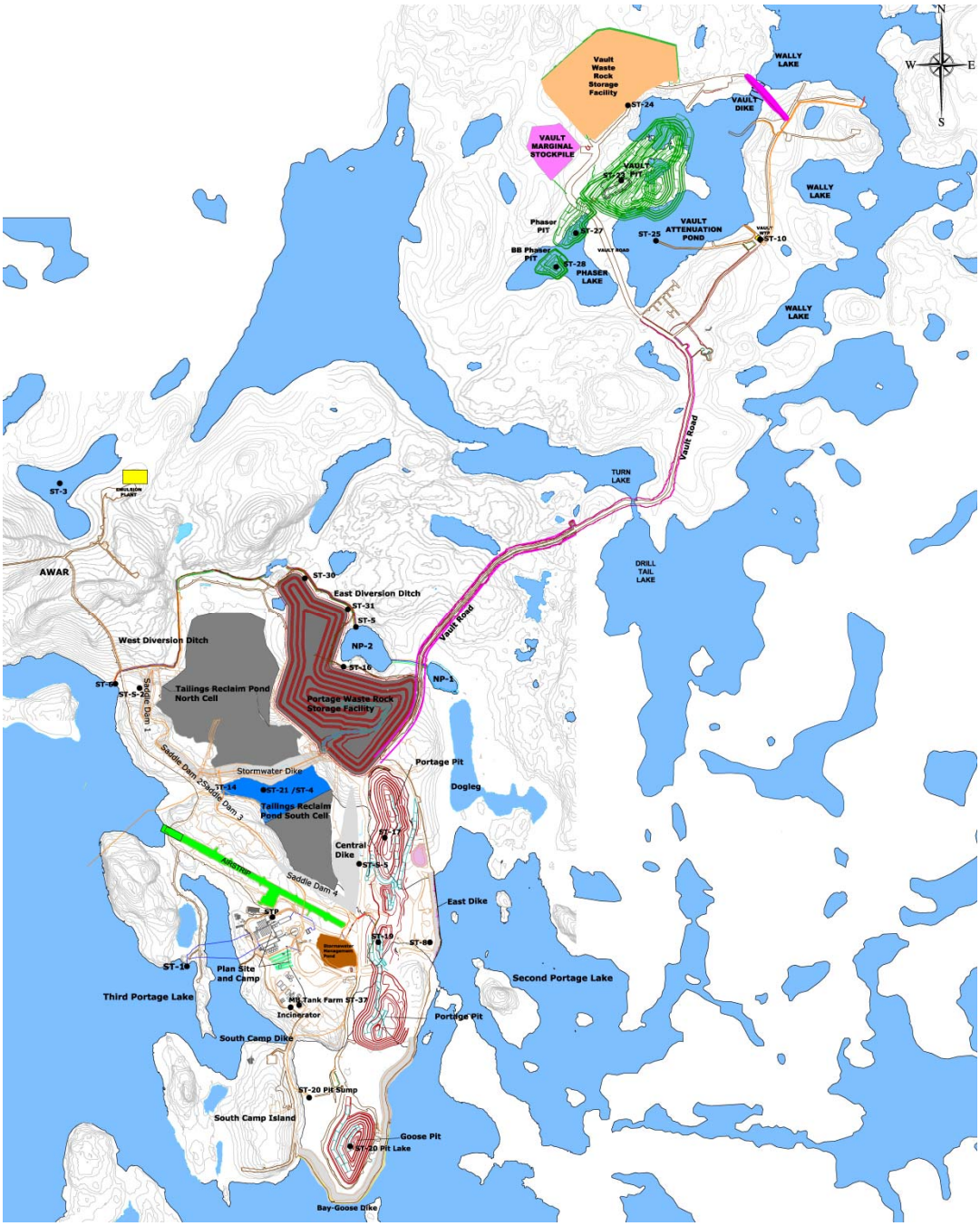


Figure 2-3: Closure Phase

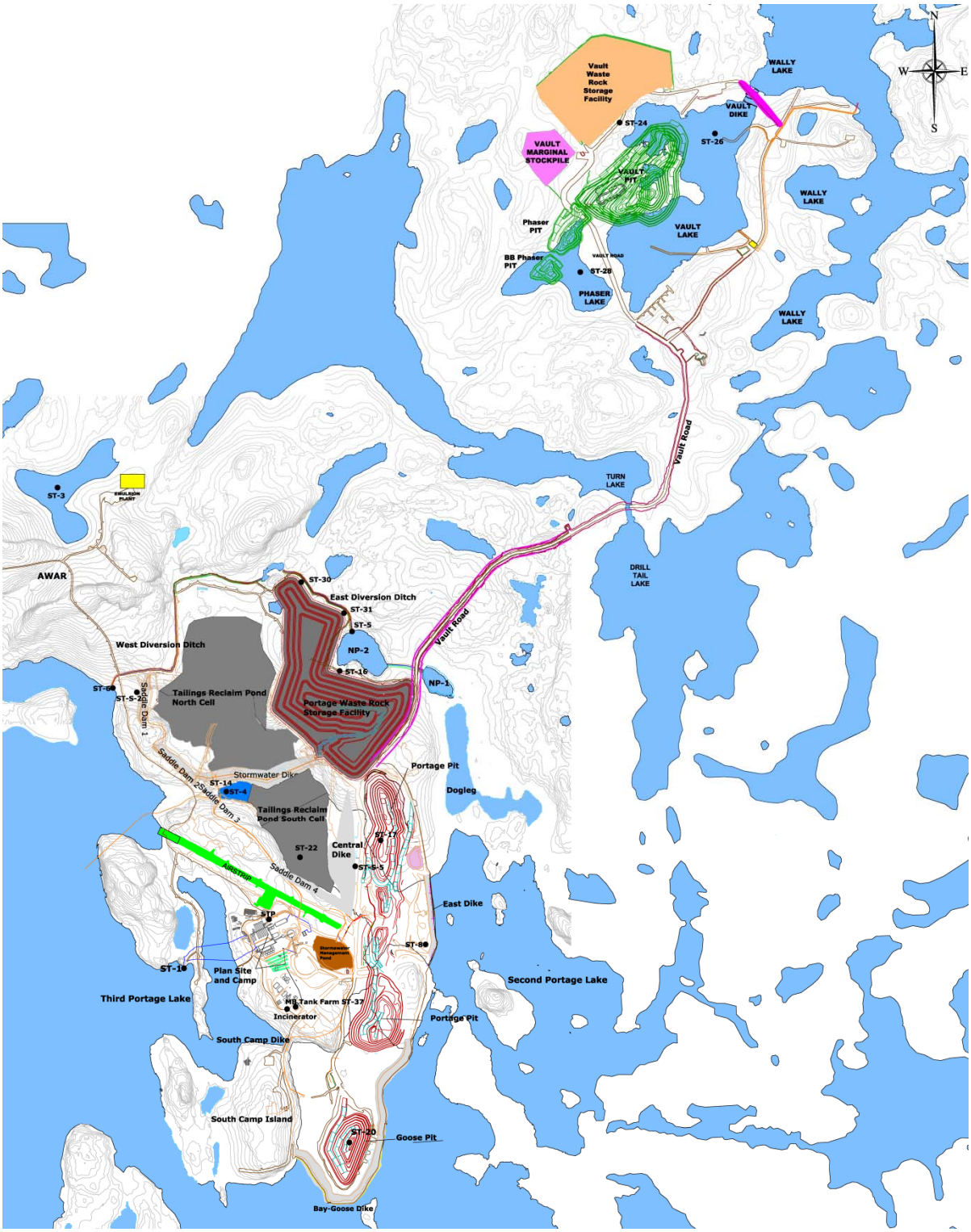


Figure 2-4: Post-Closure Phase

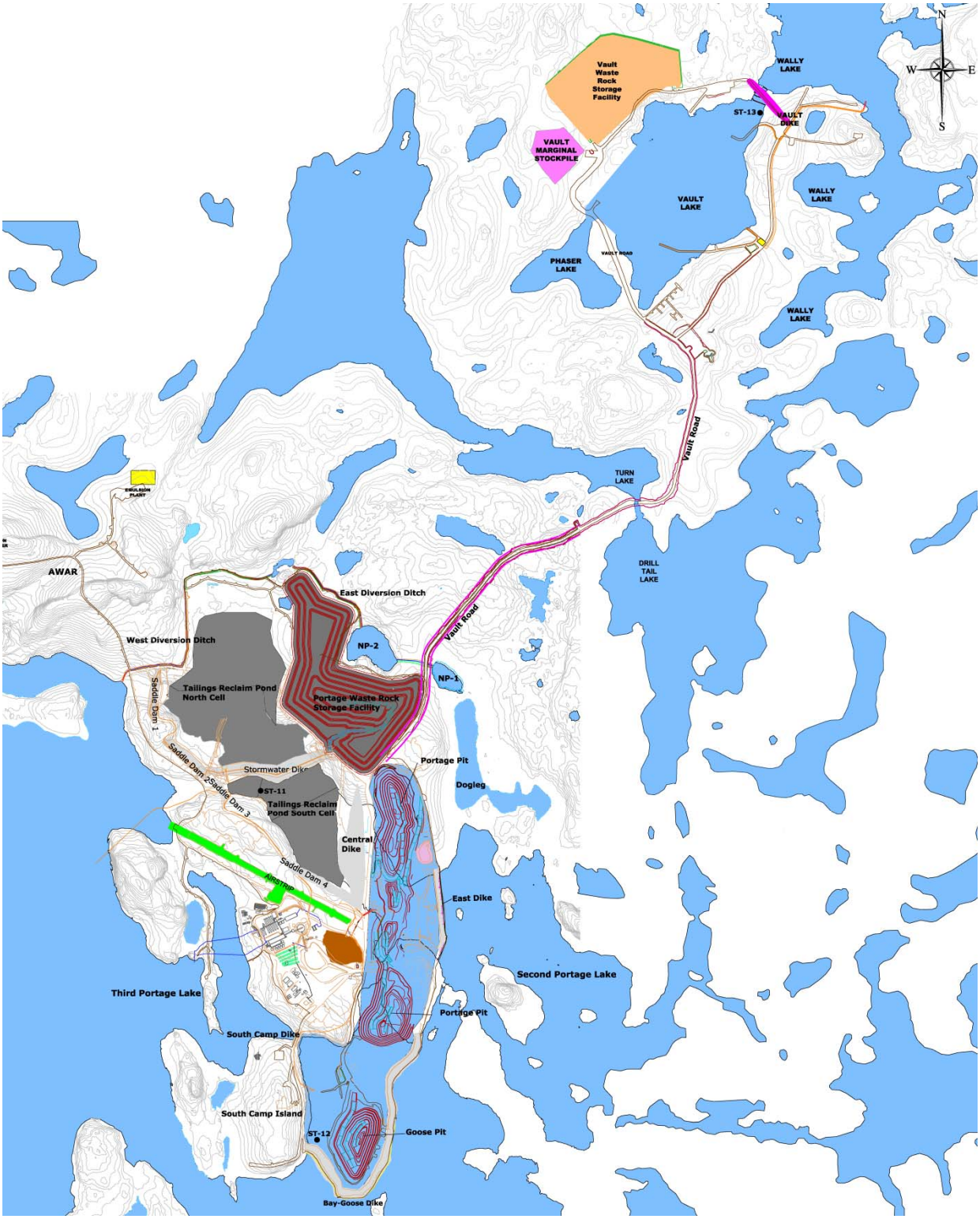
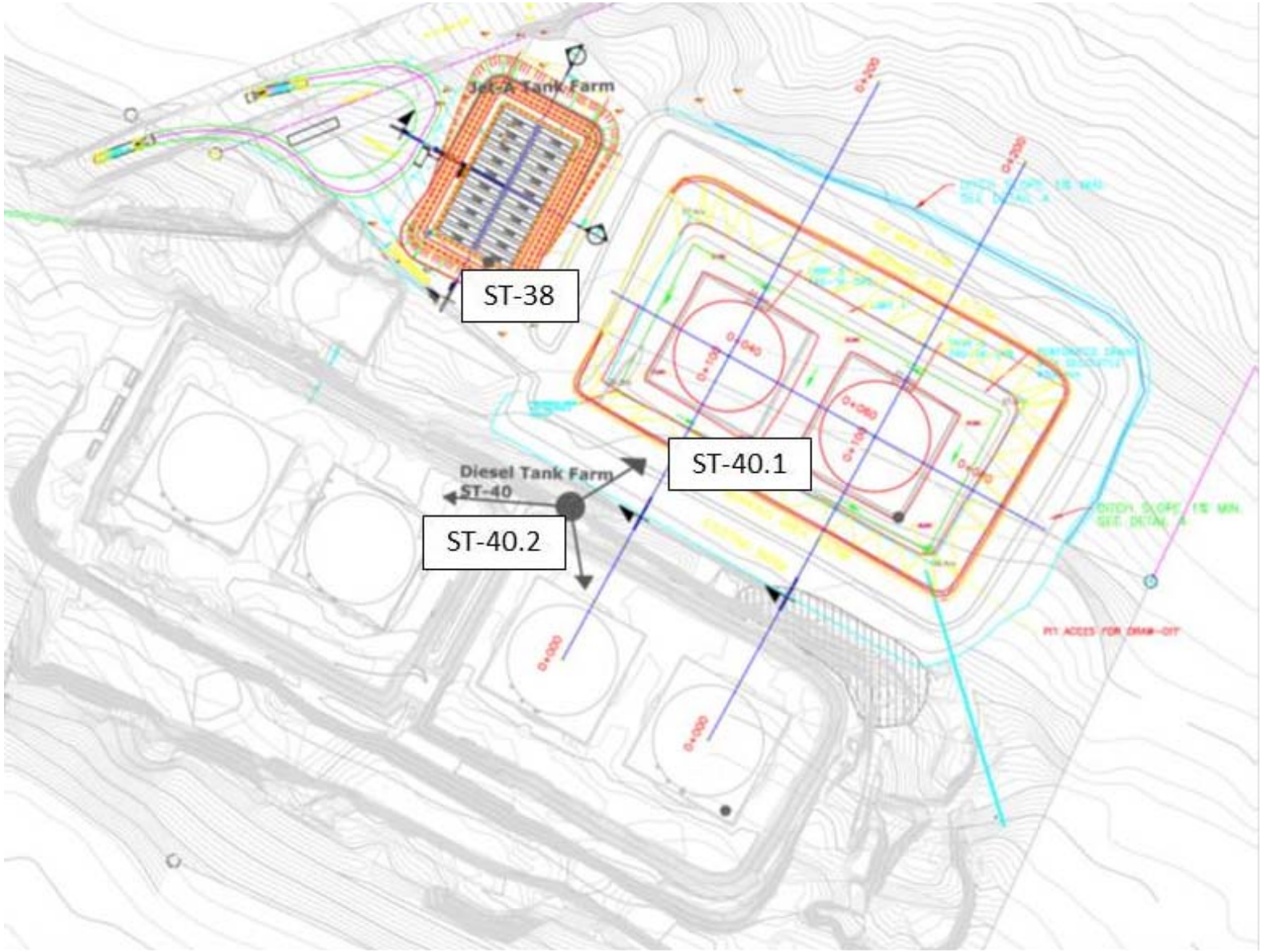
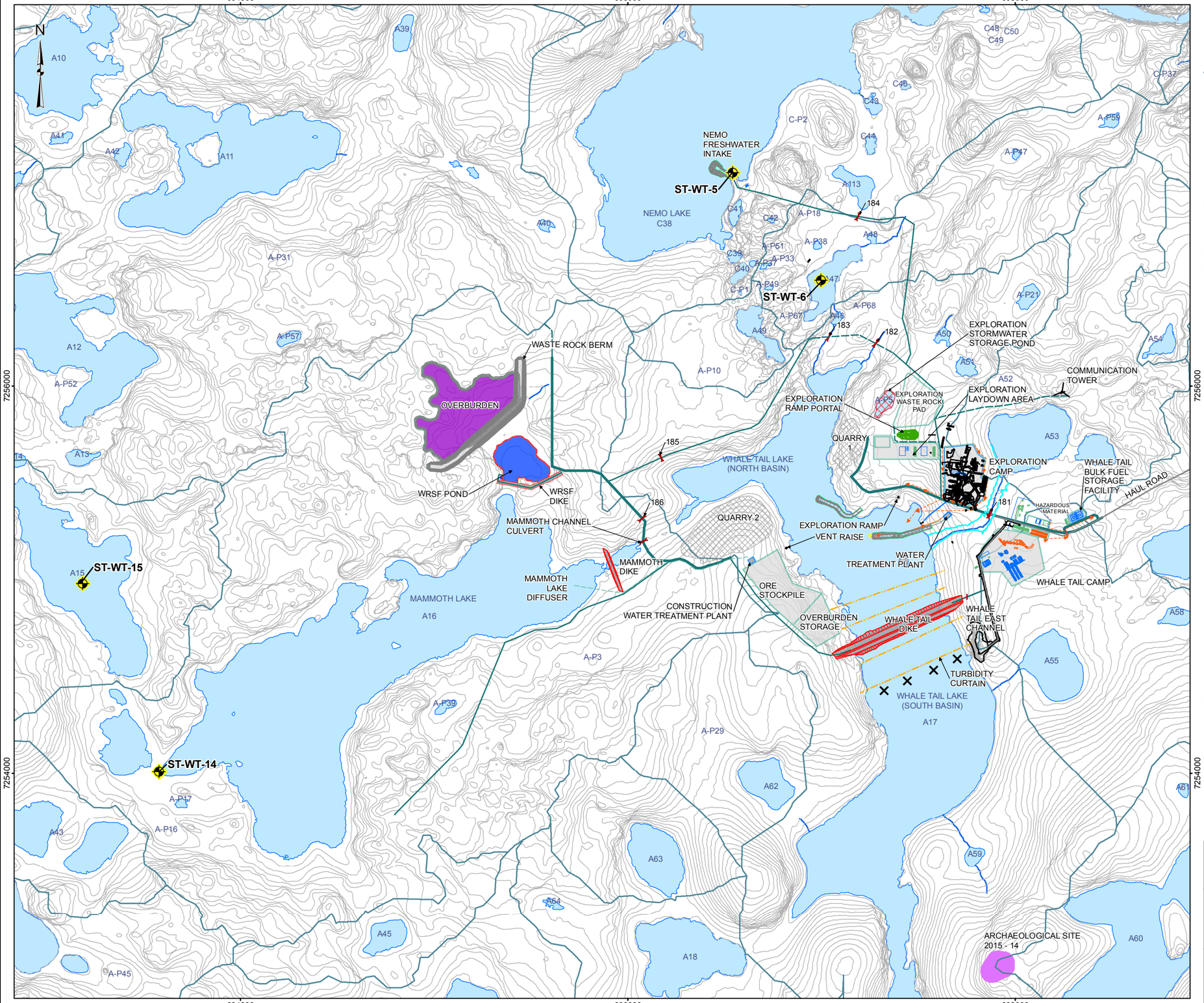


Figure 2-5: Baker Lake Site Facilities





LEGEND

- TURBIDITY MONITORING STATION
- WATER QUALITY MONITORING STATION
- ROAD
- TEMPORARY ROAD
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- TURBIDITY CURTAIN
- DIKE
- OVERBURDEN
- QUARRY
- STORM WATER STORAGE POND
- NATURAL WATERSHED
- POND/SUMP
- ARCHAEOLOGICAL SITE
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-001_R2(2018)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

SITE LAYOUT AND MONITORING PLAN (YEAR -1: 2018)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	CP	16 May 2016	SCALE AS SHOWN	REV. 0
GIS	MH	15 Jun. 2016		
CHECK	JR	21 Jun. 2016		
REVIEW	CP	21 Jun. 2016		

FIGURE 2-6

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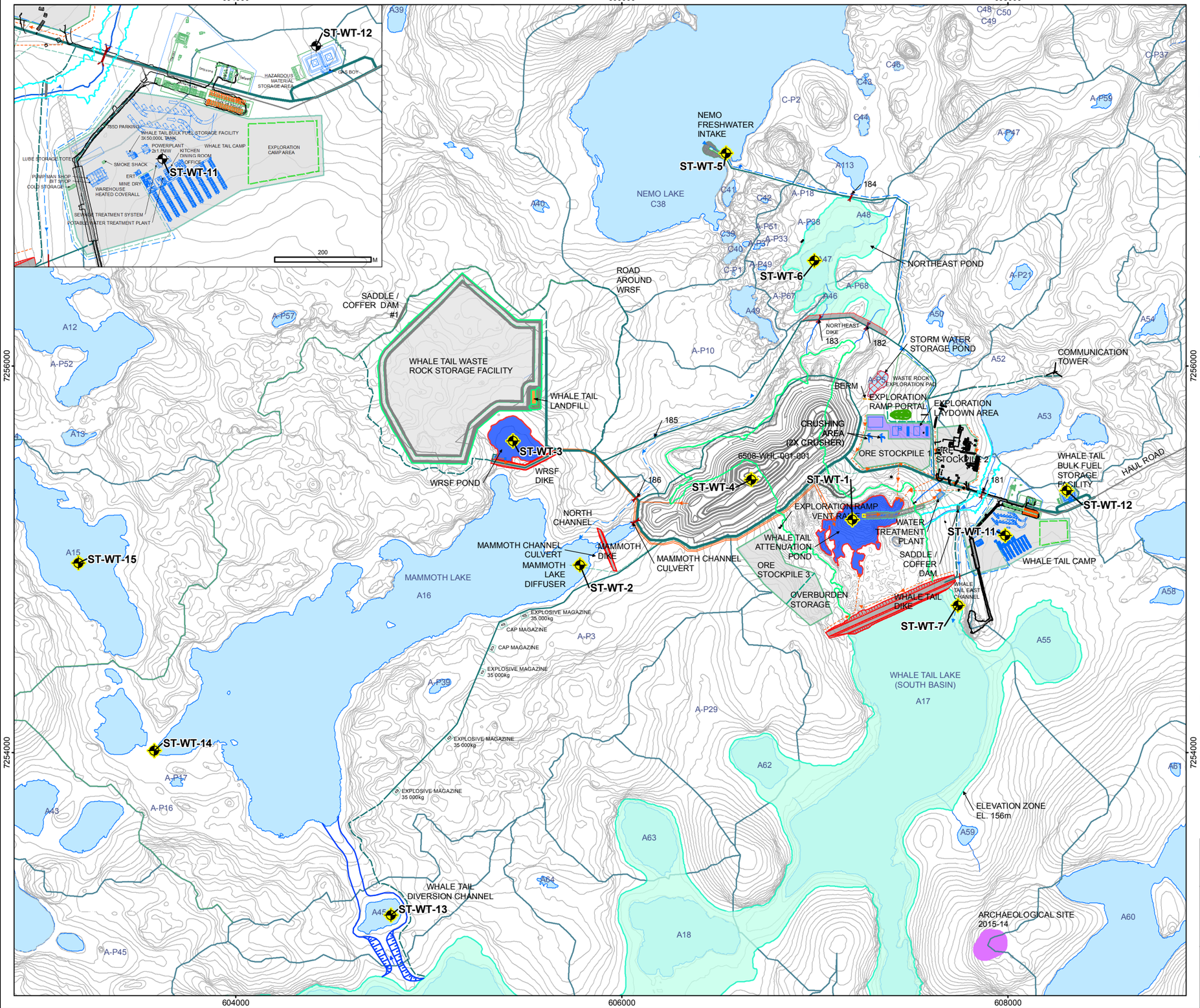

LEGEND

- WATER QUALITY MONITORING STATION
- FINAL WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- ROAD
- TEMPORARY ROAD
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- INTAKE WATER PIPE
- CONTACT WATER PIPE
- FRESHWATER PIPE
- WATERCOURSE
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-002_R2(2019)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

SITE LAYOUT AND MONITORING PLAN (YEAR 1: 2019)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	CP	16 May 2016	SCALE AS SHOWN	REV. 0
GIS	MH	15 Jun. 2016		
CHECK	JR	21 Jun. 2016		
REVIEW	CP	21 Jun. 2016		

FIGURE 2-7

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