All our energy.
All the time.

MARITIME ELECTRIC
A FORTIS COMPANY

June 28, 2018

Hand Del
357 pm
MLA

Island Regulatory and Appeals Commission
PO Box 577
Charlottetown PE C1A 7L1

Dear Commissioners:

Charlottetown Thermal Generating Station Decommissioning Study

Under Order UE16-04, Maritime Electric Company, Limited was directed by the Island Regulatory and Appeals Commission to file a Decommissioning Study with respect to the Charlottetown Thermal Generating Station ("CTGS") by June 30, 2018. Please find attached a copy of the CTGS Decommissioning Study.

Maritime Electric retained the services of GHD Limited to provide engineering and regulatory support services including preparation of a Class B cost estimate for decommissioning of the CTGS. GHD is one of the world's leading professional companies in this area, with the recent experience of demolishing and decommissioning power plants in New Brunswick (Chatham, Grand Lake and Dalhousie).

This Decommissioning Study submission is comprised of the following documents:

1. CTGS Decommissioning Study,
2. Updated Phase II Environmental Site Assessment ("ESA"), and
3. Preliminary Options Analysis for Demolition of the CTGS

The updated Phase II ESA document was prepared by GHD Limited to supplement previous investigations completed at the CTGS, aid in the development of the Decommissioning Study and assist in determining the costs to decommission the CTGS. A Phase I ESA was completed at the CTGS in 1995 by Jacques Whitford Environment Limited. The Phase I ESA was carried out to identify the existence of any actual or potential areas of environmental concerns at the CTGS. A subsequent Phase II ESA was completed in 2002 by Fundy Engineering & Consulting Ltd.

The Preliminary Options Analysis for Demolition of the CTGS document indicates that it would be cost effective for Maritime Electric to relocate the equipment associated with Combustion Turbine 3 ("CT3") currently located in the CTGS into a new building on-site. The cost to keep this equipment in the existing location and not demolish that section of the CTGS building is estimated to be $621,000 higher over the life of CT3 versus construction of a new building to house this equipment. The capital investment required for the new building to house the CT3 equipment will be filed with the Commission in a future Capital Budget application. With this equipment relocated to a new building, the Decommissioning Study proposes that the infrastructure associated with the CTGS building be totally demolished and the site remediated to result in open space.

.../2

180 Kent Street • PO Box 1328 • Charlottetown, PE C1A 7N2
telephone 1-800-670-1012 • **fax** 902-629-3665 • **maritimeelectric.com**

Prior to the decommissioning, various engineering activities, stakeholder consultations and Provincial environmental approvals will be required. The net decommissioning cost (including Owner's costs and net of salvage materials) is estimated to be approximately $10.43 million. This estimate is a Class B estimate as defined by the Association for the Advancement of Costing Engineering International with an accuracy range of -20% to +30% and is adequate considering the CTGS decommissioning and demolition is scheduled to begin in 3½ years after the necessary approvals and permitting have been received. The Company plans to use internal labour and project supervision resources to prepare for and manage the decommissioning activities. These costs are included in the Owner's cost. Market conditions will dictate contractor pricing and the salvage value of recyclable materials. The table below summarizes the Class B estimate of the decommissioning activities.

Class B Cost Estimate for Decommissioning of the CTGS ($ million)	
Site Decommissioning Cost	$6.47
Allowances	$1.94
Project Management, Engineering and Implementation (including Owner's cost)	$2.46
Post Decommissioning and Other Miscellaneous Cost	$0.69
Potential Resalable and Salvage Values	($1.13)
Net Decommissioning Cost (including Owner's costs and net of salvage materials)	**$10.43**

The Company's proposal with respect to the CTGS site and the decommissioning of the facilities will be outlined in its General Rate Application to be filed later this year. These recommendations will incorporate the results of the 2017 Depreciation Study which includes the Class B cost estimate for decommissioning as well as the remaining timeline for the decommissioning of the facilities.

If you have any questions or would like an overview of the Study in the form of a presentation, please do not hesitate to contact me at 902-629-3668.

Yours truly,

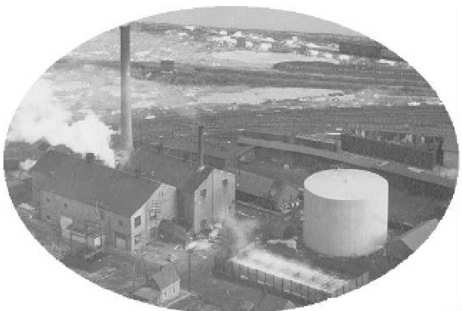
MARITIME ELECTRIC

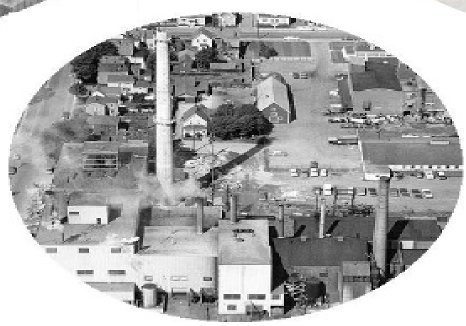
Angus S. Orford
Vice President, Corporate Planning
& Energy Supply

ASO09
Enclosure

Final

Revision 1





Decommissioning Study

Charlottetown Thermal Generation Station
50 Cumberland Street
Charlottetown, Prince Edward Island

Maritime Electric Company, Limited

GHD | 466 Hodgson Road Fredericton New Brunswick E3C 2G5

11149943| Report No 4 | June 22 2018

Glossary of Terms

AACE	Association of the Advancement of Costing Engineering International
ACM	Asbestos Containing Material
All-Tech	All-Tech Environmental Services Limited
AST	Aboveground Storage Tank
BBL	Standard Barrel of Oil (205 Liters)
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CDA	Comprehensive Development Area
CHAI	Charlottetown Harbour Authority Inc.
CT3	Combustion Turbine 3
CTGS	Charlottetown Thermal Generating Station
CW	Circulating Water
DFO	Department of Fisheries and Oceans
ECC	Energy Control Centre
EIA	Environmental Impact Assessment
EQS	Environmental Quality Standards
ESA	Environmental Site Assessment
ESL	Ecological Screening Levels
Fundy	Fundy Engineering & Consulting Ltd.
GHD	GHD Limited
HHERA	Human Health and Ecological Risk Assessment
HID	High Intensity Discharge
IRAC	Island Regulatory and Appeals Commission
JWEL	Jacques Whitford Environment Limited
km	Kilometre
kW	Kilowatt
L	Litre
lb	Pounds
m	Metre
masl	Metres Above Sea Level
MECL	Maritime Electric Company, Limited
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per litre
MgOH	Magnesium Hydroxide

Glossary of Terms

mm	millimetre
MWe	Megawatts of electricity
NB	New Brunswick
NSE	Nova Scotia Environment
ODS	Ozone Depleting Substances
PACM	Possible Asbestos Containing Material
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEI	Prince Edward Island
PEICLE	Prince Edward Island Department of Communities, Land and Environment
PID	Property Identification Number
PILC	Paper Insulated Lead Covered
PPA	Power Purchase Agreement
PSSL	Pathway Specific Screening Levels
RBCA	Risk Based Corrective Action
RBSL	Risk-Based Screening Level
RO/EDI	Reverse Osmosis/Electrodeionization
ROW	Right-of-Way
RPD	Relative Percent Differences
SQG	Soil Quality Guidelines
TPE	Total Potency Equivalents
TPH	Total Petroleum Hydrocarbons
UST	Underground Storage Tank
V	Voltage
WAWA	Watercourse and Wetland Alteration Permit
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Executive Summary

This report is a Decommissioning Study for the potential Decommissioning and Demolition for a portion of the Charlottetown Thermal Generating Station (CTGS). The Decommissioning Study includes decommissioning plans and closure cost forecasting for budgeting and planning purposes. **A separate Environmental Impact Assessment (EIA) will be completed and submitted to the Prince Edward Island Department of Communities, Land and Environment (PEICLE) in accordance with the provincial *Environmental Protection Act*.** The EIA will outline project specific mitigation measures to be implemented as part of the proposed decommissioning activities to minimize potential impacts to the public and environment (e.g., dust, noise, traffic, vibration, health and safety) and will include consultation with stakeholders and the public.

Introduction

The CTGS is a fossil fuel-fired generating station located on Cumberland Street in Charlottetown, Prince Edward Island (PEI) (herein referred to as the “CTGS”, “Site”, “Facility”, or “Plant Site”). The CTGS is owned by Maritime Electric Company, Limited (MECL) and was originally commissioned nearly 100 years ago (exact date unknown). MECL owns and maintains 105 megawatts (MW) of oil-fired generating capacity at the CTGS property. This electrical generating capacity includes one light fuel oil-fired, fast-start, simple cycle combustion turbine (CT3 – 50 MW) and 55 MW of steam-driven thermal generation, run on heavy fuel oil (Bunker C fuel oil). The steam-driven thermal generation is approaching the end of its useful life. As a result, MECL is considering the decommissioning of the steam driven units at the CTGS in a staged approach.

GHD Limited (GHD) was retained by MECL to provide engineering and regulatory support services for the potential decommissioning of the CTGS. The engineering support includes the preparation of decommissioning plans and closure cost forecasting for the Facility as outlined below.

Decommissioning Study Objectives and Methods

The objective of this Decommissioning Study is to determine the necessary activities and associated costs to decommission the Steam Plant Building and associated infrastructure including the River Pumphouse, Circulating Water (CW) supply and discharge lines and associated above ground storage tanks in a safe manner that is environmentally and economically sound and in compliance with applicable provincial and federal regulations and standards. In preparation of the Decommissioning Study, the following assumptions were made:

- CT3 and associated infrastructure, including the on-Site Energy Control Centre (ECC) building are to remain on-Site and operational for the foreseeable future. CT3 Balance of Plant equipment currently in the east end of the Steam Plant Building will be re-located to a new on-Site building prior to decommissioning. Costs for relocating this equipment are not included in the decommissioning cost estimate.
- It is proposed that infrastructure associated with the Steam Plant Building will be fully demolished and restored to an open space condition that would permit future system expansion and energy infrastructure upgrades with some limiting conditions as necessary (i.e., designated no-excavation areas or no building areas).

- All concrete walls, building slabs, stack foundations and pedestals will be demolished to 0.9 m below final grade.

A number of additional assumptions for the decommissioning and demolition of the Facility were made in consultation with MECL. A summary of the assumptions made, costs basis, and constraints for the decommissioning and demolition of the Facility is provided in Tables 5.1 and 9.2 of this report. Additional details of the on-Site infrastructure included in the Decommissioning Study as well as infrastructure that will remain on-Site post-decommissioning activities are provided in Section 2 of this report.

Environmental Conditions

GHD determined the environmental conditions at the Site by reviewing previous environmental investigations conducted at the Site and also by completing an Updated Phase II Environmental Site Assessment (ESA). Based on the results of the Updated Phase II ESA and a review of existing analytical data from MECL, several areas of environmental concern were identified to exist at the Site and are further discussed in Section 3.0 of this report. Additional environmental considerations and controls will be included in the separate EIA document for submission to the PEICLE as part of the project approval process.

Current Infrastructure Inventory

GHD conducted a detailed walk-through inventory of each structure comprising the CTGS in conjunction with a detailed review of existing construction drawings and other pertinent documents or information provided by MECL personnel to develop a reasonable and approximate estimate of the types of materials that exist at the Site. Estimates were developed for the anticipated quantities of all types of materials including but not limited to; concrete, steel, recyclable and non-recyclable demolition debris, hazardous materials to be removed prior to cleaning and the volume of voids that would require infilling following demolition. Section 4 of this report provides classifications, descriptions, and an estimate of the quantity of materials and waste that would be generated if the Steam Plant Building and associated infrastructure is decommissioned and demolished.

Decommissioning Options Analysis & Risk Items

A decommissioning options analysis was completed by GHD, in conjunction with MECL, for major Site infrastructure and closure considerations. Multiple options were considered for each item and the recommended option chosen in consultation with MECL. Further details on the options analysis are presented in Section 5 and Table 5.1 of this report. The primary items requiring an options analysis review and the chosen approach for inclusion in the cost estimate include:

- New Stack (69 m) with Leachable Lead Based Paint - Transport and dispose of stack (or a portion of stack) at licensed municipal landfill.
- River Pumphouse with Leachable Zinc Based Paint - Transport and dispose of painted concrete at licensed municipal landfill.
- PAH Impacted Soil and Groundwater – Complete additional Site investigation work to ensure impacts pose low risk to on-Site commercial receptors as well as off-Site residential and ecological receptors.
- Bulk Storage Tank Bottom Sludges - Off-Site disposal of tank bottom sludges.

- Decommissioning of Circulating Water Piping - Fill piping with flowable grout in sections below Water Street Parkway and active fuel pipelines near River Pumphouse. Dig up remainder of lines for crushing or removal.
- Decommissioning of Existing Rock Groyne Structure - Leave structure in place and maintain as required.
- Decommission River Pumphouse - Remove the entire structure to the mud line and re-contour shoreline.
- Surface Drainage Management - Retain drainage ditches and storm water collection system for discharge at existing outfalls.
- Disposal of Concrete Demolition Debris (slabs on-grade and foundations are to be removed to 0.9 m below grade) - Crush and spread out at Site.
- Demolition of Stacks - Install mast climbers on both stacks to allow workers and small demolition equipment to disassemble the stacks in small (<1.5 m) sections using the mast climber platforms for the top 38 m of the stacks. The remainder of both stacks could then be demolished with a high reach excavator equipped with demolition attachments.

Several additional environmental and demolition considerations were identified as having a low probability of occurring but would incur significant costs if required due to regulatory obligations or third party agreements. As directed by MECL, these items have been considered “risk items” and have not been included in the decommissioning cost estimate. These risk items are further detailed in Section 5.2 of this report and the estimated total cost of these risk items has been included as a footnote in Table 9.1 – Detailed Class B Cost Estimate.

Decommissioning Plan

Prior to proceeding with the decommissioning of the Facility, several engineering activities must be completed in order to obtain the necessary approvals for decommissioning the CTGS. These pre-decommissioning engineering activities include stakeholder consultation, Site topographic survey, additional environmental sampling, PEICLE EIA reporting and approvals, hazardous materials update, detailed design and tender document preparation, and contractor pre-qualification, selection and award. Upon contractor selection and award, the Facility decommissioning and demolition will commence. Decommissioning activities for the Plant Site will consist of:

- Decommissioning of building infrastructure including chemical sweep, asbestos abatement, decommissioning cleaning, Steam Plant Building and River Pumphouse building demolition, and stack demolition.
- Disposition of equipment and material assets, raw materials and consumable products, and regulated and hazardous material, demolition debris, and recyclable material. This includes disposal of lead and zinc based painted surfaces (specifically the New Stack (69 m) concrete and River Pumphouse cinder block walls) as well as disposal of PCB containing equipment and cables at a licensed facility.
- Decommissioning of civil infrastructure, including Site services associated with the Steam Plant Building and River Pumphouse and associated circulating water supply and discharge lines.

- Final Site grading, landscaping and construction/modification of surface water conveyance systems including the on-Site reuse of surplus concrete generated during decommissioning activities.

Further details on the decommissioning objectives, activities, and sequencing requirements for the above decommissioning activities are discussed in Section 6 of this report.

Decommissioning Plan Sequencing

It is anticipated that the pre-decommissioning engineering and decommissioning of the Facility will take approximately 52 weeks. A conceptual decommissioning schedule is presented on Figure 12 of this report. The duration and sequencing of each activity is based on GHD's professional experience, best management practices, and on current market conditions. The duration of each activity will ultimately be dependent on contractor availability and the selected contractor's resources (i.e., equipment and human resources); and the sequencing will partially be dependent on the selected contractor's preference and the contractor's ability to execute multiple decommissioning activities in a safe manner.

Decommissioning Cost Estimate

GHD developed a Class B Cost Estimate for Decommissioning of the CTGS. The Class B cost estimate as defined by the Association for the Advancement of Costing Engineering (AACE) International is suitable to be used for a study. The methodology used to develop this estimate is based on measured, priced, parameter quantities, where possible, and is considered to have an accuracy range of -20 to +30 percent when completed at the 20 to 30 percent project completion stage.

Costs provided in the Decommissioning and Demolition Cost Estimate include owner's cost to complete the decommissioning project such as internal labour costs, legal fees, insurance, application fees, etc. MECL costs specific to the decommissioning of the Steam Plant Building and associated infrastructure were developed independently by MECL and provided to GHD for inclusion in the closure cost forecasting.

The cost estimate is summarized in the table below and is further detailed in Section 9 and the Tables 9.1 series of this report.

Table 1 Class B Cost Estimate for Decommissioning of the CTGS

Decommissioning Activity	Estimated Cost
PART A - PLANT SITE DECOMMISSIONING	
Building Infrastructure	$ 5,459,709
Civil Infrastructure	$ 783,888
Environmental Mitigation	$ 229,087
TOTAL PART A	**$ 6,472,684**
PART B - ALLOWANCES	
Contingency Allowance (10% of Total Cost) for Unidentified Items (Part A)	$ 647,268
Allowance for Health & Safety, Mobilization-Demobilization (including accommodations), Bonds (15% of Total Cost)	$ 1,294.537
TOTAL PART B	**$ 1,941,805**
ESTIMATED DEMOLITION COST (TOTAL ESTIMATED COSTS PARTS A & B)	**$ 8,414,489**
PART C - PROJECT MANAGEMENT, ENGINEERING & IMPLEMENTATION	
Development of 2018 Decommissioning Study	$ 205,000
MECL Project Management Process	$ 525,000
Regulatory Permitting and Approvals	$ 250,000
Environmental Testing and Monitoring during Decommissioning	$ 100,000
Engineering Design Support During Decommissioning Project.	$ 200,000
Contract Administration and Construction Oversight During Decommissioning Project.	$ 566,800
Pre-demolition Condition Survey of Third Party Properties	$ 10,000
MECL Trades Labour	$ 423,000
MECL Legal/Regulatory/Permitting	$ 180,000
PROJECT MANAGEMENT, ENGINEERING AND IMPLEMENTATION COST (SUBTOTAL - ESTIMATED COST PART C)	$ **2,459,800**
PART D - POST DECOMMISSIONING AND OTHER MISCELLANEOUS COSTS	
Landscaping/Beautification	$ 200,000
Other Miscellaneous Costs	$ 439,000
Environmental Monitoring during Post-decommissioning	$ 50,000
POST DECOMMISSIONING COSTS (TOTAL PART D)	$ **689,000**
TOTAL - ESTIMATED DEMOLITION, DECOMMISSIONING COST (SUM OF PARTS A+B+C+D)	**$ 11,563,289**
POTENTIAL RESALABLE AND SALVAGE VALUE	
Recyclable Materials	$ (1,226,033)
Minus delivery to Point of Sale @ $35/tonne	$ 100,783
TOTAL POTENTIAL RESALABLE AND SALVAGE VALUE	**$ (1,125,250)**
NET CLASS B COST ESTIMATE FOR DECOMMISSIONING	**$ 10,438,039**

Table of Contents

1. Introduction 1
   1.1 Site Description 2
   1.2 Decommissioning Study Objectives and Methods 4
   1.3 Report Organization 6
2. Background 7
   2.1 Site History 7
   2.2 Overview of Current Site Facilities 9
      2.2.1 Steam Plant Building 10
      2.2.2 River Pumphouse and Circulating Water Infrastructure 12
      2.2.3 Bulk Storage Tank Farm 13
      2.2.4 Energy Control Centre 14
      2.2.5 Storage Building 14
      2.2.6 Petroleum Aboveground and Underground Storage Tanks 14
      2.2.7 Chemical Use and Storage 15
      2.2.8 Utility Services 16
   2.3 Current Regulatory Obligations 17
      2.3.1 Approvals to Operate 17
      2.3.2 Applicable Acts, Regulations, and Guidelines 18
   2.4 Potential Non-Regulatory Obligations 21
3. Environmental Conditions 22
   3.1 Previous Environmental Investigations 23
      3.1.1 Phase I Environmental Site Assessment – JWEL (1995) 23
      3.1.2 Phase II Environmental Site Assessment – Fundy (2002) 23
      3.1.3 Asbestos Assessment Reports – All-Tech 24
      3.1.4 Updated Phase II Environmental Site Assessment (2018) 24
      3.1.4.1 File Review and Site Reconnaissance 24
      3.1.4.2 Updated Phase II Environmental Site Assessment Results 26
   3.2 Hazardous Material 27
      3.2.1 Asbestos Containing Materials and Universal Wastes 28
      3.2.2 Decommissioning Cleaning Wastes 30
      3.2.3 Painted Surfaces 30
      3.2.4 PCB-Containing Equipment 31
   3.3 Effluent Water 32
   3.4 Air 33
   3.5 Summary of Current Environmental Conditions 33
      3.5.1 Areas of Potential Environmental Concern 33
      3.5.2 Hazardous Materials and Regulated Wastes 35
4. Current Infrastructure Inventory 35
   4.1 Classification, Description, and Quantity of Materials 35

Table of Contents

4.1.1 Hazardous and Regulated Materials 35
4.1.2 Demolition Debris 36
4.1.3 Recyclable Materials 37
4.1.4 Material Quantities Summary 37

4.2 Decommissioning Cleaning 37

4.2.1 Bulk Storage Tank and Pumping Systems Industrial Cleaning 37
4.2.2 Hazardous/Non-Hazardous Dust Industrial Cleaning 38
4.2.3 Cleaning of Pits/Trenches/Sumps 38
4.2.4 Other Cleaning Activities 38

4.3 Contaminated Soil or other Media 38

4.4 Below Grade Voids 39

5. Decommissioning Options Analysis 39

5.1 Qualitative/Quantitative Options Analysis - Decommissioning 40

5.1.1 Management of PAH/Metal Impacted Soil 40
5.1.2 Management of Lead (and Zinc) Based Painted Concrete 42
5.1.3 Management of Bulk Storage Tank Bottom Sludge 43
5.1.4 Decommissioning of Circulating Water Lines from River Pumphouse to Steam Plant Building 43
5.1.5 Decommissioning of the River Pumphouse, CW Outfalls and Diverter Box, and Rock Groyne 45
5.1.6 Surface Drainage Management 45
5.1.7 Disposal of Excess Concrete Generated During Demolition Activities 46
5.1.8 Demolition of the Stacks 47

5.2 Risk Items 49

6. Decommissioning Plan 50

6.1 Building infrastructure 50

6.1.1 Decommissioning Objectives 50
6.1.2 Decommissioning Activities and Sequencing Requirements 51
6.1.2.1 MECL Decommissioning Activities 51
6.1.2.2 Chemical Sweep 52
6.1.2.3 Universal Waste Removal 52
6.1.2.4 Asbestos Abatement 52
6.1.2.5 Decommissioning Cleaning 53
6.1.2.6 Equipment Removal 54
6.1.2.7 Building Demolition 54
6.1.2.8 Stack Demolition 55
6.1.3 Material Disposal 55
6.1.3.1 Equipment and Material Assets 56
6.1.3.2 Raw Material and Consumable Product Assets 56
6.1.3.3 Miscellaneous Containerized Materials 57
6.1.3.4 Regulated and Hazardous Wastes 57
6.1.3.4.1 Universal Wastes 57
6.1.3.4.2 Asbestos-Containing Material Waste 58
6.1.3.4.3 Bulk Solid Wastes 58
6.1.3.4.4 PCB Containing Equipment and Cables 58

Table of Contents

6.1.3.5 Demolition Debris ... 59
6.1.3.6 Recyclable Materials ... 59
6.1.3.6.1 Recyclable Ferrous and Non-Ferrous Metals ... 59
6.1.3.6.2 Clean Brick and Concrete/Cinderblock ... 59
6.1.3.7 Decommissioning Cleaning Wastewater ... 59

6.2 Civil Infrastructure ... 59

6.2.1 Decommissioning Objectives ... 59
6.2.2 Decommissioning Activities ... 60
6.2.2.1 Site Services ... 60
6.2.2.2 Buried Process Piping ... 61
6.2.2.3 Circulating Water Piping, Outfalls and Diverter Box ... 61
6.2.2.4 Final Site Grading ... 62
6.2.2.5 Post-Demolition Conceptual Site Layout ... 62

6.3 Remediation of Environmental Impacts ... 62

6.3.1 Remediation Objectives ... 62
6.3.2 Potential Remediation Activities ... 62

6.4 Summary ... 63

7. Pre-Decommissioning Engineering ... 63

8. Decommissioning Plan Sequencing ... 66

9. Decommissioning Cost Estimate ... 67

10. Closure ... 69

11. References ... 70

Figure Index

Figure 1	Site Location
Figure 2	Property Plan
Figure 3	Overall Site Plan
Figure 4A	Site Plan – Plant Area
Figure 4B	Site Plan – River Pumphouse Area
Figure 5A	Site Plan – Plant Area Buried Utilities
Figure 5B	Site Plan – River Pumphouse Area Buried Utilities
Figure 6	Infrastructure for Demolition
Figure 7A	Paper Insulated Lead Cables – 13.8kV (Potential PCB Containing)
Figure 7B	Paper Insulated Lead Cables – 4.16kV (Potential PCB Containing)
Figure 8A	Soil Exceedances (mg/kg)
Figure 8B	Groundwater Exceedances (µg/L)
Figure 9	Site Plan – Below Grade Voids
Figure 10	Site Plan – Conceptual Regrading Area
Figure 11	Proposed Laydown Areas
Figure 12	Conceptual Decommissioning Schedule

Table Index

Table 2.1	List of Infrastructure
Table 4.1	Classification and Description of Demolition Materials
Table 4.2	Quantitative Inventory of Demolition Related Materials
Table 4.3	Estimated Industrial Cleaning Quantities
Table 4.4	Summary of Voids Created Through Infrastructure Decommissioning
Table 5.1	Options Analysis
Table 9.1	Detailed Class B Cost Estimate
Table 9.1-A1	Detailed Class B Cost Estimate, Part A1 – Building Infrastructure
Table 9.1-A2	Detailed Class B Cost Estimate, Part A2 – Civil Infrastructure
Table 9.1-A3	Detailed Class B Cost Estimate, Part A3 – Remediation of Environmental Impacts
Table 9.2	Basis, Assumptions and Constraints for Detailed Class B Cost Estimate

Appendix Index

Appendix A Figures and Tables from Updated Phase II Environmental Site Assessment (GHD, 2018)

Appendix B Material Quantity Calculations

- B1 Summary of ACM Quantities
- B2 Crushed Concrete Volume
- B3 Summary of Steel and Other Alloy Quantities
- B4 Plant Site Building Structural Steel Quantities
- B5 Plant Site Building Material Non-Structural Steel Quantities
- B6 Plant Site Boiler Material Quantities
- B7 Plant Process Equipment Material Quantities
- B8 Bulk Storage Tank Farm and Pipeline Quantities
- B9 Turbine-Generator Material Quantities
- B10 Non-Recyclable Debris Quantities
- B11 Summary of Voids Created Through Infrastructure Decommissioning
- B12 Copper Summary
- B13 Industrial Cleaning Quantities
- B14 Transformer Oil Summary

Appendix C 2018 Asbestos Inventory Assessment Report – All-Tech (2018)

Appendix D Inventory Summaries

- D-1 Inventory of Equipment Containing Ozone Depleting Substances
- D-2 Inventory of Mercury Containing Devices
- D-3 Inventory of Oil Filled Transformers
- D-4 Inventory of Smoke Detectors
- D-5 Inventory of Paper Insulated Lead Covered Cables (Potential PCB Containing)
- D-6 Inventory of Chemicals
- D-7 Inventory of Batteries

Appendix E Scrap Metal Pricing – Supporting Documentation

1. Introduction

This report is a Decommissioning Study for the potential Decommissioning and Demolition for a portion of the Charlottetown Thermal Generating Station (CTGS). The Decommissioning Study includes decommissioning plans and closure cost forecasting for budgeting and planning purposes. **A separate Environmental Impact Assessment (EIA) will be completed and submitted to the Prince Edward Island Department of Communities, Land and Environment (PEICLE) in accordance with the provincial *Environmental Protection Act*.** The EIA will outline project specific mitigation measures to be implemented prior to and during decommissioning activities to minimize potential impacts to the public and environment (e.g., dust, noise, traffic, vibration, health and safety). During the development of the EIA and subsequent approval process, consultations with stakeholders and the public will be held. In addition, the demolition contractor(s) will be required to provide Site-specific health and safety, environmental management and demolition plans.

The CTGS is a fossil fuel-fired generating station located on Cumberland Street in Charlottetown, Prince Edward Island (PEI) (herein referred to as the "CTGS", "Site", "Facility", or "Plant Site"). The CTGS is owned by Maritime Electric Company, Limited (MECL) and was originally commissioned nearly 100 years ago (the exact date is unknown) by the Charlottetown Gas Light Company. The Charlottetown Light and Power Company emerged as the sole lighting company in Charlottetown in 1898, having taken possession of the Charlottetown Gas Light Company, and was in turn purchased by MECL in 1918.

MECL currently provides electricity sales and service to approximately 80,000 customers throughout PEI. MECL owns and operates a vertically integrated electrical system providing for the generation, transmission and distribution of electricity throughout the Province and maintains generating plants in Charlottetown and Borden-Carleton, PEI. MECL purchases approximately 75% of its energy from off-island sources. The majority of energy is delivered to PEI through four submarine power cables that link New Brunswick (NB) to PEI. These cables enable MECL to purchase energy from the mainland under various Power Purchase Agreements (PPAs). The balance of energy (approximately 25%) is supplied through wind generation owned by third parties and contracted under PPAs.

MECL owns and maintains 105 megawatts (MW) of oil-fired generating capacity installed on-island for contingency situations. This electrical generating capacity includes 90 MW of light fuel oil-fired, fast-start, simple cycle combustion turbines for standby and peaking purposes. One combustion turbine (CT3 – 50 MW) is located on the CTGS property in Charlottetown, and two combustion turbines (CT1 – 15MW and CT2 – 25 MW) are located in Borden-Carleton. The remainder of the MECL owned electrical generating capacity includes 55 MW of steam-driven thermal generation, run on heavy fuel oil (Bunker C fuel oil) located at the CTGS. It consists of four units ranging in capacity from 7.5 MW to 20 MW. This equipment is approaching the end of its useful life, and would need an extensive and expensive refurbishment to continue to operate safely and reliably. As a result, MECL is considering the decommissioning of the steam driven units at the CTGS in a staged approach.

GHD Limited (GHD) was retained by MECL to provide engineering and regulatory support services for the potential decommissioning of the CTGS. The engineering support includes the preparation of decommissioning plans and closure cost forecasting for the Steam Plant Building and associated infrastructure including the two concrete stacks, Bunker C bulk storage tank and associated distribution infrastructure (day tanks, piping and unloading area) as well as the River Pumphouse and associated circulating water (CW) piping located on the shoreline of the Hillsborough River southeast of the Site (southeast of Water Street Parkway). The decommissioning plans will be provided to the Island Regulatory and Appeals Commission (IRAC) under the Electric Power Act and the Renewable Energy Act. The decommissioning plans will also form the basis for registering the project with the PEICLE under the provincial *Environmental Protection Act* and preparation of an Environmental Impact Statement. Based on previous experience with similar projects, it is expected that the project will be registered as an “Undertaking” and require an Environmental Impact Assessment (EIA) to be carried out for review by the PEICLE to obtain approval to proceed with the decommissioning project. Cost estimates for implementation of decommissioning activities and associated engineering are provided for MECL planning purposes.

The Decommissioning Study is limited to the Steam Plant Building and associated infrastructure including the River Pumphouse and associated CW supply and discharge lines. The infrastructure associated with the CT3 and the on-Site Energy Control Centre (ECC) building are to remain on-Site and operational for the foreseeable future. In addition, the decommissioning plan assumes CT3 Balance of Plant equipment currently housed in the east end of the Steam Plant Building (i.e., switchgear, back-up diesel generators, air compressors, Reverse Osmosis/Electrodeionization (RO/EDI) water treatment equipment, and the CT3 station services transformer) will be re-located to a new on-Site building prior to initiation of the proposed decommissioning and demolition program. Costs associated with removal and relocation of CT3 Balance of Plant equipment or construction of a new CT3 Balance of Plant building are not included in the decommissioning cost estimate. On-Site infrastructure included in the Decommissioning Study as well as infrastructure that will remain on-Site post-decommissioning is detailed in the following sections.

A Site Location Map is shown on Figure 1. A Property Plan is provided as Figure 2 and an Overall Site Plan showing Facility infrastructure is provided as Figure 3. Site Plans specific to the Plant Site and the River Pumphouse are also shown as Figures 4A and 4B, respectively.

1.1 Site Description

The CTGS property consists of 14 parcels of land and 4 waterlot parcels with a total area of approximately 11.65 hectares (28.8 acres). The Site is identified by the Province of PEI Department of Provincial Treasury-Geomatics Information Centre as provincial property identification numbers (PIDs) #338921, 679381, 341396, 341503, 341511 and 341529 (Figure 2). There are nine property parcels associated with PID #338921. A review of property title records indicates that MECL has a 999 year lease agreement with Cumberland Trust for a portion of the Site (PID #338921), which began in 1853 with the Charlottetown Gas Light Company. MECL also has a lease agreement with the Charlottetown Harbour Authority Inc. (CHAI) for the 6.45 hectare water lot property (PID #671628; includes four property parcels), which began in 1990 and expires in 2040. The water lot is located southeast of the Plant Site on the Hillsborough River and includes the River Pumphouse and CW infrastructure as well as an approximately 370 metre (m) long rock groyne.

The CTGS is located within the southeastern limits of the City of Charlottetown in a mixed usage area zoned as Comprehensive Development Area (CDA). The main access route to the Site is via Cumberland Street and Richmond Street which are asphalt paved roads maintained by the City of

Charlottetown. A second entrance to the Site is located off of Water Street Parkway, which will likely be the preferred access point for the demolition contractor, with approval from the City of Charlottetown. The Charlottetown Harbour (Hillsborough River) is located directly adjacent the Site to the southeast. The Charlottetown Harbour is formed by the confluence of three rivers in the central part of PEI's south shore. The harbour opens onto the Northumberland Strait. The portion of the Charlottetown Harbour located adjacent to the River Pumphouse will be identified as the Hillsborough River for the purposes of this report. There are no other known wetlands or water bodies within 200 m of the Site boundaries.

The area surrounding the Plant Site is a mixture of commercial and residential development. An Imperial Oil bulk plant was formerly located northeast of the Site, and is now occupied by the Charlottetown Event Grounds. A Shell Canada petroleum bulk plant, which was decommissioned in the mid-1980s, was also formerly located northeast of the Site. Wash World Auto Detailing followed by Grafton Street and then the Joseph A. Ghiz Memorial Park, Glendenning Hall, a new student residence and Holland College are located to the north and northwest of the Site. Cumberland Street followed by residential properties are located to the southwest of the Site, and the Hillsborough River is located to the southeast of the Site. The Site is intersected by Water Street Parkway, which divides the River Pumphouse and associated CW infrastructure located on the shoreline of the Hillsborough River from the remainder of the Site. The leased water lot property containing the River Pumphouse is also intersected by a right-of-way (ROW) easement containing buried fuel pipelines that parallel the river shoreline from the Port of Charlottetown marine terminal located southwest of the Site to the Irving Oil bulk plant located northeast of the Site. The ROW easement area between the leased water lot property and the Plant Site property is shown on Figure 2.

The Site slopes from north to south towards the Hillsborough River. The Site ranges from approximately 1.8 m above sea level (masl) along the northwestern property line to sea level at the River Pumphouse on the southeastern portion of the Site adjacent to the Hillsborough River.

Existing infrastructure at the Site includes:

MECL Owned Infrastructure to be Decommissioned/Demolished

- Steam Plant Building and Associated Infrastructure: Boiler/Turbine Zones, Magnesium Hydroxide (MgOH) Room, Wastewater Treatment Plant (WWTP), RO-EDI Water Treatment Plant (WTP), CT3 Balance of Plant Equipment Zone, Welding and Mechanical Maintenance Shops (Note: RO-EDI equipment and CT3 Balance of Plant equipment are anticipated to be re-located to the new on-Site building prior to implementing the decommissioning and demolition activities)
- Two concrete stacks [New Stack (69 m) and Old Stack (61 m)]
- CW Infrastructure: River Pumphouse, CW Outfalls and Diverter Box and CW Piping
- Bunker C Bulk Storage Tank, Bunker C fuel lines and steam heat pipelines and Bunker C Off-Loading Area
- Thirteen exterior oil-filled transformers (mounted on concrete pads)
- Three aboveground storage tanks (ASTs) used for storage of Bunker C fuel oil (Day Tanks), two ASTs used for storage of No. 2 diesel fuel (Light Oil Tank and Plant Essential Services

Generator), four ASTs used for storage of lube oil (for the turbines) and eight propane cylinders (which are leased from Irving Energy)

MECL Owned Infrastructure Remaining on-Site

- Combustion Turbine (CT3) and associated infrastructure such as Main Light Oil Tank, associated distribution piping and diesel off-loading station
- ECC Building and associated infrastructure
- Switchyard, Transformer X4, Grounding Transformer, Siemens Switchgear
- New Electrical Controls Building for Charlottetown Substation
- Bermed Bulk Storage Tank Farm
- Rock Groyne
- Storage Building (located northwest of the ECC building)
- Four additional ASTs for storage of No. 2 diesel fuel (Stainless Steel Day Tank, New ECC Standby Generator, Dorman Diesel Day Tank and Fire Pump #3 Fuel oil tank (Dorman and Fire Pump tanks to be removed from Steam Plant Building), one AST for storage of waste oil (Diesel Fuel Off-loading Waste Tank), and one underground storage tank (UST) for collection of waste oil (CT3 Waste Collection Tank)

Details of the buildings and systems are discussed in Section 2. An Overall Site Plan based on a post-2010 aerial photograph is presented on Figure 3. Site Plans identifying specific areas and buildings at the Site are presented as Figures 4A and 4B. The approximate location of buried services including the CW lines and CW Outfalls and Diverter Box are shown on Figures 5A and 5B. Infrastructure included in the Decommissioning Study (including buried services) as well as infrastructure to remain on-Site post-decommissioning is shown on Figure 6.

1.2 Decommissioning Study Objectives and Methods

The overall objective of this study is to determine the necessary decommissioning activities and associated costs to decommission the CTGS in a safe manner that is environmentally and economically sound and in compliance with applicable provincial and federal regulations and standards.

It is GHD's understanding that infrastructure associated with Steam Plant Building will be fully demolished and restored to a condition that would permit future system expansion and energy infrastructure upgrades with some limiting conditions necessary to protect future MECL liability (i.e., designated no-excavation areas or no building areas). GHD further understands the following:

- Health and safety is paramount.
- All MECL infrastructure associated with the Steam Plant Building and River Pumphouse to be sold/decommissioned/demolished but excludes CT3 Balance of Plant Infrastructure.
- The Site will remain a power generation facility owned and operated by MECL for the foreseeable future.

- All CT3 and ECC infrastructure to remain on-Site and operational for the foreseeable future including during Steam Plant Building decommissioning activities.
- All concrete walls, building slabs, stack foundations and pedestals to be demolished to 0.9 m below final grade.
- Sub-surface floors or turbine pedestals that are below surface grade are to be broken up to allow for drainage and voids that may create potential for future differential settlement are to be filled with non-shrink grout or appropriate backfill material.
- Inert material including stack concrete to be reused, recycled or backfilled into below-surface voids or used for surface grading where practical. Initial testing of paint on New Stack (69 m) and cinder block walls of River Pumphouse completed as part of an Updated Phase II Environmental Site Assessment (ESA) indicates that this material is not suitable for use on-Site due to presence of lead and/or zinc based paint.
- Additional testing of concrete for metal leachability may be required as part of supplemental investigations to confirm on-Site disposal of inert concrete is acceptable.
- Metal liners of each stack to be recycled.
- Paved parking lots and access roads are to remain including storm water collection systems.
- MECL will use existing staff for selected decommissioning activities and will provide project management and contract administration duties with support from an engineering consultant during the decommissioning period.
- Decommissioning project will be completed over a period of approximately 1 year.
- MECL costs associated with the decommissioning project such as employee labour costs, legal costs, land tax costs, insurance costs, etc. were provided by MECL for inclusion in the decommissioning cost estimate.
- Costs associated with obtaining regulatory permits (i.e. EIA, Environmental Management Plan, Approval to Construct, Demolition Permit, etc.) and public liaison will be estimated based on similar costs incurred during decommissioning of similar fossil fuel fired generation facilities in Atlantic Canada.
- Re-location, connection and commissioning of the CT3 Balance of Plant equipment to the new CT3 building will be completed under a separate contract and, therefore, costs associated with these activities are not included in this Decommissioning Study cost estimate.
- Pricing data for salvageable materials was based on pricing averages over the last five years obtained during other demolition projects and will be used in the cost estimate.
- Decommissioning must comply with all local, provincial, and federal regulations.

In preparation of the Decommissioning Study, GHD conducted a walk-through inventory of each structure comprising the CTGS in conjunction with a detailed review of existing construction drawings and other equipment information detailed in on-Site manuals or information provided by MECL personnel. In addition, MECL personnel familiar with the CTGS provided information concerning the past and current use of the Site, accompanied GHD during the Site inspection, and/or provided additional building/infrastructure plans. The MECL personnel interviewed as part of the Decommissioning Study include:

- Mr. Kent Nicholson (MECL Project Manager)
- Mr. Adam MacKenzie (MECL Alternate Project Manager)
- Mr. Tom Mugford (MECL Health, Safety & Environment)
- Mr. Joe Steele (MECL CT3 Supervisor and Project Electrical)
- Mr. Kevin Burns (MECL Chief Engineer of Plant Operations)
- MECL on-Site Electrician and Shift Supervisors

The purpose of conducting a detailed inventory and interviewing staff familiar with the Site was to develop a reasonable and approximate estimate of the types of materials associated with the MECL infrastructure to be included in the Decommissioning Study as well as CT3 and ECC infrastructure that will remain at the Site (excluded from the Decommissioning Study). Through development of the material inventory, an approximate estimation of the quantities associated with decontamination and industrial cleaning of the Site in advance of demolition, and the volume of voids that would require infilling following demolition, were also determined.

A detailed review of infrastructure associated with all of the boiler units and turbines was conducted using available drawings and Site observations. Where data gaps occurred in the inventory, assumptions were made based on previous Decommissioning Studies completed by GHD for similar Power Plant facilities. In all cases where assumptions have been made for quantifying materials, these assumptions are listed in the quantity take-off tables attached in Appendix B.

1.3 Report Organization

This Decommissioning Study is organized in the following sections:

- **Section 2.0** – Background: provides an overview of the Site history and location
- **Section 3.0** – Environmental Conditions: outlines the current environmental conditions to be addressed through decommissioning
- **Section 4.0** – Current Infrastructure Inventory: provides an inventory of the infrastructure to be demolished and identifies the types and quantities of salvageable, recyclable, and waste materials
- **Section 5.0** – Decommissioning Options Analysis: provides a summary of the options identified and qualitative and quantitative analyses completed for the various decommissioning options
- **Section 6.0** - Decommissioning Plan: presents the decommissioning objectives and decommissioning plan
- **Section 7.0** – Pre-Decommissioning Engineering: outlines additional engineering activities that are required prior to implementation of the decommissioning activities
- **Section 8.0** – Decommissioning Plan Sequencing: provides an overview of the sequencing of the decommissioning activities

- **Section 9.0** – Decommissioning Cost Estimate: presents the forecasted decommissioning and demolition costs and MECL related liability costs during decommissioning
- **Section 10.0** – Closure: signature page
- **Section 11.0** – References

2. Background

2.1 Site History

A brief history of the Site in bullet form is provided below:

- **Approximately 1854 to 1900** – Site development on the corner of Sydney Street and Cumberland Street (near the Charlottetown waterfront) may have occurred as early as 1854 by the Charlottetown Gas Light Company. The site development would have included a number of small commercial buildings. The gas works company transported coal to the Site via railroad car and produced "coal gas" for street lamp lighting.
- **1898** – Charlottetown Light and Power Company emerged as the sole lighting company in Charlottetown, having taken possession of the Charlottetown Gas Light Company.
- **Approximately 1900** – A Corliss reciprocating engine and generator were relocated to the Site from a power plant at the corner of Pownal Street and Water Street in Charlottetown. Coal gas producers were installed at this time and were used in Charlottetown until approximately 1926 (when the first coal-fired boiler and steam-driven turbine were installed on PEI).
- **1918** – MECL, which was headquartered in Fredericton, NB, purchased the assets of Charlottetown Light and Power Company. Photographs taken around this time show that the Charlottetown Harbour was approximately 50 feet from the southeast corner of the plant. Therefore, much of the land now currently present to the south of the Steam Plant Building is reclaimed land from the Hillsborough River. A series of cooling ponds are shown in historical photographs to be located approximately where Unit 9 is currently located.
- **1926** – The first coal-fired boiler and steam-driven turbine (Westinghouse, 500 kilowatt (kW), 175 pounds (lb) steam pressure) were installed at the Site.
- **Approximately 1927** – A second steam-driven turbine (Westinghouse, 1,000 kW, 175 lb. steam pressure, "Unit 1") was installed and maintained in operational condition until 1962 when it was retired.
- **Approximately 1931** – A third steam-driven turbine (Allis Chalmers, 1,500 kW, 250 lb. steam pressure, "Unit 3") was installed and maintained in operational condition until 2003. This unit was built in the United States and was of a more modern design that the previous units, with increased steam conditions.
- **1935** - A portion of the existing Steam Plant building (currently present on Site) was constructed by 1935 to house steam boilers and steam turbines and was expanded numerous times over future years to accommodate generating capacity expansions as detailed below.

- **Approximately 1943** –A steam-driven turbo alternator (C.A. Parsons & Company Limited, 4,000 kW) complete with all necessary auxiliaries was installed increasing the generation voltage (V) from 2,400 to 4,160 V. Delivery of this unit was approximately three years and the rapidly increasing load made it necessary to relocate a steam-driven turbine (General Electric, 1,200 kW, 175 lb steam pressure, "Unit 4") from MECL's Fredericton plant to the Site before the turbo-alternator was delivered. This unit was maintained in operating condition until 1963 when it was retired.
- **1945** – MECL began the conversion from coal to Bunker C fuel oil when a new 60,000 lb/hr Babcock & Wilcox boiler and fuel tank were installed. Diesel fuel was also stored on-Site and used in igniting/starting-up boilers. The 30,000 barrel (BBL) Bunker C Fuel Oil Storage Tank was historically located in the vicinity of Unit 9.
- **1947** – The new steam-driven turbo-alternator (C.A. Parsons & Company Limited, 4,000 kW, "Unit 5") was complete. This increased the plant capacity to a total of 7,700 kW.
- **1951** – A new steam-driven turbo-alternator (C.A. Parson & Company Limited, 7,500 kW, "Unit 6") was complete. This increased the plant capacity to a total of 15,200 kW.
- **1954 to 1956** – In the early 1950s, the Government's rural electrification program grew, and the load on the plant increased more rapidly. An order was placed with Brown-Boveri for another unit (7,500 kW) which installed and commissioned in 1956. The new unit ("Unit 7") increased the plant capacity to a total of 22,700 kW.
- **1959** – The 30,000 BBL Bunker C Fuel Oil Tank (originally built in 1945), which was previously located in the vicinity of the current Unit Boiler 9, was relocated to its current location in the tank farm to facilitate expansion of the Steam Plant Building.
- **1960** – A new steam driven turbo-alternator (10,000 kW, "Unit 8") was commissioned which increased the plant capacity to a total of 32,700 kW.
- **1963** – A Cochrane ion exchange-type demineralizer with two anion and two cation resin tanks were installed as well as bulk sulphuric acid and caustic tanks. A new 20,000 kW unit and steam generator ("Unit 9") were commissioned in 1963 and operated continuously on a 24-hour basis until fall of 1977.
- **1968** – A new 20,000 kW unit and steam generator ("Unit 10") were commissioned in October 1968 and operated continuously on a 24-hour basis until fall of 1977.
- **1976** – A new package type boiler (75,000 lb/hr) was commissioned in February.
- **1977** – Submarine Cable 1 and Cable 2 were installed and commissioned in September delivering power to PEI from NB.
- **1985** – MECL and the Government of Canada participated in a demonstration project to burn Carbogel (a coal-water emulsified slurry) in Boiler 10. A baghouse (which has since been removed) was constructed for particulate removal, an insulated tank was installed on-Site (the Carbogel Tank) and the burners on the boiler were modified for Carbogel combustion. The demonstration project was conducted over the period of one year and was subsequently discontinued.

- **1989** – A Magnesium Hydroxide (MgOH) room and equipment were added to the south side of the Steam Plant Building. MgOH was injected into the boiler flue gas stream just upstream of the Ljungstrum air pre-heaters on each boiler which reacted chemically with sulphur precipitating from the flue gas (at dew point temperatures) and reduced acidic fallout from the stacks.
- **1990 to 1995** – A life extension program was undertaken to refurbish all major equipment within the Steam Plant building.
- **1996** – Further plant expansion occurred as a result of the installation of a batch Waste Water Treatment Plant which required the decommissioning and demolition of Boiler No. 1. Hydrazine and Amine tote tanks and chemical metering pumps were also added to effect cold-wet layups of the boilers and turbines during the summer months.
- **1997** – A small used Volcano package boiler (16,000 lb/hour) was purchased from the Scarborough East General Hospital in Toronto, Ontario. The boiler was relocated to the CTGS and installed above the existing Cochrane Demineralizer Plant. The package boiler was originally fired on Natural Gas at the hospital but was converted to burn Bunker C fuel oil or No. 2 Diesel fuel for Steam Plant Building heating.
- **2002/2003** – Turbine-Generators 3 and 5 were decommissioned and removed from the Steam Plant by MECL maintenance staff.
- **2005** – Major renovations including the installation of a General Electric LM6000 simple cycle combustion turbine (CT3: 50,000 kW) in the parking lot to the north of the Steam Plant Building and associated ancillary equipment including the Main Light Oil Tank [2,178,108 litre (L)]. The installation of this equipment required the removal and decommissioning of Boiler No. 3 to accommodate for the current RO-EDI WTP.
- **2017** – Turbine-Generator 6 was decommissioned and removed from the building by MECL maintenance staff.

As indicated in the preceding paragraph, the Steam Plant Building has been expanded numerous times since 1935 to accommodate the addition of new electric generation equipment. The Steam Plant Building layout as well as other infrastructure associated with the CTGS is further discussed in the following sections.

2.2 Overview of Current Site Facilities

A summary of the CTGS infrastructure is presented below. The infrastructure inventory has been divided into the following areas:

- Steam Plant Building
- River Pumphouse and CW Infrastructure
- Bulk Storage Tank Farm
- ECC
- Storage Building
- Petroleum ASTs and one UST

- Chemical Use and Storage
- Utility Services

Table 2.1 lists the identified buildings and infrastructure considered in the Decommissioning Study. The CTGS layout including specific areas of the Steam Plant Building are shown on Figure 3 to 5A/B. Infrastructure considered in the Decommissioning Study is shown on Figure 6.

2.2.1 Steam Plant Building

A series of inter-connected zones form the Steam Plant Building, which is the main component of the CTGS involved with the current and historic generation of electricity. These zones and buildings are listed below.

The Steam Plant Building, which was originally constructed in 1935, measures 95 m by 70 m in plan view. It consists of a three storey structure building with various materials including brick, steel and wood in the original section and steel framing in the new sections with foundations consisting of a combination of pilings and cast-in-place concrete. Exterior building materials include metal siding, brick and limited amounts of asbestos containing siding. The roof consists of a combination of built-up roofing (i.e. gravel ballasted, 2 ply-modified bitumen roofing) and 2-ply modified bitumen roofing with a protective coating membrane. The older portions of the building have sloped roofs while the newer sections (Units 9 & 10, Boiler 5 Zone and Turbine 8 Zone) have flat roofs. All roofs are supported by steel decking and steel structure. Trenches and floor drains are located throughout the building, along with five main sumps and two smaller drains. The building is insulated with spray-on cellulose, rigid insulation and fiberglass, with a combination of incandescent, fluorescent and mercury vapour lighting. The building is heated via a combination of steam from Boiler 2 (feeding suspended unit heaters and two large wall heaters) and electric fired suspended unit heaters located throughout the plant. The Steam Plant Building includes the following zones and infrastructure:

- **Unit 10 Boiler/Turbine Zone** – The Unit 10 Boiler/Turbine zone is located in the northwest portion of the Steam Plant Building, adjacent to the Unit 9 Boiler/Turbine Zone. This zone was constructed in 1968 and measures approximately 765 m^2 (22 m by 29 m in plan view), with a roof elevation of 16.9 m (excluding the 5.5 m Penthouse). This zone contains a 20,000 kW turbine generator, a 190,000 lb/hr boiler, a 37,850 litre day tank, a Light Oil Tank (formerly Carbogel tank) (exterior), flue gas ducting, a surge tank, high level and low level reserve water tanks, a deaerator, two oil coolers, CW wells (screen and discharge), a loading bay, heat exchangers, a generator terminal box, an exciter, various pumps, a sump pit, air receivers, service air compressors and receivers, air ejectors and a boiler lighting board.
- **Unit 9 Boiler/Turbine Zone** – The Unit 9 Boiler/Turbine zone is located in the southwest portion of the Steam Plant Building, adjacent the Unit 10 Boiler/Turbine Zone and MgOH Room. This zone was constructed in 1963 and measures 830 m^2 (35.8 m by 22 m in plan view), with a roof elevation of 16.9 m (excluding the 5.5 m Penthouse). This zone contains a 20,000 kW turbine generator, a 190,000 lb/hr boiler, a turbine oil tank, high level and low level reserve water tanks, a deaerator, two oil coolers, a 37,850 litre day tank, a cyclone dust collector, flue gas ducting, a pumping and heating set, compressors, station service switchgear, air heaters, air receivers, an air conditioner, air ejectors, screen wells, a loading bay, a generator terminal box, an exciter, and boiler feed pumps.

- **MgOH Room** – The MgOH Room is located in the southwest portion of the Steam Plant Building, adjacent the Unit 9 Boiler/Turbine Zone. This room was constructed in 1989 and measures 150 m^2 (17.7 m by 7.6 m in plan view), with a roof elevation varying between 9.1 m and 9.8 m. This room contains two MgOH silos, a bulk caustic tank as well as hydrazine and amine storage tanks.
- **Boiler 5 Zone** – The Unit 5 Boiler Zone is located in the central south portion of the Steam Plant Building, adjacent the Unit 9 Boiler/Turbine Zone, Unit 8 Turbine Zone, and Unit 4 Boiler Zone. This zone was constructed in 1960 and measures 290 m^2 (18.2 m by 14.5 m in plan view), with a roof elevation of 13.6 m. This zone contains a 105,000 lb/hr boiler, a pump surge tank, flue gas ducting for Boilers #4, 5, and 6 to the New Stack (69 m), air heaters, Boiler Stack, a bulk acid tank, a water storage tank, a sump pit, a reserve feed water pump, a space heater, switchgear, chemical pumps and tanks, an air receiver, as well as a lunchroom and offices.
- **Unit 8 Turbine Zone** – The Unit 8 Turbine Zone is located in the central north portion of the Steam Plant Building, adjacent the Unit 9 Boiler/Turbine Zone, Unit 5 Boiler Zone and Unit 7 Turbine Zone. This zone was constructed in 1960 and measures 325 m^2 (18.2 m by 14.5 m in plan view), with a roof elevation of 11.6 m. This zone contains a 10,000 kW turbine generator, a turbine oil tank, wells (screen and discharge), a sump pit, pumps (circulation water and extraction pumps), switchgear, battery rooms, oil coolers, an oil purifier, heaters and valve controls.
- **Boiler 4 Zone** – The Unit 4 Boiler Zone is located in the central south portion of the Steam Plant Building, adjacent the Unit 5 Boiler Zone, Unit 7 Turbine Zone and Wastewater Treatment Plant Zone. This zone was constructed in 1954 and measures 305 m^2 (13.3 m by 24.2 m in plan view), with a roof elevation of 16.2 m. This zone contains a 100,000 lb/hour boiler, a surge tank, a drain tank, Boiler 2, Boiler 4 steel stack and Boiler 2 stack, instrument compressors, demineralizers, boiler room switchgear and boiler station service transformer.
- **Unit 7 Turbine Zone** – The Unit 7 Turbine Zone is located in the central north portion of the Steam Plant Building, adjacent the Unit 8 Turbine Zone, Unit 4 Boiler Zone and CT3 Balance of Plant Equipment Zone. This zone was constructed in 1956 and measures 320 m^2 (15.6 m by 24.2 m in plan view), with a roof elevation varying between 8.5 m and 13.4 m. This zone contains a 7,500 kW turbine generator, a CW pump, a turbine oil tank, two oil coolers, and boiler feed pumps.
- **Wastewater Treatment Plant Zone** – The Wastewater Treatment Plant Zone is located in the southeast portion of the Steam Plant Building, adjacent the Unit 4 Boiler Zone, CT3 Balance of Plant Equipment Zone, and RO-EDI Plant. This zone was constructed prior to 1935 and measures 245 m^2 (21.8 m by 14.5 m in plan view), with a roof elevation varying between 8.5 m and 13.4 m. This zone contains a boiler (Boiler 6), an oil pump room, a 15,000 gallon old end day tank, two batch treatment tanks, an oil/water separator, a filter press, a sand filter, an air heater, a sludge pump, a wastewater treatment panel, an old end blow down tank, and chemical feed systems.
- **RO-EDI Plant** – The RO-EDI Plant is located in the southeast portion of the Steam Plant Building, adjacent the Wastewater Treatment Plant and CT3 Balance of Plant Equipment Zone. This area of the Steam Plant Building was converted to a WTP area in 2005 and houses the RO-EDI equipment and demineralized water storage tank required for the operation of the CT3. The RO-EDI Plant area measures 175 m^2 (6.5 m by 18.9 m in plan view), with a roof elevation of

13.4 m. The RO-EDI equipment (with the exception of the stainless steel demineralization water storage tank) will be relocated to a new proposed CT3 Building prior to demolition activities.

- **CT3 Balance of Plant Equipment Zone** – The CT3 Balance of Plant Equipment Zone is located in the northeast portion of the Steam Plant Building, adjacent the Wastewater Treatment Plant, RO-EDI Plant, Unit 7 Turbine Zone and Welding Shop. This zone was constructed prior to 1935 and measures 550 m^2 (28 m by 14.5 m in plan view), with a roof elevation varying between 8.5 m and 13.4 m. This zone contains lube oil storage, two Dorman diesels, generator switchgear, a control switch board, and relay panels. The majority of the equipment in this CT3 Balance of Plant Equipment Zone will be relocated to a new CT3 building prior to demolition activities. The relocation of this equipment is not included in the decommissioning cost estimate.
- **Welding Shop** – The Welding Shop is located in the northeast portion of the Steam Plant Building, adjacent the CT3 Balance of Plant Equipment Zone. This shop was constructed prior to 1935 and measures 75 m^2 (5.3 m by 9.7 m in plan view), with a roof elevation of 13.4 m. This shop contains an electrical maintenance workshop on the upper level, and a mechanical welding shop on the lower level as well as a storage area and the old elevator shaft. A washroom and employee locker room are located on the second floor.
- **Mechanical Maintenance Shop** – The Mechanical Maintenance Shop is located north of the Steam Plant, and is connected by a breezeway. This shop was constructed in 1976 and measures 170 m^2 (15.5 m by 7.8 m in plan view), with a roof elevation varying between 4.3 m and 4.6 m. This shop contains several lathes, various machining equipment, a tool crib and a maintenance shop office.
- **Stacks** – The Steam Plant currently has three stacks, which were constructed for the purpose of flue gas expulsion. The New Stack (69 m), which connects to Boilers 4, 5 and 6, was installed in 1974 and consists of a 2.3 m diameter steel liner surrounded by a steel-reinforced concrete chimney/wind column. A stainless steel cap bridges the gap between the steel liner and concrete chimney. The Old Stack (61 m), which connects to Boilers 9 and 10, was installed in 1968 and consists of a 1.8 m diameter steel liner surrounded by a steel reinforced concrete chimney/wind column. A stainless steel cap bridges the gap between the steel liner and concrete chimney. The Boiler 2 Stack was installed in 1997 and consists of a 0.8 m diameter stainless steel stack which protrudes approximately 7 m above the Steam Plant Building roofline.

2.2.2 River Pumphouse and Circulating Water Infrastructure

This section briefly discusses the River Pumphouse and associated CW infrastructure and their relative locations. The location of the River Pumphouse and CW infrastructure discussed below is shown on Figures 5A and 5B.

The CW facilities include the following:

- **River Pumphouse** – Cooling water for the CTGS operation is obtained from the Hillsborough River via the River Pumphouse. A single pumphouse structure intakes river water, passing through a trash rake and traveling screenings, and then pumps water from the vertical pits to the CW lines that service the condensers in the Steam Plant Building. The River Pumphouse measures 27 m by 9 m in plan view and consists of a three storey structure with one level. The structure was built in three sections with the west end built in the early 1950s, the middle in the late 1950s and the east end in 1969. The entire River Pumphouse was renovated in 1992. The building consists of a cinder block construction on a piled foundation (steel sheet piles) with a concrete slab floor. The exterior of the building consists of steel siding with a built-up-roof. The building is not insulated, and contains a combination of fluorescent and sodium high pressure lighting. Ancillary equipment associated with the River Pumphouse includes electrical switchgear, two station service transformers and an air compressor and receiver. The building is heated via electric heat and does not have air conditioning units. An armour stone retaining wall structure is located on the east end of the River Pumphouse. The remains of a decommissioned smaller Pumphouse structure (wooden timbers) are still visible at grade level to the west of the River Pumphouse.

- **River Pumphouse Dock Structure -** A creosote/pressure-treated timber dock supported by creosote timber pilings that is approximately 18 m x 3.5 m in plan view.
- **Rock Groyne –** A 370 m long rock groyne extending into the Hillsborough River
- **CW Outfalls and Diverter Box** – The processed cooling water is discharged through the CW discharge pipes and CW Outfalls and Diverter Box to the Hillsborough River directly west of the River Pumphouse (southwest of the rock groyne). This structure consists of a small concrete chamber that can direct water towards the River Pumphouse intake area (during winter months to keep water around pumphouse from freezing) or directly into the river.
- **CW Piping** – The CW supply lines extend from the River Pumphouse to the north and east sides of the Steam Plant Building and consist of two 1,050 mm diameter Hyprescon pipes and three cast iron pipes (with diameters of 600, 450 and 300 mm). The CW supply lines range in total length from approximately 179 to 289 m. The CW discharge lines extend from the south, west and east sides of the Steam Plant Building to the CW Outfalls and Diverter Box and consist of three Hyprescon pipes (with diameters of 900, 1050 and 1,200 mm). Subsequent to the installation of the CW lines, Water Street Parkway was constructed in 1994 and four sections of the CW intake lines were replaced with new sections of PVC and ductile iron pipe within the Water Street Parkway right of way. The CW discharge lines range in total length from approximately 193 to 275 m. The CW pipes generally range from approximately 1.5 to 3.0 m below ground surface.

2.2.3 Bulk Storage Tank Farm

There is one Bulk Storage Tank Farm at the CTGS, and it is located approximately 70 m to the northeast of the Steam Plant. It has a soil containment berm and liner system approximately 2.6 m in height around the perimeter and contains one 4,778,000 L Bunker C fuel oil AST (Main Fuel Oil Tank), one 2,178,108 L diesel fuel AST (Main Light Oil Tank), and a 114,596 L diesel fuel AST (Stainless Steel Diesel Fuel Day Tank), and associated off-loading stations. The Main Fuel Oil Tank (Bunker C Tank) was originally installed at this location in 1959 and the diesel ASTs were installed in 2005. The tanks are single walled coated carbon steel or stainless steel.

The primary sources of fuel used for combustion at the Site are Bunker C fuel oil and diesel fuel, which was formerly supplied by the Imperial Oil bulk plant located to the northeast of the Site, until it was decommissioned between 2000 and 2010. Fuel is currently supplied to the Site via tanker trucks, which utilize the off-loading stations.

The Bunker C bulk storage tank and associated distribution piping (including steam heat piping) as well as the Bunker C unloading area is included in the Decommissioning Study. However, the Bulk Storage Tank Farm area (bermed area) and diesel tanks associated with the CT3 operation will remain on-Site for the foreseeable future.

2.2.4 Energy Control Centre

The ECC is located northwest of the Steam Plant Building. The building measures 24 m by 20 m in plan view. The ECC consists of a two storey steel framed structure with concrete block support walls on a reinforced foundation. The building exterior consists of steel siding with a typical built-up roof design. The ECC has no observed sumps or trenches. The building is heated by means of an electric boiler located on the ground floor of the ECC. The ECC also has backup electric heaters in some areas, as well as two air conditioning systems. The building is insulated with fiberglass, and contains fluorescent and LED lighting. The ECC is the critical infrastructure for the distribution of power within PEI and will remain on-Site and operational for the foreseeable future.

2.2.5 Storage Building

The Storage Building, located northwest of the ECC, and measures 15 m by 13 m in plan view. The Storage Building consists of a single storey, wood framed structure on a concrete block foundation with a concrete slab floor. The building exterior consists of Abitbi wood siding above an approximately 1 m high concrete block wall. The roof consists of wood framing with asphalt shingles. The building is insulated with fiberglass, and contains fluorescent lighting. The building contains no air conditioning or heating systems. This Storage Building was used as a former automotive repair shop with walk-in concrete trench to service vehicles, but was filled in by MECL when property ownership changed. The Storage Building will remain on-Site for the foreseeable future.

2.2.6 Petroleum Aboveground and Underground Storage Tanks

In addition to the bulk fuel storage tanks, the Site contains numerous ASTs and one UST to store Bunker C fuel, No. 2 diesel fuel, lube oil, waste oil and propane. A list of the petroleum storage tanks on Site was provided by MECL.

The following ASTs are planned to be decommissioned as part of the Steam Plant Building demolition activities and included in the Decommissioning Study:

- One 4,778,000 L Bunker C Fuel , single wall, coated carbon steel AST, installed at its current location in 1959 (Bunker C Fuel), known as the Bunker C Bulk Storage Tank or Main Fuel Oil Tank
- One 68,250 L, single wall, insulated carbon steel AST, installed in 1973 (Bunker C Fuel), known as the Old End Day Tank
- One 45,460 L, single wall, insulated carbon steel AST, installed in 1993 (Bunker C Fuel), known as the Unit 9 Day Tank
- One 45,460 L, single wall, insulated carbon steel AST, installed in 1966 (Bunker C Fuel), known as the Unit 10 Day Tank

- One 113,560 L, single wall, insulated carbon steel AST, installed in 1986 (No. 2 Diesel Fuel), known as the Light Oil (formerly Carbogel) Tank
- One 455 L, single wall, coated carbon steel AST, installed in 2002 (No. 2 Diesel Fuel), known as the DGEN2 – Plant Essential Services Generator Tank
- One 6,000 L, single wall, coated carbon steel AST, installed in 1968 (Lube Oil) known as the Unit 10 Lube Oil Tank
- One 6,000 L, single wall, coated carbon steel AST, installed in 1962 (Lube Oil), known as the Unit 9 Lube Oil Tank
- One 3,000 L, single wall, coated carbon steel AST, installed in 1958 (Lube Oil), known as the Unit 8 Lube Oil Tank
- One 2,000 L, single wall, coated carbon steel AST, installed in 1953 (Lube Oil), known as the Unit 7 Lube Oil Tank
- Eight 378 L, single wall, carbon steel ASTs, leased cylinders (propane), known as Pressurized Tanks

The following ASTs and UST will remain on-Site post-decommissioning:

- One 2,178,108 L, single wall, coated carbon steel AST, installed in 2005 (No. 2 Diesel Fuel), known as the Main Light Oil Tank or Diesel Oil Storage Tank
- One 114,596 L, single wall, stainless steel AST, installed in 2005 (No. 2 Diesel Fuel), known as the Stainless Steel Diesel Fuel Day Tank
- One 969 L, double wall, coated carbon steel AST, installed in 2005 (No. 2 Diesel Fuel), known as the Dorman Diesel Day Tank (to be relocated from Steam Plant Building)
- One 2,207 L, double wall, carbon steel AST, installed in 2014 (No. 2 Diesel Fuel), known as the New ECC Standby Generator Tank
- One 675 L, double wall, coated carbon steel AST, installed in 2007 (No. 2 Diesel Fuel), known as Fire Pump #3 Tank (to be relocated from Steam Plant Building)
- One 1,135 L, double wall, coated carbon steel AST, installed in 2005 (Waste Oil), known as the Diesel Fuel Offloading Waste Tank
- One 4,520 L, double wall, polyethylene UST, installed in 2005 (Waste Oil), known as the CT3 Underground Waste Collection Tank

2.2.7 Chemical Use and Storage

Chemicals historically and presently used and stored at the Site include: lubricants, paint and solvents (degreasers), ethylene glycol, phosphate, polymer, sodium hydroxide (caustic), magnesium hydroxide, hydrazine, ferrous sulphate, sulfuric acid, ammonia, cyclohexane, alkatrol, dry chemical absorbent, poly-aluminum coagulant, ion-exchange resin as well as various acids, reagents, and alcohols.

There are several chemical ASTs located at the Site, which include:

- 17,100 L sulphuric acid tank (Boiler 5 Zone Exterior)
- 4,600 L caustic tank (MgOH Building)
- Several hydrazine and amine tote tanks (MgOH Building)
- Several 190 L chemical storage tanks located throughout Steam Plant Building

Various other small amounts of chemicals and universal wastes (rust inhibitors, degreasing agents, cleaners, etc.) were noted to be stored in cabinets in the maintenance shop and welding area.

2.2.8 Utility Services

There are a number of utility services associated with the CTGS including potable water, process water, fire suppression hydrants, sanitary and storm sewer, CW piping and overhead/underground electrical cabling. Buried utilities associated with the CTGS are presented on Figures 5A and 5B.

A 150 millimetre (mm) diameter force main from Cumberland Street provides potable water to the Steam Plant Building as well as process water to the Water Treatment Plant (RO/EDI Plant) for operation of CT3. This force main also services fire suppression hydrants along Cumberland Street. A 200 mm diameter force main from Richmond Street services the fire suppression hydrants on the Site. Potable water wells or process water wells are not located at the Site.

Industrial wastewater generated at the Site as part of the CTGS operation is collected and directed to the on-Site WWTP. Chemical releases or spills as well as water infiltration in the Steam Plant Building are captured in the floor sumps of these buildings and are directed to the WWTP. The treated wastewater is discharged to the Hillsborough River via the CW Outfalls and Diverter Box. Details of the WWTP are included in Section 2.2.1.

CW for the CTGS operation is obtained from the Hillsborough River via five supply lines that extend from the River Pumphouse and the Steam Plant Building, as detailed in Section 2.2.2.

The Steam Plant Building is serviced by a gravity sewer that discharges to the 375 mm diameter municipal sanitary sewer system. There are no known septic tanks at the Site.

The Plant Site uses electricity generated by the Steam Plant Building or receives electricity from the provincial grid to service the on-Site buildings.

Currently surface water is managed on-Site through a system consisting of drainage ditches, catch basins and underground storm sewers that discharge to the Hillsborough River. Precipitation that contacts the property either infiltrates into permeable Site surfaces, or is collected by catch basins and drainage ditches located across the Site. The following provides a brief overview of the storm water plan for the Site:

- Asphalt covered areas including access roads and parking areas in the vicinity of the CT3 infrastructure and north of the Steam Plant Building contain catch basins that directly discharge to the Hillsborough River through the 900 mm diameter Hyprescon CW discharge pipe. An asphalt parking area located north of the CT3 infrastructure is currently leased to Holland College.

- Storm water in the vicinity of the Bulk Storage Tank Farm is collected through a series of catch basins and conveyed to the Hillsborough River via a 450 mm diameter concrete discharge pipe that outfalls directly northeast of the River Pumphouse.
- Storm water collected from within the Bulk Storage Tank Farm area is collected in a sump equipped with a petroleum hydrocarbon sensor and pumped to the 450 mm diameter storm sewer discharge pipe that outfalls to the Hillsborough River.
- Water collected from within the CT3 facility is directed through a 4000 L underground wastewater collection tank equipped with petroleum hydrocarbon sensors and then directed to the WWTP within the Steam Plant Building for treatment prior to discharging to the Hillsborough River.
- Storm water that contacts the Steam Plant Building is collected in roof drains and discharged directly to the Hillsborough River.

There are a number of underground void spaces and pipe trenches associated with the Site services and include:

- Five CW supply lines [two 1050 mm Hyprescon and three cast iron (600 mm, 450 mm and 300 mm)] from the River Pumphouse to the Steam Plant Building
- Three Hyprescon CW discharge pipes (1,200 mm, 1,050 mm and 900 mm) from the Steam Plant Building to the CW Outfalls and Diverter Box
- One 0.9 by 1.2 m wooden box discharge culvert from an on-Site catch basin to the Hillsborough River
- Site storm water collection system piping that discharge directly to the Hillsborough River

2.3 Current Regulatory Obligations

2.3.1 Approvals to Operate

The facilities associated with the CTGS currently operate under two Approvals to Operate issued by the PEICLE to MECL. These approvals are outlined below:

- **Certificate of Approval to Operate #FBE0201S** – Approval to operate the fuel burning equipment for the purpose of producing steam for electrical power generation and heating requirements at the Facility by the PEICLE pursuant to the Air Quality Regulations under the Environmental Protection Act. The approval was issued in 2018 and pertains to six heavy fuel oil-fired boilers (known as Boilers 2, 4, 5, 6, 9 and 10). The Approval to Operate contains conditions on operating conditions, stack testing requirements, ash disposal requirements, record keeping and reporting requirements.
- **Certificate of Approval to Operate #99-03** – Approval for the construction and operation of the physical/chemical batch wastewater treatment plant at the Facility issued by the PEICLE under the Environmental Protection Act. The approval was issued in 1996 and revised in 1999 and pertains to two batch treatment tanks, process agitators, sand filter, sludge plate and frame filter press, chemical feed system and various pumps and piping. The approval also contains conditions on wastewater management, discharge limits, testing and monitoring, and reporting requirements.

2.3.2 Applicable Acts, Regulations, and Guidelines

Acts and Regulations that are applicable to the operation and decommissioning of the CTGS include:

Prince Edward Island Acts and Regulations

- Environmental Protection Act – Applicable regulations under this act include:
  - Air Quality Regulations (Chapter E-9) – Relates to the permit requirements for the release of a contaminant into the air from an industrial source, incinerator or fuel-burning equipment.
  - Contaminated Sites Registry Regulations (Chapter E-9) – Relates to the designation of a property as a contaminated site if the petroleum hydrocarbons exceed values provided in the Petroleum Hydrocarbon Remediation Regulations or non-petroleum hydrocarbons exceed guidelines provided by the Canadian Council of Minister's of the Environment (CCME).
  - Drinking Water and Wastewater Facility Operating Regulations (Chapter E-9) – Relates to the monitoring requirements for the operation of facilities, or permit to operate facilities, with a public drinking water supply or wastewater treatment.
  - Environmental Assessment Fees Regulations (Chapter E-9) – It is assumed the decommissioning project will be considered an undertaking in accordance with the EIA guidance of the PEICLE and subject to the fees outlined in this regulation.
  - Ozone Layer Protection Regulations (Chapter E-9) – Relates to maintenance and disposal of Ozone Depleting Substance (ODS) and other halocarbon containing equipment which are expected to be present at the Site.
  - Petroleum Hydrocarbon Remediation Regulations (Chapter E-9) - Apply to sites where petroleum hydrocarbons are present in the environmental media in excess of the acceptable concentration levels shown in the lookup tables.
  - Petroleum Storage Tanks Regulations (Chapter A-01-01) - All petroleum tanks must be decommissioned by a licensed petroleum contractor and notification provided to the PEICLE.
  - Waste Resource Management Regulations (Chapter E-9) – Lead and zinc based painted surfaces were identified to be present at the Site during the Updated Phase II ESA (see Section 3.1.4) and are expected to require off-Site disposal at the regional landfill. Disposal of the lead (or zinc) painted material is anticipated to require a Special Waste Disposal Permit under this regulation.
  - Watercourse and Wetland Protection Regulations (Chapter E-9) – Decommissioning activities associated with the River Pumphouse will occur on the shoreline of the Hillsborough River and anticipated to require a Watercourse, Wetland and Buffer Zone Activity Permit under this regulation.
- Dangerous Goods (Transportation) Act – Applicable regulations under this act include General Regulations (Chapter D-3).
- Electric Power Act – Project expenditures are subject to approval by IRAC under this act.
- Occupational Health and Safety Act – Applicable regulations under this act include General Regulations (Chapter O-1).

- Power Engineers Act - Applicable regulations under this act include general Regulations (Chapter P-15).

Federal Acts and Regulations

- Navigation Protection Act - Applicable regulations under this act include Navigable Waters Works Regulation. Impacting vessel traffic on navigable waters such as the Hillsborough River is regulated under the Navigation Protection Act and administered by the Navigation Protection Program of Transport Canada. The foreseeable activities associated with the Site decommissioning project that may potentially impact navigable waters are the decommissioning of the River Pumphouse and rock groyne. As previously indicated, it is currently assumed that the rock groyne within the water lot will remain but will require approval from Transport Canada and the CHAI. MECL has retained Granville Ridge Consulting Inc. (Granville) to review options for retaining the rock groyne and additional requirements to comply with the Navigation Protection Act. The decommissioning of River Pumphouse structure is only anticipated to potentially affect navigability in the short term as the shoreline in this area will be restored to similar conditions as part of the decommissioning work.
- Fisheries Act - The harmful alteration, disruption or destruction of fish and fish habitat is prohibited under the federal Fisheries Act. In addition, the destruction of fish by means other than fishing is also prohibited under the Fisheries Act. As the Site decommissioning work may potentially involve the complete or partial removal of the River Pumphouse and associated CW Outfalls and Diverter Box with a portion of the work to be completed below the ordinary high water mark of the Hillsborough River, there is the potential for the Site decommissioning work to impact fish and fish habitat. In order to be in compliance with the above legislation, an authorization from the Department of Fisheries and Oceans (DFO) must be obtained prior to initiating any work below the ordinary high water mark. The issuance of a Fisheries Act Authorization is conditional on developing habitat compensation and monitoring plans to ensure there will be no net loss in the productive capacity of fish habitat.
- Canadian Environmental Protection Act - Applicable regulations under this act include PCB Regulation SOR/2008-273.

Other specific permits, licenses, approvals, or authorizations that may also be required as part of the decommissioning project include:

- Certificates of Approvals issued by the PEICLE as part of the EIA process of the Environmental Protection Act.
- Atlantic Risk-Based Corrective Action (RBCA; Version 3) for petroleum hydrocarbons in soil, groundwater, surface water and sediment.
- The Contaminated Sites Registry Regulations for the Province of PEI under the Environmental Protection Act indicate CCME guidelines should be used for non-petroleum contaminants. However, the Nova Scotia Environment (NSE) Environmental Quality Standards (EQS) will be used for screening purposes as these standards were adopted from CCME, where available, and are based on multiple pathway analysis considering both human and ecological health. The NSE EQS also include screening values from other jurisdictions for parameters that do not have CCME guidelines.

- Canadian Environmental Protection Act, Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations for leachable metals in soil.
- Demolition Permit from the City of Charlottetown under Section 4.55 of the Zoning & Development Bylaw.

In addition to the compliance criteria listed in each Certificate of Approval or Permit, other applicable criteria for soil, surface water, storm water (effluent), and groundwater quality that may apply to decommissioning of the CTGS are listed below. The guidelines identified are those used to define potentially impacted areas of the Site, and are used in standard industry practice in Atlantic Canada under the current and intended future land use of the Site. The various guidelines used in this study are as follows:

Soil

Guideline: Atlantic RBCA User Guidance Version III (revised January 2015), Updated Tier I Risk-Based Screening Level (RBSLs) and Ecological Screening Levels (ESLs) as well as Tier II Pathway Specific Screening Levels (PSSLs), January 2015, Commercial Receptor (on-site), non-potable groundwater use, coarse-grained or fine-grained soil type (as applicable based on soil stratigraphy).

Parameters: Petroleum Hydrocarbons (BTEX[1]/TPH[2]).

Guideline: 2014 NSE Tier I EQS for Soil, Rationale and Guidance Document which includes CCME Canadian Soil Quality Guidelines (SQG) for the Protection of Environmental and Human Health (2007).

Parameters: Metals, PCBs[3], and PAHs[4].

Guideline: Canadian Environmental Protection Act, Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations, Current to January 30, 2018.

Parameters: Leachable Metals.

Groundwater

Guideline: Atlantic RBCA User Guidance Version III (revised January 2015), Updated Tier I RBSLs and ESLs as well as Tier II PSSLs, January 2015, Commercial Receptor (on-site), non-potable groundwater use, coarse grained or fine grained soil type (as applicable based on soil stratigraphy).

Parameters: Petroleum Hydrocarbons (BTEX/TPH).

Guideline: 2014 NSE Pathway Specific Standards (PSS) for Groundwater, Groundwater Discharge to Surface Water (>10 m from Surface Water Body), Rationale and

[1] BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes
[2] TPH – Total Petroleum Hydrocarbons
[3] PCB – Polychlorinated Biphenyls
[4] PAH – Polycyclic Aromatic Hydrocarbon

Guidance Document, Table A3. Guidelines not available from CCME for contaminants in groundwater.

Parameters: All parameters.

Surface Water

Guideline: 2014 NSE Tier I EQS Standards for Surface Water, Rationale and Guidance Document which includes CCME 2007 Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life (Marine) and Atlantic RBCA Guidelines for Protection of Aquatic Life (Marine).

Parameters: All parameters.

Paint

Guideline: Guidelines for Disposal of Contaminated Solids in Landfills, NS Environment and Labour, 2005; regulated limited of the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations with the Canadian Environmental Protection Act.

Parameters: Metals.

Transformer or Cable Oil

Guideline: Part 2 of the PCB regulations (SOR/2008-273) of the Canadian Environmental Protection Act, 2008 and amended in 2015.

Parameters: PCBs.

Specific criteria and guidelines are presented in the Updated Phase II ESA including the rationale for application of the identified criteria and guidelines (GHD, 2018). A copy of the figures and data tables (including applicable guidelines) from the Updated Phase II ESA is included in Appendix A.

2.4 Potential Non-Regulatory Obligations

For the preparation of the Decommissioning Plan, GHD personnel reviewed existing leases or contractual agreements associated with the Plant Site properties that may be affected by the Facility closure.

As discussed in the preceding section, the River Pumphouse and associated CW Outfalls and Diverter Box are located within a water lot leased from the CHAI. MECL established a lease with the CHAI in 1990 for the 6.45 hectare water lot for the operation of the CW infrastructure including the approximately 370 m long rock groyne located on the shoreline of the Hillsborough River directly east of Water Street Parkway. The water lot lease was renewed between MECL and the CHAI in September of 2010 and expires in 2040. An independent review of the lease agreement indicated that MECL will need the consent and agreement of the CHAI for the removal of property and/or the demolition of the buildings located on the property. The extent of removal and demolition work to be undertaken will require review and agreement with the CHAI prior to commencing the work or MECL could potentially be in violation of the lease agreement. In addition, the lease agreement indicates that the water lot cannot be used for any other purposes without the CHAI consent.

As indicated in Section 1.1, the leased water lot property containing the River Pumphouse is also intersected by a ROW easement containing three buried fuel pipelines that extend along the river shoreline. Decommissioning activities within the ROW will also be subject to acceptance of CHAI.

A review of property title records indicates that MECL has a 999 year lease agreement with the Cumberland Trust for a portion of the Site (PID #338921). The original lease agreement was between Bentinck Harry Cumberland (late) and Margaret William Tyron Cumberland (wife) and the Charlottetown Gas Light Company dated 1853. The leased lands comprised Town Lots 93, 94, 95 and 96 and generally correspond to portions of the Steam Plant Building including Turbine/Boiler 9; Turbine 8/Boiler 5; Turbine 7/Boiler 4; Boiler 6; and the CT3 Balance of Plant area of the building. The areas of Unit 10, ECC, and CT3 appear to be located to the north of the Cumberland Trust leased property. A review of the lease agreement indicated that there are no provisions in the lease agreement that identify restrictions on property usage.

MECL has indicated several other non-regulatory obligations with third parties that may be impacted by decommissioning and demolition. Discussions will be required with the affected third parties and the contractual agreements will require modification or lease termination. These obligations include:

- Holland College Parking Lot (located north of the CT3 infrastructure) Lease (1 year termination notice applies)
- Rails to Trails Agreement for Charlottetown Area Development Corporation Boardwalk across MECL land located behind the Storage Building (on Northeast corner of Cumberland & Richmond Streets)
- Pathway that runs from the Hillsborough River shoreline across the River Pumphouse land to Water Street Parkway
- Lease agreement with Wicked Eh Communications for rental of space on the New Stack (69 m) (1 year termination notice applies within the contract)

3. Environmental Conditions

The environmental conditions at the Site were determined based on a review of previous environmental investigations conducted at the Site by Jacques Whitford Environment Limited (JWEL), Fundy Engineering & Consulting Ltd. (Fundy) and All-Tech Environmental Services (All-Tech), and the findings of the Updated Phase II ESA conducted by GHD in conjunction with the decommissioning assessment activities (GHD, 2018).

An overview of the findings of the previous environmental investigations is provided below, followed by an overall summary of the environmental conditions at the Site.

3.1 Previous Environmental Investigations

The following reports for previous environmental investigations conducted at the Site are available and were reviewed by GHD as part of the Updated Phase II ESA program development:

- Phase I Environmental Site Assessment, Charlottetown Thermal Generating Station, Charlottetown, PEI, prepared for MECL by JWEL, October 31, 1995
- Phase II Environmental Site Assessment, Charlottetown Thermal Generating Station, Charlottetown, PEI, prepared for MECL by Fundy, November 2002
- Asbestos Abatement Specification Requirements, Maritime Electric Generating Station, prepared for MECL by All-Tech, February 2014
- Asbestos Inventory Assessment Report, Maritime Electric Generating Station, Charlottetown, PEI, prepared for GHD by All-Tech, January 2018

In addition, regulatory compliance monitoring results related to effluent discharges in 2016 and 2017 were reviewed. Based on available data, effluent quality currently being discharged from the Site is within discharge limits set in the Certificate of Approval to Operate #99-03.

An overview of the key findings of the previous investigations are presented below.

3.1.1 Phase I Environmental Site Assessment – JWEL (1995)

The following summarizes the findings from the 1995 Phase I ESA completed by JWEL:

- Adjacent properties – several ASTs and USTs located in the vicinity of the subject property
- Historical land use – Site and surrounding properties have a long history of industrial usage including petroleum service stations and bulk plants
- Aboveground fuels and chemicals – numerous ASTs and chemicals on-Site
- Spill and stain areas – hydrocarbons and vanadium pentoxide contaminated bottom ash staining apparent at various locations around the exterior of the Steam Plant Building
- Wastewater/air – caustic and acidic effluent discharged to concrete ditch area southeast of Steam Plant Building
- Asbestos – Significant quantity of asbestos pipe insulation noted in Steam Plant Building, asbestos also present on interior and exterior walls of Steam Plant Building
- Lead based paint and potential lead piping – used throughout the interior of the Steam Plant Building

3.1.2 Phase II Environmental Site Assessment – Fundy (2002)

The following summarizes the findings from the 2002 Phase II ESA completed by Fundy:

- Petroleum hydrocarbons were observed in ten of the 20 samples analyzed for these constituents. The highest concentrations of petroleum hydrocarbon constituents were observed in soil at two locations; in the vicinity of the boundary line with a neighboring property with large ASTs (BH-1) and in vicinity of a former AST (BH9-M).

- Four soil samples were analyzed for trace metal and general chemistry constituents. There are a total of thirty one parameters reported, with criteria established for 18 constituents. The applicable criteria was marginally exceeded for the following parameters (number of samples exceeding in brackets); arsenic (2), boron (4), tin (1) and zinc (1).

3.1.3 Asbestos Assessment Reports – All-Tech

In February 2014, All-Tech prepared an Asbestos Abatement Specification Requirements report for MECL. As asbestos abatement has occurred within the Facility following completion of the report, GHD retained All-Tech to update the asbestos inventory for the CTGS Facility in December 2017 (report dated February 2018). The following summarizes the key findings of the 2018 Asbestos Inventory Assessment Report prepared for GHD by All-Tech:

- Friable Asbestos-containing materials (ACM) are present in the mechanical insulation of Boilers No. 4, 9 and 10 as well as pipe insulation in Boiler/Turbine areas No. 4, 7, 8, 9 and 10. It was also noted that potential ACM may be present on gaskets throughout the building as well as boiler refractory but the presence of ACM could not be confirmed as the Facility was operational at the time of the assessment. Dust/debris in cable trays throughout the building was also identified.
- Non-Friable ACM are present in electrical arc chutes, hardboard transite panels of Boiler No. 4, 5, 9 and 10 walls and small area of mastic on exterior roof of Steam Plant Building.

It is noted that MECL staff subsequently collected samples of boiler refractory from each boiler in May 2018 and laboratory analysis confirmed that the refractory material does not contain asbestos.

The 2018 Asbestos Inventory Assessment Report is provided in Appendix C.

3.1.4 Updated Phase II Environmental Site Assessment (2018)

3.1.4.1 File Review and Site Reconnaissance

To supplement prior environmental site assessment reports, GHD completed an Updated Phase II ESA of the CTGS in December of 2017 (GHD, 2018) to identify potential sources of environmental concern. The previous Phase I ESA combined with the previous Phase II ESA programs provided the locations of potential environmental concerns that required further intrusive investigations as part of this Updated Phase II ESA. In addition, in October/November of 2017, GHD also completed a file review and Site reconnaissance to identify areas of potential environmental concern. The following actual or potential areas of environmental concern were identified to exist on the Site:

1. Historic Plant Site Operations:
    - Potential metal impacts to soil on and off-Site from historical burning of Bunker C and atmospheric deposition of vanadium rich fly ash.
    - Potential for metal impacts to soil in the vicinity of the New Stack (69 m) as this area was historically used for the off-loading of coal.
    - Potential for petroleum hydrocarbon and PAH impacts to soil and groundwater from historical on-Site coal gasification process.

- Potential for hydrocarbon impacts to soil and groundwater from off-Site property located directly east of the Site that formerly operated as a bulk petroleum storage facility.

2. AST Locations:

   - Potential hydrocarbon-impacted soil and groundwater near the existing Bulk Storage Tank Farm.
   - Potential hydrocarbon-impacted soils or groundwater in the vicinity of four active diesel and Bunker C day tanks located on exterior of the Steam Plant Building.

3. Spills/Releases/Surface Staining:

   - Metal concentrations in soils previously collected from the Site exceeded applicable CCME guidelines.
   - Potential surface soil impacts related to historical staining at the base of Unit Transformers and the Station Services transformer may exist.
   - Potential metal impacts in surface soil related to historical releases of vanadium-rich fly ash in the vicinity of the Stacks.

4. Asbestos Containing Materials (ACM):

   - Friable and non-friable ACM is present in Facility (refer to Section 3.1.3 above).

5. Polychlorinated Biphenyls (PCBs):

   - Several on-Site transformers are known to contain oils with PCB concentrations greater than 2 milligrams per kilogram (mg/kg). Bushings on transformers may also contain PCB oils.
   - Paper Insulated Lead Covered (PILC) cables are electrical cables that have the potential to contain paper impregnated with PCB oils and are potentially present in numerous areas of the Site, specifically lines extending to and from the 13.8 kV and 4.16 kV switchgear (See Figures 7A and 7B).

6. Universal Wastes:

   - The Site buildings contain numerous fluorescent and High Intensity Discharge (HID) light fixtures but MECL personnel confirmed that potential PCB-containing light ballasts have been removed from the Steam Plant Building (to the extent possible or known).
   - Two wall-mounted air conditioner units and several fridges located inside buildings potentially contain ODS. The Facility also contains two roof top cooling units that potentially contain ODS.
   - Lead based paint is potentially present throughout the original Site buildings.
   - Approximately 14 sources of mercury related to drum level indicators and flow transmitters of Boilers 4, 5 and 6 and Turbovisory Panels of Turbines 7, 8, 9 and 10. There are also several sources of mercury related to level indicators switches in Boilers 2 and 5.

3.1.4.2 Updated Phase II Environmental Site Assessment Results

The previous Phase I/II ESA programs along with the 2017 file review and Site reconnaissance provided the locations of potential environmental concerns that required further intrusive investigations as part of this Updated Phase II ESA. A copy of the tables and figures from the Updated Phase II ESA is provided in Appendix A. Figures showing the locations with contaminants of concern in soil and groundwater exceeding applicable screening guidelines are shown on Figures 8A and 8B of this report.

Based on the results of the Updated Phase II ESA and a review of existing analytical data from MECL, following areas of environmental concern were identified to exist at the Site:

Groundwater

- Sampling of the shallow groundwater monitoring wells on the Site identified concentrations of vanadium, zinc and PAH exceeding the NSE Pathway Specific Standards for discharge to a marine surface water greater than 10 m from the sampling locations. This environmental standard is protective of the receiving aquatic environment. The five monitoring wells (MW-4, MW-7, MW-9, MW-10, and MW-12) with identified exceedances are located along the southeastern property boundary, between 150 m and 50 m from the Hillsborough River.

Soil

- Metal concentrations (arsenic, lead and vanadium) in four of 13 soil samples collected across the Site, specifically the area of the south and west of the Steam Plant Building and one isolated sample from the northeastern property boundary exceeded NSE Tier I EQS for commercial and/or residential/parkland land use with coarse-grained soil.
- Iron concentrations in 13 of the 14 soil samples submitted for analyses exceeded the NSE Tier I ESQ. However, it is noted that the concentrations of iron in surface soil at the Site are within the published background concentrations for iron in soil in the province of PEI (Dillon, 2011).
- PAH concentrations [naphthalene and benzo(a)pyrene (B(a)P) total potency equivalents (TPE)] in three of the six samples collected in the area south of the Steam Plant Building (MW-3, MW-4, and MW-12) exceeded the NSE Tier I EQS for commercial and/or residential/parkland land use with coarse-grained soil.

Paint

- Paint samples were collected from porous surfaces of the Steam Plant Building such as concrete and wood as well as concrete of the Stacks and River Pumphouse. Paint was collected from porous surfaces in an effort to determine future disposal options, such as the ability to re-use crushed concrete and concrete block as backfill material on-Site versus disposal at appropriate waste disposal facilities (i.e. Construction and Demolition site (C&D site) or a municipal landfill). Results of the paint samples collected from porous surfaces at the Site are discussed below. Paint samples were also collected from metal surfaces within the Steam Plant Building and River Pumphouse for information purposes only as metalloid infrastructure at the Site will be transported off-Site for recycling as part of future facility demolition activities.

- Paint samples collected from porous media generally had metal concentrations approximately equal to or below applicable NSE Guidelines for Disposal of Contaminated Solids in Landfills (1,000 mg/kg) or contained low concentrations of leachable metals (<0.5 mg/L). The exception would be paint samples collected from the wood cabinets/wall of the Mechanical Maintenance Shop, concrete shell of the New Stack (69 m) and concrete block walls of the River Pumphouse. Analytical results specific to the New Stack (69 m) and River Pumphouse are further discussed below.
  - Paint samples collected from various elevations of the New Stack (69 m) contained concentrations of lead ranging from 300 to 32,000 mg/kg. The average concentration of lead in the paint samples collected from the New Stack (69 m) was approximately 18,000 mg/kg. Several of the paint samples collected from the New Stack (69 m) were also identified to contain leachable lead with concentrations ranging from 0.089 to 7.6 mg/L. However, concrete core samples (exterior samples with painted surfaces) collected from the New Stack (69 m) at varying elevations in February 2018 did not contain detectable concentrations of lead leachate (<0.005 mg/L). The metal leachate results for the paint samples collected from New Stack (69 m) were approximately equal to or below applicable NSE Guidelines for Disposal of Contaminated Solids in Landfills excluding one sample that contained a lead leachate concentration of 7.6 mg/L.
  - Paint samples collected from the four concrete block walls of the River Pumphouse contained concentrations of lead ranging from 33 to 3,900 mg/kg. Several of the paint samples collected from the River Pumphouse were also identified to contain leachable lead with concentrations ranging from 0.022 to 5.1 mg/L. In addition to elevated concentrations of lead in paint, the paint samples collected from the block walls also contained elevated concentrations of zinc ranging in concentration from 140 to 6,600 mg/kg. Leachable concentrations of zinc in the paint samples collected ranged from 9.6 to 41 mg/L. The metal leachate results for the paint samples collected from porous media of the River Pumphouse were approximately equal to or below applicable NSE Guidelines for Disposal of Contaminated Solids in Landfills.

Concrete

- Concrete core samples collected from the transformer pads located at the Site did not contain detectable PCB concentrations.

Electrical Cables

- Oil within a de-energized electrical cable (which was destructively tested) associated with the 4.16 kV switch gear identified to be potentially PCB-contaminated PILC cables (provided to GHD by MECL) contained a total PCB concentration of 7 mg/kg. In accordance with the PCB Regulations, concentrations of PCB containing oil above 2 mg/kg require special handling when retired from service.

3.2 Hazardous Material

The decommissioning of the CTGS will generate regulated hazardous wastes through the cessation of power generating operations as well as in the preparation for the demolition of structures. The standard of practice as the Facility nears decommissioning is to complete a supplemental hazardous material inventory to compile a detailed, quantitative, pre-demolition inventory of hazardous substances that may be found in structures in addition to previous inventories completed.

The supplemental hazardous material inventory is typically enhanced by completing a hazardous materials sweep to collect any containerized hazardous materials within containers across the Facility, and to inventory any larger, in-use hazardous materials. The supplemental hazardous material inventory will need to be completed at a further stage of decommissioning, typically completed nearer to the decommissioning date for the Site. This will also involve additional Site-specific testing for potential contaminants identified in Section 3.1.

GHD has completed a review of all structures and processes to identify both existing materials that will need to be managed and properly disposed of prior to demolition, as well as those processes and equipment that will require some level of cleaning prior to demolition. Material management and cleaning requirements are discussed in detail below.

3.2.1 Asbestos Containing Materials and Universal Wastes

There are certain materials found within the structures and process operations that occur with such frequency that they are regarded as universal wastes and include ACM. As previously indicated, for the preparation of this report, GHD retained the services of All-Tech to update the ACM inventory in the following document:

- Asbestos Inventory Assessment Report, Maritime Electric Generating Station, Charlottetown, PEI, prepared for GHD by All-Tech, February 2018

As previously indicated, MECL staff collected samples of boiler refractory in May 2018 and confirmed that the refractory material does not contain asbestos.

In addition, MECL has provided GHD with the following inventories of regulated materials:

- Inventory of ODS
- Inventory of mercury containing devices
- Inventory of oil-filled transformers
- Inventory of chemicals currently stored at the Facility
- Inventory of smoke detectors at the Facility
- Electrical single-line drawings and Facility layout plans showing location of PILC cables

Inventories of chemicals, mercury sources, ODS, and PCB sources are considered to be current but will likely require additional assessment prior to decommissioning activities. ACM requires abatement prior to demolition and MECL has routinely abated ACM as part of on-going facility maintenance. Consequently the amount and location of existing ACM at the Facility will likely change prior to the decommissioning/demolition activities tentatively scheduled for 2022.

Chemicals identified in the inventory that are currently being stored on-Site will require additional handling and disposal prior to demolition. Details on the chemicals stored and used on-Site are discussed in Section 2.2.7 and the current inventories of hazardous and regulated materials provided by MECL or obtained during the 2017 file review and Site reconnaissance are included in Appendix D.

The following regulated materials are located throughout the Site:

Universal Wastes

- Radionuclides (Smoke Detectors)
- Lighting Ballasts
- Lighting Bulbs (fluorescent and HID)
- ODS
- Mercury Devices
- Batteries
- Lab Pack (unused raw and waste chemical materials)
- Transformer Oil (Non-PCB and PCB containing)
- Electrical Cables Containing PCBs (PILC)
- Other Oils
- Sulfuric Acid (H_2SO_4)
- Caustic (NaOH)
- MgOH Powder (MgOH Room)
- Hyrdazine
- Amine
- WWTP and WTP Filter Media
- Electronic waste (including computers and circuit boards containing lead and mercury)

ACM

- ACM Insulation (on pipes and equipment)
- Other ACM (electrical arc chutes, debris/dust in cable trays, wall cladding, roofing mastic)

Bulk Solid Wastes

- Potential Product/Residue in Pipelines/Tanks
- Hazardous Dust (process fly ash and bottom ash)
- Creosote/pressure treated timber products (dock structure and old wood box culvert)

Also common throughout the Site are the presence of miscellaneous containers of raw materials, products, cleaning supplies, cylinders of compressed gases (including fire extinguishers), aerosol cans, and other materials. These materials, if not completely used or returned, will become waste upon decommissioning of the Site.

3.2.2 Decommissioning Cleaning Wastes

The removal of process equipment and storage tanks may require a level of decontamination or cleaning in order to ensure the surfaces and internal components are free of product residue. This decommissioning cleaning will generate both solid and liquid wastes, depending on the process systems.

In addition, the cleaning of pits, sumps, and trenches will result in the generation of wastewater and some accumulated solid waste, depending on the current condition. Cleaning wastewater may be processed through the existing WWTP while it remains in operation, however, during decommissioning quantities of wastewater (e.g., oily water) may exceed treatment capabilities in which case pre-treatment or off-Site treatment will be required. Cleaning wastewater generated after closure of the WWTP will require special handling and disposal/treatment. Regulated solid wastes, such as bottom ash (dust), and other accumulated process wastes will require special handling and disposal. Disposal of solid wastes on-Site will not be permitted.

3.2.3 Painted Surfaces

Consideration has been given to the presence of lead-based paint on floors and walls constructed prior to the ban of lead in paint in the 1980s. In the context of demolition, there are no known federal or provincial regulations that require the removal of lead-based paint prior to, or in conjunction with, demolition activities. Disposal of materials coated with lead based paint in the Province of Prince Edward Island requires a Special Waste Disposal Permit under the Waste Resource Management Regulations of the Environmental Protection Act. Under this regulation, “special waste” includes metal-containing soils that pass a leachate test as well as lumber and wood covered in a protective coating containing concentrations of lead that does not pass a lead leachate test. However, the regulation does not define the lead leachate criteria. Guidance documents are available from New Brunswick[5] and Nova Scotia[6] that outline the disposal requirements for lead painted materials. In general, the following guidelines are applied:

- Paint with lead concentrations less than 1,000 mg/kg may be disposed of at provincially approved construction and demolition site or is generally considered acceptable for re-use as backfill material (on or off-Site).
- Paint with lead concentrations greater than 1,000 mg/kg and a leachate concentration of less than 5 mg/L may be disposed of at a provincially approved municipal landfill (e.g., East Prince Waste Management Facility).
- Paint with leachable lead concentrations greater than 5 mg/L may require disposal of at a hazardous waste landfill (e.g., Stablex in the province of Quebec).

The guidelines from NB and NS pertaining to painted surfaces with leachable lead greater than 5 mg/L also corresponds to the hazardous constituents controlled under leachate test and regulated

[5] NBDELG Disposal of Lead Paint & Lead Painted Material Guideline, 2011 (reviewed August 2014)

[6] NSE Guidelines for Disposal of Contaminated Solids in Landfills, May 2005

limit of the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations with the Canadian Environmental Protection Act.

As discussed in Section 3.1.4.2, paint samples collected from the majority of the on-Site porous media generally had metal concentrations approximately equal to the threshold guideline of 1,000 mg/kg or contained low concentrations of leachable metals (<0.5 mg/L). However, the paint samples collected from the New Stack (69 m) concrete shell and River Pumphouse block walls had substantially elevated concentrations of lead and/or zinc. Similarly, moderately elevated concentrations of lead were also identified in paint samples collected from wood cabinets/walls in the Mechanical Maintenance Shop. The elevated concentrations of lead and zinc in paint of these structures indicate that this demolition debris may not be suitable for disposal at a C&D site or for re-use as backfill on-Site. However, concentrations of metals in leachate of the paint samples collected from the New Stack (69 m), River Pumphouse and Mechanical Maintenance Shop were below NSE Guidelines for Disposal of Contaminated Solids in Landfills indicating that this material is likely suitable for disposal at a municipal solid waste landfill (i.e., East Prince Waste Management Facility in Wellington, PEI). It is noted that one paint sample collected from the New Stack (69 m) in December 2017 had a leachable lead concentration of 7.6 mg/L which marginally exceeds the landfill disposal guideline of 5 mg/L. This paint location was re-sampled in January 2018 along with other locations of the New Stack (69 m) and contained a leachable lead concentration of 2.2 mg/L. In addition, concrete core samples collected from the New Stack (69 m) at varying elevations intended to be representative of the material potentially disposed of at the municipal landfill did not contain detectable concentrations of lead or zinc leachate.

Results of the paint sampling program will be discussed with the PEICLE as part of the EIA process that is anticipated to be required as part of the decommissioning project. For the purposes of the Decommissioning Study and associated cost estimate, it is assumed that the concrete from the New Stack (69 m) and painted portions of concrete walls of the River Pumphouse will be transported off-Site for disposal at the municipal solid waste landfill (i.e., East Prince Waste Management Facility in Wellington, PEI) under a Special Waste Disposal Permit issued in accordance with the Waste Resource Management Regulations of the Environmental Protection Act. It is assumed that remaining concrete surfaces can be re-used on-Site for backfill or grading material. Subject to additional verification as part of a pre-demolition survey, additional painted non-structural building elements such as wood, plaster, drywall that was painted prior to 1974 such as the wooden cabinets of the Mechanical Maintenance Shop may require further characterization to identify appropriate waste disposal facilities (i.e. C&D site versus the municipal landfill).

3.2.4 PCB-Containing Equipment

Information provided to GHD as part of the Decommissioning Study indicated that an extensive PCB removal program has been on-going at MECL since the 1980s. As part of this program, known or suspected equipment containing PCB oils, such as transformers and capacitors, were drained and the PCB-containing oil transported off-Site for disposal. The transformer oil was subsequently replaced with mineral oil or other suitable non-hazardous oil. The PCB removal program also included the removal of all interior light ballasts that contained PCB oils. However, several of the larger transformers located on the exterior of the Steam Plant Building contain oil with concentrations of PCBs greater than 2 milligram per kilogram (mg/kg). Bushings on these exterior transformers also appear to be oil filled and may contain oil with residual concentrations of PCBs. In accordance with the PCB regulations (SOR/2008-273) of the Canadian *Environmental Protection Act* (2008 and amended in 2015), equipment containing oil with PCB concentrations greater than 2 mg/kg (but less than 50 mg/kg) require special handling by a licensed handling facility before being recycled.

Similarly, there are numerous electrical cables associated with the Steam Plant Building (on the interior and exterior) that have been identified as PILC cables and potentially contain oils with PCB concentrations greater than 2 mg/kg (see Figures 7A and 7B). One de-energized interior electrical cable associated with the 4.16 kV switchgear previously identified to be potentially PILC was destructively tested during the Updated Phase II ESA program completed in 2017. Results of the sampling confirmed that the free oil within the cable contained a PCB concentration of 7 mg/kg and requires specific handling and disposal as part of the recycling process. The oil impregnated paper within the cable also contained a PCB concentration of 2.8 mg/kg. Based on the data available at the time of the preparation of the Decommissioning Study, it is assumed that ten of the exterior pad mounted transformers associated with the Steam Plant Building as well as numerous electrical cables identified as PILC cables will require handling and disposal at a facility licensed to handle PCB containing equipment. Subject to verification as part of a pre-demolition survey and following de-energization of the Steam Plant Building, oil filled transformers and suspected PILC cables will require further characterization to minimize any potential wastes requiring disposal as PCB containing. An inventory of oil filled transformers and potential PILC cables at the Site is provided in Appendix D.

The interior transformers observed during the 2017 Site inspection were identified to be dry-type and these observations were confirmed by MECL representatives.

During the Site inspection, additional exterior pole-mounted transformers were identified adjacent to the Steam Plant Building on the Site (within the Site perimeter fence and directly adjacent to the fenced area). MECL representatives indicated that it is unlikely that these transformers contain PCBs. However, all transformers of a certain vintage are tested for PCB concentrations when removed from service. Removal and disposal of pole-mounted transformers at the Site (if required) is not included in the Decommissioning Study cost estimate.

3.3 Effluent Water

As part of the Certificate of Approval to Operate (#99-03) the industrial WWTP, MECL completes batch test monitoring of wastewater including the analysis of pH, suspended solids, turbidity, and metals. Results of the monitoring program provided to GHD dating back to 2005 indicate effluent quality is within discharge limits set in the Certificate of Approval to Operate. MECL provides an annual report to the PEICLE pertaining to the effluent quality monitoring in accordance with the approval to operate.

A review or testing of the water quality in the Hillsborough River (effluent receiving waters) was not completed in association with the Decommissioning Study.

3.4 Air

MECL currently has an Approval to Operate (Identification No. FBE0201S) from PEICLE for the fuel burning equipment (six heavy fuel oil-fired boilers) for the purpose of electrical power generation and heating requirements at the CTGS. The PEICLE issued this Air Quality Permit pursuant to section 4 of the Air Quality Regulations EC 377/92 under the Environmental Protection Act R.S.P.E.I. 1988 Cap. E-9. This Approval to Operate contains conditions on operating, stack testing requirements, ash disposal requirements, record keeping and reporting requirements, as detailed in this section.

The Approval to Operate indicates that the Steam Plant boilers must be the only equipment to burn fuel with a sulphur content of greater that 0.7% by weight and utilize a heavy fuel oil with a sulphur content less than or equal to 1.5% by weight. MECL must operate the Facility in compliance with the Power Engineers Regulation field under the Power Engineers Act. The boilers are not to be operated unless the Boiler Monitoring Equipment and Pollution Control Devices are fully functional and in operation, and must be operated in a manner such that the opacity of the flue gases does not exceed 20%, except for a time interval no greater than eight minutes in a 60 minute period (opacity can increase to 50%), or during periods of soot blowing. MECL is permitted to burn the following fuels in boilers: small quantities of used lubricants resulting from the normal operation of the Facility, or the Borden-Carleton Generating Station, on an as-generated basis; and other waste fuels (significant quantities of used motor oil or lubricants, for example) upon being issued a Letter of Approval to Burn from the province. MECL must advise the PEICLE in writing before any changes in the operation of the Facility are made, including facility re-design or expansion.

MECL currently sends both bottom ash and fly ash for off-island disposal as disposal within the province is not permitted. MECL also keep records from the fuel supplier that provide heavy fuel oil analysis, including the sulphur content and specific gravity of the heavy fuel oil for all purchases. MECL provides PEICLE with annual reports outlining operational hours and fuel consumption, sulphur content of fuel, MgOH usage, bottom and fly ash recovery and accidental releases (if any).

It is not known if the historical operation of the CTGS has negatively impacted surface soil at the point of flue gas impingement. Potential environmental liabilities associated with pre-closure air emissions were not investigated as part of the Decommissioning Study but potential on-Site environmental liabilities are further discussed in the following sections.

3.5 Summary of Current Environmental Conditions

3.5.1 Areas of Potential Environmental Concern

Based on the investigations summarized above and as shown on Figures 8A and 8B, the following describes the current environmental condition of the Site that will be required to be addressed in the near future, during decommissioning or following the decommissioning activities:

- *Soil* – One surface soil sample (MW-11) collected from near the northeastern property boundary contained a lead concentration of 670 mg/kg which exceeded the NSE Tier I EQS (commercial land use). The NSE Tier I EQS for lead is based on protection of human health (soil contact/ingestion pathway).

- *Soil* – One surface soil sample (MW-7) collected along the southeastern property boundary, down-gradient of the Steam Plant Building contained an arsenic concentration of 41 mg/kg which exceeded the NSE Tier I EQS (commercial land use) for the protection of human health (soil contact/ingestion pathway).
- *Soil* – Two soil samples (SS-8 and MW12) collected from the southeast and southwest side of the Steam Plant Building, at the property boundaries, had concentrations of vanadium (52 and 990 mg/kg, respectively), which exceeded the NSE Tier I EQS for the protection of human health (soil contact/ingestion pathway; 39 mg/kg for residential/parkland land use and 160 mg/kg for commercial land use). Sample SS-8 was screened using residential/parkland land use to be protective of the residential properties located along Cumberland Street.
- *Soil* – Two soil samples (MW-3 and MW-4) collected on the southeast and southwest side of the Steam Plant Building along the property boundaries had concentrations of naphthalene (120 and 24 mg/kg, respectively), which exceeded the NSE Tier I EQS for the protection of human health indoor air pathway of 2.2 mg/kg for residential/parkland land use and 25 mg/kg for commercial land use. Sample MW-4 was screened using residential/parkland land use to be protective of the residential properties located along Cumberland Street.
- *Soil* – Three soil samples (MW-3, MW-4 and MW-12) collected on the southeast and southwest side of the Steam Plant Building along the property boundaries had calculated B(a)P TPE levels (8.3 to 114 mg/kg) which exceeded the NSE Tier I EQS for the protection of human health (soil contact/ingestion pathway; 5.3 mg/kg for residential/parkland and commercial land use). However, the soil samples exceeding the NSE Tier I EQS for B(a)P TPE were collected at depths of 1.2 m (or greater) below surface grade and therefore human receptors are unlikely to be exposed to these impacts (excluding construction workers). It is not known if surface soil conditions at these locations contain concentrations of B(a)P exceeding applicable guidelines.
- *Shallow Groundwater* – Concentrations of vanadium in the shallow groundwater collected from monitoring well MW-12, down-gradient of the Steam Plant Building, exceeds the NSE PSS for discharge to a marine surface water greater than 10 m from the sampling locations (500 µg/L).
- *Shallow Groundwater* – Concentrations of zinc in the shallow groundwater collected from monitoring well MW-10, located on the eastern corner of the Site, slightly exceeds the NSE PSS for discharge to a marine surface water greater than 10 m from the sampling locations (100 µg/L).
- *Shallow Groundwater* – Concentrations of PAH parameters in the shallow groundwater collected from four of the five monitoring wells located along the southeastern property boundary of the Site (nearest the Hillsborough River) exceeded the NSE PSS for discharge to a marine surface water.
- *Lead/Zinc Based Painted Surfaces* – Elevated concentrations of lead and zinc in paint on the New Stack (69 m) concrete shell and River Pumphouse block walls likely limit re-use of this material on-Site as backfill or disposal at a Construction and Demolition site. However, leachate results were approximately equal to or below guidelines for disposal at a municipal solid waste landfill (i.e., East Prince Waste Management Facility in Wellington, PEI).

3.5.2 Hazardous Materials and Regulated Wastes

An inventory of ACM, mercury sources, ODS, radionuclide-containing devices (smoke detectors), chemicals and PCB sources was available through MECL or the file review completed in 2017 as part of the Decommissioning Study (Appendix D). However, the inventory of hazardous materials and regulated wastes will require updating and a supplemental hazardous material inventory survey will likely need to be completed to confirm the presence of all hazardous and regulated wastes prior to decommissioning. Hazardous materials, universal wastes, and decommissioning cleaning wastes identified will need to be managed in accordance with applicable laws and regulations.

4. Current Infrastructure Inventory

GHD conducted a detailed walk-through inventory of each structure comprising the CTGS in conjunction with a detailed review of existing construction drawings and other equipment information detailed in the manuals or information provided by MECL personnel. The purpose of this inventory was to develop a reasonable and approximate estimate of the types of materials that exist at the Site. Through development of the material inventory, an approximate estimation of the quantities associated with decontamination and industrial cleaning of the Site in advance of demolition, and the volume of voids that would require infilling following demolition, were also determined.

This section provides the classifications, descriptions, and an estimate of the quantity of materials and waste that would be generated if the Site is closed and demolished. Backup for material quantity calculations are provided in Appendix B.

4.1 Classification, Description, and Quantity of Materials

The types of potential demolition materials have been categorized into three principal types, specifically: hazardous and regulated wastes, demolition debris, and recyclable materials. Hazardous and regulated wastes must be disposed of in accordance with applicable federal and provincial regulations. Non-hazardous demolition debris is inert and may be disposed of at a licensed construction and demolition debris landfill. Recyclable materials have inherent asset value and may be recycled for use on-Site as backfill or shipped off-Site for material recycling. A description of the waste and waste classification of materials to be addressed during decommissioning was developed based on infrastructure identified in Table 2.1. A summary of the waste classification and description of materials that would be generated as part of decommissioning activities is presented in Table 4.1.

4.1.1 Hazardous and Regulated Materials

GHD has estimated and/or calculated quantities for the hazardous and regulated wastes for the Site previously identified in Section 3.2.1. The quantities are detailed in Table 4.2.

An inventory outlining the amount, type and location of ODS, PCB containing materials, mercury containing devices, chemicals and batteries was provided by MECL (Appendix D). An ACM Inventory Assessment was completed by All-Tech in December 2017 and is included in Appendix C. As previously indicated, MECL representatives also collected samples of boiler refractory material in May 2018 and the material was identified to be asbestos-free. The estimated number of other regulated wastes such as fluorescent light bulbs and ballasts were based on GHD Site visits and experience in completing estimates for similar facilities. The quantities of these universal wastes are estimated based on quantities provided by MECL, based on professional experience at other similar generation facilities and from the 2017/2018 Site visits, and are included for costing purposes only. As detailed in Section 3.2, these inventories are assumed based on the information available at the time of the Decommissioning Study but may be incomplete and may require additional assessment prior to completing decommissioning activities.

In some cases, the volume of wastes generated during decommissioning is speculative, being dependent on the volume of residuals in process equipment and structures at the time of decommissioning. All equipment requires the removal of process residue and dust. No free liquid may remain in equipment reservoirs or piping that will be released during demolition. Accumulated tank sludge must be removed and properly handled after equipment is taken out of service. The volume of wastewater generated during decommissioning cleaning will be determined based on the extent of cleaning required and the methods used to clean the equipment.

Universal wastes occur throughout the Steam Plant and River Pumphouse. Batteries will be recycled from each battery bank as well as batteries that are found in emergency lights and exit signs. Light bulbs and fixture ballasts will be removed and recycled or identified for disposal. ODS will be removed from refrigeration equipment and recycled. Computers and electronic waste such as circuit boards containing lead and mercury will be removed and recycled or disposed of in accordance with applicable regulations. Cylinders of compressed gases will be returned to the supplier. Mercury containing devices will be collected and properly recycled or identified for disposal. Containers of miscellaneous chemicals will be collected through a detailed “chemical sweep” of the Plant Site. These containers will be segregated by type and recycled or disposed of in accordance with applicable federal and provincial regulations.

4.1.2 Demolition Debris

Demolition debris is considered waste that is not regulated and has no inherent recyclable value. GHD has conservatively estimated and/or calculated quantities for the following demolition debris for the Plant Site as detailed in Table 4.2, specifically:

- Wood
- Non-ACM Insulation
- Roofing Materials

Demolition debris will be disposed of off-Site at a licensed construction and demolition debris disposal site. Wood or other painted demolition debris identified to contain lead based paint exceeding the threshold of 1,000 mg/kg and leachate below 5 mg/L will be transported to the municipal landfill for disposal. Similarly, any building products painted with zinc based paint exceeding 1,500 mg/kg and zinc leachate below 500 mg/L will be transported to the municipal landfill for disposal. Disposal of lead and zinc based painted surfaces is further discussed in Sections 5 and 6.

4.1.3 Recyclable Materials

GHD has estimated and/or calculated quantities for the following recyclable materials for the Steam Plant Building, Bulk Storage Tank Farm and River Pumphouse (including associated ancillary equipment/buildings) as detailed in Table 4.2, specifically:

- Plate and Structural Standard Carbon Steel
- Standard Carbon Steel (pipes, cladding, ducting)
- Stainless Steel (tanks, pipes, tubing)
- Other alloys (brass, alum brass, wrought iron, cast iron)
- Copper (wiring, switch gear, transformers, condenser tubes)
- Aluminum
- Clean Brick/Concrete/Cinderblocks

The inventory for these materials was developed through a detailed inspection of structures and a review of construction drawings and other equipment information. The inventory includes approximate total estimates derived from the examination of: individual component parts such as the number and approximate weight of boiler and heat exchanger tubes and condenser tubes, structural steel drawings, pipe drawings and plans, and tank dimensions and construction. The volume of copper was estimated based on field observations, data provided in transformer manuals/nameplate drawings and MECL provided data on transformer specifications, turbine drawings and manuals and electrical single line drawings.

4.1.4 Material Quantities Summary

An inventory of demolition related quantities to be generated during decommissioning of the Site is presented in Table 4.2.

4.2 Decommissioning Cleaning

Most of the CTGS facility infrastructure will require industrial cleaning. The areas that require industrial cleaning will be finalized as part of pre-demolition engineering activities. For closure cost forecasting, an estimate of the Site areas requiring industrial cleaning is provided in Table 4.3. The following sections provide industrial cleaning details.

4.2.1 Bulk Storage Tank and Pumping Systems Industrial Cleaning

The Bulk Bunker C Storage Tank will be cleaned before being demolished. The interior of the tank will be accessed by cold cutting an opening in the tank wall. Additional openings will be created as required to help control atmospheric conditions in the tank. Decommissioning activities will commence with the bulk removal of Bunker C and fuel oil sludge from the tanks. The interior steam heaters, piping, walls, and floor will be pressure washed to remove residual waste and oil. Tanks will be verified empty prior to release for demolition. Similarly, the Bunker C day tanks and diesel start-up tanks will be cleaned by a licensed petroleum contractor and transported off-Site for disposal (or re-certification and re-use). Wastewater generated by cleaning activities will be pre-treated to remove bulk oils prior to processing at the WWTP or at a mobile water treatment unit.

4.2.2 Hazardous/Non-Hazardous Dust Industrial Cleaning

Potential hazardous cleaning will be required in some of the buildings or areas of the Site that have been exposed to potentially hazardous dust. These areas include the breeching, boilers, as well as select ducting and pipes in the turbine/boiler zones, Balance of Plant zone, MgOH Room and WWTP. It is assumed that MECL operations and maintenance personnel will complete the cleaning of the boiler interiors prior to the Site decommissioning, as the boiler cleaning will require the MgOH system to be operational. Non-hazardous cleaning will be required for the mechanical maintenance shop, welding shop, RO-EDI Plant and River Pumphouse as well as all associated ducting and pipes. These areas will need to be assessed as part of the pre-demolition engineering activities to determine the extent of cleaning required. Based on Site observations it is likely only the basement areas and any stained concrete slabs will require cleaning as the plant is currently in a very clean state. Specific methods and health and safety procedures will also be developed for cleaning of hazardous dusts.

4.2.3 Cleaning of Pits/Trenches/Sumps

A number of pits, trenches, and sumps are located in the basement of the Steam Plant Building (primarily in the areas surrounding the boilers and turbines). Pits, trenches, and sumps will be vacuumed to remove any residual liquids and then pressure washed, followed by final vacuuming. Pits, trenches, and/or sumps containing oil or grease may need to be washed with a degreasing soap.

4.2.4 Other Cleaning Activities

Based on information provided to GHD, several transformers at the Site are PCB free while several others contain concentrations of PCBs in oil between 2 and 49 mg/kg. It is anticipated that the PEICLE will require that all transformers be retested before leaving the Site. Testing of all transformers will be completed as part of the pre-demolition engineering activities. Results of the transformer testing program will dictate transformer oil draining and disposal requirements to be implemented as part of the facility decommissioning work.

Various process tanks on-Site will be cleaned through pressure washing as part of the decommissioning activities and the stacks will require extensive cleaning prior to being released for demolition.

4.3 Contaminated Soil or other Media

Metal and PAH impacted soils above applicable guidelines were generally confined to the southwest corner of the Site, directly adjacent to the Steam Plant Building. A small quantity of lead contaminated soil was also identified in the northeastern property boundary. The quantity of impacted soil was estimated to be 6,000 m^3 but is considered approximate and provided for information purposes only as the area of impacted soil has not been delineated. In addition, concentrations of metals and PAHs in groundwater above the guidelines for discharge to receiving waters are also located in the area of soil impacts and have not been delineated.

Additional contaminated soil may be present at the Site, specifically beneath the existing Bunker C bulk storage tank but this area was not assessed as part of the Updated Phase II ESA given that the tank farm containment berm is lined and currently active. Similarly, sediment and surface water in the vicinity of the River Pumphouse and CW intake/outfall structures was not assessed as part of the Updated Phase II ESA as available data indicated effluent discharges from the Site are within applicable Certificates of Approval to Operate. In addition, the Hillsborough River is a tidal river that is subject to numerous anthropogenic inputs related to industrial operations, bulk petroleum storage facilities and pipelines, storm water inputs, agricultural run-off, etc. Given the dynamic changes in water and sediment conditions over a tidal cycle, assessment of surface water and sediment conditions specific to Site related inputs would be very difficult. It is not expected that remediation of contaminated soil, sediment, groundwater, surface water at the Site or off-Site will be required as part of future Steam Plant Building and associated infrastructure decommissioning activities.

4.4 Below Grade Voids

It is estimated that demolition of the Site will create void space of 4,745 m^3 as summarized in Table 4.4 (detailed calculation provided in Appendix B11). This total volume of voids includes 1,161 m^3 of voids for the CW supply and discharge piping. A portion of this void space will not require backfilling as the piping below Water Street Parkway and the petroleum pipelines adjacent to the River Pumphouse will be decommissioned using a combination of grout and plugs (see Section 5.0). Therefore, this volume has been omitted in backfilling costs in Table 9.1. Other void spaces include basements, tunnels, trenches, pits and sumps and small voids from the removals of foundation walls and slabs-on-grade. The voids created through infrastructure demolition are depicted on Figure 9.

5. Decommissioning Options Analysis

The decommissioning objectives are to decommission and demolish the steam driven units at the CTGS in a manner that is environmentally and economically sound, in compliance with applicable provincial and federal regulations and standards, and to maximize the potential end use value of the Site. It is GHD's understanding that only the Steam Plant Building, River Pumphouse, Bunker C Tank/Piping and all associated infrastructure will be demolished with the CT3 facility and ECC building remaining operational at the Site for the foreseeable future. As such, the Decommissioning Study and associated cost estimate assume that the Site will remain fenced and classified as commercial/industrial land use that would permit future system expansion and energy infrastructure upgrades with some limiting conditions. There is also the potential that the Steam Plant Building area of the Site could be converted to a fenced green space area.

A decommissioning options analysis was completed by GHD, in conjunction with MECL, for major Site infrastructure (e.g., infrastructure retained or sold) and decommissioning considerations (e.g., contaminated soil management). The decommissioning option analysis was completed as follows:

1. Review of Decommissioning Assumptions Pre-determined by MECL: The pre-determined assumptions are primarily related to post closure ownership, general decommissioning approaches, and MECL liability and management requirements during decommissioning.

2. Identification of potential decommissioning options. Options were developed for management of environmental liabilities (i.e., impacted soils and groundwater, surfaces with lead/zinc-based paint, residual tank sludge and sourcing of material for Site grading and closure methods).
3. Qualitative Analysis of Potential Decommissioning Options: A qualitative evaluation of potential decommissioning options was completed to identify viable options for specific decommissioning activities based on local environment, regulatory requirements and best management practices.
4. Quantitative Analysis of Decommissioning Options: Quantitative assessment was completed for options where more than one option for a decommissioning activity was considered viable following the qualitative analysis.

The following eight decommissioning activities were discussed and/or carried forward to the quantitative option analysis:

1. Management of metal/PAH impacted soil and groundwater
2. Management of lead (and zinc) based painted concrete
3. Management of bottom sludge from the Bulk Storage Tank and day tanks
4. Decommissioning of CW lines from River Pumphouse to Steam Plant Building and from Steam Plant Building to the CW Outfalls and Diverter Box
5. Decommissioning of the River Pumphouse, Wharf, Armour Stone Retaining Wall, CW Outfalls and Diverter Box
6. Surface Drainage Management
7. Disposal of Excess Concrete Generated During Demolition Activities
8. Demolition of the Stacks

A summary of the overall options analysis is presented in Table 5.1. Details on the options analysis outlined above are presented in the following sections.

5.1 Qualitative/Quantitative Options Analysis - Decommissioning

5.1.1 Management of PAH/Metal Impacted Soil

It is estimated that approximately 6,000 m^3 of PAH impacted soil and groundwater exceeding applicable guidelines may be present in the southwest corner of the Site, in the vicinity of the Boiler/Turbine Zone #9, MgOH Room and Boiler Zones #4 and #5. Based on analytical data and field observations collected during the Updated Phase II ESA (GHD, 2018), the PAH impacted soil is generally confined to sub-surface soil at depths ranging from approximately 1.2 to 4.0 m below surface grade. The PAH impacts are likely related to historical facility operations (i.e. coal gasification, presence of rail lines, etc.) as current facilities generally do not generate these types of organic contaminants. The locations with concentrations of PAHs and metals in soil or groundwater exceeding applicable guidelines is shown on Figures 8A and 8B.

Given that the PAH impacts are generally confined to subsurface soil and groundwater in the area is non-potable (potable water provided by the City of Charlottetown), it is unlikely that soil and groundwater quality at the Site would pose a risk to human health through the direct ingestion and dermal contact pathway. However, several PAH constituents are semi-volatile and could pose a risk to human health through the indoor air pathway and the area of PAH impacts on and off-Site have not been delineated.

There were four isolated hotspots in soil at the Site that contained concentrations of arsenic, lead or vanadium in soil exceeding applicable human health guidelines. However, as the majority of the surface soil samples collected from the Site contained metal concentrations below applicable guidelines, it is assumed that the concentrations of metals in soil at the Site pose a low risk to human health for the current or foreseeable future land use. The Updated Phase II ESA did not include collection of surface soil samples from off-Site areas and therefore, the potential for metal impacted flue gas particulate to adversely affect off-Site soil conditions is not known.

The Updated Phase II ESA also indicated that concentrations of PAHs and metals (vanadium and zinc) in groundwater in the southwest corner of the Site exceed guidelines for groundwater potentially discharging to surface waters such as the Hillsborough River. However, it is noted that organic contaminants, specifically PAHs, have a strong affinity to bind to soil particles and are not readily soluble. In addition, several of the groundwater samples collected during the Updated Phase II ESA were noted to contain suspended solids which have a tendency to bias groundwater analytical results. Given that the Hillsborough River is located greater than 50 m from the Site, it is reasonable to assume that contaminants dissolved in groundwater at the Site are unlikely to pose a risk to surface water quality of the Hillsborough River.

Options for the management of PAH impacted soil and groundwater at the Site were qualitatively evaluated and include:

1. Complete a supplemental ESA to delineate the area of PAH impacted soil and groundwater exceeding applicable screening guidelines. Also complete soil vapour sampling to confirm concentrations of semi-volatile PAHs in soil/groundwater do not pose a risk to human health through the indoor air pathway. Complete additional groundwater monitoring using low-flow sampling techniques to minimize the amount of suspended sediment in samples collected to confirm concentrations of contaminants in groundwater pose a low risk to surface water quality of the Hillsborough River. If concentrations of contaminants in soil or groundwater exceed applicable screening criteria complete a Human Health and Ecological Risk Assessment (HHERA) to develop Site specific target levels. For the purposes of the Decommissioning Study, it is assumed the supplemental ESA along with a pathway specific risk assessment will demonstrate that remedial action is not required for the area. The estimated cost to complete Option 1 is $150,000.
2. There is the potential that concentrations of contaminants in soil or groundwater may exceed applicable generic screening guidelines as well as risk based Site specific target levels and remedial action or risk management measures may be required. There are several remedial options available to address PAH impacted soil such as excavation and off-Site disposal, in-situ bioremediation, on-Site land farming, land use restrictions, etc. but the recommended remedial option is dependent on a number of factors such as the contaminant depth and thickness and soil and groundwater conditions. A volume of 6,000 m^3 of PAH impacted soil and groundwater has been assumed for this area based on data obtained during the Updated Phase II ESA. Recent remediation programs completed on Prince Edward Island by GHD indicate that the cost to excavate, transport, and dispose of the PAH impacted soil to a licensed facility in NB (no known

facilities in PEI are licensed to accept PAH impacted soil) is estimated at \$220/m^3. The volume of soil and groundwater requiring remediation (if any) and the associated cost estimate should be confirmed following completion of the recommended supplemental ESA.

Option 1 is considered appropriate to address environmental liabilities for this area of the Site based on available information.

5.1.2 Management of Lead (and Zinc) Based Painted Concrete

Results of the Updated Phase II ESA indicated that elevated concentrations of lead and zinc in paint on the New Stack (69 m) concrete and River Pumphouse block likely limit re-use of this material as on-Site backfill or for disposal at a C&D site. However, concentrations of metals in leachate of the paint samples collected from the New Stack (69 m) and River Pumphouse were either below or only marginally exceeded NSE Guidelines for Disposal of Contaminated Solids in Landfills indicating that this material is likely suitable for disposal at a municipal solid waste landfill (i.e., East Prince Waste Management Facility in Wellington, PEI). In addition, concrete core samples collected from the New Stack (69 m) which were intended to be representative of material potentially requiring disposal did not contain detectable concentrations of leachable metals (lead and zinc).

The final disposal options for this material will be based on discussions with PEICLE, however for the purposes of the Decommissioning Study and associated cost estimate, it is assumed that the concrete from the New Stack (69 m) and painted portions of concrete walls of the River Pumphouse will be transported off-Site for disposal at the municipal solid waste landfill (i.e., East Prince Waste Management Facility in Wellington, PEI) under a Special Waste Disposal Permit issued in accordance with the Waste Resource Management Regulations of the Environmental Protection Act. The volume of painted concrete requiring disposal at the regional landfill is 294 m^3. The estimated cost for transportation and disposal of painted concrete from the New Stack (69 m) and River Pumphouse is \$125/tonne including transport for a total cost of approximately \$74,000.

As such, costs for additional treatment or disposal options for these painted surfaces was not completed as part of the Decommissioning Study. However, if the PEICLE or other regulatory agencies determine that the concrete of the New Stack (69 m) and River Pumphouse are not acceptable for disposal at the licensed municipal landfill, alternative options reviewed were limited to the following:

1. Sand blasting of painted surfaces and re-use of “cleaned” concrete on-Site or disposal at a C&D facility (paint collected as part of the sand blasting activities would require disposal at a hazardous waste facility).

2. Transport and dispose of painted concrete at a hazardous waste facility (nearest facility located in the Province of Quebec).

For the purposes of the Decommissioning Study and associated cost estimate, it is assumed that the remainder of the concrete structures at the Site are suitable for re-use on-Site as fill material or are suitable for disposal at an approved C&D facility. Re-use of concrete on-Site (or disposal at a C&D facility) is dependent on acceptance from the PEICLE.

It is also noted that several painted wood cabinets in the Mechanical Maintenance shop may also require disposal at the municipal landfill. However, given the small quantity of this material (estimated to be less than 1 tonne), additional disposal or remedial options were not evaluated.

5.1.3 Management of Bulk Storage Tank Bottom Sludge

The bulk volume of sludge to be removed from the Bunker C Storage Tank and associated day tanks is estimated at 66 m^3, based on the assumption of 0.1 m of residual sludge in each tank.

Two decommissioning options were considered in the options analysis as follows:

1. Off-Site shipment for disposal
2. On-Site treatment (centrifugation unit) and off-Site shipment of solids for recycling

Off-Site disposal involves sludge preparation, transportation to a licensed disposal facility (in NB), and disposal of residual material. Prior to transportation of the sludge, the sludge would be mixed with an absorbent material such as saw dust so that the sludge can be safely handled and transported. The volume of sludge in the Bunker C Bulk Storage Tank alone is estimated at 36 m^3. The total volume of sludge in all tanks and piping scheduled for decommissioning is estimated at 66 m^3. The resulting material (approximately 73 tonnes sludge and 37 tonnes absorbent) would be shipped off-Site (approximately 400 km) for disposal. The estimated cost for sludge transportation, and disposal of residual material is $300/tonne for a total cost of approximately $33,000.

On-Site treatment involves mobilization and set-up of a centrifuge and processing of the sludge, to segregate oil and solids. The solids would be transported [approximately 100 kilometres (km)] for further treatment and recycling, while the oil would be recycled (and possibly reused depending on quality).

Given the low volume of sludge expected to be present in the Bunker C bulk storage tank and associated day tanks, it is assumed that Option 1 or similar off-Site disposal/recycling method will be the preferred method for management of the bottom sludge.

5.1.4 Decommissioning of Circulating Water Lines from River Pumphouse to Steam Plant Building

The CW supply lines extending from the River Pumphouse to the north and east sides of the Steam Plant Building consist of two 1050 mm diameter Hyprescon pipes and three cast iron pipes (with diameters of 600, 450 and 300 mm). The CW discharge lines extending from the west, south and east side of the Steam Plant Building to the River Pumphouse consist of three Hyprescon pipes (with diameters of 900, 1050 and 1200 mm). Portions of a former wooden box culvert (approximately 1 m x 1.2 m creosote timber construction) used previously for stormwater is also anticipated to be present on the on the Site and extends from the east side of the Steam Plant Building to Water Street Parkway.

Subsequent to the installation of the CW lines, Water Street Parkway was constructed in 1994 and four sections of the CW intake lines were replaced with new sections of PVC and ductile iron pipe within the Water Street Parkway right of way. It has been assumed that the old sections of the intake lines beneath Water Street Parkway were abandoned during the 1994 construction and no costs to decommission those sections of lines have been included in the decommissioning cost estimate. Also, a portion of the petroleum fuel lines extending from the CHAI wharf unloading facility to the Irving Oil bulk petroleum storage facility are located directly over the CW lines directly adjacent to the River Pumphouse.

Eight decommissioning options for the CW pipelines were carried forward to a quantitative options analysis:

1. Complete a conditions assessment to determine structural integrity of the CW lines. This would be required for any decommissioning option below that considers leaving any portions of the CW Lines void, to assess the current condition of the pipe and the viability of each option. The estimated cost is $20,000.
2. Leave pipes void and cap at each end. Potential future pipe collapse may result in settlement, resulting in a potential safety/liability risk due to Water Street Parkway and petroleum pipelines being built over the CW lines. The estimated cost is $35,000, not including the conditions assessment. MECL reported that there have been three occurrences of soil subsidence above the CW lines over the past 20 years.
3. Partially excavate all pipes to crush pipes in-place or remove for recycling (cast iron pipes), and backfill excavated area. This option was not considered viable as it would result in the closure of Water Street Parkway for an extended period. This option would also require approval and permitting from the City of Charlottetown. No costing provided given the low probability of occurrence.
4. Cap and fill pipes with flowable grout in the area below Water Street Parkway. This option reduces the risk of future settlement under Water Street Parkway but not under the petroleum pipelines. Potential future collapse of CW pipes in other areas would likely only result in settlement at surface but would likely be restricted to MECL owned property reducing safety/liability risk and costs to repair settlement. The estimated cost is $130,000, not including the conditions assessment. This option was not recommended given the potential for future liability related to the settlement beneath the fuel pipelines.
5. Fill the full length of the CW lines (supply and discharge) with flowable grout. This option reduces the risk of future settlement due to line collapse for the entire length of the CW lines but is very costly. The estimated cost is $1,200,000. This option is not recommended due to the high costs.
6. Cap and fill pipes with flowable grout in the area below Water Street Parkway and all the way down to the River Pumphouse. Partially excavate remaining sections of pipes on the MECL Site property to crush pipes in-place or remove for recycling (cast iron pipes), and backfill excavated areas. This option reduces the risk of future settlement under Water Street Parkway and the entire length of piping on the water side of the roadway. It also has the added benefit of creating more void space on-Site for excess concrete to be used as backfill. The estimated cost is $500,000 including contingency of $100,000 for groundwater control and possible treatment during piping removal activities.
7. Cap and fill pipes with flowable grout in the area below Water Street Parkway and the petroleum pipelines and partially excavate remaining sections of pipes to crush pipes in-place or remove for recycling (cast iron pipes), and backfill excavated areas. This option reduces the risk of future

settlement under Water Street Parkway and the petroleum pipelines as well as differential settlement on the Site. It also has the added benefit of creating more void space on-Site for excess concrete to be used as backfill. The estimated cost is $292,000 including contingency of $100,000 for groundwater control and possible treatment during piping removal activities.

8. Cap and fill pipes with flowable grout in the area below Water Street Parkway and all the way down to the River Pumphouse. Leave the remainder of the pipes void. Reduces risk of future settlement under the main roadway (Water Street Parkway) and active fuel lines near River Pumphouse. Potential future collapse of void pipe in other areas on MECL property will result in minor settlement at surface only, with minor cost to repair settlement. The estimated cost is $344,000.

Option 7 is the preferred method for decommissioning of the CW lines as it reduces the potential for future differential settlement beneath Water Street Parkway and the petroleum fuel pipelines as well as MECL property and is more economical than Option 6 and Option 8.

5.1.5 Decommissioning of the River Pumphouse, CW Outfalls and Diverter Box, and Rock Groyne

The River Pumphouse structure is located southeast of the Steam Plant Building on the shoreline of the Hillsborough River and consists of four large pumps and vertical pits that supply cooling water to the Steam Plant Building. The vertical pits are connected to the CW lines that service the Steam Plant Building. The existing rock groyne extends approximately 370 m southeast from the shoreline into the Hillsborough River.

Three decommissioning options for the River Pumphouse Structure are as follows:

1. Remove the River Pumphouse to the mudline
2. Remove the River Pumphouse superstructure and convert the concrete floor to a dock
3. Leave the River Pumphouse and CW Outfalls and Diverter Box in place

As previously indicated, any modifications to the River Pumphouse, CW outfalls, diverter box or the rock groyne would require notification and agreement by the CHAI. Based on discussions with MECL during the Options Analysis meeting it was indicated that for reductions in long-term maintenance and post-closure costs, and for aesthetic reasons, the preferred option would be that the River Pumphouse and Wharf infrastructure will be totally removed and the shoreline re-graded and contoured to match existing conditions (Option 1). In addition, MECL indicated that it is to be assumed that the rock groyne will remain in-place with potential improvements depending on requirements of the Navigation Protection Program and the CHAI.

5.1.6 Surface Drainage Management

Currently surface water is managed on-Site through a system consisting of drainage ditches, catch basins and underground storm sewers that discharges to the Hillsborough River. The retention of the existing drainage system is essential to ensure adequate drainage of the Site post-demolition. However, the majority of the storm water collection system that services the northern portion of the

Site in the vicinity of CT3 discharges to the 900 mm diameter Hyprescon CW discharge line. As previously indicated, the CW lines are to be decommissioned to prevent future differential settlement.

Three decommissioning options for maintenance of the surface drainage management system are as follows:

1. Retain current drainage ditches and storm water collection system for discharge to the Hillsborough River through the existing CW discharge lines. A conditions assessment will be required to verify the structural integrity of the CW line to remain and determine if this is a viable option.
2. Install new storm water discharge line to replace existing CW discharge line on the Site and south of Water Street Parkway. The portion of the 900 mm diameter CW discharge pipe located beneath Water Street Parkway and the petroleum fuel lines could be used as a conduit for installation of the new line in these areas to limit excavation or horizontal drilling. This option will still allow for grouting of the CW lines below Water Street Parkway and the fuel pipelines to prevent future differential settlement.
3. Divert plant area surface drainage to municipal storm water collection system. This would require approval from the City of Charlottetown. In addition, the location and elevations of the existing municipal system could not be confirmed at the time of the Decommissioning Study evaluation but appeared to be on the opposite side of Water Street Parkway, which would likely mean this option would be a very expensive option.

Development of a surface water management plan including verification of municipal storm water lines and elevations will be required to determine the optimal design for future water management at the Site post decommissioning activities. This surface water management plan must also ensure future grading and water management preserve the integrity of the CT3 and ECC as this infrastructure is critical to the stability of the electrical grid for the province. For costing purposes, Option 2 is recommended as it allows for the elimination of the CW discharge lines but also allows for flexibility in future storm water management decisions. Based on discussions with MECL it was also decided to carry an allowance in the cost estimate for minor re-sloping of the Site once the Steam Plant Building has been removed and the installation of 4 additional catch basins to help manage surface water drainage post demolition.

5.1.7 Disposal of Excess Concrete Generated During Demolition Activities

The volume of below grade voids that will require backfilling as part of the Facility decommissioning is estimated at 4,745 m^3 (including CW lines). Clean concrete/cinderblock generated during Facility decommissioning is assumed to be suitable to be placed within the below grade voids (excluding concrete from the New Stack (69 m) and block walls of the River Pumphouse). This material will be crushed and backfilled in the voids intermixed with soil to help reduce settlement over time. The estimated volume of clean concrete/cinderblock to be generated during decommissioning is estimated to be 7,210 m^3. As such, approximately 2,465 m^3 of excess concrete will be generated during the decommissioning activities that will require disposal or re-use.

Potential options for use of the excess concrete were identified:

1. Spread out on-Site or transport off-Site as clean crushed concrete fill to PEICLE approved site requiring fill material. The estimated cost is approximately $25,000
2. Transport to C&D facility. The estimated cost is approximately $110,500

The cost of using the concrete on-Site as cover material or off-Site fill material (Option 1) was carried as it is approximately $85,500 less expensive than off-Site disposal at a C&D facility and is also promoting recycling of materials.

As part of the Options Analysis, it was also discussed with MECL regarding the possibility of not removing slab-on-grade and building foundations to 0.9 m below grade to reduce the amount of concrete debris generated during demolition. However, MECL indicated that they may not wish to leave slabs in place as it could have negative effects on the types and quantities of trees, shrubs and other vegetation they may choose to plant on-Site post-demolition. Therefore, this option was not chosen at this time but may be reviewed further by MECL closer to the actual demolition date.

5.1.8 Demolition of the Stacks

There are two concrete stacks at CTGS associated with the Steam Plant Building The New Stack (69 m) is approximately 69 m tall and is constructed of slip-form concrete with steel reinforcing and metal liner. The Old Stack (61 m) is approximately 61 m tall and constructed of slip form concrete with steel reinforcing and metal liner.

Five decommissioning options for demolition of the stacks were carried forward to a quantitative options analysis. The five options evaluated are as follows:

1. Use a crawler crane on top of the existing slab/foundations following demolition of the plant buildings and use a demolition attachment on the crane to disassemble the top 38-46 m of the concrete stacks (to an approximate height of 23 m). The remainder of the stacks could then be demolished with a high reach excavator equipped with demolition attachments. The estimated cost for disassembling the stacks with the use of a crawler crane combined with a high reach excavator is $1,400,000 combined for the two stacks. It is noted that the Old Stack (61 m) is located approximately 18 m from the ECC building. Therefore, there is the potential that falling concrete debris from this stack demolition method could affect operations of the ECC and specific mitigation measures may be required for protection of the ECC. Also, the stacks contain steel liners that require removal prior to the demolition of the concrete wind shells. This involves high risk access and removal activities within the stack annulus. If the liners are not removed prior to the demolition of the concrete shells, there is the potential for sections of the steel liners to be exposed to winds and lateral movements during the demolition activities. These lateral movements could cause the liners to become unstable and fall in an uncontrolled manner posing a safety hazard.
2. Install mast climbers on both stacks to allow workers and small demolition equipment to disassemble the stacks in small (<1.5 m) sections using the mast climber platforms for the top 38 m of the stacks. The remainder of both stacks could then be demolished with a high reach excavator equipped with demolition attachments. The mast climbers consist of tracks that are secured to the concrete stack and platforms that run up and down the stack using the tracks. It should be noted that the mast climbers cannot work in winds above 40 km/hr. In addition, the

platform diameter requires adjustment due to the difference in the stack diameter below 30 m making this method more time consuming than the crane and high reach excavator method. However, concrete debris generated using this method is contained on the platform and then dropped inside the stack for subsequent disposal (i.e. no falling debris on outside of stack). The estimated cost for disassembling the stacks with the use of mast climbers is $2,000,000 combined for the two stacks.

3. This option is a combination of Options 1 and 2. Decommissioning of the New Stack (69 m) would utilize Option 1. Decommissioning of the Old Stack (61 m) would utilize the procedures outlined in Option 2 due to the proximity of the ECC building. The estimated combined cost for the use of a crawler crane method for the New Stack (69 m) and the use of mast climbers for the Old Stack (61 m) is $1,700,000.

4. Use a crawler crane on top of the existing slab/foundations following demolition of the plant buildings and use a demolition attachment on the crane to disassemble the top 38-46 m of both concrete stacks (to an approximate height of 23 m). Demolish the remaining 23 m of the Old Stack (61 m) with a high reach excavator equipped with demolition attachments. The remaining 23 m of the New Stack (69 m) could be felled by blasting. Felling this stack does present a significant risk of damaging adjacent properties, on and off-site utilities and the CT3 infrastructure from blast vibrations and flying debris when the stack hits the ground. Also, there is the potential the stack could fall towards Water Street located to the southeast of the Site, which could cause damage and/or temporary closure of this main roadway. The estimated cost for the combined mechanical demolition and with felling a portion of the New Stack (69 m) is $1,125,000. However, the potential risks associated with this option outweigh the cost savings and is not a recommended option from a risk management perspective.

5. Partially demolish the Steam Plant Building and preserve the exterior walls to act as a containment barrier for felling the stacks into the building footprint. As indicated in Option 4 felling the stacks presents a significant risk of damaging on and off-Site infrastructure, including critical MECL infrastructure, Water Street, and the residential properties to the west of Cumberland Street. If the stacks were to not fall in the correct direction there could be significant property damage incurred, a main roadway closed and a significant power generating interruption if the ECC Building and/or CT3 were to be damaged. The estimated cost for felling the stacks is $600,000 for the two stacks. However, the potential risks associated with this option outweigh the cost savings and is not a recommended option from a risk management perspective.

After initial review of the above five options the three favored options by MECL were Options 1, 2 & 3. These three options were considered above Options 4 & 5 due to the reduced safety and property damage risk compared to Options 4 & 5, which involved blasting and felling of the stacks. The Site is in an urban setting with a limited area for laydown of the stacks, which presents a significant risk of damaging on and off-Site infrastructure, including critical MECL infrastructure, Water Street Parkway, and residential properties to the west of Cumberland Street if blasting/felling methods are utilized.

Options 1 and 3 were considered viable options but given the proximity of the Old Stack (61 m) to the CT3 and the ECC Building and the safety risks associated with the steel liners (outlined above in 5.1.8.2) it was decided to go with the more cautious approach of using a combination of mast climbers and high reach equipment for both stacks and therefore Option 2 was decided upon by GHD and MECL as the recommended option for costing purposes.

5.2 Risk Items

Several environmental and demolition options were identified in Section 5.1 as having a low potential of occurring based on professional judgment and information provided by MECL. However, several of these specific activities could incur significant costs to the decommissioning project if they are required due to regulatory obligations or third party agreements and have therefore been identified as potential risk items. These following items were discussed with MECL during project specific meetings and, as directed by MECL, the estimated total cost specific to the identified risk items has been added as a footnote to Table 9.1 – Detailed Class B Cost Estimate. These risk items are not included in the decommissioning costs.

- **Potential for Remediation of PAH Impacted Soil/Groundwater:** It is expected that additional assessment of the PAH impacted soil and groundwater located in the southwest corner of the Site (and potentially off-Site) can be managed using a risk-based approach without implementation of in-situ remediation. However, if the risk based approach is not acceptable from a technical, regulatory or social perspective, excavation, transportation and disposal of the impacted soil/groundwater off-Site may be required.
- **Potential for Change in Land Use:** If a change in land use were to occur for a portion of the Site following decommissioning of the Steam Plant Building, the applicable guidelines would change for screening contaminants of concern in soil and groundwater and additional assessment or remediation may be required depending on the final chosen land use.
- **Potential for Off-Site Assessment of Surface Soil:** There is the potential that assessment of off-Site surface soil may be required to confirm metal concentrations do not pose a risk to human health (residential and commercial receptors). It is noted that the CTGS is located in an area of Charlottetown that historically contained numerous industries (bulk storage tank farms, rail yards, etc.) with potentially similar contaminants of concern so determining background soil conditions of Charlottetown would be a critical component of any future soil sampling programs and additional assessment is likely to demonstrate that remedial action is not required for the off-Site areas.
- **Rock Groyne Improvements or Removal:** It was assumed that the rock groyne will remain in its current condition (with some potential improvements). However, there is the potential that the rock groyne will require removal if the River Pumphouse and CW Outfalls and Diverter Box are removed.
- **Assessment of Sediment and Surface Water Quality of the Hillsborough River:** Assessment of sediment/surface water quality of the Hillsborough River is not expected as part of the Facility decommissioning process, however additional assessment work could be required to ensure historical Site activities and associated effluent discharges have not adversely affected aquatic habitat of the river.
- **Removal of PILC Cables:** If PILC cables beneath Cumberland Street and parallel to Sydney Street west of the Site cannot be physically extracted from the buried conduits by pulling, they will need to be trenched for extraction at an additional cost.

- **Bulk Storage Tank Farm:** The area beneath the existing Bulk Bunker C Tank was not assessed during the Phase II ESA as the area was in operation and the containment berm is lined. There is the potential for hydrocarbon impacted soil to be present beneath the tank that would require remediation or risk management.
- **Lead or Zinc Based Painted Surfaces**: If the PEICLE indicate that the New Stack (69 m) and River Pumphouse painted concrete is not acceptable for disposal at the municipal landfill, the concrete would require on-Site abatement (i.e., sand blasting) or disposal as hazardous waste. The nearest hazardous waste facility licensed to accept this type of material is located in the province of Quebec.
- **Disposal of PCB Containing Equipment:** Previous testing completed on potential PCB containing equipment located on-Site identified PCB concentrations less than 50 mg/kg. However, during decommissioning activities, there is the potential for identification of equipment containing PCB concentrations greater than 50 mg/kg that would require disposal at a specialized facility.
- **Dust Control:** There is the potential for dust generated during demolition activities to adversely affect operation of the CT3 combustion turbine. It is noted that specific mitigation measures for controlling dust impacts to neighbouring properties will be included in the EIA that will be submitted to PEICLE for approval.
- **Noise Control:** There is the potential that demolition of the concrete stacks will be completed utilizing hydraulic hammers that may generate noise above acceptable levels. Therefore, utilization of alternative methods that may result in decreased demolition productivity at an additional cost may be required. It is noted that specific mitigation measures for controlling noise levels will be included in the EIA that will be submitted to PEICLE for approval.

6. Decommissioning Plan

The decommissioning plan for the CTGS has been divided into the three following categories of activities: building infrastructure, civil infrastructure, and remediation of environmental impacts. The decommissioning objectives, activities, and sequencing requirements for each category are discussed below. A comprehensive hazard assessment to include work activities task-by-task, hazards, recommended controls and risk ranking will be completed by the demolition contractor prior to the commencement of the decommissioning and demolition activities.

6.1 Building infrastructure

6.1.1 Decommissioning Objectives

As part of the decommissioning of the CTGS, the Steam Plant Building and associated structures, equipment, and support facilities will become inactive. If decommissioned, it is the intent of MECL to safely remove these facilities through a demolition program that will meet the following specific objectives:

- Develop a condition that would permit future system expansion and energy system upgrades with some limiting conditions.
- Minimize waste disposal through maximizing economic opportunities for reuse and recycling of materials.
- Maximize utilization of existing labour forces.
- Abandon Site infrastructure in place with structures, footings, and foundations removed to a depth of 0.9 m below finished grade.
- Utilize the expected surplus of inert construction debris (i.e. concrete, concrete block and brick) for re-grading the Site.
- Sequence decommissioning activities so that potential impacts to the operation of the ECC and CT3 are minimized to the extent possible.

6.1.2 Decommissioning Activities and Sequencing Requirements

The decommissioning activities required for the building decommissioning are discussed below. The sequencing of the activities, where imperative to implementation, is also discussed. Prior to initiating Site decommissioning activities, the demolition contractor will set up Site offices and access points. Throughout the decommissioning and demolition, the contractor will also designate areas of the Site for equipment and salvage storage. These proposed areas are shown on Figure 11, however, the demolition contractor may propose alternate laydown areas upon commencement of the project.

6.1.2.1 MECL Decommissioning Activities

MECL personnel will complete certain tasks prior to CTGS closure. For costing purposes, it is assumed that MECL personnel or operational staff familiar with the Steam Plant Building and associated infrastructure will complete the following decommissioning tasks and costing has not been included in the closure cost forecasting:

- Cleaning of the boiler interiors prior to de-energizing of the MgOH system
- Removal of raw material for sale/transfer including fuel and chemical additives (e.g., sulphuric acid, caustic, hydrazine, etc.) to minimize waste disposal quantities
- Deactivation and de-energizing of electrical generating and production equipment and buildings
- Coordinate the transfer of the CT3 Balance of Plant equipment, including the RO/EDI water treatment equipment and above ground CT3 diesel lines, to the new CT3 building
- Removal of surplus equipment for sale or transfer from the Steam Plant Building
- Re-routing of electrical supply to navigational beacons on stacks to ensure functionality until stacks are decommissioned
- Preparing the Site for temporary electrical and water supply for the demolition contractor(s)
- Draining of process lines
- Collection of miscellaneous waste containers throughout the Facility

6.1.2.2 Chemical Sweep

Prior to demolition, a thorough "sweep" will be made of the Steam Plant Building and River Pumphouse by the demolition contractor to ensure that all containerized materials have been accumulated and temporarily stored at a central collection point. Once the sweep is complete, a commercial waste disposal firm will be retained for the proper packaging, transportation, and disposal of the chemical wastes in accordance with provincial regulations.

6.1.2.3 Universal Waste Removal

The removal, collection, and handling of each of the universal wastes will be required prior to demolition. Batteries will be recycled from each battery bank as well as batteries that are found in emergency lights and exit signs. Light bulbs and fixture ballasts will be removed and recycled or disposed of in accordance with applicable regulations. ODS will be removed from refrigeration equipment and recycled. Cylinders of compressed gases will be returned to the supplier. Mercury-containing and radioactive devices will be collected and properly recycled or disposed of in accordance with applicable regulations. Computers and electronic waste such as circuit boards containing lead and mercury will be removed and recycled or disposed of in accordance with applicable regulations. Proper safety measures will be defined and a labour force will be employed that is trained in the removal and handling of these materials. Transportation and disposal will occur at a MECL approved recycling site.

6.1.2.4 Asbestos Abatement

Prior to demolition, the removal of ACM must be completed. This work is to be performed by a licensed asbestos abatement contractor and consists of removal of friable ACM such as insulation for mechanical equipment, piping and pipe fittings and removal of non-friable ACM such as transite wall panels.

In preparation for asbestos abatement activities, the asbestos audit prepared for the Facility in 2017/2018 will be updated and verified. This is required due to on-going asbestos abatement performed by MECL. The updated asbestos audit will be used as the basis to define the scope of work for ACM abatement.

Abatement of the vessel, piping, and other equipment insulation will be within individual constructed containment areas around the equipment. Alternatively, glove bagging may be used for individual pipe fittings, elbows, and piping. A third technique allows glove bagging at both ends of a long section of pipe. The pipe is then cut on the clean, insulation-free sections and lowered. This technique, termed "cut and wrap", requires that the entire lowered pipe section be wrapped in plastic and disposed of as ACM waste. Although this technique increases abatement productivity, it also requires the transportation and disposal of greater volumes of ACM waste. Mechanically lowering and removal of the pipe sections also presents a potential safety issue, as well as a loss of revenue given the salvage value of the pipe.

During abatement of the friable ACM third party area-wide air monitoring will be conducted. Air monitoring is required to verify that no release of asbestos fibers has occurred from any containment, and within the containment to determine that the interior of the containment is "adequately cleaned" before removal.

A summary of the estimated ACM quantities within each area at the Site is presented in Appendix C.

6.1.2.5 Decommissioning Cleaning

As part of the decommissioning of the CTGS, various equipment, bulk storage and process tanks, piping, ducts, pits, floor trenches, sumps, and surfaces will be purged, rinsed, and otherwise cleaned prior to demolition. This cleaning will remove accumulated solid residue and oils or other liquids that otherwise may be released during demolition activities. No free liquid may remain in equipment reservoirs or piping that will be released during demolition. Accumulated tank sludge must be removed and properly handled after equipment is taken out of service. The level of cleaning will also be determined by the need to remove potentially hazardous dust. Cleaning will render the recyclable materials free of gross process residue, enabling shipment of salvageable materials.

Techniques for cleaning will include low volume, high-pressure water blasting, steam cleaning, washing with detergent or degreasing soap, and other means and methods. Wastewater will be contained and collected. Wastewater is anticipated from decommissioning cleaning of the following areas:

- Cleaning of the Bulk Bunker C Storage Tank and associated day tanks including interior walls, floor and piping.
- Cleaning of the fuel pipeline and pumping system within the Bulk Storage Tank Farm and between the tank farm and the Steam Plant Building and within the Steam Plant Building.
- Cleaning and removal of potentially hazardous dust from various boiler and turbine zones (Units 4, 5, 7, 8, 9 and 10, Balance of Plant Zone, the WWTP area, Welding Shop and the MgOH Room). It is assumed that MECL operations and maintenance staff will complete cleaning of the boiler interiors prior to the Facility decommissioning, as the boiler cleaning requires the MgOH system to be operational.
- Cleaning of stacks and all associated ducting, breeching and pipes.
- Cleaning and removal of non-hazardous dust from Mechanical Maintenance Shop, RO/EDI Plant and River Pumphouse, as well as all associated ducting and pipes.
- Cleaning of pits, trenches, and sumps located in the basement of the Steam Plant Building.
- Cleaning of non-PCB oil stained concrete under pumps and process equipment, if present.
- Cleaning of bottom ash storage and conveyance equipment as well as historical coal handling equipment.
- Cleaning of various process tanks, ASTs, and piping systems.
- Cleaning of the WWTP, including storage and treatment tanks and filter press.

Cleaning would typically be completed in two stages. Initial cleaning would consist of cleaning that may occur while the facility is energized, such as cleaning of pipes and breechings. Final cleaning would consist of cleaning that requires the area to be de-energized prior to cleaning such as washing of the interior building walls. During final cleaning, temporary power would be required for lighting and washing equipment operations.

The interior of the Bunker C bulk storage tank and associated day tanks will be accessed by cold cutting an opening in tank walls. Decommissioning activities will commence with the bulk removal of Bunker C sludge from the tanks. The interior piping, walls, and floor will be pressure washed to remove residual waste and oil. Tanks will be verified empty prior to release for demolition or off-Site disposal. Wastewater generated by cleaning activities will be pre-treated to remove bulk oils prior to processing at the WWTP or a mobile water treatment unit.

Cleaning wastewater will be segregated if certain contaminants are anticipated (i.e., if any PCB-contaminated surfaces should be identified). Segregation may also be necessary if wastewaters are suspected of containing high concentrations of vanadium dust or free-phase petroleum product.

6.1.2.6 Equipment Removal

Prior to demolition, all equipment and parts will be removed from the buildings.

6.1.2.7 Building Demolition

A safe and efficient operation will be critical to a successful demolition at each stage of the process. The successful contractor(s) will be required to have a corporate safety management program and to provide a Site specific plan and risk registry for each activity of the demolition. The plan will address overall Site safety for the on-Site workers, MECL employees involved with the operation of CT3 when necessary as well as members of the public.

The contractor(s) will adhere to all pertinent federal, provincial, MECL and contract related safe work standards, procedures and methods in the performance of the work. As demolition work involves activities that can be considered high risk, each hazard must be identified and managed to reduce risk to an acceptable level before work begins.

Demolition will commence once the structures have been abated, regulated materials and wastes have been removed, and decommissioning cleaning has been completed. Demolition will require the use of heavy equipment equipped with specialized demolition attachments, such as grapples, pulverizers and shears. Experienced equipment operators will remove the structures by progressive demolition and the controlled gravitational fall of the structural components.

Given the height of the main buildings, the use of modern "high reach" equipment will be considered. This equipment is engineered and constructed to enable an extended boom to operate demolition attachments. The equipment tracks are spaced further apart than conventional hydraulic excavators. There is also an increase in the counter weight and improvements to the hydraulic systems. This extended boom equipment allows the operator to reach the top of the structures with greater control over the demolition process.

As part of mechanical demolition, demolition debris, concrete, cinderblock, brick, and ferrous and non-ferrous metals will be removed and segregated. The ferrous and non-ferrous metals (including: structural, stainless, and plate steel; copper; and aluminum) will be sized to either mill sizing or other shipment size depending on the salvage contract to achieve maximum asset value. An on-Site scale may be maintained and certified to track disposition of salvage materials.

The removal of concrete footings, foundations, pedestals and slabs will occur to a depth of 0.9 m below finished grade. Basement floors will be fractured for drainage. Clean cinderblock, brick, and concrete will be crushed and placed in basement and excavation voids as backfill. It is estimated that there will be an excess of 2,465 m^3 of crushed concrete that will be utilized on-Site for re-grading.

6.1.2.8 Stack Demolition

Several options for demolition of the stacks were discussed in detail in Section 5.1.8. For costing and planning purposes it is assumed that demolition of the stacks will most likely occur by utilizing a combination of mast climbers and high reach equipment. Mast climbers will be used to demolish the top 38 m of the stacks in approximately 1.5 m sections with the debris generated felled inside the stack for subsequent removal and crushing by heavy equipment. The remainder of both stacks could then be demolished with a high reach excavator equipped with demolition attachments. This method of demolition was chosen instead of crane demolition given the close proximity of the Old Stack (61 m) to the ECC Building and the CT3 equipment and the safety risks associated with the demolition of the steel liners utilizing the crane method (outlined above in 5.1.8.2). Also, based on discussions with MECL during the options analysis review, it was agreed that minimizing vibrations and the risk of falling debris around these two structures were major factors to consider given the potential negative impacts to critical MECL operations. Utilizing the mast climbing platforms minimizes the risk of falling debris damaging other Site infrastructure by allowing all debris to be contained on the platform, pushed inside of the top of the stacks, and dropped within the stack footprint. An access opening would then be prepared in the bottom of the stacks to allow for the debris to be removed on a regular basis. Establishment of a safe exclusion zone at the base of both stacks during demolition operations would also further reduce risk to on-Site workers and critical infrastructure. This will require stack demolition to be sequenced following partial (or full) demolition of the CT3 Balance of Plant and Unit 10 Boiler/Turbine zones.

As previously discussed, free-fall of either of the stacks will generate increased vibrations and uncontrolled debris compared to the use of a mast climber or high reach equipment, and is therefore considered a high risk activity given the urban nature of the Site and continued operation of sensitive equipment (CT3 and ECC) and not recommended for this Site.

The proposed demolition methods for the stacks described above are based on demolition equipment/technology available at this time, GHD's previous experience and on MECL's safety/risk management requirements. They form the basis for developing the current plan and budget for this project. It should be noted that demolition contractors may propose to utilize different means and methods for demolition of the concrete stacks than those recommended above. It should also be noted that significant innovation for concrete stack demolition has been achieved in the past several years and further innovative methods might be developed prior to the actual demolition of this Site. If new methods are available at the time of demolition or if alternative means and methods are proposed by a demolition contractor, that may reduce costs and/or improve safety for the stack demolition, they will be considered and evaluated at that time by MECL.

6.1.3 Material Disposal

As summarized in Table 4.2, the decommissioning of CTGS will generate quantities of various materials and wastes. A significant portion of these materials may be considered assets, in that they have recyclable value either for use as clean fill, or for re-use or re-sale elsewhere. The recyclable value of these assets will be used to offset the costs of the CTGS decommissioning program. The handling and disposition of assets at the CTGS is discussed further in Sections 6.1.3.1 and 6.1.3.2.

Although some materials will be of little value, proper management will minimize their removal costs (as identified in Section 6.1.3.3). Other materials identified in Section 6.1.3.4 are regulated and must be properly handled and disposed of in accordance with all applicable federal and provincial regulations. The detailed listing of materials to be generated by decommissioning the CTGS is listed in Table 4.1, with the approach for the disposition of these materials discussed in the following subsections.

6.1.3.1 Equipment and Material Assets

Maximizing the value of existing assets is a significant aspect of project cost reduction. The CTGS is currently operational as a well-managed power generating facility. GHD in consultation with MECL has developed a listing of existing CT3 Balance of Plant equipment that is to be transferred to the new CT3 building prior to initiating decommissioning activities. To maximize the value of MECL remaining assets in the Steam Plant Building, the option exists to sell selected pieces of equipment for reuse rather than disposal for scrap metal value which could potentially reduce recyclable material quantities.

Equipment and material assets that may be removed from the Facility prior to demolition include such items as transformers, compressors, large motors, and heat exchangers. Options for the disposition of equipment and material assets include:

- Re-allocation and distribution at other MECL operational facilities
- Individual sale of component parts within the power industry
- Auctioning of power generating equipment and related component parts inventory through commercial power equipment firms
- Regional auctioning of smaller reusable items, such as office furniture, maintenance tooling, lifts, and miscellaneous equipment

6.1.3.2 Raw Material and Consumable Product Assets

The CTGS operates with an inventory of raw material and other consumable products. Most notable on this list of raw materials is the residual Bunker C fuel (up to 30,000 BBL at peak capacity in the Bulk Bunker C Storage Tank Farm). To the extent possible, the remaining fuel will be consumed during the operational life of the Facility prior to commencing CTGS decommissioning activities. The fuel will be processed in a manner that allows back flushing of fuel within each heated tank, thereby allowing for the re-suspension of settled solids. This technique minimizes the amount of solids in the tanks, and maximizes utilization of the fuel resource.

Associated with current plant operations are raw materials that have recycle/reuse value. These materials include:

- Compressed gases (e.g., argon, oxygen, etc.)
- Acids and caustics

- Chemical additives and flocculent
- Lab packs (unused raw and waste chemical materials)
- Transformer and other non-PCB containing oils

The volume of these materials varies with the demand for their use. Inventory management of raw material assets is the best option available to MECL to reduce the volume of material that will remain at the time the Steam Plant Building operations cease. All unused bulk materials may be reclaimed, reused, or recycled.

Raw material will be removed for sale or re-use as part of post-shutdown activities. Suppliers may be notified and where possible, unused raw materials may be returned for credit. If this is not possible, the products will be recycled as part of the decommissioning activities by the contractor.

6.1.3.3 Miscellaneous Containerized Materials

Throughout the Facility there are individual containers of various products and chemicals. The amount, sizes, and types vary, including aerosol cans, small cans, pails and drums of paints, lubricants, grease, and cleaning agents. These materials also include laboratory chemicals used as testing reagents.

The miscellaneous materials will be collected as a specific decommissioning activity. The materials will be properly identified and handled in a manner that is in compliance with all provincial and federal regulations. Wherever possible, these materials will be consumed prior to decommissioning the CTGS. Surplus containers will occur however, and these materials must be inventoried and segregated by type.

The reuse options for the miscellaneous materials are limited. The materials may be sent for use at other MECL facilities, and it is conceivable that some materials, such as cleaning supplies, may be distributed elsewhere. The final option is collection and packaging for disposal as chemical waste. This would be at considerable cost, and therefore the minimization of containerized materials should be a management goal prior to and during the shutdown of the Steam Plant Building operations.

6.1.3.4 Regulated and Hazardous Wastes

6.1.3.4.1 Universal Wastes

Within the CTGS structures, materials exist that must be properly handled during closure of the Facility. These materials are identified in Section 3.2.1 and Table 4.1, and their quantities are summarized in Table 4.2.

The removal, collection, and proper handling of each of the universal waste materials will be a specific decommissioning activity, and will be conducted in accordance with provincial and federal regulations. Recycling options exist for the majority of these materials.

Prior to demolition, the removal and packaging of the universal wastes will be required. Proper safety measures will be defined and a labour force will be employed that is trained in the removal and handling of these materials. Transportation and disposal will occur at a recycling site approved by MECL.

6.1.3.4.2 Asbestos-Containing Material Waste

The friable ACM insulating material on vessels, tanks, piping, and other equipment, as well as containment materials and disposable personal protective equipment, will be double-bagged and placed in lined roll-off containers for disposal. Other non-friable ACM, such as roofing materials and transite wall panels will also be placed in a segregated lined roll-off container for disposal.

All ACM waste materials will be disposed of at a licensed off-Site facility authorized to accept ACM waste.

6.1.3.4.3 Bulk Solid Wastes

Potential hydrocarbon product/residue in pipelines and tanks will be removed as part of shutdown decommissioning activities. Other bulk solid waste will include dust residue and solids generated from the cleaning of vessels and other equipment prior to demolition, including bottom ash in the boilers (containing vanadium). Another solid waste that will be generated through demolition will be creosote/pressure-treated timbers from the River Pumphouse structure and wooden box culvert.

Solid wastes will be characterized for disposal in accordance with provincial and federal regulations.

Bunker C bulk storage tank bottom sludge will be collected and transported off-Site for disposal or incineration given the small volume of fuel anticipated to be remaining in the bulk storage tank and associated day tanks.

6.1.3.4.4 PCB Containing Equipment and Cables

PCB containing equipment on-Site includes nine wet transformers and an extensive amount of PILC copper cables. These materials have a PCB content of greater than 2 mg/kg but less than 50 mg/kg and as such will have to be sent to licensed facilities for processing and disposal. The demolition contractor will prepare these items for shipment to the licensed facilities but the disposal facility will be responsible for retrieving and transportation of the PCB equipment and cables. At the licensed disposal facility, the PCB contaminated oils and other porous materials will be extracted for disposal and non-porous materials (i.e., copper) recovered for recycling. MECL will receive credit for this recyclable scrap metal. GHD has obtained pricing (including credit for valuable scrap metals) from two trusted facilities to collect and dispose of these PCB containing materials and that has been carried forward in the cost estimate.

6.1.3.4.5 **Lead and Zinc Based Painted Surfaces**

The concrete surfaces of the New Stack (69 m) and River Pumphouse contain lead and/or zinc based painted surfaces that likely limit re-use of the material on-Site or disposal at a C&D site. Leachate testing completed as part of the Updated Phase II ESA indicated that these painted surfaces are likely acceptable for disposal at a municipal landfill (e.g., East Prince Waste Management Facility) with a Special Waste Disposal Permit from the PEICLE. If the PEICLE indicate that this material is not acceptable for disposal at the municipal landfill, the concrete would require on-Site abatement (i.e. sand blasting) or disposal as hazardous waste. For the purpose of this Decommissioning Study and associated cost estimate, it is assumed concrete from the New Stack (69 m) and cinder block walls of the River Pumphouse are suitable for disposal at the East Prince Waste Management Facility in Wellington, PEI.

6.1.3.5 Demolition Debris

Non-recyclable demolition material will be handled and disposed of as debris. The non-recyclable materials consist of wood, non-asbestos containing insulation and roofing materials. The demolition debris will be disposed of at a licensed C & D facility authorized to accept demolition waste.

6.1.3.6 Recyclable Materials

6.1.3.6.1 Recyclable Ferrous and Non-Ferrous Metals

Demolition of the structures and equipment will include the segregation and processing, and recycling of a variety of ferrous and non-ferrous metals. Substantial value exists in the quantity of recyclable metals, which will be determined by the international market at the time of demolition.

6.1.3.6.2 Clean Brick and Concrete/Cinderblock

Clean brick and concrete/cinderblock will be pulverized on-Site with heavy equipment to an aggregate size that allows the clean material to be used as machine-compacted backfill in basements, pits, and other excavations. No off-Site transportation of this material is anticipated. However, as previously indicated, for the purpose of this Decommissioning Study, it is assumed that concrete from the New Stack (69 m) and painted concrete cinder block walls of the River Pumphouse that contained lead and/or zinc based paint will be transported to the East Prince Waste Management Facility in Wellington, PEI.

6.1.3.7 Decommissioning Cleaning Wastewater

Wastewater is anticipated from decommissioning cleaning of the Facility in preparation for demolition. The use of the on-Site WWTP (with oil/water separator) for the treatment and disposal of all wastewater is anticipated. Wastewater generated during decommissioning of the WWTP will be transported off-Site for disposal.

MECL representatives will continue to operate the WWTP during decommissioning. The continued operation of this facility for receiving wastewater will be sequenced into the decommissioning plan. This will require that electrical "cuts and caps" segregate the WWTP; and the final cleaning of the WWTP would be sequenced accordingly. Should the use of surfactants inhibit performance of the oil/water separator, other filtration methods will be employed.

6.2 Civil Infrastructure

6.2.1 Decommissioning Objectives

The decommissioning objectives for civil infrastructure at the Plant Site include the following:

- Develop a condition that would permit future system expansion and energy system upgrades with some limiting conditions.
- Decommission Site services associated with the Steam Plant Building (i.e., water main, sanitary sewer, cooling water lines and electrical service) and River Pumphouse infrastructure to minimize long-term maintenance and post-closure care.

- Manage surface water runoff from the Site in a manner that is protective of human health and the environment and minimizes long-term maintenance and health and safety concerns. This includes protection of existing surface water control infrastructure (catch basins, manholes, conveyance piping, etc.) that currently serves the CT3 infrastructure. This also includes potential improvements to piping discharging to the Hillsborough River (or connection to City services) as well as installation of new catch basin and conveyance infrastructure to ensure protection of CT3 and the ECC building.
- Abandon Site infrastructure in place with structures, footings, pedestals, slabs/pads and foundations removed to a depth of 0.9 m below finished grade.

6.2.2 Decommissioning Activities

Decommissioning of the civil infrastructure at the Site considers services for the Steam Plant Building, River Pumphouse structure, cooling water infrastructure, final Site grading, and surface water infrastructure. The decommissioning activities associated with each civil component are discussed below.

6.2.2.1 Site Services

The services (sanitary sewer, storm sewer, potable water and fire suppression hydrants) at the Site will generally remain in place with only service connections to the Steam Plant Building and associated infrastructure abandoned. Each service connection abandoned outside of the building(s) footprint will be marked using wood posts prior to backfilling and GPS coordinates recorded. Abandoning of service connections will be completed prior to building demolition. Chambers and hydrants to remain will be protected during demolition activities to maintain the integrity of the system and to prevent the collection of debris within the sewer systems.

The storm water sewer system will remain in place and operational to allow for surface water drainage at the Site following demolition. As it is expected the Site will continue to operate as power generation facility, maintenance and potential upgrades to the current storm water sewer system are essential for the continued operation of CT3 and protection of essential services such as the ECC building. Service connections to the Steam Plant Building will be abandoned through cutting and capping of the piping outside of the building.

A 150 mm diameter force main from Cumberland Street provides potable water to the Steam Plant Building as well as process water to the Water Treatment Plant (RO/EDI Plant) for operation of CT3. As part of Facility decommissioning the water mains will be shut-off at the main shutoff valves at the property limits in accordance with City of Charlottetown Requirements. Given that the force main provides process water for the operation of the CT3, coordination of the CT3 Balance of Plant equipment to the new CT3 building prior to implementing decommissioning activities will be a critical path to minimize disruptions to the operation of CT3. The connections at the Steam Plant Building will be capped using flanged pressure rated caps.

The Steam Plant Building is also serviced by a gravity sewer that discharges to a 375 mm diameter municipal sanitary sewer system. The sanitary sewer system connection to the buildings will be cut and capped using concrete. There are no known septic tanks at the Site that require cleaning or decommissioning as part of the decommissioning activities.

The Plant Site uses electricity generated by CTGS or receives electricity from the provincial grid. Electrical services to the Steam Plant Building, River Pumphouse and associated infrastructure such as the Mechanical Maintenance Shop, Welding Shop, Bulk Storage Tank Farm, day tanks, and pad mounted transformers will be disconnected prior to decommissioning. At this time, the removal of light standards and footings will likely be limited to areas on the south side of the Steam Plant Building and River Pumphouse area.

6.2.2.2 Buried Process Piping

In addition to water, storm sewer and sanitary sewer, underground and aboveground process piping supports the Steam Plant Building operations, including WWTP piping, steam lines and boiler blowdown lines. All service connections to Site buildings and between the buildings will be abandoned through cutting and capping.

6.2.2.3 Circulating Water Piping, Outfalls and Diverter Box

As noted in Section 2.2.2, CW for the CTGS operation is obtained from the Hillsborough River via the River Pumphouse. The processed CW is discharged through the CW discharge pipes and CW Outfalls and Diverter Box to the Hillsborough River directly west of the River Pumphouse. Since the installation of the CW supply and discharge lines, Water Street Parkway was constructed over a section of the piping (approximately 14 m) and four sections of the CW intake lines within the Water Street Parkway right of way were replaced with PVC and ductile iron pipe in 1994. It has been assumed that the old sections of the intake lines beneath Water Street Parkway were abandoned during the 1994 construction and no costs to decommission those sections of lines have been included in the decommissioning cost estimate. In addition, three petroleum distribution pipelines were constructed over the CW lines directly adjacent to the River Pumphouse (approximately 3 m section).

As detailed in Section 5.1, several options exist for decommissioning of the five supply lines and three discharge lines between the Steam Plant Building and the River Pumphouse. It is assumed that the CW lines beneath Water Street Parkway and the petroleum pipelines will be filled with flowable grout and the remainder of the lines will be excavated, crushed in place or removed, and the excavation backfilled. This option reduces the risk of potential future differential settlement beneath the road and fuel pipelines as well as on MECL property.

To minimize disturbance of shoreline on either side of the River Pumphouse, the concrete walls of the existing structures will be demolished inward and the building debris pulled back towards the shoreline. The painted portions of the concrete cinder block wall debris will be disposed of at the municipal landfill. Unpainted concrete debris will be used for filling landside voids of the CW Outfalls and Diverter Box and River Pumphouse structures including building sumps and other voids. The River Pumphouse infrastructure will be demolished to approximately 1 m below existing shoreline or river bottom grade (i.e. mudline). The armour stone wall located at the eastern end of the pumphouse will be dismantled and the armour stone will be re-used, in addition to imported armour stone and rip rap, to create a new shoreline face that will be tapered into the existing shoreline on either side of the building. Rock intrusion in the Hillsborough River is not expected to extend beyond the footprint of the existing River Pumphouse building.

6.2.2.4 Final Site Grading

Following completion of the demolition activities, the surface areas disturbed during decommissioning will be graded to match into the existing hard surfaces to remain and to achieve positive drainage to the remaining storm sewer system catch basins and ditches.

Approximately 2,465 m^3 of excess concrete material will be generated during the decommissioning activities that requires re-use on-Site or off-Site disposal at a C&D facility. This volume of concrete excludes the New Stack (69 m) concrete and River Pumphouse cinder block walls that has been assumed will be transported to the municipal landfill for disposal. The current plan is to re-use this material on-Site to regrade the Site. For costing purposes, it is assumed that the 2,465 m^3 of excess concrete will be spread out on-Site in a 0.3 m lift (8,500 m^2) and then the concrete covered with approximately 0.6 m of imported fill to create a growing medium (for planting of grasses, plants, and small shrubs/trees) and to also ensure crushed concrete debris is not visible at finished grade. Other options for the excess concrete, such as constructing berms and infilling the bermed tank farm, have been discussed and may be explored further closer to actual decommissioning. The current option costed is considered to be a conservative option and should cover the costs of most other options being considered. As discussed in Section 5.1.7, a grading and storm water management plan will be required as part of the pre-decommissioning engineering activities to ensure placement of this excess demolition debris does not adversely affect drainage patterns for the Site or adjacent private and municipal properties.

6.2.2.5 Post-Demolition Conceptual Site Layout

The post-demolition conceptual Site layout and re-grading area is provided on Figure 10. The figure shows post-demolition infrastructure (e.g., roads) and existing buildings, storm water collection piping and other infrastructure associated with CT3 and the ECC that will remain, void spaces from removed infrastructure to be backfilled, and potential areas for spreading out the excess crushed concrete/cinder block. As previously indicated, the location for spreading out the excess concrete is conceptual only and will be reviewed as part of pre-decommissioning engineer activities.

6.3 Remediation of Environmental Impacts

6.3.1 Remediation Objectives

The specific objectives for remediation of environmental impacts at the Site include the following:

- Ensuring that the Site is decommissioned in a manner that is protective of human and ecological health in compliance with pertinent Federal and Provincial regulatory requirements and the Site specific Environmental Protection Plan
- Minimizing long-term maintenance requirements

6.3.2 Potential Remediation Activities

As indicated in Section 4.3 and 5.1, remediation of soil and groundwater at the Site or off-Site is not considered required as part of the decommissioning activities. However, additional delineation along with additional groundwater monitoring and soil vapour sampling is required to confirm that PAH impacted soil and groundwater in the southwest corner of the Site does not pose an unacceptable risk to human health on and off-Site or to ecological receptors of the Hillsborough River.

The Updated Phase II ESA did not include assessment of off-Site surface soil conditions from historical flue gas impingement, assessment of sediment or surface water conditions of the Hillsborough River or assessment of soil conditions beneath the Bulk Bunker C Storage Tank. Although it is unlikely that remediation of these areas is required as part of future decommissioning activities, these specific areas have been identified as risk items that may require additional assessment.

6.4 Summary

Decommissioning activities for the Plant Site will consist of:

- Decommissioning of building infrastructure including chemical sweep, ACM abatement, decommissioning cleaning, Steam Plant Building and River Pumphouse building demolition, and stack demolition.
- Additional assessment of PAH and metal impacted soil and groundwater to ensure on or off-Site remediation is not required.
- Material disposition of equipment and material assets, raw materials and consumable products, and regulated and hazardous material, demolition debris, and recyclable material. This includes the assumption that lead and zinc based painted surfaces (specifically the New Stack (69 m) concrete shell and River Pumphouse cinder block walls) will be disposed of at the municipal landfill as well as disposal of PCB containing equipment and cables at a licensed facility.
- Decommissioning of civil infrastructure, including Site services associated with the Steam Plant Building, River Pumphouse and CW infrastructure.
- Final Site grading and construction/modification of surface water conveyance systems including the on-Site reuse of surplus concrete generated during decommissioning activities.

7. Pre-Decommissioning Engineering

In order to obtain the necessary approvals for decommissioning the CTGS, and to prepare tender documents to retain contractor(s) to implement the decommissioning activities, the following pre-decommissioning engineering is required:

- Stakeholder Consultation
- Topographic Survey including Site Grading and Storm Water Control Plan
- Landscaping Plan
- Additional Environmental Sampling
- PEICLE EIA Reporting and Approvals
- Hazardous Materials Update

- Detailed Design and Review/Update of Tender Document(s) previously prepared by GHD including Scope of Work, Codes, Standards of Practice, etc.
- Contractor Pre-Qualification, Selection and Award

1. ***Stakeholder Consultation***

Stakeholder consultation will be required to determine final decommissioning activities for the:

- River Pumphouse, CW Outfalls and Diverter Box removal as well as rock groyne maintenance in consultation with the CHAI, Transport Canada (Navigable Waters Protection Act), the PEICLE (Environmental Protection Act) and DFO (Fisheries Act).
- The CW pipelines extending from the River Pumphouse to the Steam Plant Building in consultation with third party property owners (i.e., City of Charlottetown and the CHAI), as the CW lines extend beneath third party properties.
- Potential connection of the storm water system to the municipal system in consultation with City of Charlottetown.
- Abandonment of Site services, specifically municipal water supply and sanitary sewer, in consultation with the City of Charlottetown.
- The assumed transportation and disposal of lead and zinc based painted surfaces, specifically concrete of the New Stack (69 m) and cinder block walls of the River Pumphouse, in consultation with the PEICLE (Special Waste Disposal Permit).

2. ***Topographic Survey including Site Grading and Storm Water Control Plan***

A topographic survey will be required to verify existing grades for use in the preparation of a detailed final grading, cut/fill requirements, and tender quantities. This will also form the basis of developing a Storm Water Control Plan for the Site to determine if improvements to the storm water collection system is required for protection of critical infrastructure (i.e., CT3 and ECC). The topographic survey and Storm Water Control Plan will also review the potential discharge locations for Site storm water and whether connection to municipal infrastructure is a viable option.

3. ***Landscaping Plan***

A landscaping plan will be required to ensure the final landscaping of disturbed areas is functional and aesthetically adequate. The plan will identify planting locations for vegetation such as shrubs and trees as well as identification of areas that will require hydroseeding.

4. ***Additional Environmental Sampling***

Sampling will be required as follows:

- Soil, groundwater, and soil vapour sampling in the southwest corner of the Site to further characterize current environmental conditions and the potential for risk to on-Site and off-Site receptors.
- Sampling of oils for PCB analysis from on-Site transformers and suspected PILC cables.

- Source testing of aggregates to determine physical and chemical properties for materials to be imported for use in the works, specifically in the vicinity of the River Pumphouse.

5. ***PEICLE EIA Reporting and Approvals***

To obtain the PEICLE approval on the decommissioning methodology and requirements, MECL will be required to submit a Project Information Form to the PEICLE to determine if the project meets the definition of an undertaking. It is assumed that the decommissioning project will be considered an undertaking and will require the preparation of an Environmental Impact Statement along with public consultation. Upon successful completion of the EIA process, Approval to proceed with the project will be issued by the PEICLE. It is anticipated that there will likely be several conditions associated with the Approval that may require pre-decommissioning engineering including:

- Obtain a Watercourse, Wetland and Buffer Zone Activity Permit from the PEICLE
- Obtain a Special Waste Disposal Permit from the PEICLE
- Obtain a Demolition Permit from the City of Charlottetown
- Obtain a Permit from PEICLE for ACM disposal
- Prepare a Site-specific Environmental Protection Plan and submit to the PEICLE for approval
- Prepare a Surface Water Control Plan and submit to the PEICLE and/or City of Charlottetown for approval
- Update MECL's PCB Plan and submit to the PEICLE for approval
- Prepare an ODS (and other Halocarbons) Removal Action Work Plan and submit to the PEICLE for approval
- Prepare a Remedial Action Plan and submit to the PEICLE for approval
- Consultation and preparation of an Engineered Traffic Management Plan for routing of equipment, materials, wastes, and oversized equipment

6. ***Hazardous Materials Update***

Hazardous materials typically included in Site reconnaissance survey as well as information obtained from MECL includes (but are not limited to) potential ACM, ODS, nuclear substances (smoke detectors), mercury sources, PCB sources, lead based paint and chemical inventory.

The Phase I ESA report (JWEL, 1995) along with the Updated Phase II ESA identified potentially hazardous materials at the Facility. A facility inventory of ACM was completed as part of the Decommissioning Study preparation and is considered to provide sufficient detail to satisfy the EIA registration requirements. Similarly, inventories of mercury, ODS, nuclear sources, chemicals, lead based paint and PCB sources were available in MECL files and verified during the 2017/2018 Site Reconnaissance and Updated Phase II ESA. At this time, the inventory of potentially hazardous materials at the Facility has been sufficiently quantified to satisfy the EIA requirements.

However, it is anticipated that a supplemental Hazardous Material Inventory survey will need to be completed prior to implementing the decommissioning activities to confirm the presence and quantities of hazardous and regulated waste remaining at the Facility. In particular, the inventory of oil filled transformers and PILC cables on the Site and associated PCB concentrations will require re-testing (e.g., transformer bushings), and destructive testing of boilers will need to be conducted to confirm the presence of ACM within these Units that are currently identified as possible asbestos containing material (PACM) in the ACM report. Hazardous materials, universal wastes, and decommissioning cleaning wastes identified will need to be managed in accordance with applicable regulations.

7. ***Detailed Design and Tender Document Preparation***

Detailed design of the decommissioning work is required, including preparation of tender documents, following which the tender package will be issued for tender such that MECL may obtain competitive quotes for implementation of the Facility Decommissioning. The tender documents will include instructions to bidders, contract requirements, general and technical specifications, detailed design drawings, and form of bid. As part of the detailed design scope of work, a Class A Engineer's Estimate for decommissioning activities will likely also be completed for bid comparison purposes.

8. ***Contractor Pre-Qualification, Selection and Award***

Contractor selection will likely include a pre-qualification process to short-list a number of contractors who have the required qualifications and can validate that they have the technical and management expertise to complete the decommissioning and demolition of the CTGS safely, efficiently and with minimal disruption to the public and MECL operations. Bid submissions received will be reviewed for bidder qualifications, exceptions to the specified requirements of the bid documents, and non-submission or incomplete submission of requested information. Bid submissions will also be reviewed on the basis of accuracy, and adherence to project specifications. A recommendation of a selected bid submission will be based on the results of the reviews and evaluations identified above, and overall contract price.

8. Decommissioning Plan Sequencing

A conceptual decommissioning schedule is presented on Figure 12. The schedule shows decommissioning activities and pre-decommissioning engineering identified in Sections 6 and 7, respectively. The duration and sequencing of each activity is based on GHD's professional experience, best management practices, and on current market conditions. The duration of each activity will ultimately be dependent on contractor availability and the selected contractor's resources (i.e., equipment and human resources); and the sequencing will partially be dependent on the selected contractor's preference and the contractor's ability to execute multiple decommissioning activities in a safe manner. Additionally, the schedule may be adjusted to maximize:

- Utilization of MECL personnel to the extent practical
- Construction of the new CT3 building and transference of CT3 Balance of Plant Equipment
- Potential sale of equipment in lieu of salvage for scrap value

- Matching scrap material recycling to optimum market conditions

The key internal (MECL) dependencies for which major grouping of activities are based include:

- ID-2 MECL Pre-Decommissioning Engineering (including stakeholder engagement, tender period and contractor selection): Qtr 2 through 4; 2021
- ID-8 MECL Planning & Management Activities (including asset management planning, raw material and containerized material inventory management and electrical disconnection planning) : Qtr 2; 2021

External dependencies for which major grouping of activities are based include:

- ID-14-15 Demolition Contractor decommissioning activities (including submittals, mobilization to Site and initial Site inspections) : Qtr 4; 2021 through Qtr 1; 2022
- ID-16 Demolition activities (including abatement activities, demolition of buildings and associated infrastructure, remediation of environmental impacts and final Site grading) : Qtr 1; 2022 through Qtr 4; 2022

9. Decommissioning Cost Estimate

The Tables 9.1 series of tables present a Class B Cost Estimate for Decommissioning of the CTGS. The Class B cost estimate as defined by the Association for the Advancement of Costing Engineering International (AACE) is suitable to be used for a study. The methodology used to develop this estimate is based on measured, priced, parameter quantities, where possible, and is considered to have an accuracy range of -20 to +30 percent when completed at the 20 to 30 percent project completion stage of a project. Where market conditions drive the costs, such as in the salvage value of recyclable materials, the cost may be outside the above noted range. All costing is provided in 2018 Canadian dollars.

Table 9.1 provides a summary of the overall cost liability model for Decommissioning of the CTGS. The Cost Liability Model (or Closure Cost Forecasting) is intended for MECL use only. It is GHD's understanding that MECL plans to update the Cost Liability Model before initiating or tendering the decommissioning work in approximately 3 years.

The Closure Cost Forecasting is divided into five parts (Parts A through E) as follows:

- Part A – Site Decommissioning Cost
- Part B – Allowances
- Part C – Project Management, Engineering and Implementation
- Part D – Post Decommissioning and Other Miscellaneous Cost
- Part E – Potential Resalable and Salvage Values

Part A – Site Decommissioning Cost

Costs under Part A represent costs associated with the various decommissioning activities outlined in Section 6 of the Decommissioning Study associated with the Steam Plant Building and associated infrastructure that would be undertaken by an outside contractor. The costs are for the specific activities and do not include administrative allowances such as allowances for contractor bonds, insurance, mobilization, health and safety, etc. Administrative allowances are included under Part B.

Part A cost is further divided into three subsections Parts A1 to A3 and detailed costing for each subsection is included on the respective tables as follows:

- Table 9.1-A1 – Building Infrastructure
- Table 9.1-A2 – Civil Infrastructure
- Table 9.1-A3 – Environmental Mitigation

At the request of MECL, the total estimated cost for the risk contingency items identified in Section 5.2 is provided as a footnote in Table 9.1 – Detailed Class B Cost Estimate. This risk contingency cost has been identified for reference purpose but has not been included in the Class B Cost Estimate prepared as part of the Decommissioning Study.

Table 9.2 provides a summary of the costs basis, assumptions and constraints for each of the activities under Part A.

Part B – Allowances

Costs under Part B represent allowances for decommissioning activities as a percentage of the decommissioning costs outlined under Part A. Allowances are carried for unidentified items (10 percent), Contractor's Administrative Requirements, e.g., bonds, insurance, mobilization, accommodations, health and safety (15 percent).

Part C – Project Management, Engineering and Implementation

Costs under Part C represent costs for project management, engineering, and implementation of the project throughout the life of the decommissioning project. This includes external resource costs for studies, approvals, design, procurement, decommissioning oversight, and project management during decommissioning. Costs estimated for Part C are a combination of actual expenditures for completed activities, percentage of decommissioning costs, estimates based on similar scopes of work at similar facilities. Owners' costs to complete the decommissioning project such as internal labour costs, legal fees, application fees, etc. specific to the decommissioning of the Steam Plant Building and associated infrastructure were developed by MECL and provided to GHD for inclusion in the Part C costs.

Part D – Post Decommissioning and Other Miscellaneous Cost

Costs under Part D represent other miscellaneous owner's costs (insurance, consumables, technical support, etc.), landscaping, post-decommissioning monitoring and post-decommissioning maintenance and care. These costs typically include internal and external resource costs. As indicated above for Part C, internal MECL costs associated with the decommissioning project were developed by MECL and provided to GHD for inclusion in the Part D costs. Costs developed for expected future environmental monitoring requirements were based on similar scopes of work at similar facilities.

Part E – Potential Resalable and Salvage Values

Part E represents the potential values of materials generated during decommissioning. All values are based on metal scrap value, with the exception of transformer oil. GHD sub-divided the scrap metal anticipated from demolition into seven categories for which scrap metal historical spot pricing is available. The historical spot metal prices were obtained by MECL and GHD from historical decommissioning projects as well as internet websites that track metal pricing worldwide (i.e., American Metal Market or similar). Yearly average spot metal price for the last five years (2013 to 2017 inclusive) was obtained and compiled to obtain an average price per scrap type over the last five years. The spot metal prices were based on the average price being offered each day at major scrap buyer locations in Eastern Canada. The logical delivery location for scrap from the Site is Saint John, NB, since it has year-round ocean shipping capability. The average scrap metal pricing from the last five years was then compared against spot metal pricing for the month of February 2018 (source: American Iron & Metals) by calculating relative percent differences (RPDs). The RPD is the absolute difference in two results times 100 divided by the arithmetic mean of the two results:

$$\text{RPD} = \frac{(\text{Original Concentration} - \text{Duplicate Concentration}) * 100}{(\text{Original Concentration} + \text{Duplicate Concentration}) / 2}$$

The RPD values between the 5 year average and the current spot price for each metal type was within approximately 20% excluding red brass. The current spot price value of this commodity has increased over 40% compared to the historic five year average. As such, the scrap values used in the decommissioning cost estimate are based on the 5 year average (2013 to 2017) which is considered to be a reasonably conservative estimate of scrap metal value to be generated during the decommissioning project. The spot scrap metal prices should be reviewed again immediately prior to issuing the decommissioning tender package(s) and the estimated value of scrap metal to be generated as part of the decommissioning project updated accordingly. The five year average scrap metal prices and the February 2018 scrap metal spot pricing data in numerical form is found in Appendix E.

10. Closure

All of Which is Respectfully Submitted,

GHD

M. G. Gallahue

Mike Gallahue, P. Eng.

Troy Small

Troy Small, M.Sc. CE

Cherie Babin

Cherie Babineau, P. Eng.

Reviewed by:

Robert E. Schloesser, B.S., M.S., C.H.M.M.

11. References

All-Tech Environmental Services Limited (All-Tech), 2018. Asbestos Inventory Assessment Report, Maritime Electric Generating Station, Charlottetown, PEI. February 22, 2018.

Conestoga-Rovers & Associates (CRA), 2007. 2007 Environmental Audit, Charlottetown Thermal Generating Station, Charlottetown, Prince Edward Island. October 2007.

Conestoga-Rovers & Associates (CRA), 2011. Decommissioning Plan, Dalhousie Thermal Generating Station, Dalhousie, New Brunswick. March 2011.

Dillon Consulting Limited, Review of Environment Canada's Background Soil Database (2004 2009), Version No. 1, March 2011.

Fundy Engineering & Consulting Ltd., 2002. Phase II Environmental Site Assessment, Charlottetown Thermal Generating Station, Charlottetown, PEI. November 2002.

Fundy Engineering & Consulting Ltd., 2004. Geotechnical Investigation, Maritime Electric Combustion Turbine Project, Charlottetown, PEI, Draft Report. October 1, 2004.

Fundy Engineering & Consulting Ltd., 2018. Geotechnical Report, Stack Demolition Project, Maritime Electric Generating Station, 50 Cumberland Street, Charlottetown, Prince Edward Island. January 2018.

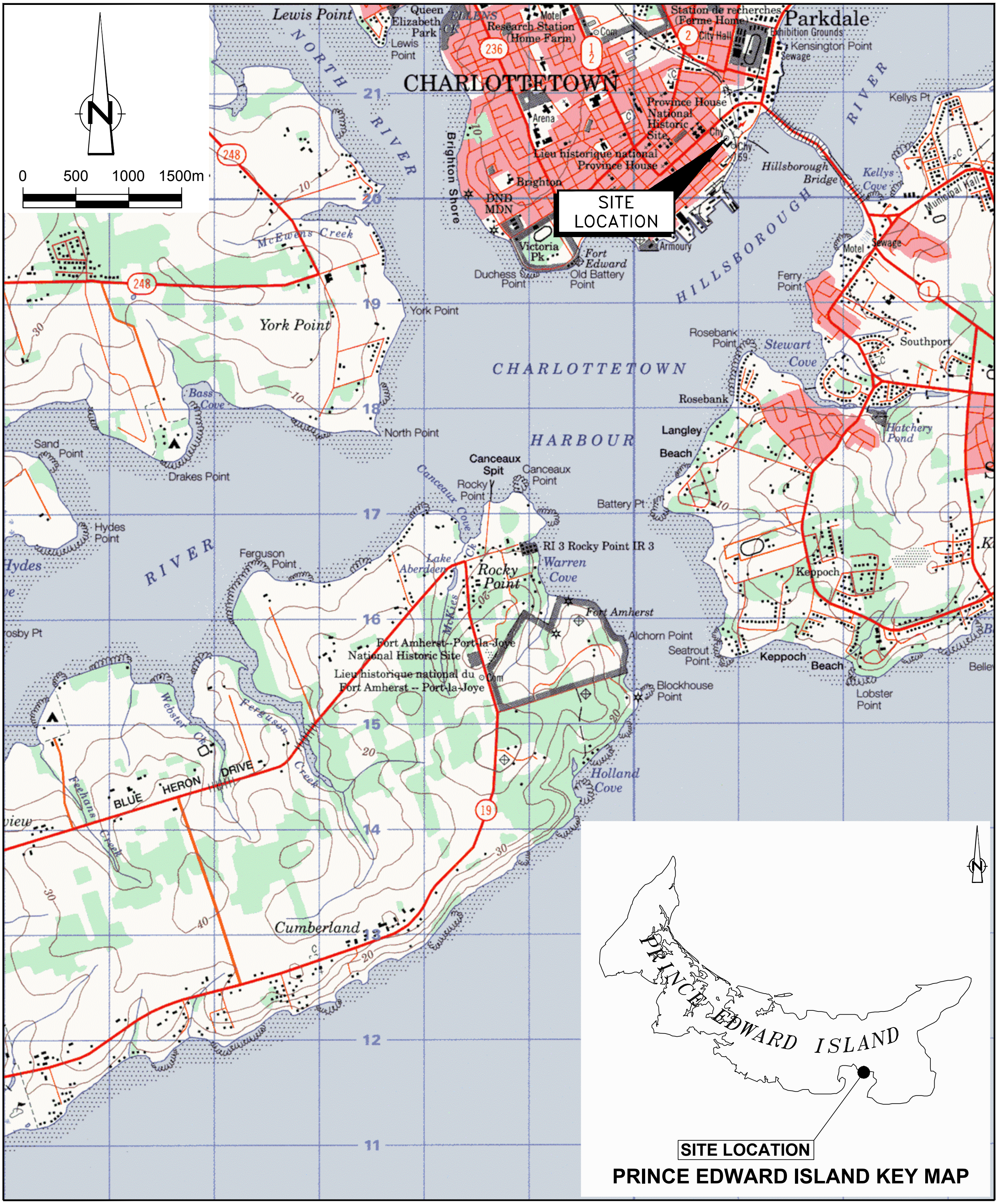
GHD Limited, 2018. Updated Phase II Environmental Site Assessment, Charlottetown Thermal Generating Station, Charlottetown, Prince Edward Island. June 2018.

Jacques Whitford Environment Limited (JWEL), 1995. Phase I Environmental Site Assessment, Charlottetown Thermal Generating Station, Charlottetown, PEI. October 31, 1995.

Maritime Electric Company, Limited (MECL), 2017. Request for Proposal 2017-24, Owner's Engineer for Steam Plant Decommissioning Study Report, EIA & Tender Packages Preparation.

New Brunswick Department of Environment (NBDENV), 2005. Disposal of Lead Paint & Lead Painted Material, draft guideline. 2005.

Nova Scotia Environment (NSE), 2005. Guidelines for Disposal of Contaminated Solids in Landfills. May 2005.



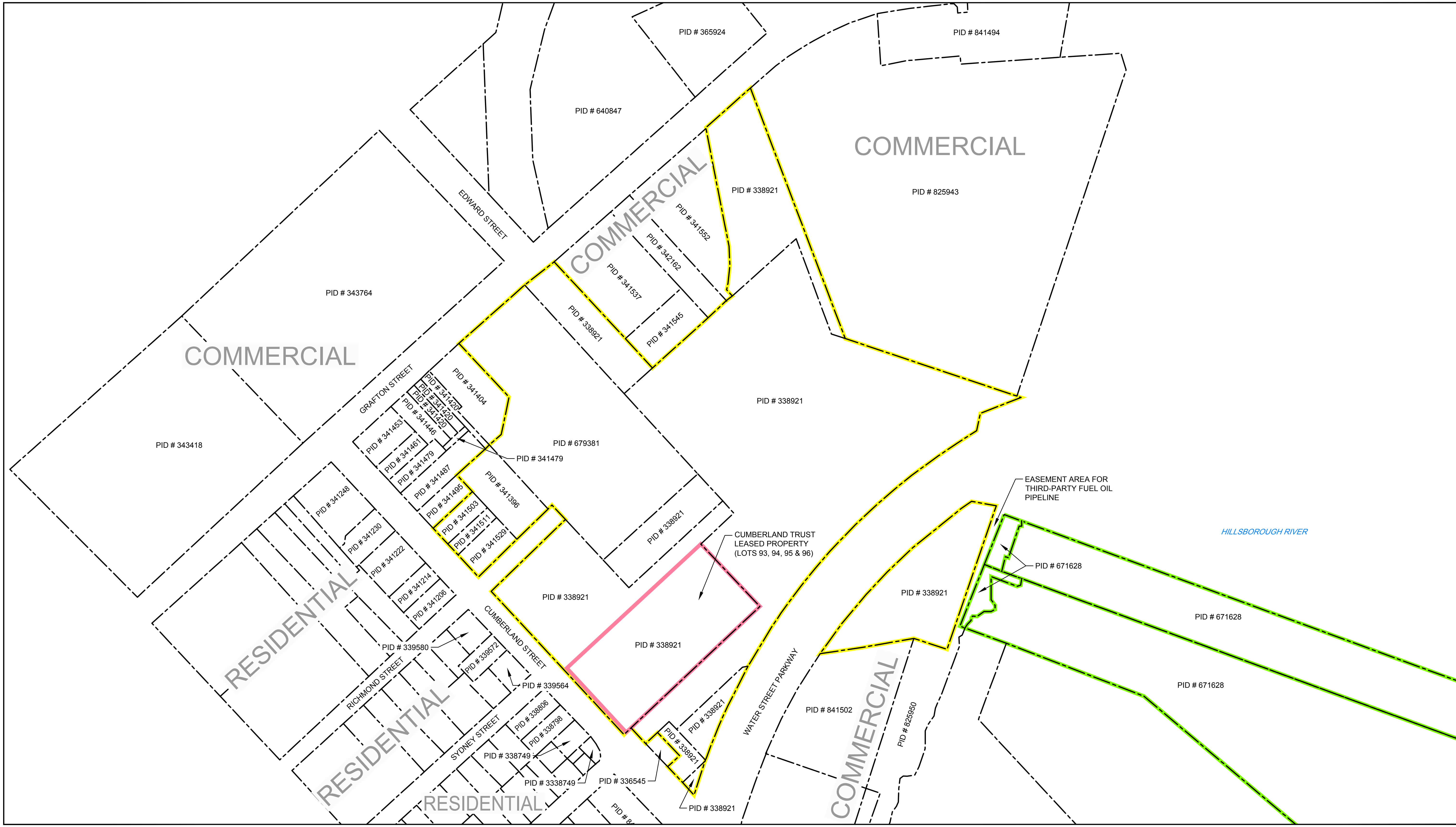
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Mar 16, 2018

SITE LOCATION

FIGURE 1

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR001.dwg



0 20 40 60m

N

LEGEND

SUBJECT SITE BOUNDARY

LEASED WATERLOT BOUNDARY

CUMBERLAND TRUST LEASED PROPERTY BOUNDARY

PROPERTY LINES

GHD

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

PROPERTY PLAN

11149943-03(004)
Mar 19, 2018

FIGURE 2

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR002.dwg

Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed February, 2018.

0 15 30 45m

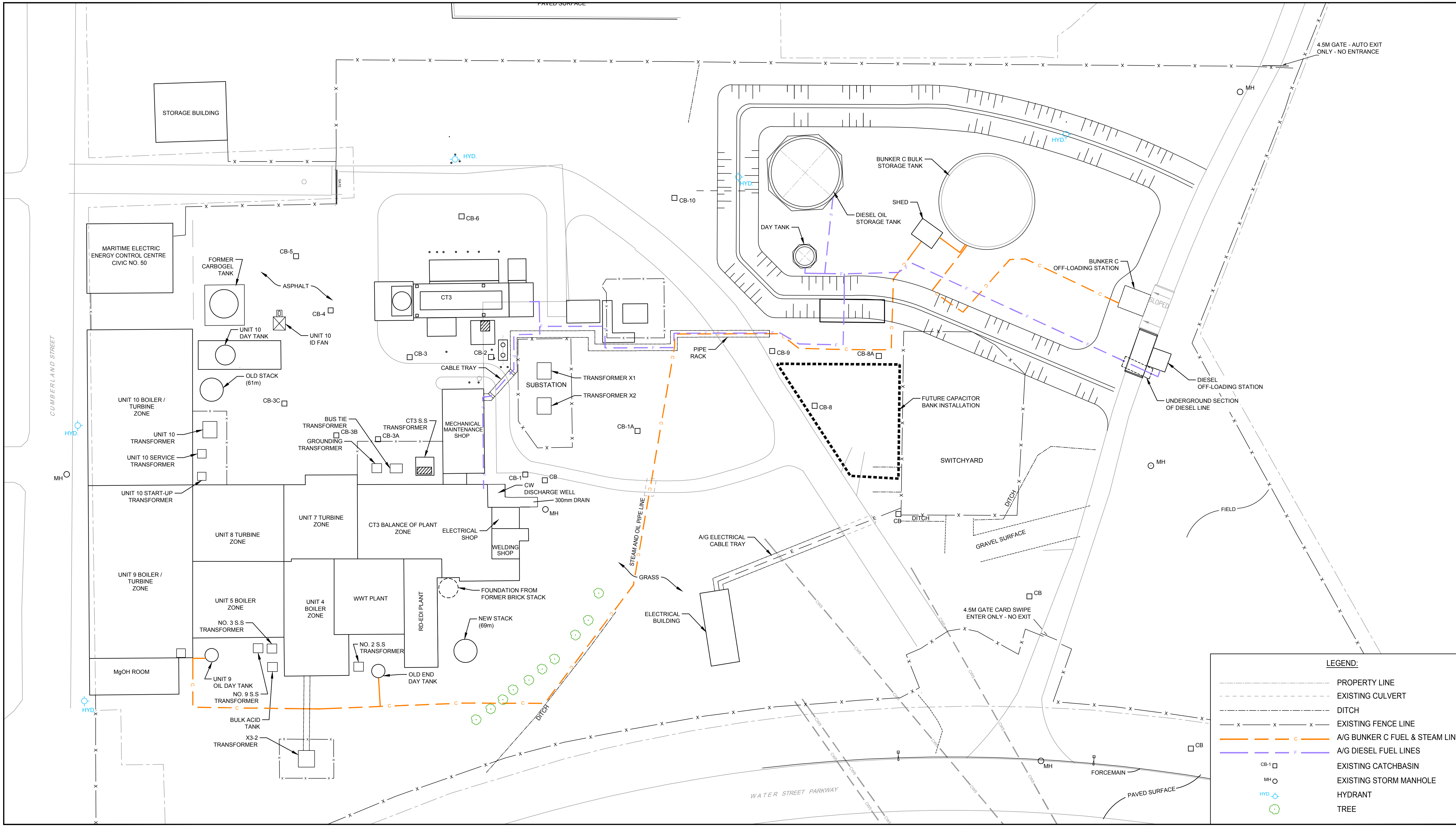
MARITIME ELECTRICAL COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Jun 21, 2018

OVERALL SITE PLAN

FIGURE 3

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR003.dwg



0 8 16 24m

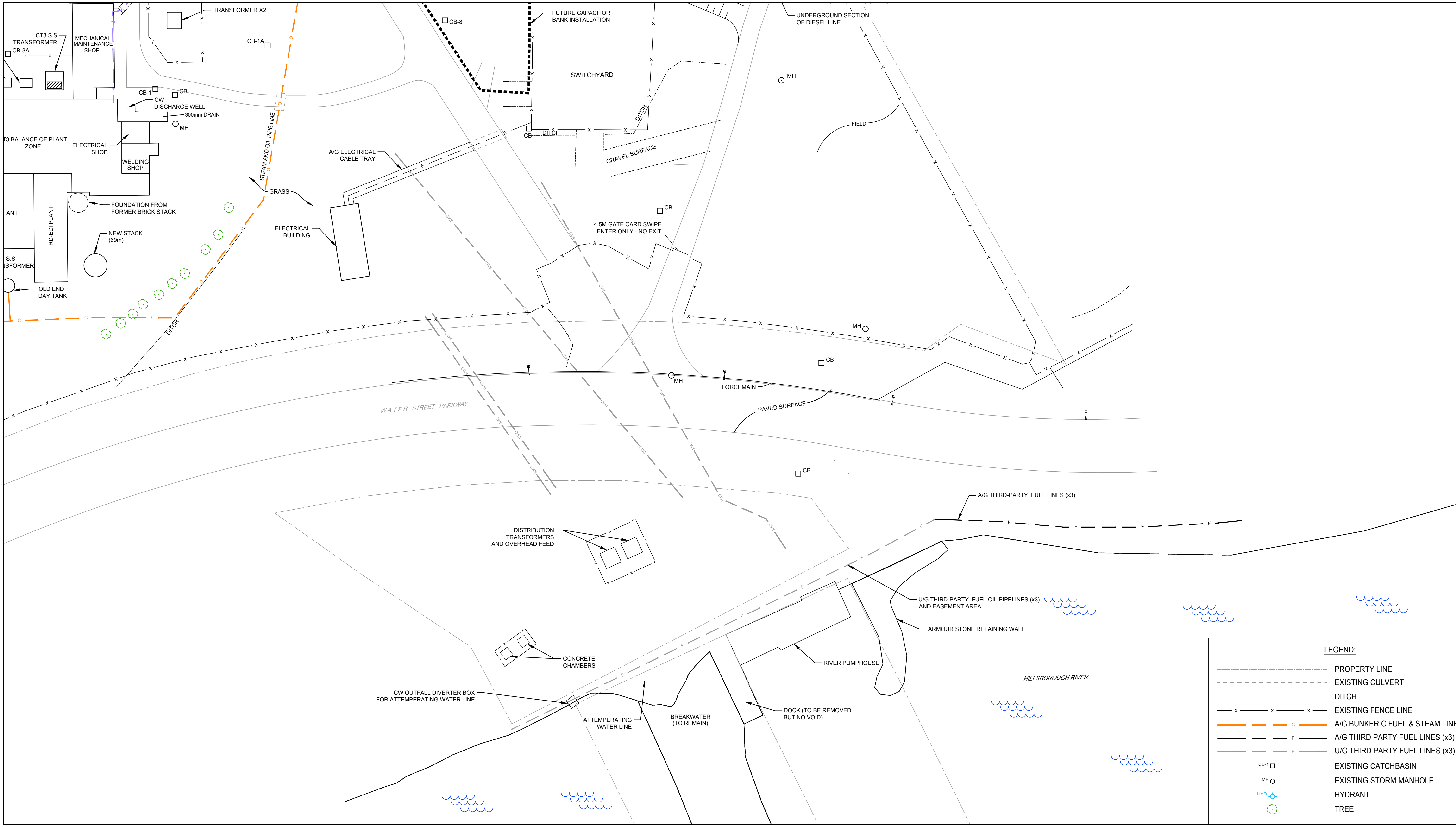
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Jun 21, 2018

SITE PLAN - PLANT AREA

FIGURE 4A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR004.dwg



0 8 16 24m

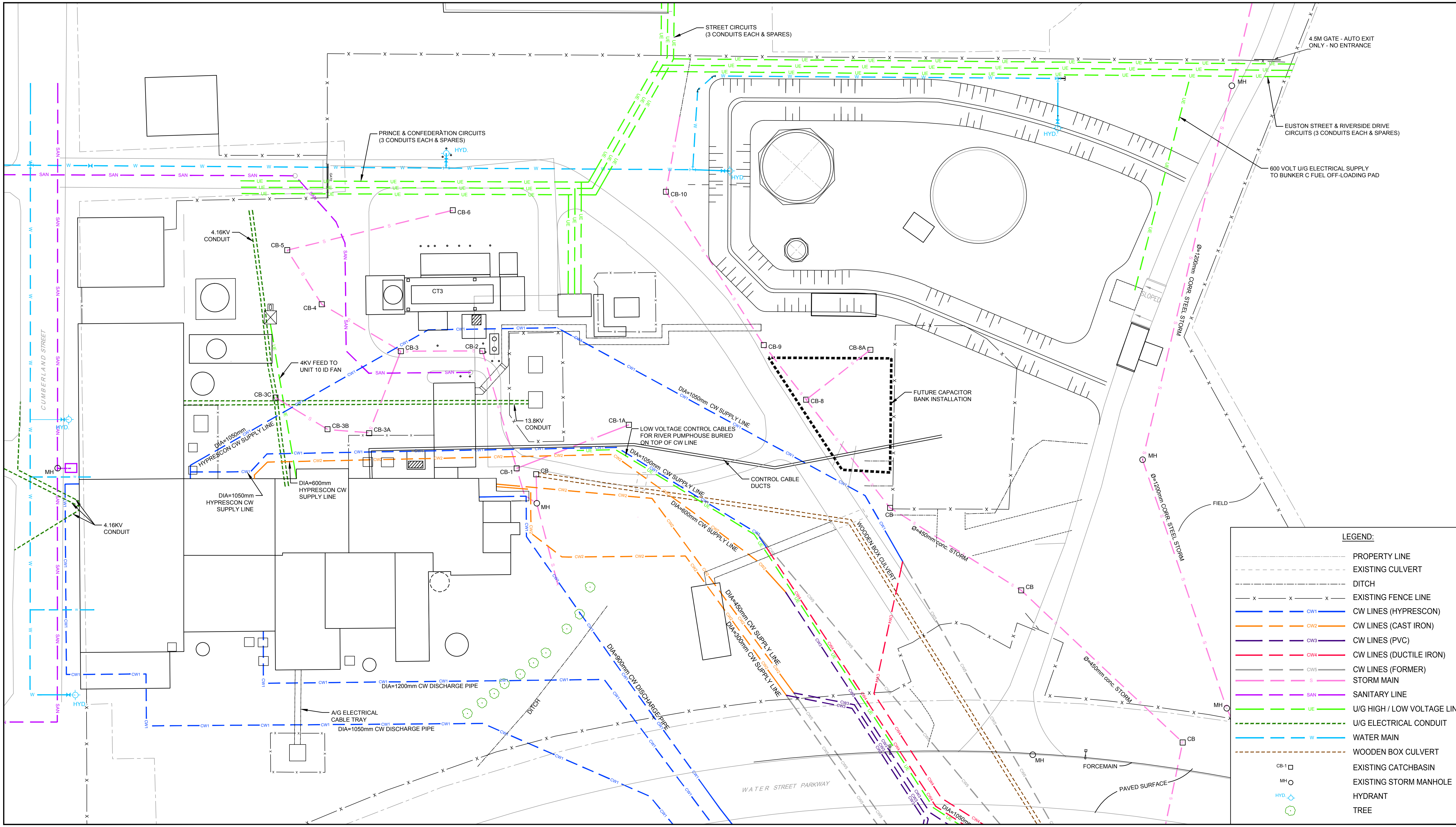
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Jun 21, 2018

SITE PLAN - RIVER PUMPHOUSE AREA

FIGURE 4B

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR004.dwg



0 8 16 24m

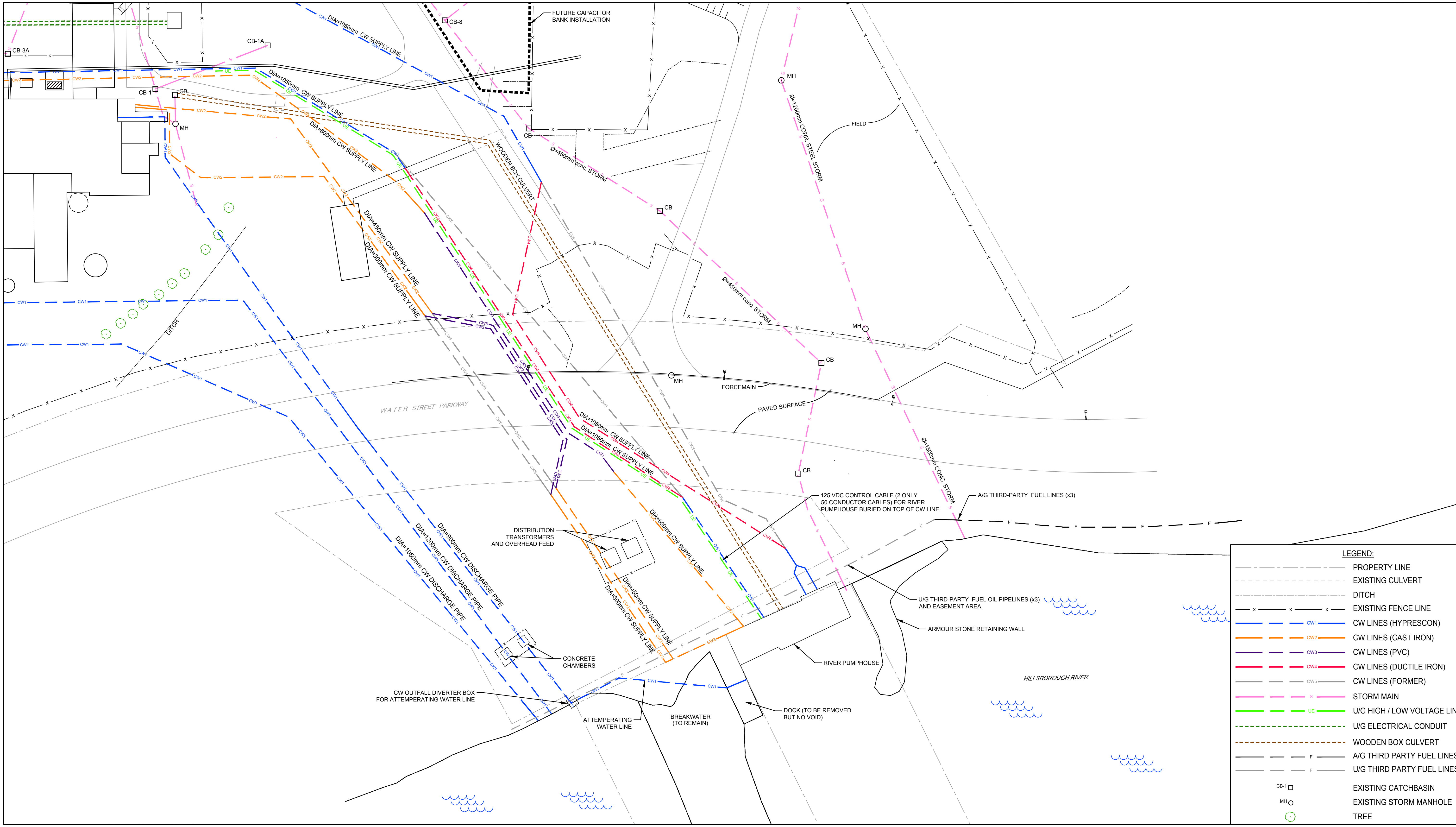
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
May 28, 2018

SITE PLAN - PLANT AREA BURIED UTILITIES

FIGURE 5A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR004.dwg



0 8 16 24m

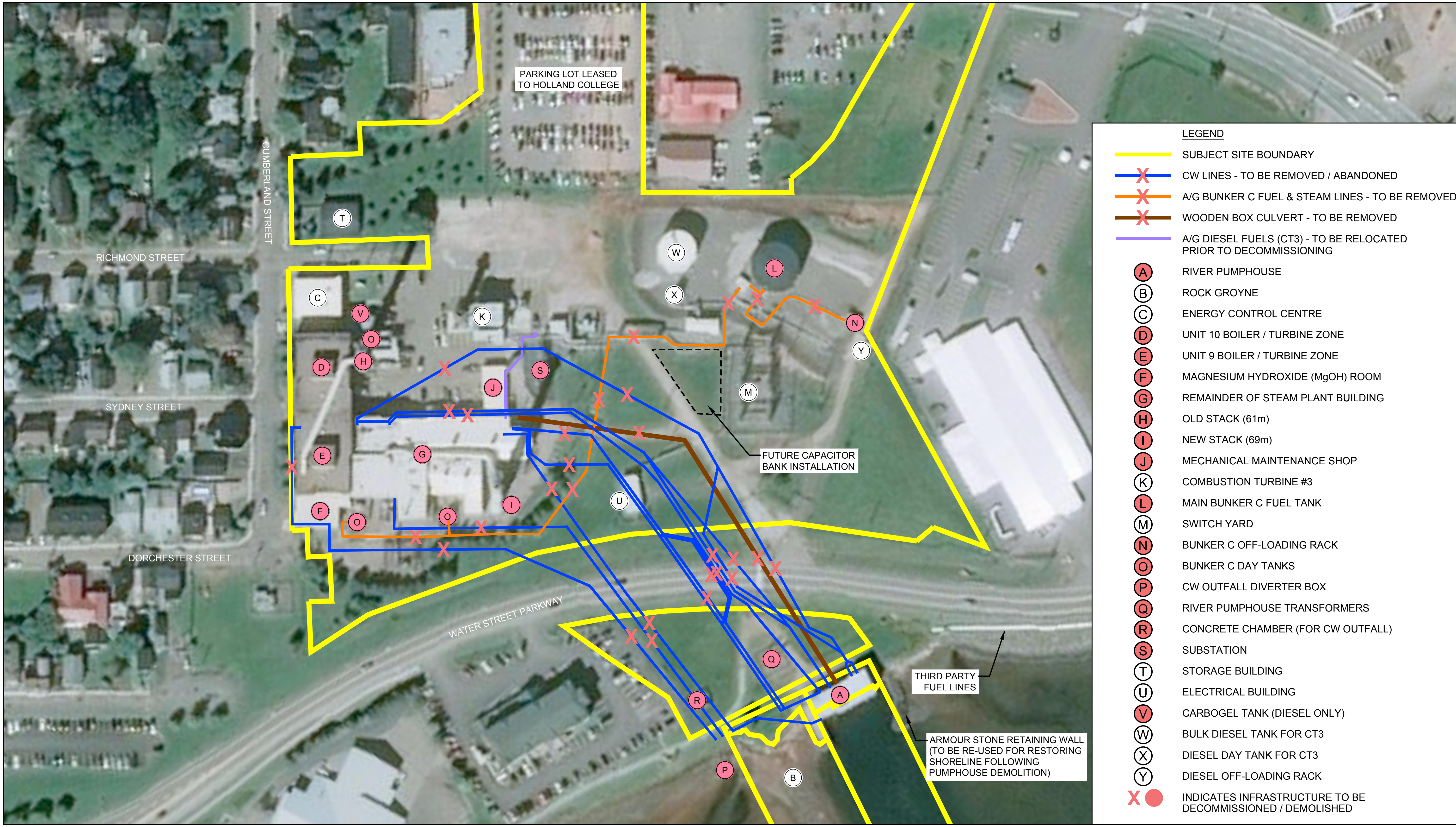
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
May 28, 2018

SITE PLAN - RIVER PUMPHOUSE AREA BURIED UTILITIES

FIGURE 5B

CAD File: I:\CAD\8-chars\11-------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR004.dwg



Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed February, 2018.

0 15 30 45m

NOTE: TRANSFORMERS ASSOCIATED WITH STEAM PLANT BUILDING WILL ALSO BE DECOMMISSIONED BUT ARE NOT SPECIFICALLY INDICATED ON PLAN.

FORMER CW LINES BENEATH WATER STREET PARKWAY ARE ASSUMED TO HAVE BEEN ABANDONED.

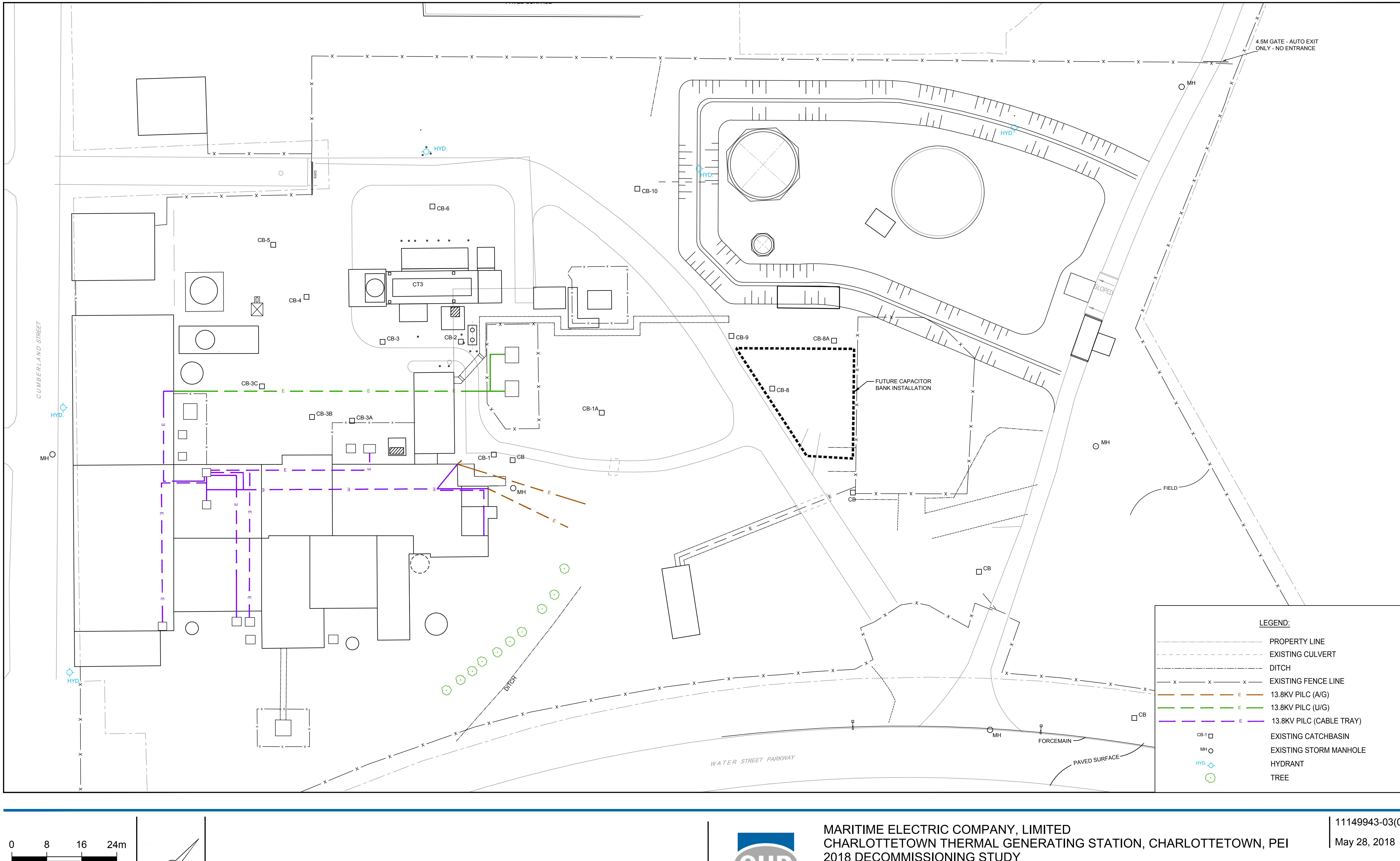
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Jun 21, 2018

INFRASTRUCTURE FOR DEMOLITION

FIGURE 6

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR005.dwg



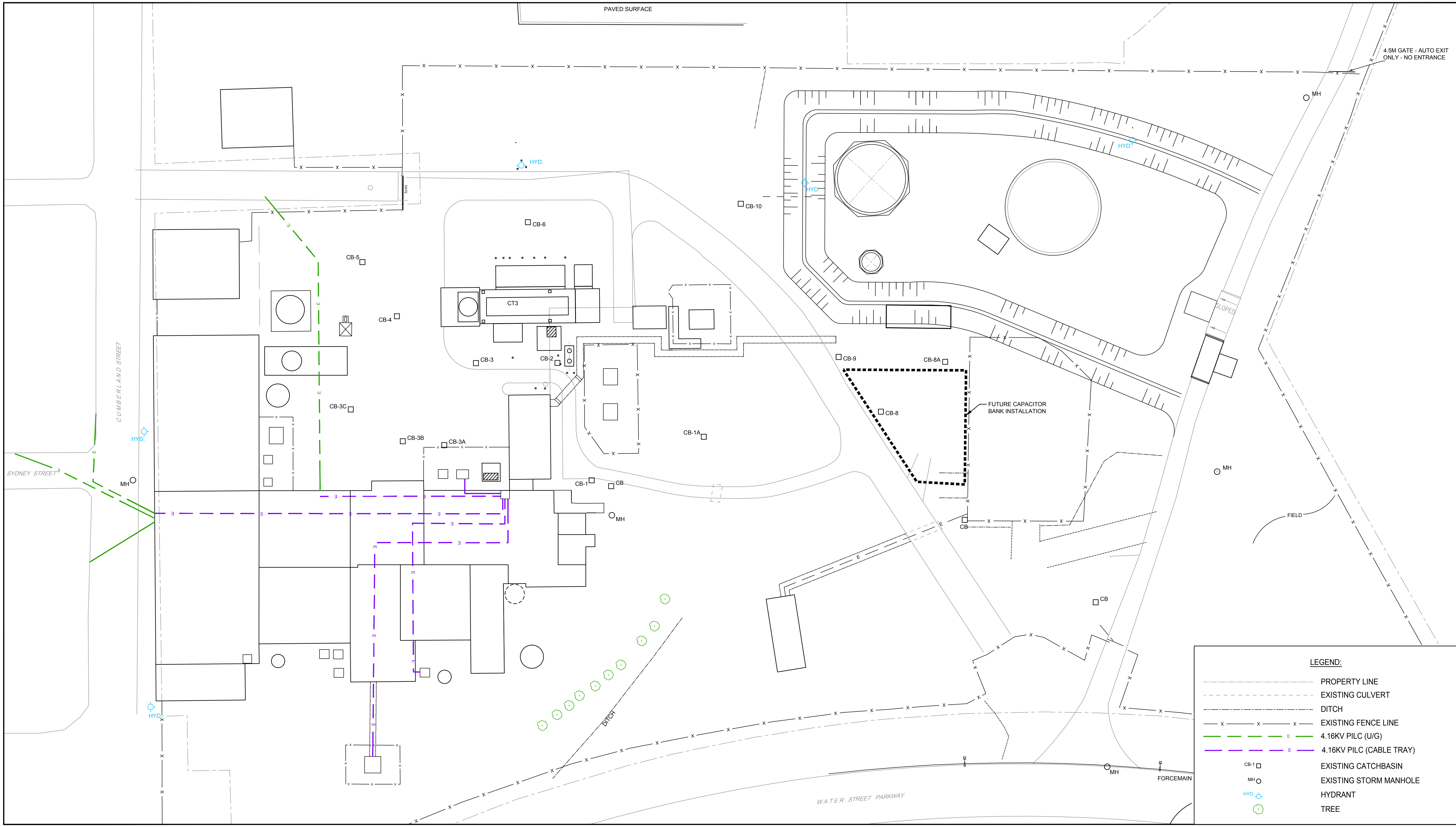
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

PAPER INSULATED LEAD CABLES - 13.8KV
(POTENTIAL PCB CONTAINING)

11149943-03(004)
May 28, 2018

FIGURE 7A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR004.dwg



0 8 16 24m

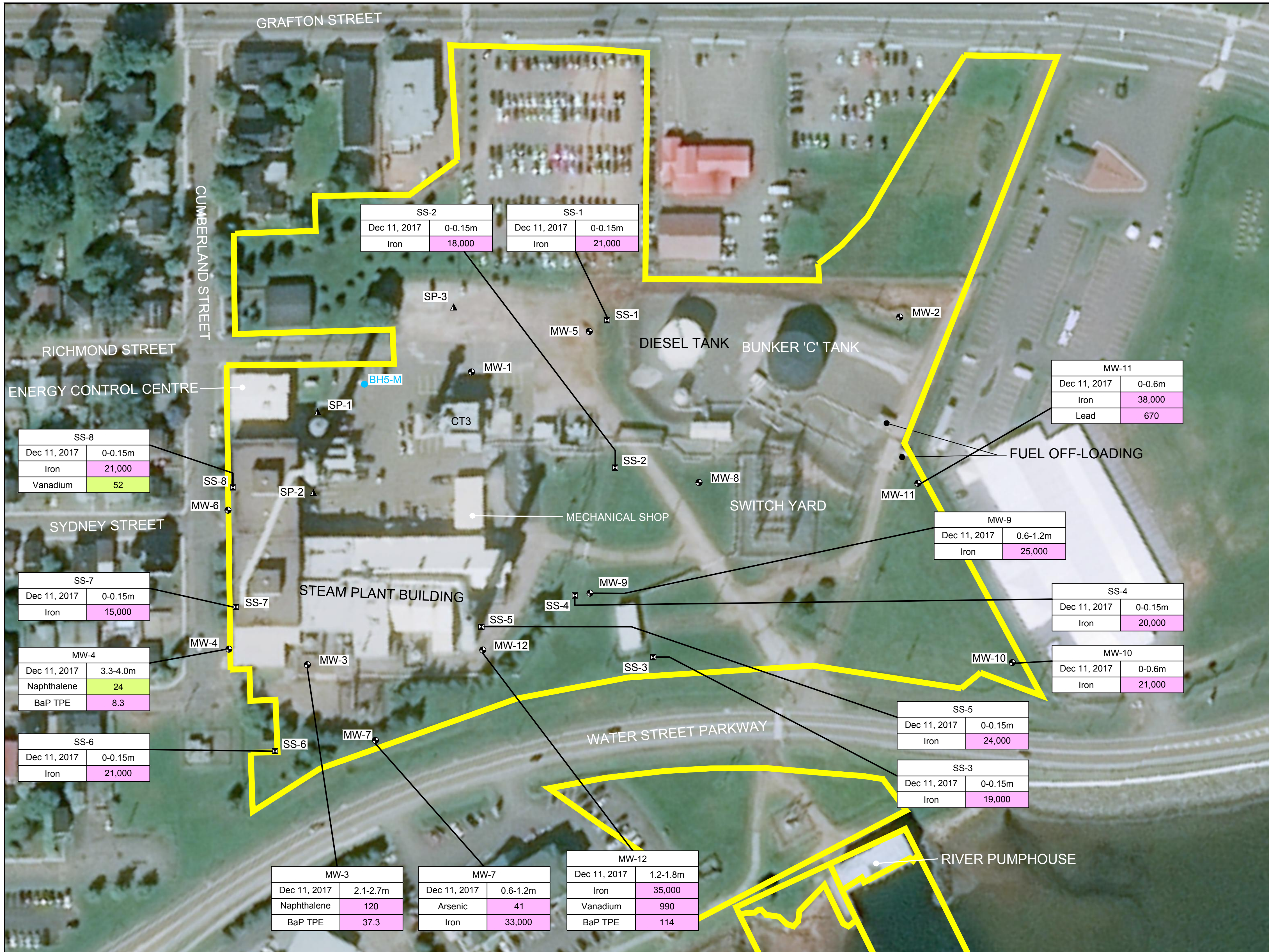
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

PAPER INSULATED LEAD CABLES - 4.16KV
(POTENTIAL PCB CONTAINING)

11149943-03(004)
May 29, 2018

FIGURE 7B

CAD File: I:\CAD\8-chars\11-------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR004.dwg



REGULATORY CRITERIA (mg/kg)		
PARAMETER	CRITERIA 'a'	CRITERIA 'b'
Arsenic	31	31
Iron	11,000	11,000
Lead	260	140
Vanadium	160	39
Naphthalene	25	2.2
BaP TPE	5.3	5.3

'a' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR SOIL AT A NON-POTABLE SITE - COARSE SOIL TYPE, COMMERCIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'b' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR SOIL AT A NON-POTABLE SITE - COARSE SOIL TYPE, RESIDENTIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

CONCENTRATIONS IN SOIL EXCEEDING COMMERCIAL CRITERIA

CONCENTRATIONS IN SOIL EXCEEDING RESIDENTIAL CRITERIA

CONCENTRATIONS IN SOIL EXCEEDING COMMERCIAL AND RESIDENTIAL CRITERIA

Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed February, 2018.

0 15 30 45m

LEGEND:

PROPERTY BOUNDARY (APPROX.)
BH5-M 2002 HISTORICAL MONITOR WELL LOCATION
MW 2017 MONITOR WELL LOCATION
SP 2017 SOIL PROBE LOCATION
SS 2017 SURFACE SOIL SAMPLE LOCATION

GHD

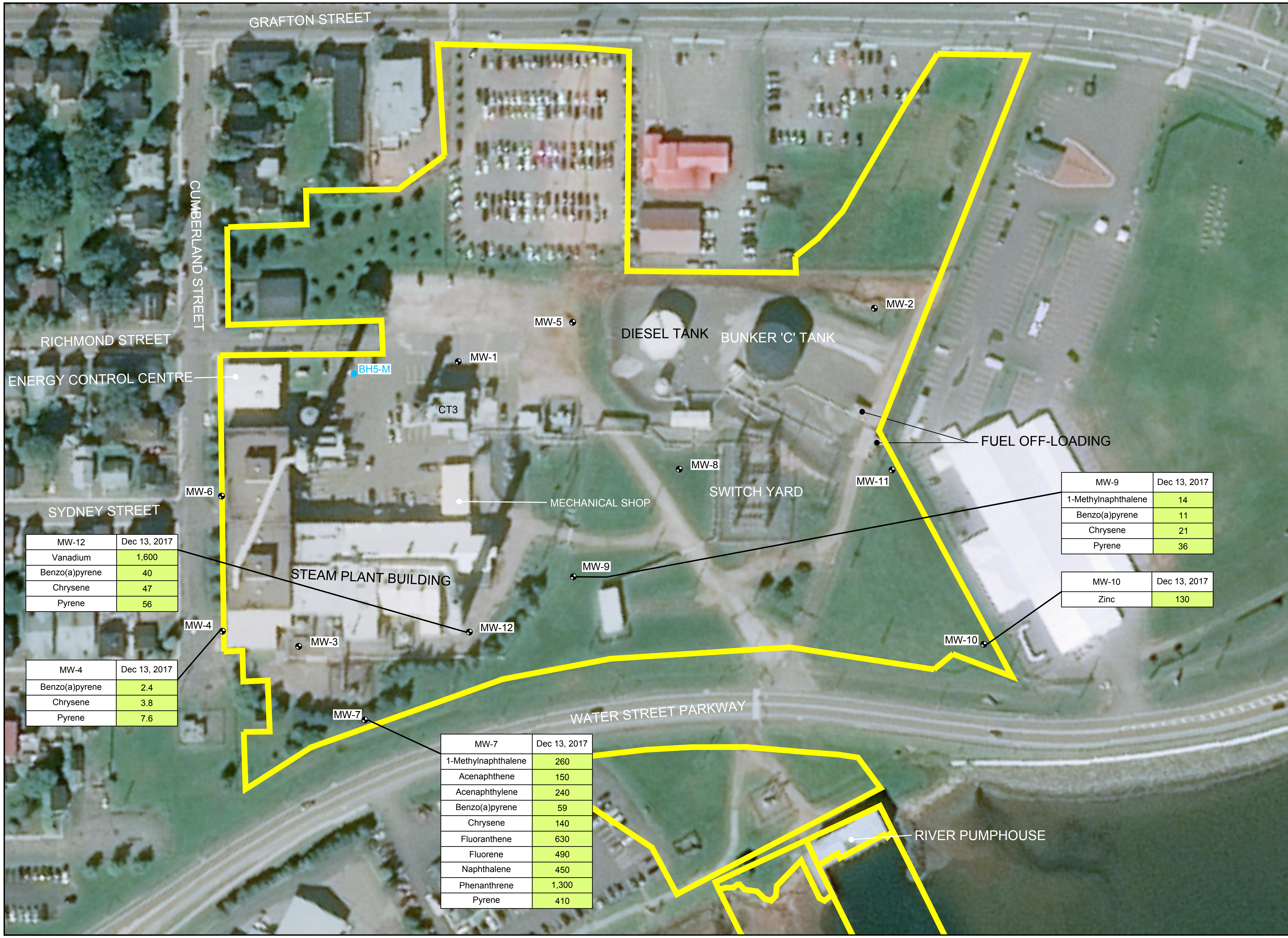
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

SOIL EXCEEDENCES (mg/kg)

11149943-03(004)
Mar 19, 2018

FIGURE 8A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR006.dwg



MW-12	Dec 13, 2017
Vanadium	1,600
Benzo(a)pyrene	40
Chrysene	47
Pyrene	56

MW-4	Dec 13, 2017
Benzo(a)pyrene	2.4
Chrysene	3.8
Pyrene	7.6

MW-7	Dec 13, 2017
1-Methylnaphthalene	260
Acenaphthene	150
Acenaphthylene	240
Benzo(a)pyrene	59
Chrysene	140
Fluoranthene	630
Fluorene	490
Naphthalene	450
Phenanthrene	1,300
Pyrene	410

MW-9	Dec 13, 2017
1-Methylnaphthalene	14
Benzo(a)pyrene	11
Chrysene	21
Pyrene	36

MW-10	Dec 13, 2017
Zinc	130

REGULATORY CRITERIA (µg/L)			
PARAMETER	CRITERIA 'a'	CRITERIA 'b'	CRITERIA 'c'
Vanadium	NG	NG	500
Zinc	NG	NG	100
1-Methylnaphthalene	38,000	6,200	10
Acenaphthene	NG	NG	60
Acenaphthylene	750	36	60
Benzo(a)pyrene	NG	NG	0.1
Chrysene	NG	NG	1
Fluoranthene	NG	NG	110
Fluorene	NG	NG	120
Naphthalene	7,000	600	14
Phenanthrene	NG	NG	46
Pyrene	NG	NG	0.2

'a' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR GROUNDWATER AT A NON-POTABLE SITE - COARSE SOIL TYPE, COMMERCIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'b' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR GROUNDWATER AT A NON-POTABLE SITE - COARSE SOIL TYPE, RESIDENTIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'c' - NOVA SCOTIA ENVIRONMENT (NSE) PATHWAY SPECIFIC STANDARDS (PSS) FOR GROUNDWATER (µg/L) - GROUNDWATER DISCHARGE TO SURFACE WATER - >10 METRES FROM SURFACE WATER BODY - DISCHARGE TO MARINE WATER (APRIL 2014) (ECOLOGICAL).

CONCENTRATIONS IN GROUNDWATER EXCEEDING ECOLOGICAL CRITERIA

Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed February, 2018.

0 15 30 45m

LEGEND:

PROPERTY BOUNDARY (APPROX.)

BH5-M 2002 HISTORICAL MONITOR WELL LOCATION

MW 2017 MONITOR WELL LOCATION

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

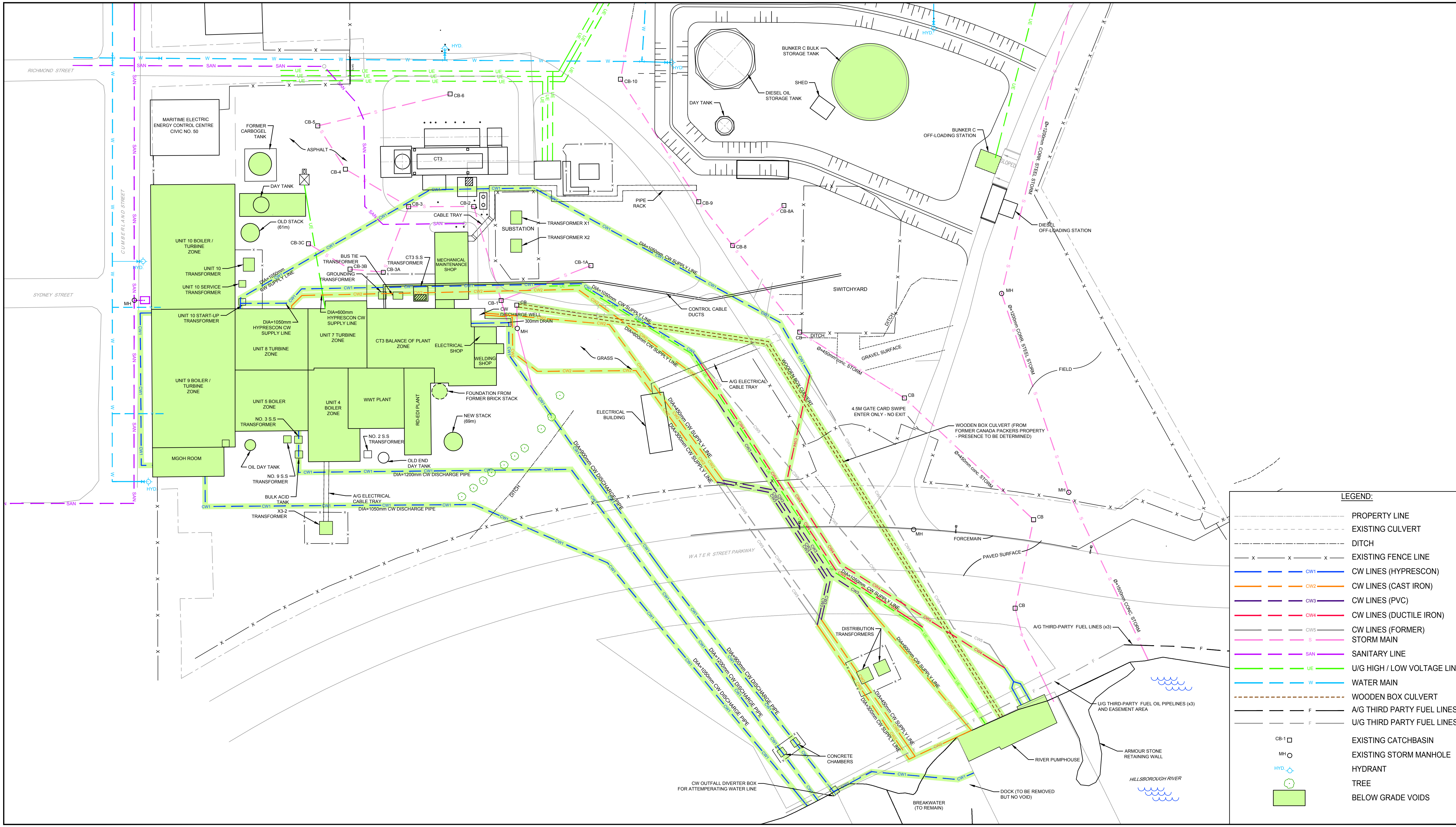
GROUNDWATER EXCEEDENCES (µg/L)

11149943-03(004)

Mar 19, 2018

FIGURE 8B

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR007.dwg



0 10 20 30m

NOTE: FORMER CW LINES BENEATH WATER STREET PARKWAY ARE ASSUMED TO HAVE BEEN PREVIOUSLY ABANDONED DURING 1994 WATER STREET PARKWAY CONSTRUCTION ACTIVITIES.

GHD

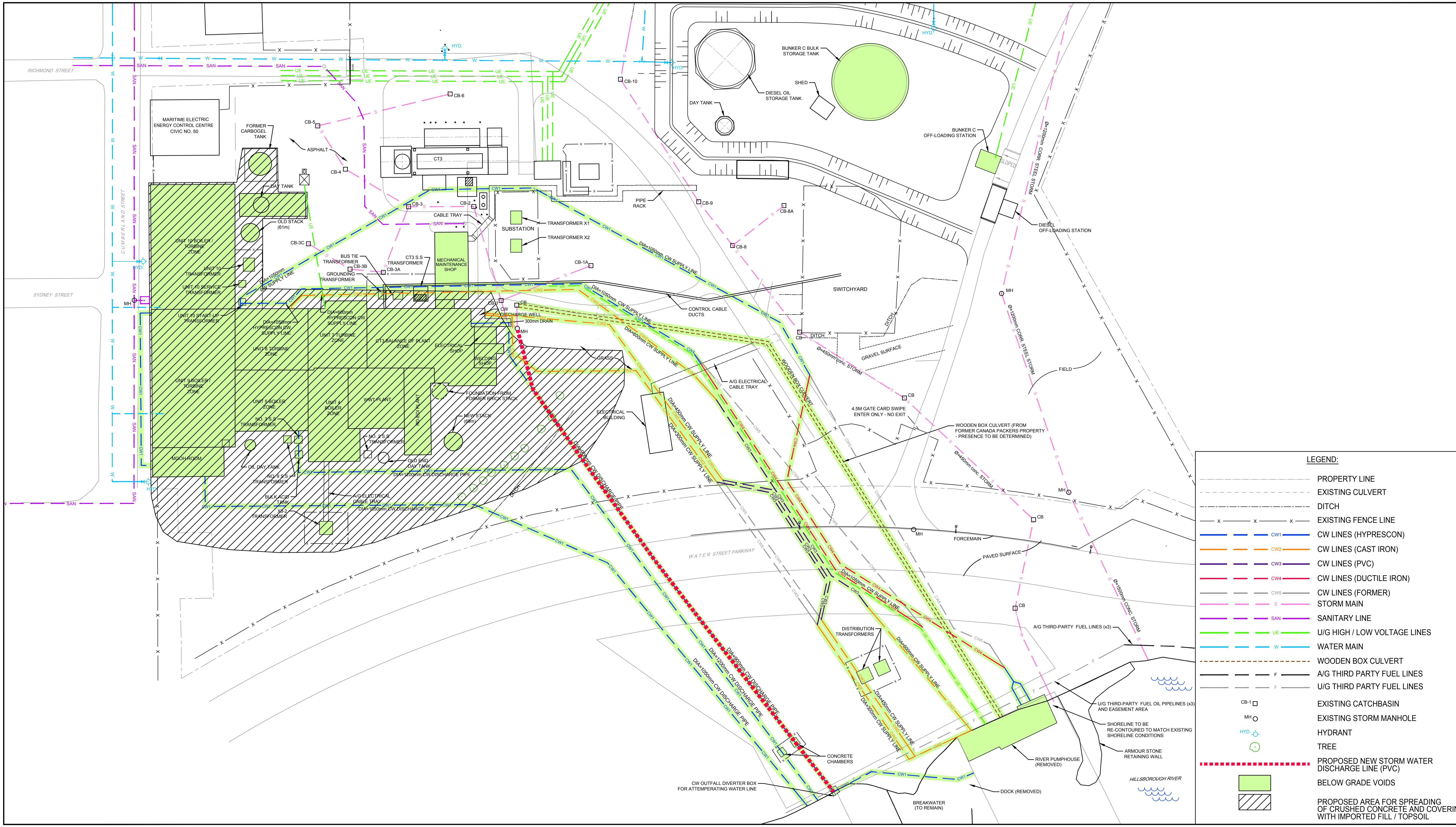
MARITIME ELECTRIC COMPANY LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Jun 21, 2018

SITE PLAN - BELOW GRADE VOIDS

FIGURE 9

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR008.dwg



0 10 20 30m

NOTE: FORMER CW LINES BENEATH WATER STREET PARKWAY ARE ASSUMED TO HAVE BEEN PREVIOUSLY ABANDONED DURING 1994 WATER STREET PARKWAY CONSTRUCTION ACTIVITIES.

GHD

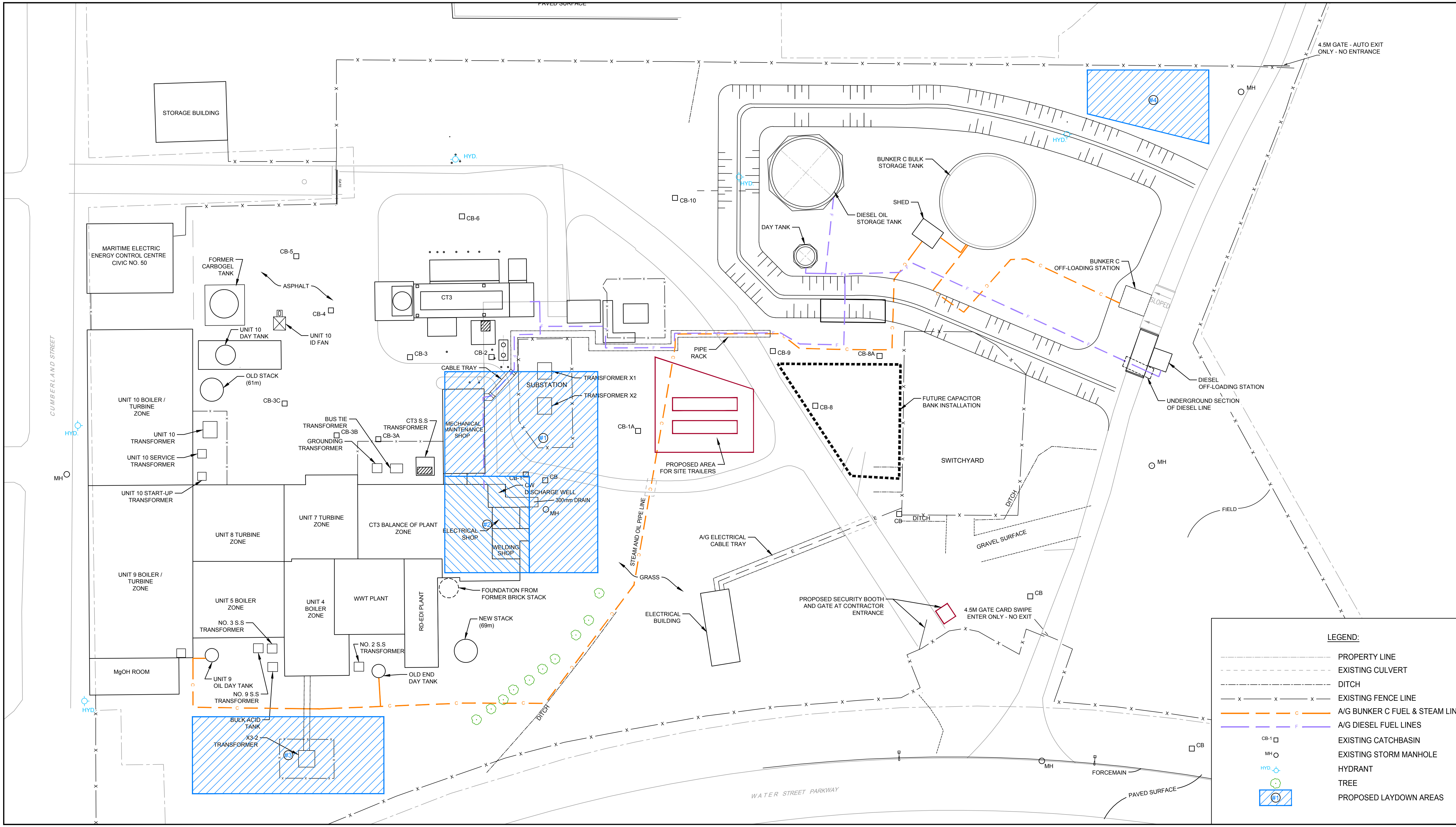
MARITIME ELECTRIC COMPANY LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Jun 21, 2018

SITE PLAN - CONCEPTUAL REGRADING AREA

FIGURE 10

CAD File: I:\CAD\8-chars\11-------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR008.dwg



MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
2018 DECOMMISSIONING STUDY

11149943-03(004)
Jun 21, 2018

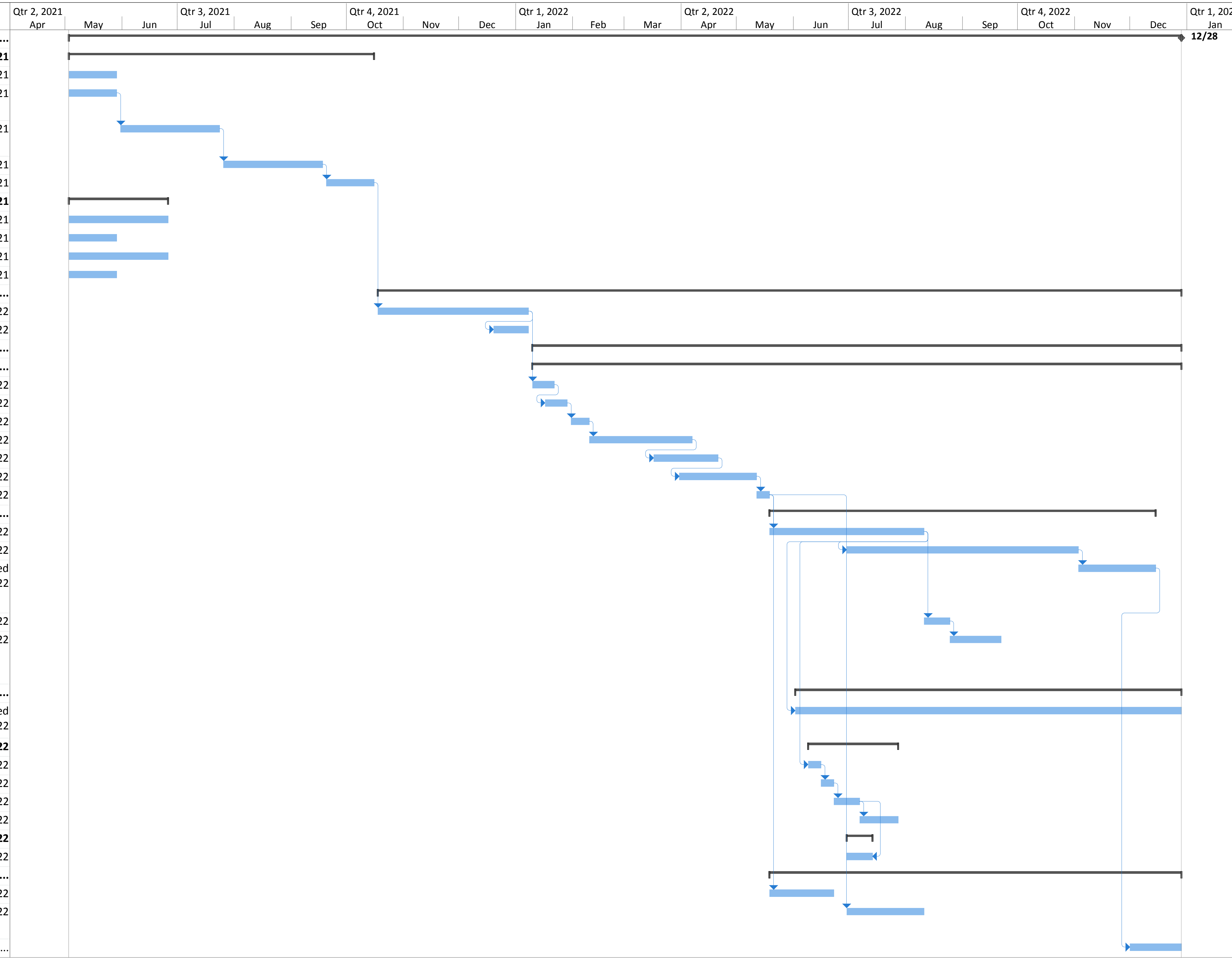
PROPOSED LAYDOWN AREAS

FIGURE 11

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-03(004)\11149943-03(004)GN\11149943-03(004)GN-FR009.dwg

Figure 12
CONCEPTUAL DECOMMISSIONING SCHEDULE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

ID	Task Name	Duration	Start	Finish
1	**CTGS Decommissioning & Demolition**	**433 days**	**Mon 5/3/21**	**Wed 12/28...**
2	**Pre-decommissioning Engineering**	**120 days**	**Mon 5/3/21**	**Fri 10/15/21**
3	Stakeholder Consultation and Agreement	20 days	Mon 5/3/21	Fri 5/28/21
4	Update Class B Decommissioning Cost Estimate, Specifications & HAZMAT Survey	20 days	Mon 5/3/21	Fri 5/28/21
5	Contractor Pre-Qualification Document Development, Submittals & Review to Select Pre-Qualified Contractors	40 days	Mon 5/31/21	Fri 7/23/21
6	Tender period	40 days	Mon 7/26/...	Fri 9/17/21
7	Contractor Selection and Award	20 days	Mon 9/20/...	Fri 10/15/21
8	**MECL Planning and Management Activities**	**40 days**	**Mon 5/3/21**	**Fri 6/25/21**
9	Asset Management Planning	40 days	Mon 5/3/21	Fri 6/25/21
10	Electrical Disconnection Planning and Engineering	20 days	Mon 5/3/21	Fri 5/28/21
11	Raw Material Inventory Management	40 days	Mon 5/3/21	Fri 6/25/21
12	Containerized Material Inventory Management	20 days	Mon 5/3/21	Fri 5/28/21
13	**Decommissioning**	**313 days**	**Mon 10/1...**	**Wed 12/28...**
14	Project Start-up, Contractor Submittals and Mobilization	60 days	Mon 10/18...	Fri 1/7/22
15	Pre-Decommissioning Inspections/Inventories	15 days	Mon 12/20...	Fri 1/7/22
16	**Building Infrastructure**	**253 days**	**Mon 1/10...**	**Wed 12/28...**
17	**Main Plant Buildings**	**253 days**	**Mon 1/10...**	**Wed 12/28...**
18	Installation of Temporary Facilities and Controls	10 days	Mon 1/10/...	Fri 1/21/22
19	Deactivation and De-energizing of Equipment	10 days	Mon 1/17/...	Fri 1/28/22
20	Chemical Sweep & Universal Waste Removal	8 days	Mon 1/31/...	Wed 2/9/22
21	Asbestos Abatement	40 days	Thu 2/10/22	Wed 4/6/22
22	Initial Decommissioning Cleaning	25 days	Thu 3/17/22	Wed 4/20/22
23	Equipment Removal	30 days	Thu 3/31/22	Wed 5/11/22
24	Final Decommissioning Cleaning	5 days	Thu 5/12/22	Wed 5/18/22
25	**Building and Structure Demolition**	**150 days**	**Thu 5/19/22**	**Wed 12/14...**
26	Demolition of Steam Plant Superstructures	60 days	Thu 5/19/22	Wed 8/10/22
27	Demolition of Stacks	90 days	Thu 6/30/22	Wed 11/2/22
28	Demolition of Concrete Steam Plant Concrete Slabs, Foundations and Supports to 0.9m Below Grade	30 days	Thu 11/3/22	Wed 12/14/22
29	Demolition of River Pumphouse	10 days	Thu 8/11/22	Wed 8/24/22
30	Demolition of River Pumphouse Foundations, Slabs, Concrete Supports and Dock Structure to Mudline	20 days	Thu 8/25/22	Wed 9/21/22
31	**Material Disposal**	**150 days**	**Thu 6/2/22**	**Wed 12/28...**
32	Transportation and Off-site Disposal of Regulated Wastes, Recyclable Materials &	150 days	Thu 6/2/22	Wed 12/28/22
33	**Bulk Storage Tanks**	**35 days**	**Thu 6/9/22**	**Wed 7/27/22**
34	Installation of Temporary Facilities and Controls	5 days	Thu 6/9/22	Wed 6/15/22
35	Deactivation and De-energizing of Equipment	5 days	Thu 6/16/22	Wed 6/22/22
36	Decommissioning Cleaning	10 days	Thu 6/23/22	Wed 7/6/22
37	Infrastructure Demolition	15 days	Thu 7/7/22	Wed 7/27/22
38	**Material Disposal**	**10 days**	**Thu 6/30/22**	**Wed 7/13/22**
39	Handling of Residual Product/Sludge	10 days	Thu 6/30/22	Wed 7/13/22
40	**Civil Infrastructure**	**160 days**	**Thu 5/19/22**	**Wed 12/28...**
41	Site Services Decommissioning/Abandonment	25 days	Thu 5/19/22	Wed 6/22/22
42	Decommission, excavate, remove/crush CW lines, backfill and install grout in select locations	30 days	Thu 6/30/22	Wed 8/10/22
43	Final Site Grading including subsurface voids	20 days	Thu 12/1/22	Wed 12/28/...



CTGS Conceptual Decommissionin
Date: Tue 6/5/18

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress | Manual Progress

TABLE 2.1

LIST OF INFRASTRUCTURE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Building Name	Approximate Dimensions (m)
Steam Plant	
Unit 10 Boiler/Turbine Zone	22 m by 29 m
Unit 9 Boiler/Turbine Zone	35.8 m by 22 m
MgOH Room	17.7 m by 7.6 m
Unit 5 Boiler Zone	18.2 m by 14.5 m
Unit 8 Turbine Zone	18.2 m by 14.5 m
Unit 4 Boiler Zone	13.3 m by 24.2 m
Unit 7 Turbine Zone	15.6 m by 24.2 m
Wastewater Treatment Plant Zone	21.8 m by 14.5 m
RO-EDI Plant	6.5 m by 18.9 m
CT3 Balance of Plant Equipment Zone	28 m by 14.5 m
Welding Shop	5.3 m by 9.7 m
Mechanical Maintenance Shop	15.5 m by 7.8 m
Old Stack	200-foot high (60.1 m) & 17 foot diameter (5.2 m)
New Stack	225-foot high (68.6 m) & 17.5 foot diameter (5.3 m)
Circulating Water Facilities	
River Pumphouse	27 m by 9 m
Circulating Water Outlet Diverter Box	---
Circulating Water Piping	Varies
Bulk Storage Tank Farm	
Bunker C Bulk Storage Tank	30,000 BBL
Bunker C/Steam Heat Pipelines	Varies

TABLE 4.1

CLASSIFICATION AND DESCRIPTION OF DEMOLITION MATERIALS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Structure/Operation	Charlottetown Thermal Generating Station - Facility Decommissioning/Demolition		
	Hazardous and Regulated Materials	**Non-Hazardous Demolition Materials**	**Recyclable Materials**
Steam Plant			
Unit 10 Boiler/Turbine Zone	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids, ACM on pipes, transite panel, boiler and in process equipment, selective cleaning of pits and trenches in lower level	demolition debris including wood, insulation, and other non-recyclable materials, roofing materials, non-ACM insulation on pipes and equipment	structural steel, carbon steel, stainless steel, copper, brass, alum brass, concrete, concrete block, brick, aluminum, titanium
Unit 9 Boiler/Turbine Zone	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids, ACM on pipes, transite panel and in process equipment, selective cleaning of pits and trenches in lower level	demolition debris including wood, insulation, and other non-recyclable materials, roofing materials, non-ACM insulation on pipes and equipment	structural steel, carbon steel, stainless steel, copper, brass, alum brass, concrete, concrete block, brick, aluminum
MgOH Room	common universal wastes associated with structures, mercury switches, miscellaneous chemicals	demolition debris including insulation, and other non-recyclable materials, roofing materials, non-ACM insulation on pipes and equipment	structural steel, carbon steel, copper, concrete, concrete block, brick, aluminum
Unit 5 Boiler Zone	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids, ACM on transite panel, selective cleaning of pits and trenches in lower level	demolition debris including insulation, and other non-recyclable materials, roofing materials, non-ACM insulation on pipes and equipment	structural steel, carbon steel, copper, concrete, aluminum
Unit 8 Turbine Zone	common universal wastes associated with structures, mercury switches, battery bank rooms - recycle batteries, miscellaneous chemicals, oil and other petroleum based fluids, ACM on pipes, selective cleaning of pits and trenches in lower level	demolition debris including insulation, and other non-recyclable materials, roofing materials, non-ACM insulation on pipes and equipment	structural steel, carbon steel, copper, brass, concrete, aluminum
Unit 4 Boiler Zone	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids, ACM on pipes, transite panel, process equipment and in boiler, selective cleaning of pits and trenches in lower level	demolition debris including insulation, and other non-recyclable materials, roofing materials, non-ACM insulation on pipes and equipment	structural steel, carbon steel, stainless steel, copper, concrete
Unit 7 Turbine Zone	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids, ACM on pipes, selective cleaning of pits and trenches in lower level	demolition debris including insulation, and other non-recyclable materials, roofing materials, non-ACM insulation on pipes and equipment	structural steel, carbon steel, copper, brass, concrete
Wastewater Treatment Plant Zone	common universal wastes associated with structures, lab pack, tank and floor trench cleaning residue, tank sludge, oil/water separator sludge, chemicals such as ferrous sulphate, caustic, sulfuric acid	miscellaneous demolition debris, non-ACM insulation, roofing materials	structural steel, copper, carbon steel, concrete, brick
RO-EDI Plant	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids	miscellaneous demolition debris, non-ACM insulation, roofing materials	structural steel, copper, carbon steel, stainless steel, concrete, concrete block, brick
CT3 Balance of Plant Equipment Zone	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids, selective cleaning of pits and trenches in lower level	miscellaneous demolition debris including wood, non-ACM insulation, roofing materials	structural steel, copper, carbon steel, concrete, brick
Welding Shop	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids	miscellaneous demolition debris including wood, non-ACM insulation, roofing materials	structural steel, copper, concrete, brick
Mechanical Maintenance Shop	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oils, lubricants and other petroleum based fluids	miscellaneous demolition debris, non-ACM insulation, roofing materials	structural steel, copper, concrete, carbon steel
Old Stack	none expected	none expected	wrought iron, concrete
New Stack	Lead based paint on concrete	none expected	carbon steel
Circulating Water Facilities & Infrastructure			
River Pumphouse	common universal wastes associated with structures, mercury switches, miscellaneous chemicals, oil and other petroleum based fluids, selective cleaning of pits and sumps, zinc based paint on concrete block	demolition debris including wood, insulation, and other non-recyclable materials, roofing materials	structural steel, copper, concrete, carbon steel
Circulating Water Outlet Structure	none expected	none expected	concrete
Circulating Water Piping	creosote timber for box culvert	wood debris for box culvert	concrete, cast iron
Bulk Storage Tank Farm			
Bulk Storage Fuel Tank	sludge, fuel oil residue	none expected	structural and plate steel, carbon steel, concrete
Fuel/Steam Pipeline	fuel residue	non-ACM insulation	carbon steel, aluminum, concrete

TABLE 4.2

QUANTITATIVE INVENTORY OF DEMOLITION RELATED MATERIALS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Area of Facility	Approximate Total Mass [Metric Tonnes (MT)]	Approximate Bulked Volume (m^3)	Notes
Steam Plant			
Regulated & Hazardous Materials			
Universal Waste			
Radionuclides (Smoke Detectors)	0.5	--	< 50 detectors and sensors as per fire inspection report
Lighting Ballasts	1	--	estimated quantity based on 500 units
Lighting Bulbs (fluorescent and HID)	0.25	--	estimated quantity based on 600 units
Ozone Depleting Substances	0.006	--	estimated quantity based on field observations
Mercury devices	0.0477	--	estimate 105 lbs from field observations and MECL inventory
Batteries	1	--	estimate from field observations (35 batteries)
Lab pack (unused raw and waste chemical materials)	3	--	in various containers, estimate
Transformer Oil	48	--	Appendix B14 and Appendix D
Other Oil (hydraulic, lubrication)	2	--	estimated residual quantity 10% of tank volume
Sulfuric Acid	--	2	Appendix B13. Estimated residual quantity 10% of tank volume.
Caustic	--	1	Appendix B13. Estimated residual quantity 10% of tank volume.
ACM Waste			
Friable ACM Waste (pipes, mechanical insulation, pipe fittings)	--	226	Appendix B1
Non-Friable ACM Waste (transite, wall panels)	--	41	Appendix B1
Bulk Solid Waste			
Potential Product/Residue Trenches, Sumps, Pits	51	46	estimated quantity based on 0.1m of sludge in pits/sumps/trenches (void volumes from Appendix B11 used)
Potential Product/Residue in Pipelines/Tanks	34	31	estimated quantity based on 0.1m of sludge in tanks and pipelines (Appendix B13)
Non-Recyclable Concrete from New Stack	468	312	Appendix B10
Demolition Debris			
Wood, Non-ACM Insulation, Roofing Materials	98	1,578	Appendix B10
Recyclable Materials			
Plate and Structural Standard Carbon Steel	1,368	--	Appendix B3
Standard Carbon Steel (pipes, cladding, ducting)	905	--	Appendix B3
Stainless Steel	5	--	Appendix B3
Aluminum	7	--	Appendix B3
Brass	13	--	Appendix B3
Alum Brass	37	--	Appendix B3
Cast Iron	66	--	Appendix B3
Wrought Iron	18	--	Appendix B3
Bare Copper (tubing, switch gear, transformers)	42	--	Appendix B12 & Appendix B3
Insulated Copper Wire	30	--	Appendix B12
Concrete/Cinderblock	8,178	5,567	computed crushed concrete volume, Appendix B2
Circulating Water Facilities & Infrastructure			
Regulated & Hazardous Materials			
Universal Waste			
Radionuclides (Smoke Detectors)	--	--	included in Steam Plant total
Lighting Ballasts	--	--	included in Steam Plant total
Lighting Bulbs (fluorescent and HID)	--	--	included in Steam Plant total
Transformer Oil	--	--	included in Steam Plant total
Lab pack (unused raw and waste chemical materials)	--	--	
Bulk Solid Waste			
Potential Product/Residue in Trenches, Sumps, Pits	8	7	estimated quantity based on limited volume of sludge in pits/sumps for water pumps
Creosote Timber	140	232	Appendix B10
Non-Recyclable Concrete Block from River Pumphouse	119	158	Appendix B10
Demolition Debris			
Wood, Non-ACM Insulation, Roofing Materials, Non-Recyclable Brick	2	46	Appendix B10
Recyclable Materials			
Plate and Structural Standard Carbon Steel	60	--	Appendix B3
Standard Carbon Steel (pipes, cladding, ducting)	71	--	Appendix B3
Cast Iron	90	--	Appendix B3
Copper (wiring, switch gear, transformers)	--	--	included in Steam Plant total
Concrete/Cinderblock	2,369	1,285	computed crushed concrete volume, Appendix B2
Bulk Storage Tank Farm			
Regulated & Hazardous Materials			
ACM Waste	--	--	
Bulk Solid Waste			
Potential Product/Residue in Pipelines/Tanks	39	36	Appendix B13. Based on 0.1m of sludge in bottom of the bulk storage tank and total sludge in pipeline assumed to be 10% of pipe volume. (est $1m^3$ = 1.1 MT)
Demolition Debris			
Non-ACM Insulation	1	29	Appendix B10
Recyclable Materials			
Plate and Structural Standard Carbon Steel	147	--	Appendix B3
Standard Carbon Steel (pipes, cladding, shell)	20	--	Appendix B3
Copper (wiring, switch gear)	--	--	included in Steam Plant total
Aluminum	0.5	--	Appendix B3
Concrete/Cinderblock	533	356	computed crushed concrete volume, Appendix B2

TABLE 4.3

ESTIMATED INDUSTRIAL CLEANING QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Area	Approximate Surface Area Cleaning Total (m^2) (Appendix B13)	Approximate Bulk Removal Total (m^3) (Appendix B13)
Steam Plant		
Unit 10 Boiler/Turbine Zone		
Washdown of Building Interior (Building Slabs only)	638	--
Cleaning of Pits, Sumps, and Trenches	--	148
Process Piping (for entire Steam Plant)	100	--
Washdown of Ducting	155	--
Turbine oil tank	17	0.4
Oil coolers (x2)	9	0.1
10,000 Gallon #10 Day Tank	66	1.0
Carbogel Tank	151	4.8
Unit 9 Boiler/Turbine Zone		
Washdown of Building Interior (Building Slabs only)	788	--
Cleaning of Pits, Sumps, and Trenches	--	154
Washdown of Ducting	115	--
Washdown of Cyclone Dust Collector	121	--
Turbine oil tank	17	0.4
Oil coolers (x2)	9	0.1
10,000 Gallon #9 Day Tank	66	1.0
MgOH Room		
Washdown of Building Interior	135	--
Washdown of MgOH Silos	23	--
Bulk caustic tank	13	0.5
Unit 5 Boiler Zone		
Washdown of Building Interior (Building Slabs only)	264	--
Cleaning of Pits, Sumps, and Trenches	--	28
Washdown of Ducting	157	--
Unit 5 Stack	130	--
Bulk acid tank south of No. 5 boiler	33	1.7
Unit 8 Turbine Zone		
Washdown of Building Interior (Building Slab only)	264	--
Cleaning of Pits, Sumps, and Trenches	--	40
Turbine oil tank	11	0.2
Unit 4 Boiler Zone		
Washdown of Building Interior (Building Slabs only)	322	--
Cleaning of Pits, Sumps, and Trenches	--	18
Boiler 4 Steel Stack	105	--
Boiler 2 30" stack	33	--
Unit 7 Turbine Zone		
Washdown of Building Interior (Building Slab only)	226	--
Cleaning of Pits, Sumps, and Trenches	--	60
Turbine oil tank	11	0.2
Oil coolers (x2)	9	0.1

TABLE 4.3

ESTIMATED INDUSTRIAL CLEANING QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Area	Approximate Surface Area Cleaning Total (m^2) (Appendix B13)	Approximate Bulk Removal Total (m^3) (Appendix B13)
Wastewater Treatment Plant Zone		
Washdown of Building Interior (Building Slab only)	316	--
Cleaning of Pits, Sumps, and Trenches	--	7
Batch treatment tanks (x 2)	172	15
Oil/Water separator	37	1.4
Filter Press	10	0.2
Sand filter	15	2.2
CT3 Balance of Plant Equipment Zone		
Washdown of Building Interior (Building Slab only)	406	--
Washdown of Oil Pump Rooms	23	--
Cleaning of Pits, Sumps, and Trenches	--	10
15,000 Gallon Old End Day Tank	88	1.3
Lube Oil Stores		
Washdown of Building Interior (Building Slab only)	36	--
Old Stack		
Old (200') Stack	996	--
New Stack		
New (225') Stack	1140	--
Steam Plant - Cleaning of Pits, Sumps and Trenches (m^3)	--	**464**
Steam Plant - Cleaning of Storage and Process Tanks and Piping (m^3)	**975**	**31**
Steam Plant - Surface Cleaning (m^2)	**7224**	--
Circulating Water Facilities		
River Pumphouse		
Washdown of Building Interior (Building Slab only)	220	--
Circulating Water Facilities - Cleaning of Pits, Sumps and Trenches (m^3)	--	--
Circulating Water Facilities - Cleaning of Storage and Process Tanks and Piping (m^3)	--	--
Circulating Water Facilities - Surface Cleaning (m^2)	**220**	--
Bulk Storage Tank Farm		
Bunker C Fuel Oil Heater	5	0.1
Bunker C Bulk Storage Tank	1081	34.7
6" Bunker C Pipeline to Plant	115	0.4
10" Bunker C Fill Pipeline	45	0.3
Tank Farm - Cleaning of Pits, Sumps and Trenches (m^3)	--	--
Tank Farm - Cleaning of Storage and Process Tanks and Piping (m^3)	**1246**	**35.5**
Tank Farm - Surface Cleaning (m^2)	**1246**	--
Summary		
Total Cleaning of Pits, Sumps and Trenches (m^3)	--	**464**
Total Cleaning of Storage and Process Tanks and Piping (m^3)	**2221**	**66.1**
Total Surface Cleaning (m^2)	**8690**	--

TABLE 4.4

SUMMARY OF VOIDS CREATED THROUGH INFRASTRUCTURE DECOMMISSIONING
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Area	Approximate Total, m^3 (Appendix B11)
Steam Plant	
Basements	1,242
Trenches, Pits, Sumps, Piping	639
Slabs, Foundations, Equipment Pads	1,261
SUB-TOTAL	**3,142**
Circulating Water Facilities	
Basements	0
Trenches, Pits, Sumps, Piping	1,381
Slabs, Foundations, Equipment Pads	0
SUB-TOTAL	**1,381**
Bulk Storage Tank Farm	
Basements	0
Trenches, Pits, Sumps, Tunnels	8
Slabs, Foundations, Equipment Pads	214
SUB-TOTAL	**222**
Summary - Charlottetown	
Basements	1,242
Trenches, Pits, Sumps, Tunnels	2,028
Slabs, Foundations, Equipment Pads	1,475
TOTAL	**4,745**

TABLE 5.1

OPTIONS ANALYSIS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Options	Qualitative Assessment of Viability	Retain for Quantitative Assessment (Yes/No)	Quantitative Assessment of Viability	Recommended Option & Rationale
Options predetermined with Maritime Electric					
Future land use	Decommissioning planning has assumed that Plant area lands will remain in MECL ownership indefinitely in an open space condition that would permit future system expansion and energy infrastructure upgrades with some limiting conditions as necessary. It has also assumed that the CT3 gas turbine will continue to operate during and post demolition.	Included in Decommissioning Study	Yes	Only the Site infrastructure (such as roads and storm water infrastructure) that are required for CT3 operations will remain post demolition	Plant area lands (with the exception of the CT3 area) should be decommissioned to produce an open space condition that would permit future system expansion and energy infrastructure upgrades that will be suitable for re-use by MECL only.
Decommissioning costs allocated based on MECL asset accounts	Costs for decommissioning tasks to be split into asset account categories provided by MECL so that MECL can track costs by each individual asset account.	Viable but will add costs to Decommissioning Study Preparation	No	Not Applicable	Discussed option with MECL accounting and it was decided to NOT allocate Decommissioning Costs based on MECL Asset Accounts at this time.
Infrastructure retained or sold	All MECL infrastructure to be sold / decommissioned / demolished excluding equipment to be relocated to new CT3 Building. Relocation of equipment to CT3 Balance of Plant to be completed under separate contract.	Included in Decommissioning Study	Yes	Assumed all infrastructure remaining at the MECL facility (with the exception of the CT3 Balance of Plant and ECC building) will be decommissioned for recycling	All MECL infrastructure to be sold / decommissioned / demolished with the exception of the CT3 Balance of Plant, ECC building and associated infrastructure.
Decommissioning approaches	Break sub-surface floors or pedestals that create potential for future differential settlement or water ponding.	Included in Decommissioning Study	Yes	Evaluated in cost estimate	Break sub-surface floors or pedestals that create potential for future differential settlement or water ponding.
	Maximize on-site disposal in below-surface voids (basements) according to type of waste.	Included in Decommissioning Study	Yes	Evaluated in cost estimate	Maximize on-site disposal in below-surface voids (basements) according to type of waste.
	Paved parking lot and access roads to remain	Included in Decommissioning Study	Yes	Not Applicable	Paved parking lot and access roads to remain
	Painted concrete slabs, walls, floors, etc. to remain on-site as fill material excluding New Stack and cinder block in pumphouse. Additional paint testing indicated that material is suitable for disposal at regional landfill with approval from PEICLE.	Included in Decommissioning Study	Yes	Not Applicable	Paint analysis completed in 2017 indicated that painted concrete surfaces in steam plant have lead and zinc below guidelines. Assumed Steam Plant concrete is acceptable for re-use on-site (excluding New Stack and River Pumphouse).
	Stack concrete will be tested for metals related to flue gas to determine if stack concrete can remain on-Site as backfill. Metal liner will be recycled as scrap metal.	Included in Decommissioning Study	Yes	Assumed concrete is suitable for fill material on-Site (see Areas of Environmental Concern related to lead based paint)	Stack concrete will be tested for metals related to flue gas to determine if stack concrete can remain on-Site as backfill. Metal liner will be recycled as scrap metal.
Decommissioning costs to be provided by MECL for inclusion in GHD report	MECL Owner's cost during decommissioning period	Owner's Cost to be developed by MECL and provided to GHD for inclusion in GHD report	No	Evaluated in cost estimate based on MECL supplied information	Owner's Cost to be developed by MECL and provided to GHD for inclusion in GHD report
	Land taxes during decommissioning period	Owner's Cost to be developed by MECL and provided to GHD for inclusion in GHD report	No	Evaluated in cost estimate based on MECL supplied information	
	Insurance costs during decommissioning period	Owner's Cost to be developed by MECL and provided to GHD for inclusion in GHD report	No	Evaluated in cost estimate based on MECL supplied information	
	Regulatory permitting & liaison during decommissioning period	Owner's Cost to be developed by MECL and provided to GHD for inclusion in GHD report	No	Evaluated in cost estimate based on MECL supplied information	
	Switchyard and other transmission equipment modifications due to decommissioning operations.	Owner's Cost to be evaluated separately	No	Not Applicable	No costing included for this item in Decommissioning Plan
	MECL will provide costing data for salvagable materials based on the last 5 years	Included in Decommissioning Study	Yes	Evaluated in cost estimate based on MECL supplied information	Salvage value data to be provided by MECL for inclusion in GHD report

TABLE 5.1

OPTIONS ANALYSIS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Options	Qualitative Assessment of Viability	Retain for Quantitative Assessment (Yes/No)	Quantitative Assessment of Viability	Recommended Option & Rationale
Areas of environmental concern					
New Stack with leachable lead based paint	Use stack concrete for backfill on-site (as-is)	Viable with regulatory approval (potential environmental risk)	Yes	Unlikely based on initial results. Leachate results generally equal to or below landfill disposal guidelines and concrete core sample results did not contain leachable lead.	Recommend off-Site disposal based on 2017 and 2018 leachate results.
	Sand blast concrete prior to stack demolition and use concrete on-site for fill	Viable	No	Unlikely based on initial results. Leachate results generally equal to or below landfill disposal guidelines and concrete core sample results did not contain leachable lead.	Lead based paint and leachate results indicated material is suitable for off-Site disposal without mitigation subject to PEICLE approval
	Transport and dispose of all (or a portion of stack) at licensed landfill	Viable (subject to PEICLE approval)	Yes	Leachate results generally equal to or below landfill disposal guidelines and concrete core sample results did not contain leachable lead.	Recommended option based on available data but subject to PEICLE approval
	Transport and dispose at hazardous waste facility (nearest facility is in Montreal)	Viable but likely highly costly	No	Unlikely based on initial results. Leachate results generally equal to or below landfill disposal guidelines and concrete core sample results did not contain leachable lead.	Lead based paint and leachate results indicated material is suitable for disposal at regional landfill subject to PEICLE approval
River Pumphouse with leachable zinc based paint	Use concrete cinder blocks for on-site backfill (as-is)	Viable with regulatory approval (potential environmental risk)	Yes	Unlikely based on initial results. Leachable lead and zinc identified in samples but concentrations below landfill disposal guidelines.	Recommend off-Site disposal based on 2017 and 2018 leachate results.
	Sand blast concrete cinder blocks prior to building demolition and use concrete on-site for fill	Viable	No	Unlikely based on initial results. Leachable lead and zinc identified in samples but concentrations below landfill disposal guidelines.	Lead/zinc based paint and leachate results indicated material is suitable for off-Site disposal without mitigation subject to PEICLE approval
	Transport and dispose at licensed landfill	Viable (subject to PEICLE approval)	Yes	Leachable lead and zinc identified in samples but concentrations below landfill disposal guidelines.	Recommended option based on available data but subject to PEICLE approval
	Transport and dispose at hazardous waste facility	Viable but likely highly costly	No	Unlikely based on initial results. Leachable lead and zinc identified in samples but concentrations below landfill disposal guidelines.	Lead/zinc based paint and leachate results indicated material is suitable for disposal at regional landfill subject to PEICLE approval
Area of PAH impacted soil and groundwater in southwest corner of property	Complete additional site investigation work (soil vapour monitoring, low flow sampling, groundwater modeling and delineation) to ensure impacts pose low risk to on-site commercial receptors as well as off-site residential and ecological receptors. Assumed costs also include future costs for completion of a Tier II Human Health and Ecological Risk Assessment (HHERA)	Viable	Yes	Assumed $150,000 to complete task. Estimate based on professional judgement and discussions with MECL as off-site intrusive data limited or not available.	Information on current soil and groundwater conditions in the area indicate PAHs exceed guidelines for on and off-site land use. Complete additional assessment program and HHERA to determine if impacts pose an unacceptable risk to human health or ecological receptors. This option is recommended based on information available.
	Excavate and dispose of potential hydrocarbon-impacted soil	Viable	Yes	Assumed 6000 m^3 of PAH impacted soil present in area for costing purposes. However, potentially impacted areas on or off-site have not been delineated. Excavation and disposal of impacted soil (if required) estimated at $1,320,000	Results of 2018 Phase II ESA NB indicated PAH impacts in soil and groundwater may require remediation but considered unlikely. Include remediation costs as a risk item.
	Alternate remediation options	Viable	No	Not Applicable	Limited information on impacts and geological conditions to evaluate alternate remedial options (if required)
Decommissioning options					
Management of bulk storage tank bottom sludges	Off-site Disposal	Viable - Assume 0.1 m of sludge in tank bottom (as indicated from MECL)	Yes	Requires trucking to licensed disposal facility in NB. Assumed 36 m3 of sludge in bulk tank mixed with an absorbent for a total combined density of 60 tonnes. Total density in all tanks and piping estimated at 73 tonnes plus absorbent (110 tonnes total). Off-Site disposal is estimated at $300/tonne ($250/tonne disposal plus trucking) for a total estimated disposal cost of $33,000.	Chosen due to low volume of Bunker C sludge. See below rationale.
	On-site Sludge Treatment and Off-site fuel sale and separated solids treatment/disposal	Viable - Assume 0.1 m of sludge in tank bottom (as indicated from MECL)	No	Requires on-site centrifuging to separate low grade fuel from oily solids. Given low volume of sludge unlikely to be a viable option.	The low grade of the oil that could be obtained from the sludge and the current low market value of oil deem recycling to be un-economical

TABLE 5.1

OPTIONS ANALYSIS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Options	Qualitative Assessment of Viability	Retain for Quantitative Assessment (Yes/No)	Quantitative Assessment of Viability	Recommended Option & Rationale
Decommissioning of large diameter Circulating Water pipes from River Pumphouse to Plant	Condition Assessment	Viable	Yes	$20,000	Required for all options that consider leaving pipes void to determine current condition of pipes
	Leave piping void and cap access points to tunnels	Viable	Yes	$35,000	Potential future pipe collapse may result in settlement at the ground surface. This may create a safety/liability risk due to the fact that the CW pipes extend below a Water Street and active fuel pipelines. MECL reported that there have been three occurrences of soil subsidence above the CW lines over the past 20 years.
	Dig up entire length of CW piping	Not viable due to closure of main roadway (Water Street) during construction in that area and having to excavate and re-build main roadway. Costly and would require city approval. Option would also require digging beneath active fuel lines near River Pumphouse	No	Not Applicable	Not Recommended
	Fill piping with flowable grout in sections below the main roadway and leave remainder of pipes void. Cap pipes at river.	Viable but potential liability related differential settlement beneath active fuel lines	Yes	$130,000	Not recommended due to potential differential settlement beneath active fuel pipelines near River Pumphouse. Option does reduced risk of future settlement under the main roadway (Water Street). Potential future collapse of void pipes on MECL property will result in minor settlement at surface only, with minor cost to repair settlement. This option reduces safety/liability risk that could be caused by settlement/collapse in main roadway.
	Fill entire length of CW piping with flowable grout	Viable but very costly	Yes	$1,200,000	Not recommended due to the high costs.
	Fill section of CW piping starting at the main roadway and all the way down to the River Pumphouse with flowable grout. Dig up and crush remainder of pipes on MECL property.	Viable	Yes	$500,000 ($400,000 for grouting, excavation and concrete crushing operations plus $100,000 contingency for GW treatment)	Recommended due to reduced risk of future settlement under the main roadway (Water Street) and active fuel pipelines near River Pumphouse. This option also eliminates any potential future collapse of piping on MECL property and creates additional voids for on-site concrete to be placed.
	Fill piping with flowable grout in sections below the main roadway and active fuel pipelines near River Pumphouse. Dig up remainder of lines for crushing or removal.	Viable	Yes	$292,000 ($192,000 for grouting, excavation and concrete crushing operations plus $100,000 contingency for GW treatment)	Recommended due to reduced risk of future settlement under the main roadway (Water Street) and active fuel pipelines near River Pumphouse. This option also eliminates any potential future collapse of piping on MECL property and creates additional voids for on-site concrete to be placed. Also reduces cost associated with using flowable grout between Water Street and the active fuel pipeline.
	Fill section of tunnels starting at the main roadway and all the way down to the River Pumphouse with flowable grout. Leave remainder of pipes void. Cap access points to pipes.	Viable	Yes	$344,000	Recommended due to reduced risk of future settlement under the main roadway (Water Street) and active fuel lines near River Pumphouse. Potential future collapse of void pipe in other areas on MECL property will result in minor settlement at surface only, with minor cost to repair settlement.
Decommissioning of the existing Rock Groyne structure	Remove the structure	Viable - Approval may be required by regulatory agencies	No	MECL has indicated that rock groyne is to remain with some minor improvements based on Third-party review (subject to CHAI approval)	Not evaluated but identified as a risk item as per MECL instructions.
	Sell the structure to 3rd party	Viable - Approval may be required by regulatory agencies	No	Rock groyne is to be retained by MECL	Not evaluated as per MECL instructions.
	Leave structure in place and maintain as required	Viable - Approval may be required by regulatory agencies	Yes	Not Applicable	Recommended to avoid destruction of marine habitat in vicinity of structure
Decommission River Pumphouse	Remove the entire structure and re-contour shoreline	Viable - Approval from CHAI Required	Yes	MECL indicated intent is to remove River Pumphouse Structure with approval from CHAI	Included in Decommissioning Study
	Remove the superstructure and convert into dock	Viable - Approval from CHAI Required	No	MECL indicated intent is to remove River Pumphouse Structure with approval from CHAI	Not Evaluated as per MECL instructions

TABLE 5.1

OPTIONS ANALYSIS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Options	Qualitative Assessment of Viability	Retain for Quantitative Assessment (Yes/No)	Quantitative Assessment of Viability	Recommended Option & Rationale
Surface drainage management	Retain drainage ditches and storm water collection system for discharge at Outfalls	Viable	Yes	Based on available information assumed new discharge line (PVC) would be installed on-Site to convey storm water directly to Hillsborough River (as per current conditions). Potential option for connection to municipal storm system.	Existing storm water system likely required to ensure adequate surface drainage. Upgrades may also be required in boiler areas. Surface Water Management plan required as part of pre-decommissioning engineering to ensure optimal discharge configuration (Hillsborough River or municipal system).
	Decommission existing storm water collection system and divert plant area surface drainage via sheet flow to discharge near existing Outfalls	Viable	No	Not Applicable	See above rationale
Disposal of excess concrete demolition debris if we remove slabs on grade and foundations to 0.9 m below grade	Transport and dispose at a local C & D Facility	Viable but may be costly	Yes	Void space estimate is approximately 4,745 m3. Volume of crushed concrete and brick debris that can be used as backfill is estimated to be 7,210 m3 creating an excess of 2,465 m3 of concrete. Cost to transport and dispose of excess concrete debris off-site at a C & D Facility is $110,500 (assuming tipping fee of $20/MT and transport costs).	
	Crush and spread out on site or transport off site for use as usable fill	Viable	Yes	Void space estimate is approximately 4,745 m3. Volume of crushed concrete and brick debris that can be used as backfill is estimated to be 7,210 m3 creating an excess of 2,465 m3 of concrete. Cost to spread this material out on-site in a 0.3m lift (8,183 m2 area required) is approximately $25,000	Recommended
Disposal of excess concrete demolition debris if we <u>do not</u> remove slabs on grade and foundations to 0.9 m below grade	Transport and dispose at a local C & D Facility	Viable but may be costly	Yes	Void space estimate is approximately 3,373 m^3. Volume of crushed concrete and brick debris that can be used as backfill is estimated to be 4780 m3 creating an excess of 1407 m3 of concrete. Cost to transport and dispose of excess concrete debris off-site at a C & D Facility is $63,000 (assuming tipping fee of $20/MT and transport costs). Also, with this option there would be a savings of $100k for not having to demolish the concrete slabs and foundations	
	Crush and spread out at site	Viable	Yes	Void space estimate is approximately 3,373 m^3. Volume of crushed concrete and brick debris that can be used as backfill is estimated to be 4,780 m^3 creating an excess of 1,407 m^3 of concrete. Cost to spread this material out on-site in a 0.3 m lift is approximately $14,000. Also, with this option there would be a savings of $100k for not having to demolish the concrete slabs and foundations	Recommended

TABLE 5.1

OPTIONS ANALYSIS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Options	Qualitative Assessment of Viability	Retain for Quantitative Assessment (Yes/No)	Quantitative Assessment of Viability	Recommended Option & Rationale
Demolition of the Stacks	Use a crawler crane on top of the existing slab/foundations following demolition of the plant buildings and use a demolition attachment on the crane to disassemble the concrete stacks to 23 m. Demolish the remainder of the stacks with a high reach excavator with a demolition attachment.	Viable	Yes	$1,400,000	Recommended due to urban setting of Site. However, the Old Stack is located approximately 18 m from the ECC building and there is the potential that falling concrete debris from this stack demolition method could affect operations of the ECC. Also, this option involves the removal of steel liners without mast climber platforms, which increases safety risk to workers. If the liners are not removed prior to removal of the concrete shell there is the potential of sections of the steel liner becoming unstable once sections of the concrete shell are removed exposing the liners to winds and lateral movements, which could cause the liners to fall in an uncontrolled manner posing a safety hazard
	Install mast climbers on both stacks to allow workers and small demolition equipment to dissemble the stacks in small (< 1.5 m) sections using the mast climber platforms for the top 38 m of the stacks. The remainder of the stacks (30 m for the New Stack and 23 m for the Old Stack) could then be demolished with a high reach excavator equipped with demolition attachments	Viable	Yes	$2,000,000	Recommended as most viable option due to urban setting of Site, overall safety of workers during removal of steel liners, limited falling debris from stacks and proximity of Old Stack to ECC critical infrastructure.
	Combination of two above options. Use a crawler crane on top of the existing slab/foundations for demolition of New Stack. Use mast climbers on Old Stack due to proximity of stack to ECC building and reduced likeliness of falling debris.	Viable	Yes	$1,700,000	Recommended due to urban setting of Site and proximity of Old Stack to ECC critical infrastructure. However, this option involves the removal of the steel liner in the New Stack without a mast climber platform, which increases safety risk to workers. If the liners are not removed prior to removal of the concrete shell there is the potential of sections of the steel liner becoming unstable once sections of the concrete shell are removed exposing the liners to winds and lateral movements, which could cause the liners to fall in an uncontrolled manner posing a safety hazard.
	Use a crawler crane on top of the existing slab/foundations following demolition of the plant buildings and use a demolition attachment on the crane to disassemble the concrete stacks to 23 m. Demolish the remainder of the stacks by felling them with explosives.	Viable	Yes	$1,125,000	Not recommended due to the use of explosives which pose a risk of damaging adjacent properties and utilities, including the CT3 and ECC building. Also, involves the removal of steel liners without mast climber platforms, which increases safety risk to workers.
	Partially demolish the main plant and preserve the exterior walls to act as containment barriers for felling stacks. Fell the stacks into the building footprint.	Viable	Yes	$600,000	Not recommended due to the use of explosives which pose a high risk of damaging adjacent properties and utilities, including the CT3 and ECC building.

TABLE 9.1

DETAILED CLASS B COST ESTIMATE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	*Decommissioning Activity*	*Estimated Cost*	*Comments*
PART A - PLANT SITE DECOMMISSIONING			
PART A1 – BUILDING INFRASTRUCTURE			
A.1.1	Chemical Sweep and Universal Waste Removal	$ 52,000	
A.1.2	Asbestos Abatement	$ 850,020	
A.1.3	Decommissioning Cleaning	$ 597,294	
A.1.4	Building Demolition	$ 1,688,000	
A.1.5	Stack Demolition	$ 2,052,000	
A.1.6	Material Disposal	$ -	Category heading only for items below
A.1.6.1	Equipment and Material Assets	$ -	All carried as salvage
A.1.6.2	Raw Material and Consumable Products	$ -	Assumed all raw materials will be used by MECL prior to Demolition
A.1.6.3	Miscellaneous Containerized Materials	$ 10,000	
A.1.6.4	Universal Wastes	$ 8,625	
A.1.6.5	Asbestos Containing Material Waste	$ 13,250	
A.1.6.6	Bulk Solid Waste	$ 133,975	
A.1.6.7	Demolition Debris	$ 4,545	
A.1.6.8	Recyclable Materials	$ -	See *Potential Salable and Salvage Value*
A.1.6.9	Decommissioning Cleaning Wastewater	$ 50,000	
A.1.6.10	Transformer Oil (Non-PCB)	$ -	See *Potential Salable and Salvage Value*
	SUBTOTAL PART A1 - BUILDING INFRASTRUCTURE	**$ 5,459,709**	
PART A2 - CIVIL INFRASTRUCTURE			
A.2.1	Site Services	$ 151,520	
A.2.2	Cooling Water Infrastructure	$ 291,800	
A.2.3	Final Site Grading including sub-surface voids	$ 252,693	
A.2.4	Shoreline Restoration	$ 87,875	
	SUBTOTAL PART A2 - CIVIL INFRASTRUCTURE	**$ 783,888**	
PART A3 - ENVIRONMENTAL MITIGATION			
A.3.1	Allowances for Additional Soil/Groundwater Investigation	$ 150,000	
A.3.2	Transportation and Recycling of Transformers (PCB containing)	$ 61,977	
A.3.3	Transportation and Recycling of PILC (PCB containing)	$ 17,110	
	SUBTOTAL PART A3 - REMEDIATION WORKS	**$ 229,087**	
	TOTAL PART A	**$ 6,472,684**	
PART B - ALLOWANCES			
B.1	Contingency Allowance (10% of Total Cost) for Unidentified Items (Part A)	$ 647,268	10% of Total Cost for Part A
B.2	Allowance for Health & Safety, Mobilization-Demobilization, contractor accommodations/travel costs, Bonds (20% of Total Cost)	$ 1,294,537	20% of Total Cost for Part A
	TOTAL PART B	**$ 1,941,805**	
	TOTAL ESTIMATED COSTS PARTS A & B	**$ 8,414,489**	**"ESTIMATED DEMOLITION COST"**

TABLE 9.1

DETAILED CLASS B COST ESTIMATE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	*Decommissioning Activity*	*Estimated Cost*	*Comments*
PART C - PROJECT MANAGEMENT, ENGINEERING & IMPLEMENTATION			
C.1	Development of 2018 Decommissioning Study for Charlottetown Thermal Generating Station	$ 205,000	Includes: Phase II Environmental Site Assessment; Existing Conditions Analysis; Option Assessment; Decommissioning Plan
C.2	MECL Project Management Process	$ 525,000	Costs provided by MECL
C.3	Regulatory Permitting and Approvals for Decommissioning Project	$ 250,000	Includes: Environmental Impact Assessment (EIA) Application; Environmental Protection Plan; Demolition Permit from City, Special Waste Handling Permit, etc.
C.4	Environmental Testing and Monitoring during Decommissioning	$ 100,000	Waste Treatment; Testing and handling hazardous materials; Environmental Sampling and Analyses including Dust and Noise Monitoring; ACM Air Monitoring; Reporting. Estimate based on costs incurred during similar decommissioning projects.
C.5	Engineering Design Support During Decommissioning Project. Includes costing for: Preliminary Design; Detailed Design and Drawings; Engineering Assessments; Technical Specifications; & Tender Evaluations	$ 200,000	Includes River Pumphouse shoreline restoration design, storm water management planning and design, etc. Costs are based on engineering design costs incurred during similar power plant decommissioning project
C.6	Contract Administration and Construction Oversight During Decommissioning Project. Includes support by qualified contractor(s) for: Contract Administration and Contractor Oversight During Project Execution.	$ 566,800	Includes full-time site supervisor (50 hrs/week), 1 site progress meeting every 2 weeks (including preparation and circulation of meeting minutes), contract administration (includes max. 16hrs for Project Manager, 12hrs for Project Coordinator), technical support for contractor oversight, construction reviews and building clearances prior to demolition. Weekly rate of $10.900/wk for 52 weeks.
C.7	Pre-demolition Condition Survey of Third Party Properties	$ 10,000	Allows for completion of a record of property conditions of third party land which may be affected by demolition activities. Records may be used if disputes arise regarding landscaping and property restoration following demolition.
C.8	MECL Trades Labour	$ 423,000	Costs provided by MECL
C.9	MECL Legal/Regulatory/Permitting	$ 180,000	Costs provided by MECL
	SUBTOTAL - ESTIMATED COST PART C	$ 2,459,800	**PROJECT MANAGEMENT, ENGINEERING AND IMPLEMENTATION**
PART D - POST DECOMMISSIONING AND OTHER MISCELLANEOUS COSTS			
D.1	Landscaping/Beautification	$ 200,000	Costs provided by MECL
D.2	Other Miscellaneous Costs	$ 439,000	Costs provided by MECL
D.3	Environmental Monitoring during Post-decommissioning	$ 50,000	Assumes 2 Year Post Decommissioning Monitoring Required
	TOTAL PART D	$ 689,000	
	TOTAL - ESTIMATED DEMOLITION, DECOMMISSIONING COST	**$ 11,563,289**	Sum of Parts A+B+C+D
POTENTIAL RESALABLE AND SALVAGE VALUE (Note 1)			
	Resalable Equipment and Materials	$ -	No value assigned
	Recyclable Materials - Type 1	$ (370,125)	Scrap values based on the mean from past five year average values (Years 2013 to 2017 inclusive) Supporting data provided in Appendix E.
	Recyclable Materials - Type 2	$ (274,950)	
	Recyclable Materials - Type 3	$ (7,665)	
	Recyclable Materials - Type 4	$ (253,344)	
	Recyclable Materials - Type 5	$ (110,280)	
	Recyclable Materials - Type 6	$ (8,693)	
	Recyclable Materials - Type 7	$ (200,000)	
	Recycle Value - Transformer Oil	$ (976)	
	Minus delivery to Point of Sale @ $35/tonne	$ 100,783	
	TOTAL POTENTIAL RESALABLE AND SALVAGE VALUE	**$ (1,125,250)**	
	NET CLASS B COST ESTIMATE FOR DECOMMISSIONING	**$ 10,438,039**	

Note 1: Assumed no Resaleable Equipment and Materials remain on-Site.

Note 2: Risk Items not included in Cost Estimate. Several environmental and demolition options were identified as having a low probability of occurring based on professional judgment and information provided by MECL. However, several of these specific items would incur significant costs (or save costs) to the decommissioning project if they are required based on regulatory obligations or third party agreements. The risk items are outlined in Section 5.2 with an estimated total contingency cost of $3,050,775. The contingency costs for potential risk items have not been included in the Total Estimated Demolition, Decommissioning Cost provided above (Parts A+B+C+D).

TABLE 9.1-A1

DETAILED CLASS B COST ESTIMATE
PART A1 - BUILDING INFRASTRUCTURE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	*Decommissioning Activity*	*Unit*	*Estimated Quantity*	*Unit Price*	*Total Price*
PART A1 – BUILDING INFRASTRUCTURE					
A1.1	**Chemical Sweep and Universal Waste Removal**				
	Chemical Sweep	DAY	3	$ 4,000	$ 12,000
	Removal of Universal Wastes	DAY	5	$ 4,000	$ 20,000
	Removal of ODS	LS	--	$ 5,000	$ 5,000
	Laboratory Analysis of Waste Removed	LS	--	$ 15,000	$ 15,000
	Total				**$ 52,000**
A1.2	**Asbestos Abatement [(1)]**				
	Type 1 Abatement - Non-Friable ACM	DAY	32	$ 7,095	$ 227,040
	Type 3 Abatement - Friable ACM	DAY	45	$ 13,844	$ 622,980
	Total				**$ 850,020**
A1.3	**Decommissioning Cleaning**				
A1.3a	**Plant Buildings - Equipment Cleaning and Removal**				
	Cleaning of Pits, Sumps, Trenches and Hazardous Dusts	DAY	20	$ 7,520	$ 150,400
	Cleaning of Storage and Process Tanks and Piping	DAY	20	$ 7,280	$ 145,600
	Washdown of Non-Hazardous Dust and stained concrete (Building slabs, basement walls)	DAY	5	$ 5,408	$ 27,040
	Draining of Equipment Oils	DAY	10	$ 3,224	$ 32,240
	Draining of Transformer Oils	DAY	5	$ 4,850	$ 24,250
	Final Cleaning of Structures	DAY	5	$ 5,408	$ 27,040
	Subtotal				**$ 406,570**
A1.3b	**Cleaning of Bulk Storage Tanks and Fuel Pumping Systems**				
	Removal of Insulation on Piping	M3	24	$ 60	$ 1,440
	Access Tank & Provide Ventilation	LS	1	$ 25,000	$ 25,000
	Removal of Sludge from Bunker C Tank	DAY	6	$ 8,224	$ 49,344
	Cleaning of Bunker C Tank	DAY	3	$ 9,680	$ 29,040
	Cleaning of Fuel Piping System	DAY	4	$ 6,450	$ 25,800
	Subtotal				**$ 130,624**
A1.3c	**Stack Cleaning (2 large stacks and smaller steel stacks from boilers)**				
	Cleaning of Stack Walls	M2	2,404	$ 25	$ 60,100
	Subtotal				**$ 60,100**
	Decommissioning Cleaning Total				**$ 597,294**

TABLE 9.1-A1

DETAILED CLASS B COST ESTIMATE
PART A1 - BUILDING INFRASTRUCTURE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	*Decommissioning Activity*	*Unit*	*Estimated Quantity*	*Unit Price*	*Total Price*
A1.4	**Building Demolition**				
	Demolition of Bulk Storage Tank, Fuel/Steam Pipelines and Fuel Pumping Systems	WK	3	$ 31,000	$ 93,000
	Interior Demolition of Steam Plant	WK	6	$ 63,000	$ 378,000
	Demolition of Steam Plant Superstructure	WK	12	$ 67,000	$ 804,000
	Demolition of Steam Plant Foundations, Slabs and Concrete Supports to 0.9m Below Grade	WK	6	$ 34,000	$ 204,000
	Demolition of River Pumphouse	WK	2	$ 23,500	$ 47,000
	Demolition of River Pumphouse Foundations, Slabs, Concrete Supports and Dock Structure to Mudline	WK	2	$ 55,000	$ 110,000
	Crushing of Concrete Debris from Structures	WK	4	$ 13,000	$ 52,000
	Total				**$ 1,688,000**
A1.5	**Stack Demolition**[2]				
	Old Stack (61 m high stack)	LS	1	$ 1,000,000	$ 1,000,000
	New Stack (69 m high stack)	LS	1	$ 1,000,000	$ 1,000,000
	Crushing of Stack Material (Old stack only)	WK	4	$ 13,000	$ 52,000
	Total				**$ 2,052,000**
A.1.6	**Material Disposal**				
A1.6.1	**Equipment and Material Assets (Carried in Salvage Value)**	-	-	-	$ -
A1.6.2	**Raw Material and Consumable Products**	-	-	-	$ -
A1.6.3	**Miscellaneous Containerized Materials**	LS	-	$ 10,000	$ 10,000
	Subtotal				**$ 10,000**
A1.6.4	**Universal Waste**				
A1.6.4a	Radionuclides, Light Ballasts & Bulbs, Mercury, Batteries, ODS	MT	6	$ 350	$ 2,100
A1.6.4b	Sulfuric Acid	L	1,675	$ 3	$ 5,025
A1.6.4c	Caustic	L	500	$ 3	$ 1,500
	Total				**$ 8,625**
A1.6.5	**Asbestos Containing Material Waste**				
A1.6.5a	Friable ACM	LS	1	$ 7,250	$ 7,250
A1.6.5c	Non-Friable ACM	LS	1	$ 6,000	$ 6,000
	Total				**$ 13,250**
A1.6.6	**Bulk Solid Wastes**				
A1.6.6a	Residue/Sludge in Tank Farm Tanks (Assumes 0.1m of sludge in the Bunker C tank and each of the 4 day tanks, on-site sludge treatment and off-site disposal) and Process Tanks[3]	MT	110	$ 300	$ 33,000
A1.6.6b	Sludge from Pits, Sumps and Trenches (assumes 0.1m of sludge in bottoms)	MT	59	$ 100	$ 5,900
A1.6.6c	Creosote Timbers	MT	140	$ 155	$ 21,700
A1.6.6d	Non-Recyclable Concrete Block from River Pumphouse to Landfill	MT	119	$ 125	$ 14,875
A1.6.de	Non-Recyclable Concrete from New Stack to Landfill	MT	468	$ 125	$ 58,500
	Total				**$ 133,975**

TABLE 9.1-A1

DETAILED CLASS B COST ESTIMATE
PART A1 - BUILDING INFRASTRUCTURE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	*Decommissioning Activity*		*Unit*	*Estimated Quantity*	*Unit Price*	*Total Price*
A1.6.7	**Demolition Debris**					
A1.6.7a	Wood, Non-ACM Insulation & Roofing Materials		MT	101	$ 45	$ 4,545
		Total				**$ 4,545**
A1.6.8	**Recyclable Materials**					
Type 1	Plate and Structural Standard Carbon Steel		MT	1,575	$ (235)	$ (370,125)
Type 2	Standard Carbon Steel/Cast iron/Wrought Iron (Pipes, Cladding, Ducting)		MT	1,170	$ (235)	$ (274,950)
Type 3	Stainless Steel (Tanks, Pipes, Tubing)		MT	5	$ (1,533)	$ (7,665)
Type 4	Bare Copper		MT	42	$ (6,032)	$ (253,344)
Type 5	Insulated Copper Wire		MT	30	$ (3,676)	$ (110,280)
Type 6	Aluminum		MT	7.5	$ (1,159)	$ (8,693)
Type 7	Brass		MT	50	$ (4,000)	$ (200,000)
	Transport Scrap to Point of Sale		MT	2,880	$ 35	$ 100,783
		Total				**$ (1,124,274)**
A1.6.9	**Decommissioning Cleaning Wastewater**					
	Management of Washwaters though on-Site WWTP		L	500,000	$ 0.10	$ 50,000
		Total				**$ 50,000**
A1.6.10	**Transformer Oils (Non-PCB)**					
	Transformer Oil (Non-PCB)		L	8,131	$ (0.12)	$ (976)
		Total				**$ (976)**

Note:

(1) Quantities based on All-Tech Environmental Services Limited, Asbestos Reassessment Report, January 2018. Samples of boiler refractory collected by MECL in May 2018 indicated that this material is asbestos-free.

(2) Stack demolition costing assumes that the stacks will be demolished using a combination of mast climbers and high reach equipment. If stacks are to be demolished by any other means and methods the demolition costing could change significantly and would require further review by GHD.

(3) Includes 73 MT of sludge from Bunker C tank, day tanks, process tanks and associated piping. The 73 MT of sludge is then mixed with 37 MT (50% ratio) of sawdust/absorbent prior to disposal for a total of 110 MT.

LS "Lump Sum"
WK "Week"
M3 "Cubic Metres"
M2 "Square Metres"
MT "Metric Tonnes"
L "Litres"

TABLE 9.1-A2

DETAILED CLASS B COST ESTIMATE
PART A2 - CIVIL INFRASTRUCTURE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	*Decommissioning Activity*	*Unit*	*Estimated Quantity*	*Unit Price*	*Total Price*
PART A2 - CIVIL INFRASTRUCTURE					
A.2.1	**Site Services**				
	Cut and Cap Watermains to site	LS	1	$ 10,000	$ 10,000
	New storm line to replace current CW Line being used as a storm line	LM	264	$ 430	$ 113,520
	Allowance for additional catch basins on-site to control surface water run-off once buildings have been removed	EA	4	$ 4,000	$ 16,000
	Removal and re-installation of select areas of fence	LM	80	$ 50	$ 4,000
	Supply and install fence once buildings removed	LM	100	$ 80	$ 8,000
	Total				**$ 151,520**
A.2.2	**Cooling Water Infrastructure**				
	Fill CW Piping below roadway and 3rd party infrastructure near pumphouse with flowable grout	M3	87	$ 1,000	$ 87,000
	Dig up and crush all concrete CW piping on MECL lands that are not located below roadway or 3rd party infrastructure	WK	4	$ 21,500	$ 86,000
	Dig up and remove all cast iron CW piping on MECL lands that are not located below roadway or 3rd party infrastructure	WK	2	$ 9,400	$ 18,800
	Allowance for groundwater control and potential treatment of groundwater prior to disposal	LS	1	$ 100,000	$ 100,000
	Total				**$ 291,800**
A.2.3	**Final Site Grading Including Sub-Surface Voids (4729 m3 of voids)**				
	Backfill of Voids With Crushed Brick, Concrete/Cinderblock	M3	4,745	$ 5	$ 23,725
	Use of excess crushed concrete (2465 m^3) on-site to create sloping and build-up of former steam plant footprint	M3	2,465	$ 10	$ 24,650
	0.6m Cover for Concrete Backfill Consisting of Engineered Fill and Topsoil	M3	5,108	$ 30	$ 153,240
	Geotextile between concrete and granular backfill to avoid loss of fines	M2	8,513	$ 5	$ 42,565
	Hydroseed and Mulch to create a green space for former steam plant footprint after demolition	M2	8,513	$ 1	$ 8,513
	Total				**$ 252,693**
A.2.4	**Shoreline Restoration**				
	Temporary Controls (maintenance of silt curtains and booms installed during demolition of River Pumphouse and dock structure)	LS	1	$ 10,000	$ 10,000
	Placement of Rip Rap - 150mm	MT	125	$ 55	$ 6,875
	Placement of Rip Rap - 450mm	MT	300	$ 57	$ 17,100
	Placement of Armour Stone - 2MT Avg.	MT	725	$ 62	$ 44,950
	Placement of Armour Stone - 6MT Avg. - Toe Rock	MT	120	$ 65	$ 7,800
	Placement of Geotextile	M2	230	$ 5	$ 1,150
	Total				**$ 87,875**

Note:

LS	"Lump Sum"	M3	"Cubic Metres"
LM	"Linear Metres"	M2	"Square Metres"
EA	"Each"	MT	"Metric Tonnes"
WK	"Week"	L	"Litres"

TABLE 9.1-A3

DETAILED CLASS B COST ESTIMATE
PART A3 - REMEDIATION OF ENVIRONMENTAL IMPACTS
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	*Decommissioning Activity*	*Unit*	*Estimated Quantity*	*Unit Price*	*Total Price*
PART A3 - ENVIRONMENTAL MITIGATION					
A.3.1	**Allowances for Additional Soil/Groundwater Investigation**				
	Installation of Soil Vapour Probes (assumed four probes)	PROBE	4	$ 1,250	$ 5,000
	Soil Vapour Probe sampling (assumed 2 rounds)	PROBE	8	$ 225	$ 1,800
	Low Flow GW Sampling of Existing Wells (assumed 10 wells with 2 rounds of sampling)	WELL	20	$ 250	$ 5,000
	Additional On-Site Surface Soil Sample Collection	SAMPLE	10	$ 50	$ 500
	Laboratory Costs - Soil/Groundwater	SAMPLE	30	$ 150	$ 4,500
	Laboratory Costs - Soil Vapour	SAMPLE	8	$ 400	$ 3,200
	Disbursements	LS			$ 10,000
	Off-Site Soil and Groundwater Delineation	LS			$ 75,000
	Human Health and Ecological Risk Assessment	LS			$ 45,000
	Total				**$ 150,000**
A.3.2	**Transportation and Recycling of Transformers (PCB containing)**				
	Crane for Loading Transformers (assumed Grove GMK 5150)	DAY	2	$ 5,000	$ 10,000
	Transportation of 4 Station Services (Power) Transformers	LOAD	4	$ 12,500	$ 50,000
	Transportation of 5 Small Distribution Transformers	LOAD	1	$ 12,500	$ 12,500
	Transformer Cleaning and Recycling (PCB >2 and <50 ppm)	KG	122,000	$ (0.25)	$ (30,500)
	Transformer Oil Transportation (PCB >2 and <50 ppm)	LOAD	1	$ 12,500	$ 12,500
	Transformer Oil Disposal (PCB >2 and <50 ppm)	L	37,387	$ 0.20	$ 7,477
	Total				**$ 61,977**
A.3.3	**Transportation and Recycling of PILC (PCB containing)**				
	Extraction and Sorting	LS			$ 10,000
	Transportation to Licensed Cleaning and Recycling Facility	LOAD	1	$ 12,500	$ 12,500
	Cable Cleaning and Recycling	KG	24,500	($0.22)	$ (5,390)
	Total				**$ 17,110**

Note:

LS	"Lump Sum"
KG	"Kilogram"
LS	"Litre"
LOAD	"Tandem Truck Load"

TABLE 9.2

BASIS, ASSUMPTIONS, AND CONSTRAINTS FOR DETAILED CLASS B COST ESTIMATE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Decommissioning Activity	Basis	Assumptions	Constraints
PART A1 – BUILDING INFRASTRUCTURE				
A.1.1	Chemical Sweep and Universal Waste Removal	Costing based on data from GHD-approved contractor's hourly equipment rates and quantities identified in Tables 4.2 and 4.3 and Appendix B.	**Chemical Sweep**: Contractor personnel will collect raw material to be recycled as part of decommissioning activities. WWTP closure will be sequenced requiring both raw materials and lab chemicals to be utilized. The delayed closure of the WWTP will require a second chemical sweep to be performed. **Universal Waste:** Universal wastes will be packaged, transported, and disposed within a single scheduled shipment. ODS removal will be completed by licensed contractor in accordance with applicable regulations.	MECL will utilize raw materials to extent possible prior to decommissioning.
A.1.2	Asbestos Abatement	Cost estimate is based on data from GHD-approved contractor's hourly equipment rates, recent rates received by MECL from local contractors and quantities provided in Table 4.2 and Appendix B1.	Pipe and fittings will be abated using glove bag technique where possible. A negative air enclosure will be required for abatement of various process tanks and boiler insulation (approximately 11 enclosures will be required based on locations of friable asbestos). All transite wall siding will be removed using hand tools prior to demolition.	All ACM will be transported to and disposed of at an approved facility (Wellington).
A.1.3	Decommissioning Cleaning (Main Plant Buildings – Equipment Cleaning and Removal)	Cost estimate is based on GHD-approved contractor's hourly equipment rates. Quantity estimate is based on Tables 4.2 and 4.3 and Appendix B.	Consistency of the sludge in pits, sumps, and trenches is assumed to be compacted ash and dirt that can be vacuumed with physical agitation and application of water spray. Water washing of pits, sumps, and trenches is to be cleaned to a demolition standard. Wastewater from washing will be processed by the on-Site WWTP without pre-treatment. No allowance for washing equipment reservoirs. Confined space is limited. All other work is from top surface of building slab. Large station and service transformer oil will be removed directly by MECL or representative. All remaining oil will be removed and segregated for disposal by contractor. Large volumes of process oils will be consumed by MECL to the extent possible. Storage and process tanks will not be reused. Access to piping and tank interior will be destructive.	Sludge to be transported off-Site for disposal. Possibility that pre-treatment may be required for wastewater prior to sending to WWTP.
	Decommissioning Cleaning (Cleaning of Bulk Storage Tanks and Fuel Pumping Systems)	Cost estimate is based on GHD-approved contractor's hourly equipment rates and rates recently received from similar projects in Atlantic Canada. Quantity estimate is based on Table 4.3 and Appendix B.	Assumes 0.1m of sludge in the bulk storage tank and the day tanks and that all Bunker C and Fuel has been utilized to the extent possible by MECL. No provision for pumping excess fuel from the tanks is included. Wash water to be stored for pre-treatment prior to discharge to on-Site WWTP. Sludge to be disposed of off-site at an approved facility. Access to tank provided by independent subcontractor for water laser cold cutting of tank shell, two openings per tank due to tank atmosphere.	Tank cleaning must be performed under Level B supplied air limiting productivity to 5 hours per day. Work must be performed under favorable weather conditions.

TABLE 9.2

BASIS, ASSUMPTIONS, AND CONSTRAINTS FOR DETAILED CLASS B COST ESTIMATE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Decommissioning Activity	Basis	Assumptions	Constraints
A.1.4	Building Demolition	Cost estimate based on GHD-approved demolition contractor's hourly equipment rates. Level of effort and duration of demolition based on volume estimates presented in Table 4.2 and Appendix B, GHD field observations, and past experience.	Work is planned with a single mobilization and the use of mechanical equipment such as high-reach excavators with shear attachments, excavators with demolition attachments such as grapples, concrete pulverizers, shears and drill hammers. Smaller equipment such as skid steers, loaders and dozers with demo attachments will also be utilized for sorting and loading debris. Work is sequenced to allow for interior stripout to occur in conjunction with demolition of support structures. Following interior stripout the Steam Plant demolition will commence, leaving only the existing floor slab and foundations. Stack demolition will occur only after enough of the Steam Plant superstructure has been demolished to create safe exclusion zones around the stacks to allow for set-up and use of mast climbers. The slab and foundations of the Steam Plant will be demolished after the stack demolition is complete. Non-union labor rates have been used to develop the cost estimate.	Winter conditions can limit productivity.
A.1.5	Stack Demolition	Cost estimate to clean the stacks based on previous Power Plant facility Decommissioning Studies. Cost to process stack material based on volume estimates presented in Appendix B. Cost estimate for demolition based on labor and equipment rates provided by GHD-approved demolition contractors and based on other Power facility Decommissioning Studies. Rates for mast climbing equipment provided specifically for this site by access equipment contractor located in Atlantic Canada.	Assumes that demolition of the stacks will occur by utilizing a combination of mast climbers and high reach equipment. Mast climbers will be used to allow workers and small demolition equipment to demolish the top 38 m of the stacks in approximately 1.5 m sections with the debris generated felled inside the stack for subsequent removal and crushing by heavy equipment. The remainder of the stacks (30 m for the New Stack and 23 m for the Old Stack) could then be demolished with a high reach excavator equipped with demolition attachments.	Winter conditions can limit productivity. Navigation beacons must be kept active until stack demolition occurs. An electrical reroute will be necessary. No cost is included to provide electrical service to the beacons by a contractor-supplied generator.
A.1.6	Material Disposal			
A.1.6.2 A.1.6.3	Raw Material, Consumable Products and Miscellaneous Containerized Materials	Cost is based on current processes and GHD's experience with similar size facilities and operations.	MECL will utilize a raw material inventory reduction program following the announced cessation of power generation. Bulk materials will be consumed. Contractor personnel will collect raw material to be recycled as part of decommissioning activities.	Materials in active use at the WWTP cannot be removed from service.
A.1.6.4	Universal Wastes	Cost is based on GHD's experience with similar size facilities and operations and quantities provided in Tables 4.2, 4.3 and Appendix B.	All ODS and mercury will be recycled. Light bulbs and ballasts will be properly disposed of as regulated wastes.	Universal wastes from decommissioning WWTP will require separate shipping.

TABLE 9.2

BASIS, ASSUMPTIONS, AND CONSTRAINTS FOR DETAILED CLASS B COST ESTIMATE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

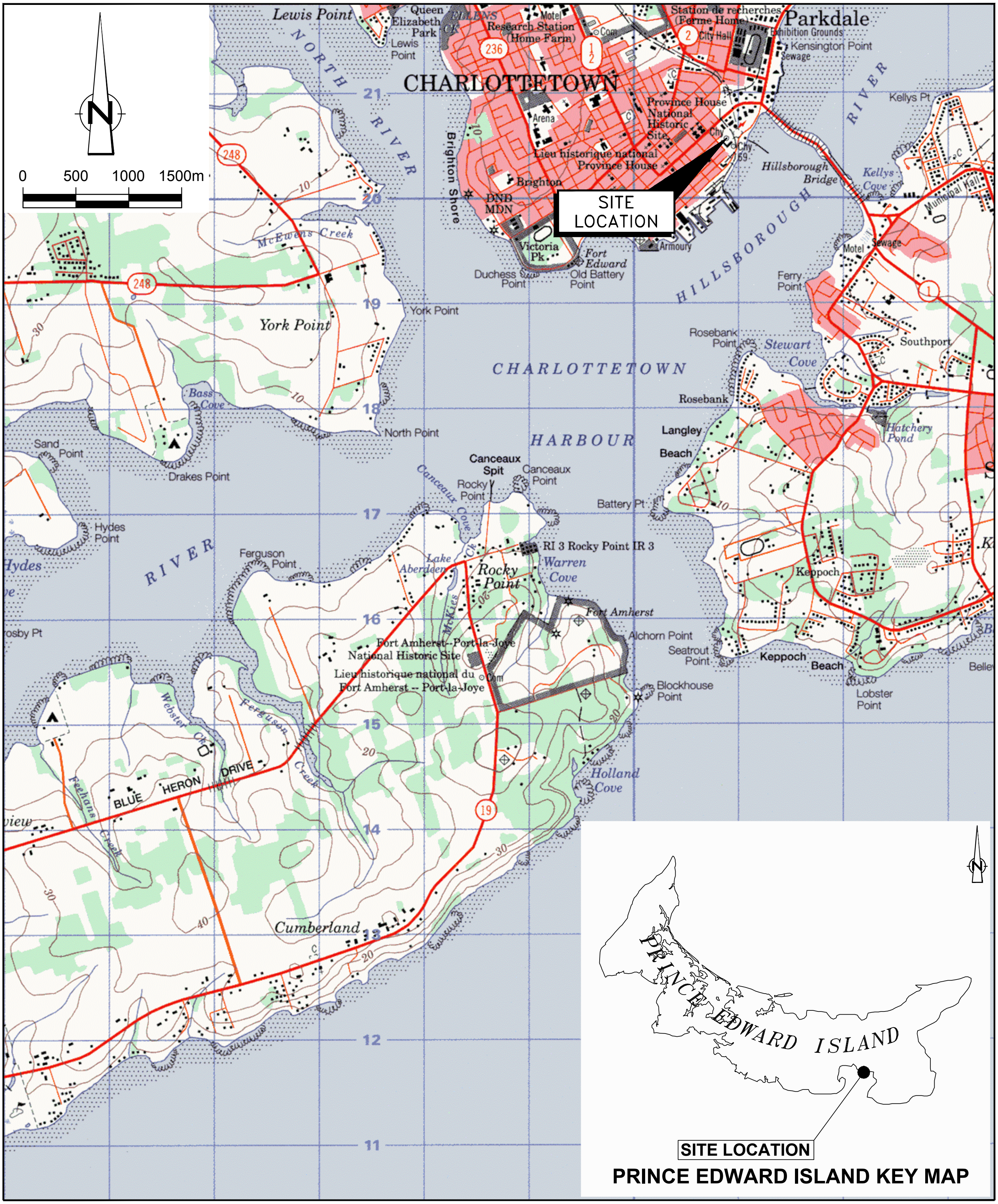
Item	Decommissioning Activity	Basis	Assumptions	Constraints
A.1.6.5	ACM Waste	Cost estimate is based on tipping fees from Wellington Landfill, trucking costs (from local contractor) and quantities provided in Table 4.2 and Appendix B1.	ACM waste will be double bagged and sealed for off-Site disposal at an approved facility (Wellington).	All ACM will be transported to and disposed of at an approved facility (Wellington). A permit for disposal will be required from the province prior to delivering any ACM to the landfill.
A.1.6.6	Bulk Solid Wastes	Cost is based on GHD's experience with similar size facilities and operations and volumes provided in Table 4.2 and Appendix B.	Bulk waste will be disposed of at an approved facility. Cost estimate is based on tipping fees and transportation costs.	None
A.1.6.7	Demolition Debris	Cost is based on tipping fees for demolition debris obtained from local C & D Facility, GHD's experience with similar size facilities and operations and volumes provided in Table 4.2 and Appendix B.	All demolition debris will be disposed of at an approved Construction and Demolition (C & D) Landfill.	None
A.1.6.8	Recyclable Materials	Cost is based on GHD's experience with similar size facilities and operations, scrap metal pricing data for the last 5 years provided by MECL and volumes provided in Table 4.2 and Appendix B.	Cost estimate uses the average level for scrap metal prices from the last 5-years (See Appendix E). Scrap values are currently rising so it is assumed that the scrap value being used for this current estimate is a conservative value.	Actual scrap values can vary significantly from year to year and will be determined by current market conditions at time of Facility decommissioning.
A.1.6.9	Decommissioning Cleaning Wastewater	Cost is based on GHD's experience with similar size facilities and operations.	Portable treatment system will be required to remove excess oils not able to be handled by current WWTP. Wastewater from cleaning bulk storage tanks will require pre-treatment prior to discharge to the on-Site WWTP. Costs are based on an estimated 500,000 liters.	None

TABLE 9.2

BASIS, ASSUMPTIONS, AND CONSTRAINTS FOR DETAILED CLASS B COST ESTIMATE
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Decommissioning Activity	Basis	Assumptions	Constraints
PART A2 - CIVIL INFRASTRUCTURE				
A.2.1	Site Services & Buried Process Piping	Cost estimate is based on civil drawings provided by MECL, local resources, and GHD's experience with facilities of similar size and operations.	Existing storm system will remain in place and functioning. Any watermain or sewer piping less than 24" in diameter will be abandoned in place. Watermains will be cut and capped at property boundaries.	None
A2.2	Circulating Water Lines	Cost estimate is based on civil drawings provided by MECL and GHD's experience with facilities of similar size and operations. Quotes for grouting obtained from Contractor.	CW Lines under main roadway and all 3rd party infrastructure will be filled with flowable grout. The remainder of the CW Lines will be dug-up and crushed (concrete lines) or removed (cast iron lines).	Placement of the material and daily production could be subject to tides.
A.2.3	Final Site Grading	Cost estimate is based on civil drawings provided by MECL and volumes provided in Table 4.2, Table 4.4 and Appendix B.	Elevation data provided assumed to be accurate for development of void/fill volume requirements.	None
PART A3 - ENVIRONMENTAL MITIGATION				
A.3.1	Allowances for Additional Soil/Groundwater Investigation	Cost estimate is based on findings of the Updated Phase II ESA and GHD's experience with facilities of similar size and operations.	Assumed that the primary exposure pathway impacted soil and groundwater on-Site is through volatilization to indoor air (PAHs only), direct soil contact/ingestion (metals only) and groundwater discharge to aquatic receptor (PAHs and metals). Assumed soil vapour sampling and additional groundwater monitoring along with off-Site delineation will indicate these pathways are at acceptable levels. Assumed metal impacted surface soil will be managed on-Site through risk assessment or capping and land management (if approved by PEICLE).	Quantity of potentially impacted soil/groundwater exceeding Tier I screening guidelines primarily based on results of the Updated Phase II ESA (GHD, 2018) did not include off-Site assessment of soil and groundwater conditions. Impacted soil and groundwater quantities to be confirmed following additional assessment.
A.3.2	Transportation and Recycling of Transformers (PCB Containing)	Cost estimate based on transformer data provided by MECL (see Appendix D), costing information obtained from licensed disposal/handling facilities and local crane company	Assumed PCB analytical results are accurate along with transformer weights and oil volumes.	If re-testing of oils at time of decommissioning indicate PCB concentrations >50 ppm, recycling of materials will not be permitted which will affect disposal requirements and costs
A.3.3	Transportation and Recycling of PILC (PCB Containing)	Cost estimate based on PILC data provided by MECL (see Figure 7A/7b and Appendix D) as well as costing information obtained from licensed disposal/handling facilities.	Assumed electrical drawings are correct as several lines could not be field validated. Also assume cable oils have PCBs >2 and <50 ppm based on analytical results from a single line (Updated Phase II ESA report).	If re-testing of cables at time of decommissioning indicate PCB concentrations >50 ppm, recycling of materials will not be permitted which will affect disposal requirements and costs

Appendix A (Decommissioning Study) Figures and Tables from Updated Phase II Environmental Site Assessment (GHD, 2018)



MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

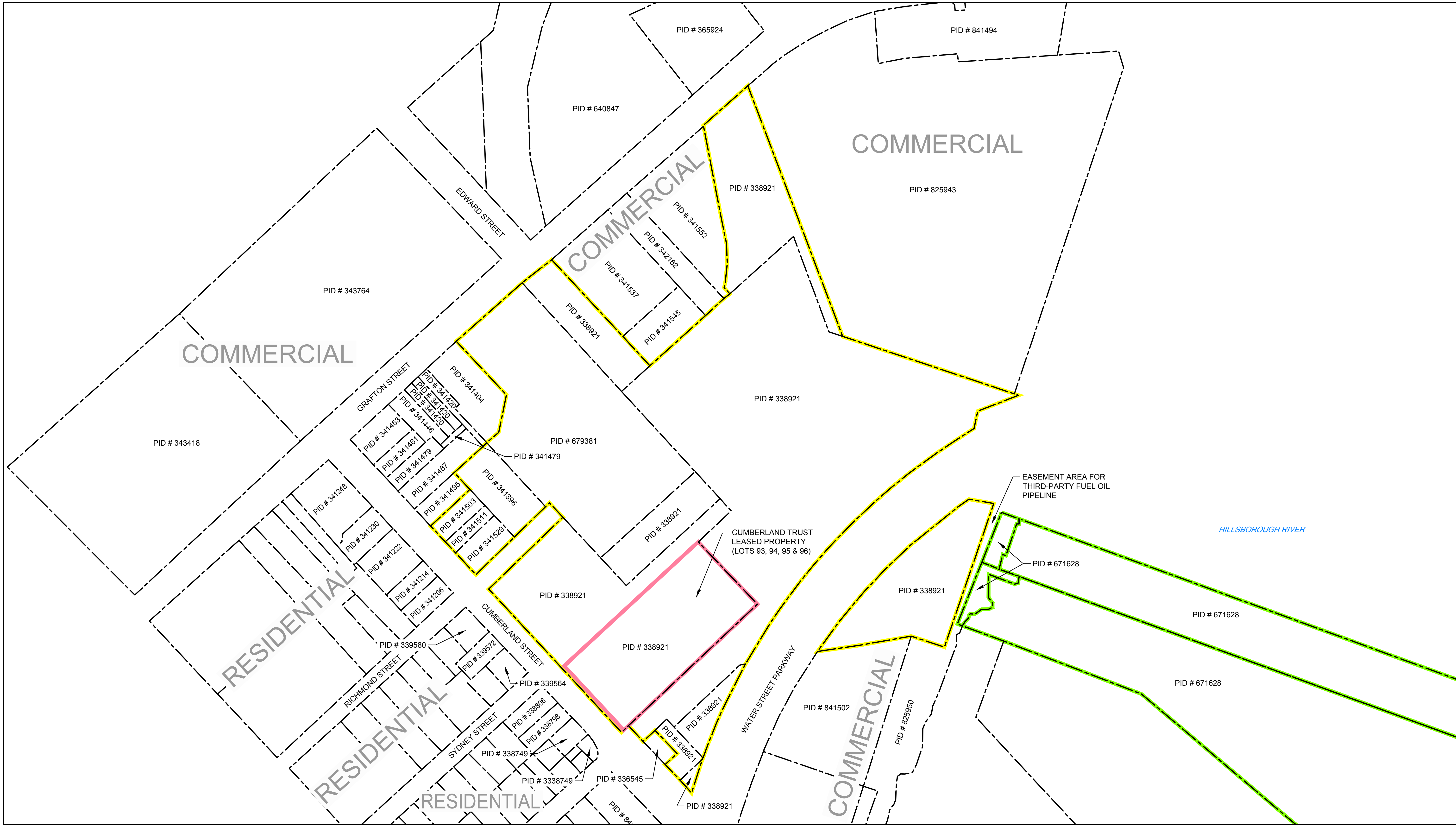
11149943-07(003)

Mar 19, 2018

SITE LOCATION

FIGURE 1

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR001.dwg



0 20 40 60m

N

LEGEND

SUBJECT SITE BOUNDARY
LEASED WATERLOT BOUNDARY
CUMBERLAND TRUST LEASED PROPERTY BOUNDARY
PROPERTY LINES

GHD

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

PROPERTY PLAN

11149943-07(003)
Mar 20, 2018

FIGURE 2

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR002.dwg

Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed January, 2018.

0 15 30 45m

LEGEND:

PROPERTY BOUNDARY (APPROX.)
TP2 / BH10 2002 HISTORICAL BOREHOLE / TESTPIT LOCATION
BH5-M 2002 HISTORICAL MONITOR WELL LOCATION
MW 2017 MONITOR WELL LOCATION
SP 2017 SOIL PROBE LOCATION
SS 2017 SURFACE SOIL SAMPLE LOCATION

NOTE: SOIL SAMPLE LOCATIONS SPECIFIC TO PCB ANALYSIS CORRESPOND TO TRANSFORMER PAD LOCATIONS SHOWN ON FIGURE 3B.

GHD

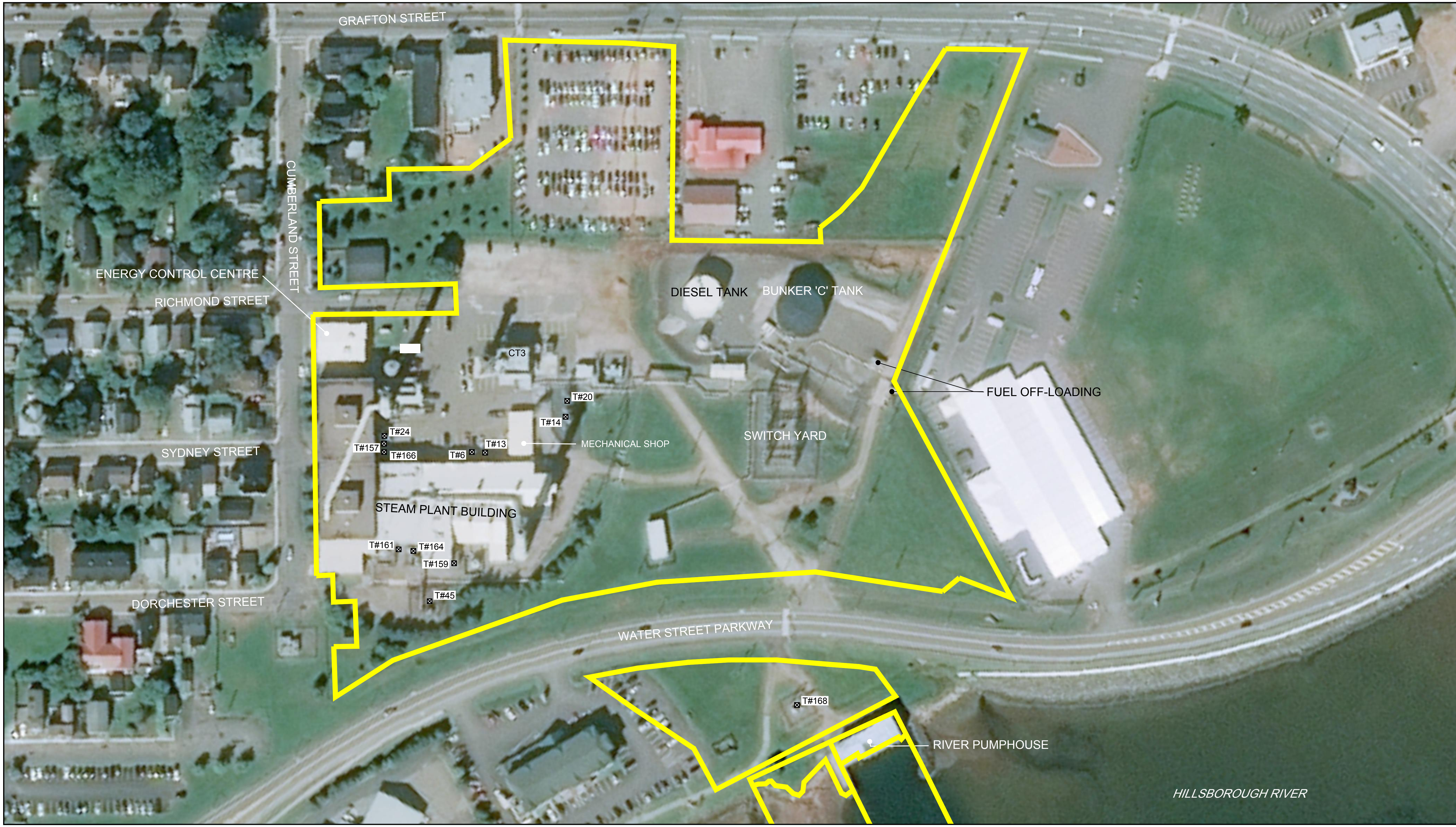
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

SITE PLAN WITH SAMPLE LOCATIONS
- SOIL AND GROUNDWATER

11149943-07(003)
Mar 19, 2018

FIGURE 3A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR003.dwg



Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed January, 2018.

0 15 30 45m

LEGEND:

PROPERTY BOUNDARY (APPROX.)

T#168 ⊠ TRANSFORMER PAD SAMPLE LOCATION

NOTE: SOIL SAMPLE LOCATIONS SPECIFIC TO PCB ANALYSIS CORRESPOND TO TRANSFORMER PAD LOCATIONS.

GHD

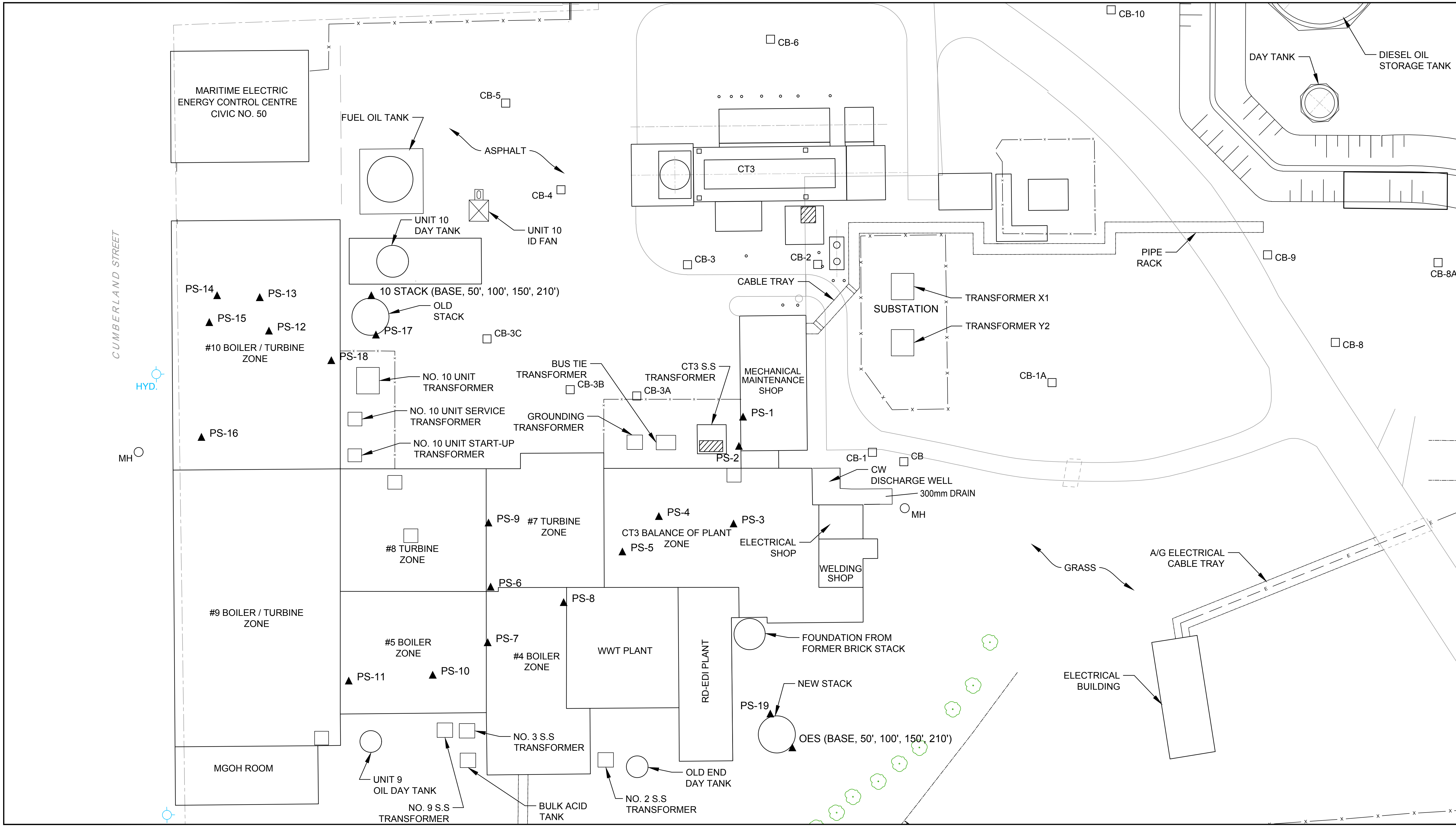
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

SITE PLAN WITH SAMPLE LOCATIONS
- TRANSFORMER PADS (CONCRETE)

11149943-07(003)
Mar 19, 2018

FIGURE 3B

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR003.dwg



0 5 10 15m

LEGEND:

PROPERTY LINE
EXISTING CULVERT
DITCH
EXISTING FENCE LINE

CB-1 EXISTING CATCHBASIN
MH EXISTING STORM MANHOLE
HYDRANT
TREE
PAINT SAMPLE LOCATION

GHD

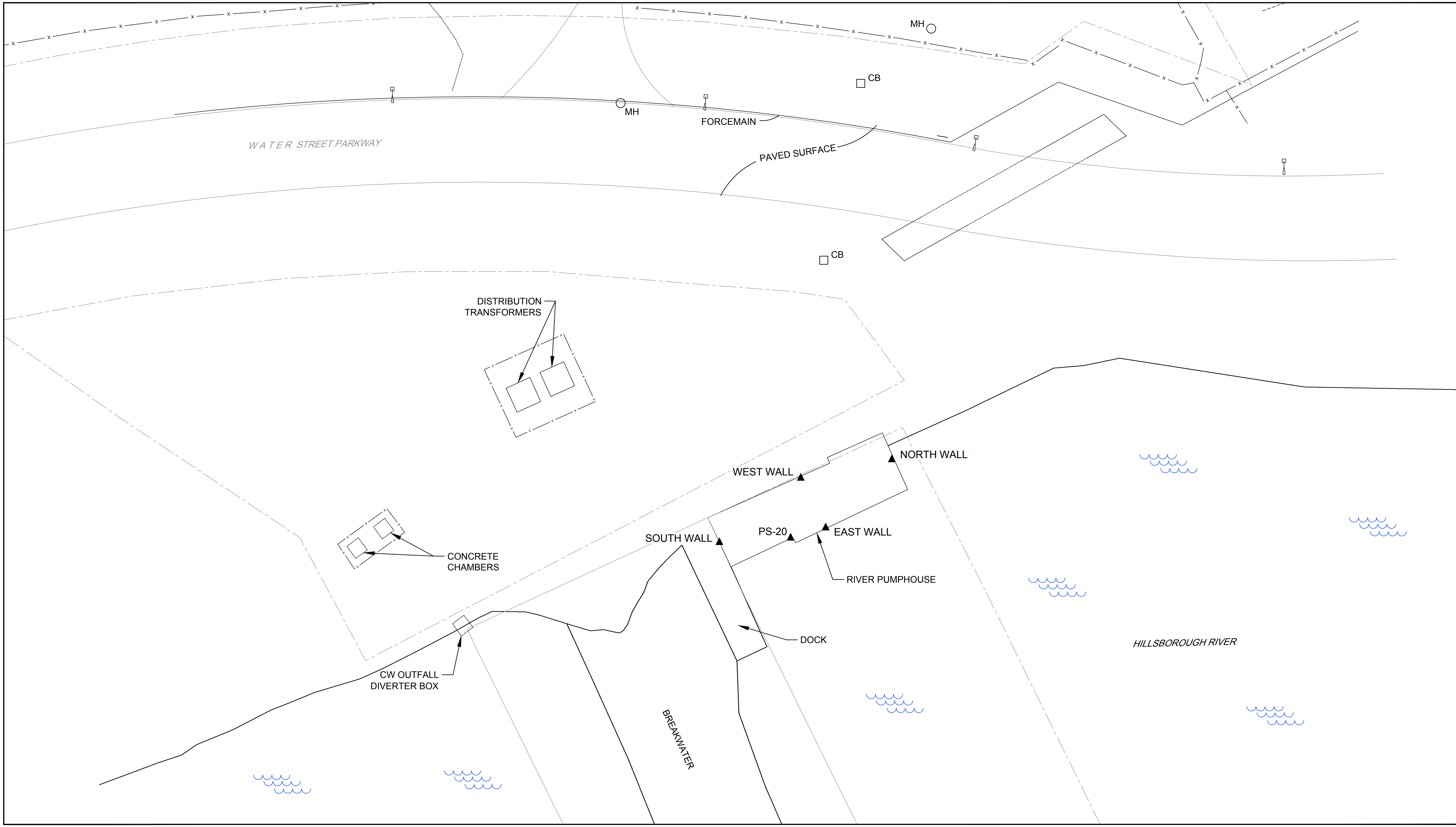
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Mar 19, 2018

SITE PLAN - PAINT SAMPLE LOCATIONS STEAM PLANT AREA

FIGURE 4A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR004.dwg



0 5 10 15m

LEGEND:

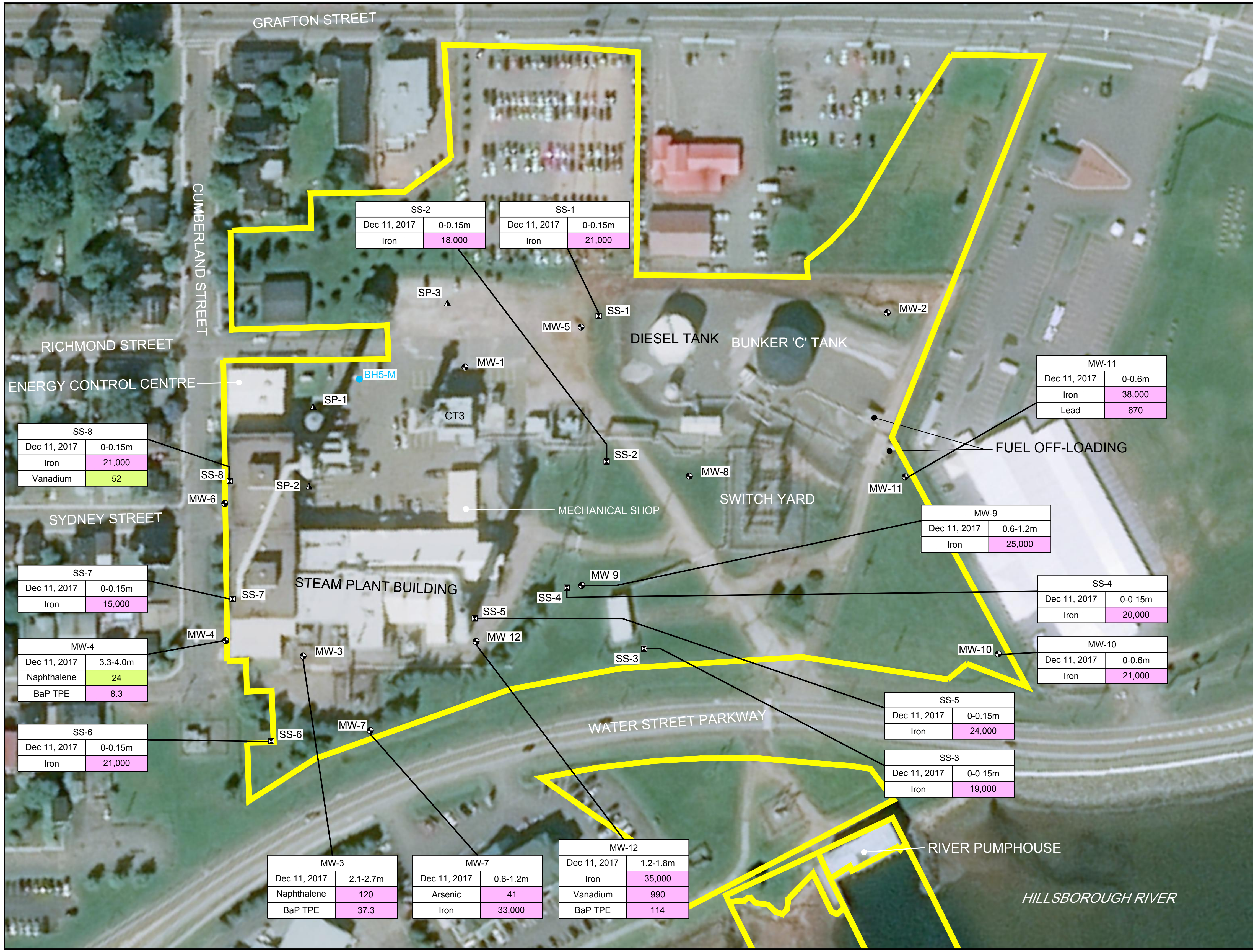
PROPERTY LINE
EXISTING CULVERT
DITCH
EXISTING FENCE LINE
EXISTING CATCHBASIN
EXISTING STORM MANHOLE
PAINT SAMPLE LOCATION

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Mar 19, 2018

SITE PLAN - PAINT SAMPLE LOCATIONS RIVER PUMPHOUSE AREA FIGURE 4B

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR004.dwg



REGULATORY CRITERIA (mg/kg)		
PARAMETER	CRITERIA 'a'	CRITERIA 'b'
Arsenic	31	31
Iron	11,000	11,000
Lead	260	140
Vanadium	160	39
Naphthalene	25	2.2
BaP TPE	5.3	5.3

'a' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR SOIL AT A NON-POTABLE SITE - COARSE SOIL TYPE, COMMERCIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'b' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR SOIL AT A NON-POTABLE SITE - COARSE SOIL TYPE, RESIDENTIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

CONCENTRATIONS IN SOIL EXCEEDING COMMERCIAL CRITERIA

CONCENTRATIONS IN SOIL EXCEEDING RESIDENTIAL CRITERIA

CONCENTRATIONS IN SOIL EXCEEDING COMMERCIAL AND RESIDENTIAL CRITERIA

0 15 30 45m

LEGEND:

- PROPERTY BOUNDARY (APPROX.)
- BH5-M 2002 HISTORICAL MONITOR WELL LOCATION
- MW 2017 MONITOR WELL LOCATION
- SP 2017 SOIL PROBE LOCATION
- SS 2017 SURFACE SOIL SAMPLE LOCATION

GHD

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Mar 19, 2018

SOIL EXCEEDENCES (mg/kg)

FIGURE 5

MW-12	Dec 13, 2017
Vanadium	1,600
Benzo(a)pyrene	40
Chrysene	47
Pyrene	56

MW-4	Dec 13, 2017
Benzo(a)pyrene	2.4
Chrysene	3.8
Pyrene	7.6

MW-7	Dec 13, 2017
1-Methylnaphthalene	260
Acenaphthene	150
Acenaphthylene	240
Benzo(a)pyrene	59
Chrysene	140
Fluoranthene	630
Fluorene	490
Naphthalene	450
Phenanthrene	1,300
Pyrene	410

MW-9	Dec 13, 2017
1-Methylnaphthalene	14
Benzo(a)pyrene	11
Chrysene	21
Pyrene	36

MW-10	Dec 13, 2017
Zinc	130

REGULATORY CRITERIA (µg/L)			
PARAMETER	CRITERIA 'a'	CRITERIA 'b'	CRITERIA 'c'
Vanadium	NG	NG	500
Zinc	NG	NG	100
1-Methylnaphthalene	38,000	6,200	10
Acenaphthene	NG	NG	60
Acenaphthylene	750	36	60
Benzo(a)pyrene	NG	NG	0.1
Chrysene	NG	NG	1
Fluoranthene	NG	NG	110
Fluorene	NG	NG	120
Naphthalene	7,000	600	14
Phenanthrene	NG	NG	46
Pyrene	NG	NG	0.2

'a' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR GROUNDWATER AT A NON-POTABLE SITE - COARSE SOIL TYPE, COMMERCIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'b' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR GROUNDWATER AT A NON-POTABLE SITE - COARSE SOIL TYPE, RESIDENTIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'c' - NOVA SCOTIA ENVIRONMENT (NSE) PATHWAY SPECIFIC STANDARDS (PSS) FOR GROUNDWATER (µg/L) - GROUNDWATER DISCHARGE TO SURFACE WATER - >10 METRES FROM SURFACE WATER BODY - DISCHARGE TO MARINE WATER (APRIL 2014) (ECOLOCICAL).

CONCENTRATIONS IN GROUNDWATER EXCEEDING ECOLOGICAL CRITERIA

Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed February, 2018.

0 15 30 45m

LEGEND:

PROPERTY BOUNDARY (APPROX.)
BH5-M 2002 HISTORICAL MONITOR WELL LOCATION
MW 2017 MONITOR WELL LOCATION

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Feb 27, 2018

GROUNDWATER EXCEEDENCES (µg/L)

FIGURE 6

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR006.dwg

Table 1

Groundwater Elevations
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Monitor Well ID	Measured Monitor Well Depth (mbgs)	Eastings	Northings	Elevation Top of Casing (masl)	Ground Elevation (masl)	Monitor Well Stick-up above Ground Surface (m)	Subsurface Vapour Concentration (PPM)	Free Phase Product Thickness (mm)	Static Water Level (m below TOC)	Static Water Level (mbgs)	Groundwater Elevation (masl)
December 14, 2017											
MW-1	4.55	490858.8	5120605.4	2.13	2.23	0	150	0	1.85	1.95	0.28
MW-2	4.35	490958.3	5120721.1	3.50	2.81	0.69	35	0	0.87	0.18	2.63
MW-3	5.53	490884.9	5120489.6	2.24	2.37	0	150	0	1.12	1.25	1.12
MW-4	4.96	490858.9	5120473.2	1.80	1.87	0	70	0	1.37	1.44	0.43
MW-5	5.91	490880.1	5120643.9	2.50	2.59	0	0	0	2.22	2.36	0.23
MW-6	5.80	490826.0	5120509.9	2.35	2.50	0	860	0	2.05	2.20	0.30
MW-7	5.26	490920.7	5120485.8	2.30	2.44	0	520	0	1.85	1.99	0.45
MW-8	5.78	490944.7	5120630.1	2.66	2.75	0	100	0	1.73	1.82	0.93
MW-9	5.95	490942.3	5120575.2	4.48	4.55	0	55	0	3.69	3.76	0.79
MW-10	4.43	491069.7	5120656.9	2.75	2.83	0	45	0	0.46	0.54	2.29
MW-11	4.45	491002.4	5120681.8	3.71	3.78	0	95	0	2.10	2.17	1.61
MW-12	5.62	490927.6	5120534.9	1.77	1.88	0	300	0	1.44	1.55	0.33
BH5-M	9.08	490833.5	5120576.8	2.04	2.14	0	0	0	1.89	1.99	0.15
SP-1	---	490831.0	5120555.0	---	0.92	---	---	0	---	---	---
SP-2	---	490846.0	5120536.0	---	0.91	---	---	0	---	---	---
SP-3	---	490839.0	5120618.0	---	1.07	---	---	0	---	---	---

Notes: Assigned Benchmark Elevation of 3m (north corner of the CT3 Generator concrete pad)

TOC Top of Casing
masl Metres Above Sea Level
mbgs Metres Below Ground Surface
--- Not Applicable

Eastings and Northings taken in the NBNAD83 coordinate system.

Table 2

Soil Analytical Results - Petroleum Hydrocarbons
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Petroleum Hydrocarbons			Benzene	Toluene	Ethylbenzene	Total Xylenes	F1 C_6 - C_{10} (less BTEX)	F2 $>C_{10}$-C_{16}	F3 $>C_{16}$-C_{21}	F3 $>C_{21}$-$<C_{32}$	mTPH	Hydrocarbon Resemblance
Atlantic RBCA Tier I RBSLs - Commercial, Non-Potable, Coarse Grained [1]			2.5	10,000	10,000	110	NG	NG	NG	NG	870	Gasoline
											4,000	Diesel/No. 2 Fuel Oil
											10,000	No. 6 Oil/Lube Oil
Atlantic RBCA Tier I RBSLs - Residential, Non-Potable, Coarse Grained [2]			0.099	77	30	8.8	NG	NG	NG	NG	74	Gasoline
											270	Diesel/No. 2 Fuel Oil
											1,100	No. 6 Oil/Lube Oil
Sample ID	**Sample Depth (m)**	**Sample Date**										
SP-1	**2.4-3.0**	12/11/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
SP-2	**2.1-2.7**	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
SP-2	**3.3-4.0**	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
SP-3	**2.4-3.0**	12/12/2017	<0.025	0.13	<0.025	0.14	<2.5	<10	<10	<15	<15	-
MW-1	**2.7-3.3**	12/11/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-1 Lab Dup	**2.7-3.3**	12/11/2017	-	-	-	-	-	<10	<10	<15	-	-
MW-2	**4.9-5.5**	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-3	**2.1-2.7**	12/13/2017	0.11	0.24	<0.025	0.25	<2.5	750	930	1000	2700	One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
MW-3	**4.6-5.2**	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-4 [3]	**3.3-4.0**	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	180	240	310	720	One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
MW-5	**3.0-3.7**	12/12/2017	0.039	0.14	<0.025	0.15	<2.5	<10	<10	<15	<15	-
MW-6 [3]	**2.7-3.3**	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-7	**2.4-3.0**	12/13/2017	0.078	0.20	<0.025	0.10	<2.5	<10	<10	<15	<15	-
MW-7	**3.7-4.3**	12/13/2017	<0.025	0.070	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-8	**3.7-4.3**	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-8	**4.9-5.5**	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-9	**3.0-3.7**	12/13/2017	0.27	0.89	0.066	0.92	7.0	31	59	220	320	One product in fuel oil range. Lube oil fraction.
MW-9	**4.9-5.5**	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	14	46	74	130	One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
MW-10	**0.6-1.2**	12/13/2017	<0.025	0.070	0.29	1.7	65	800	1300	1500	3600	Weathered fuel oil fraction. Lube oil fraction.
MW-10	**4.3-4.9**	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	36	36	Possible lube oil fraction.
MW-11	**1.8-2.4**	12/13/2017	<0.025	0.071	<0.025	<0.050	<2.5	<10	13	38	51	Possible lube oil fraction.
MW-12	**4.9-5.5**	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-

Notes:

[1] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Soil - Commercial Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)

[2] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Soil - Residential Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)

[3] Soil Samples are compared to Atlantic RBCA Tier I RBSLs for Residential Land Use as residential properties are located adjacent to MW-4 and MW-6.

Results for all parameters are reports in milligrams per kilogram (mg/kg)

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

NG - No Guideline

m - Metres

mTPH - Modified Total Petroleum Hydrocarbons

BOLD/UNDERLINE - Exceeds commercial criteria

SHADING - Exceeds residential criteria

Table 3

Soil Analytical Results - Metals
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	Sample ID	SS-1	SS-2	SS-3	SS-4	SS-4 Lab Dup	SS-5	SS-6 [3]	SS-7 [3]	SS-8 [3]	MW-7	MW-9	MW-10	MW-11	MW-12	SPOIL PILE
				Sample Depth (m)	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.6-1.2**	**0.6-1.2**	**0.0-0.6**	**0.0-0.6**	**1.2-1.8**	**-**
				Sample Date	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/12/2017	12/15/2017
Aluminum	mg/kg	15,400	15,400		9900	7600	8600	8800	9100	7200	9600	6000	11000	4600	8000	9300	9900	13000	3500
Antimony	mg/kg	63	7.5		<2.0	<2.0	2.7	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.7	<2.0	<2.0	3.0	<2.0	<2.0
Arsenic	mg/kg	31	31		4.3	3.1	4.3	5.0	5.2	3.5	3.6	3.5	3.5	**<u>41</u>**	18	5.2	31	19	3.8
Barium	mg/kg	15,000	10,000		45	21	29	48	53	27	30	27	26	110	110	32	320	120	12
Beryllium	mg/kg	320	38		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bismuth	mg/kg	NG	NG		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	mg/kg	24,000	4,300		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	mg/kg	49	14		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.38	<0.30	1.1	0.36	<0.30
Chromium	mg/kg	630	220		19	14	16	17	18	27	20	13	19	12	18	18	28	26	9.0
Cobalt	mg/kg	250	22		7.9	5.7	6.6	6.6	6.9	8.0	7.3	5.1	7.4	4.7	7.2	7.5	9.5	10	3.2
Copper	mg/kg	4,000	1,100		11	9.3	13	16	17	27	12	8.9	13	25	35	14	76	77	6.3
Iron	mg/kg	11,000	11,000		**<u>21000</u>**	**<u>18000</u>**	**<u>19000</u>**	**<u>20000</u>**	**<u>20000</u>**	**<u>24000</u>**	**<u>21000</u>**	**<u>15000</u>**	**<u>21000</u>**	**<u>33000</u>**	**<u>25000</u>**	**<u>21000</u>**	**<u>38000</u>**	**<u>35000</u>**	10000
Lead	mg/kg	260	140		16	11	31	64	69	18	25	16	14	87	130	36	**<u>670</u>**	62	9.2
Lithium	mg/kg	NG	NG		22	20	21	22	23	13	22	15	22	10	20	24	21	21	10
Manganese	mg/kg	NG	NG		560	370	480	440	430	530	480	340	400	220	450	450	700	480	190
Mercury	mg/kg	24	6.6		<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	0.29	<0.10	0.67	0.27	<0.10
Molybdenum	mg/kg	1,200	110		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	5.7	3.6	<2.0	4.3	5.3	<2.0
Nickel	mg/kg	2,200	330		17	14	18	21	21	29	17	13	20	19	26	18	25	180	24
Rubidium	mg/kg	NG	NG		9.7	6.7	8.5	8.8	8.9	4.0	10	5.9	11	5.2	7.1	9.3	9.8	5.1	2.7
Selenium	mg/kg	125	80		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.3	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	mg/kg	490	77		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50
Strontium	mg/kg	9,400	9,400		13	<5.0	7.0	7.9	8.3	20	6.4	6.3	6.2	33	24	7.5	37	64	<5.0
Thallium	mg/kg	1	1		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.40	0.19	<0.10	0.31	0.13	<0.10
Tin	mg/kg	9,400	9,400		<2.0	<2.0	<2.0	2.6	5.8	<2.0	<2.0	6.4	<2.0	4.3	4.3	<2.0	24	4.5	<2.0
Uranium	mg/kg	33	23		1.0	0.57	0.54	0.55	0.57	0.73	0.57	0.72	0.90	0.36	0.58	0.71	0.71	0.81	0.26
Vanadium	mg/kg	160	39		25	24	50	59	62	73	25	20	52	75	83	34	35	**<u>990</u>**	77
Zinc	mg/kg	47,000	5,600		64	38	64	100	100	650	78	47	56	94	200	61	450	280	25

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Residential Land Use (July 6, 2013)

[3] Soil Samples are compared to NSE Tier I EQS for Residential Land Use as residential properties are located adjacent to SS-6, SS-7 and SS-8.

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

NG - No Guideline

<u>BOLD/UNDERLINE</u> - Exceeds commercial criteria

SHADING - Exceeds residential/parkland criteria where applicable

Table 4

Soil Analytical Results - Polyaromatic Hydrocarbons (PAHs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PAHs	Units	RDL	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	CCME PEFs [for B(a)P TPE calculations - NOT Guidelines] [3]	Sample ID	MW-3	MW-4 [3]	MW-7	MW-9	MW-10	MW-12
						Sample Depth (m)	2.1-2.7	3.3-4.0	2.4-3.0	0.6-1.2	0.6-1.2	1.2-1.8
						Sample Date	12/13/2017	12/12/2017	12/13/2017	12/13/2017	12/13/2017	12/12/2017
1-Methylnaphthalene	mg/kg	0.01	560	72			46	9.2	<0.010	0.083	1.7	0.65
2-Methylnaphthalene	mg/kg	0.01	560	72			36	2.9	<0.010	0.11	2.0	1.0
Acenaphthene	mg/kg	0.01	8,000	3,900			12	2.6	<0.010	0.083	0.77	5.1
Acenaphthylene	mg/kg	0.01	66	4.5			4.1	3.0	<0.010	0.018	0.099	0.36
Anthracene	mg/kg	0.01	37,000	24,000			61	9.1	<0.010	0.23	0.32	16
Benzo(a)anthracene	mg/kg	0.01	NG	NG	0.1		30	6.9	<0.010	0.63	<0.17	67
Benzo(a)pyrene	mg/kg	0.01	NG	NG	1		25	5.8	<0.010	0.75	0.13	58
Benzo(b)fluoranthene	mg/kg	0.01	NG	NG	0.1		18	3.5	<0.010	0.71	<0.13	69
Benzo(b/j)fluoranthene	mg/kg	0.02	NG	NG			31	6.8	<0.020	1.1	<0.19	120
Benzo(g,h,i)perylene	mg/kg	0.01	NG	NG	0.01		9.7	1.6	<0.010	0.37	0.083	56
Benzo(j)fluoranthene	mg/kg	0.01	NG	NG	0.1		13	3.4	<0.010	0.44	<0.060	50
Benzo(k)fluoranthene	mg/kg	0.01	NG	NG	0.1		13	2.8	<0.010	0.48	0.034	50
Chrysene	mg/kg	0.01	NG	NG	0.01		26	5.6	<0.010	0.68	<0.30	53
Dibenz(a,h)anthracene	mg/kg	0.01	NG	NG	1		3.6	0.62	<0.010	0.091	<0.030	25
Fluoranthene	mg/kg	0.01	5,300	3,500			85	16	<0.010	1.1	0.37	72
Fluorene	mg/kg	0.01	4,100	2,700			59	14	<0.010	0.070	1.5	5.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.01	NG	NG	0.1		9.7	1.7	<0.010	0.31	0.026	62
Naphthalene	mg/kg	0.01	25	2.2			**120**	24	<0.010	0.075	0.26	1.7
Perylene	mg/kg	0.01	NG	NG			5.8	1.1	<0.010	0.18	0.091	24
Phenanthrene	mg/kg	0.01	NG	NG			160	28	0.020	0.80	3.9	42
Pyrene	mg/kg	0.01	3,200	2,100			50	11	<0.010	0.96	0.39	58
BaP TPE	mg/kg	-	5.3	5.3			**37.3**	**8.3**	0.01	1.1	0.17	**114**

Notes:
[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)
[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Residential Land Use (July 6, 2013)
[3] Soil Samples are compared to NSE Tier I EQS for Residential Land Use as residential properties are located adjacent to MW-4.
BaP TPE - Benzo(a)pyrene Total Potency Equivalents
NG - No Guideline
BOLD/UNDERLINE - Exceeds commercial criteria
SHADING - Exceeds residential criteria

Table 5

Soil Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T#6-1	T#6-2	T#13-1	T#13-2	T#14-1	T#14-2	T#20-1	T#20-2	T#24-1
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1260	µg/g	NG		0.19	<0.050	<0.050	0.079	<0.050	<0.050	0.14	<0.050	0.071
Calculated Total PCB	µg/g	33		0.19	<0.050	<0.050	0.079	<0.050	<0.050	0.14	<0.050	0.071

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

PCB - Polychlorinated Biphenyls

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

Sample locations for surface soil samples collected for PCB analysis correspond to the transformer pad locations shown on Figure 3b.

Table 5

Soil Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T#24-2	T#45-1	T#45-2	T#157-1	T#157-2	T#159-1	T#159-2	T#159-2 Lab Dup	T#161-1
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1260	µg/g	NG		1.0	<0.050	<0.050	<0.050	<0.050	<0.050	0.87	0.86	0.079
Calculated Total PCB	µg/g	33		1.0	<0.050	<0.050	<0.050	<0.050	<0.050	0.87	-	0.079

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

PCB - Polychlorinated Biphenyls

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

Sample locations for surface soil samples collected for PCB analysis correspond to the transformer pad locations shown on Figure 3b.

Table 5

Soil Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T#161-2	T#164-1	T#164-2	T#166-1	T#166-2	T#168-1	T#168-2
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1260	µg/g	NG		0.62	0.19	0.25	0.095	0.65	<0.050	<0.050
Calculated Total PCB	µg/g	33		0.62	0.19	0.25	0.095	0.65	<0.050	<0.050

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

PCB - Polychlorinated Biphenyls

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

Sample locations for surface soil samples collected for PCB analysis correspond to the transformer pad locations shown on Figure 3b.

Table 6

Groundwater Analytical Results - Petroleum Hydrocarbons
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Petroleum Hydrocarbons		Benzene	Toluene	Ethylbenzene	Total Xylenes	F1	F2	F3		Modified TPH	Hydrocarbon Resemblance
						C_6 - C_{10} (less BTEX)	$>C_{10}$-C_{16}	$>C_{16}$-C_{21}	$>C_{21}$-$<C_{32}$		
Atlantic RBCA Tier I RBSLs - Commercial, Non-Potable, Coarse Grained [1]		20	20	20	20	NG	NG	NG	NG	20	Gasoline
										20	Diesel/No. 2 Fuel Oil
										20	No. 6 Oil/Lube Oil
Atlantic RBCA Tier I RBSLs - Residential, Non-Potable, Coarse Grained [2]		2.6	20	20	20	NG	NG	NG	NG	20	Gasoline
										20	Diesel/No. 2 Fuel Oil
										20	No. 6 Oil/Lube Oil
Atlantic RBCA Tier 1 ESLs - Protection of Plants and Invertebrates [3]		350	200	110	120	11	3.1	NG		NG	-
Atlantic RBCA Tier 1 ESLs - Protection of Marine Aquatic Life - 50 m to Surface Water [4]		17	15	11	10	NG	NG	NG	NG	22	Gas
										6	Diesel/#2
										22	#6 Oil/Lube
Sample ID	**Sample Date**										
MW-1	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-2	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-3	12/15/2017	<0.0010	<0.0010	<0.0010	0.011	0.064	1.0	0.19	<0.10	1.3	One product in fuel oil range. Unidentified compound(s) in fuel oil range.
MW-4 [5]	12/15/2017	<0.0010	<0.0010	<0.0010	0.0032	<0.010	0.060	<0.050	<0.10	<0.10	
MW-5	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-6 [5]	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	0.017	<0.050	<0.050	<0.10	<0.10	
MW-7	12/15/2017	0.0075	0.0095	0.0043	0.024	0.084	2.7	0.70	0.19	3.7	One product in fuel oil range. Unidentified compound(s) in fuel oil range.
MW-8	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.052	0.084	<0.10	0.14	One product in fuel oil range.
MW-9	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.23	0.28	0.16	0.67	One product in fuel oil range. Unidentified compound(s) in fuel oil range.
MW-10	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.11	0.18	0.13	0.43	One product in fuel / lube range.
MW-11	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-12	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.081	0.27	0.27	0.62	One product in fuel / lube range.
BH-5	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	

Notes:

[1] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Groundwater - Commercial Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)

[2] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Groundwater - Residential Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)

[3] Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Ecological Screening Levels (ESLs) for Plant and Invertebrate Direct Contact with Shallow Groundwater - Commercial Land Use, Coarse-Grained Soil Type (July 2012, revised January 2015) - only applicable to groundwater present within 3 metres of ground surface

[4] Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Groundwater Ecological Screening Levels (ESLs) for Protection of Marine Aquatic Life - Distance to Surface Water of 50 metres (MW-10 is closest monitoring well) (July 2012, revised January 2015)

[5] Groundwater Samples are compared to Atlantic RBCA Tier I RBSLs for Residential Land Use as the residential properties are located adjacent to MW-4 and MW-6.

Results for all parameters are reports in milligrams per liter (mg/L)

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

SHADING - Exceeds residential criteria

Table 7

Groundwater Analytical Results - Metals
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	NSE PSS - Discharge to Surface Water - >10 m from Marine Surface Water Body [3]	Sample ID	MW-4	MW-4 Lab Dup	MW-7	MW-9	MW-10	MW-12
					Sample Date	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017
Aluminum	µg/L	NG	NG	NG		<5.0	<5.0	370	28	45	<50
Antimony	µg/L	NG	NG	5,000		2.2	2.2	1.6	<1.0	<1.0	<10
Arsenic	µg/L	NG	NG	125		1.8	1.8	3.7	<1.0	<1.0	<10
Barium	µg/L	NG	NG	5,000		100	110	10	43	15	61
Beryllium	µg/L	NG	NG	1,000		<1.0	<1.0	<1.0	<1.0	<1.0	<10
Bismuth	µg/L	NG	NG	NG		<2.0	<2.0	<2.0	<2.0	<2.0	<20
Boron	µg/L	NG	NG	12,000		<50	<50	180	160	200	1100
Cadmium	µg/L	NG	NG	1.2		0.21	0.22	0.026	<0.010	0.33	<0.10
Calcium	µg/L	NG	NG	NG		140000	140000	2700	82000	180000	110000
Chromium	µg/L	NG	NG	NG		<1.0	<1.0	3.7	<1.0	1.2	<10
Cobalt	µg/L	NG	NG	NG		1.4	1.4	0.91	1.8	3.4	<4.0
Copper	µg/L	NG	NG	20		<2.0	<2.0	<2.0	<2.0	2.3	<20
Iron	µg/L	NG	NG	NG		<50	<50	1800	4800	3800	<500
Lead	µg/L	NG	NG	20		<0.50	<0.50	1.6	<0.50	<0.50	<5.0
Magnesium	µg/L	NG	NG	NG		27000	27000	230	28000	19000	190000
Manganese	µg/L	NG	NG	NG		210	200	780	4000	1300	720
Mercury	µg/L	NG	NG	0.16		<0.013	NA	<0.013	<0.013	<0.013	<0.013
Molybdenum	µg/L	NG	NG	NG		17	19	17	<2.0	4.0	65
Nickel	µg/L	NG	NG	83		2.1	<2.0	3.0	3.4	13	40
Phosphorus	µg/L	NG	NG	NG		<100	<100	360	<100	<100	<1000
Potassium	µg/L	NG	NG	NG		11000	11000	2500	11000	9800	83000
Selenium	µg/L	NG	NG	20		<1.0	<1.0	1.1	<1.0	<1.0	<10
Silver	µg/L	NG	NG	15		<0.10	<0.10	<0.10	<0.10	<0.10	<1.0
Sodium	µg/L	NG	NG	NG		1000000	1000000	260000	81000	23000	1900000
Strontium	µg/L	NG	NG	NG		460	450	9.9	260	240	1100
Thallium	µg/L	NG	NG	213		<0.10	<0.10	<0.10	<0.10	<0.10	<1.0
Tin	µg/L	NG	NG	NG		2.9	3.1	10	<2.0	2.1	<20
Titanium	µg/L	NG	NG	NG		<2.0	<2.0	29	<2.0	<2.0	<20
Uranium	µg/L	NG	NG	1,000		2.4	2.4	0.88	0.30	0.33	1.9
Vanadium	µg/L	NG	NG	500		130	130	31	<2.0	3.6	1600
Zinc	µg/L	NG	NG	100		<5.0	<5.0	5.1	13	130	<50

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Commercial Land Use (July 6, 2013)

[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Residential Land Use (July 6, 2013)

[3] Nova Scotia Environment (NSE) Pathway Specific Standards (PSS) for Groundwater - Groundwater Discharging to Surface Water, >10 metres from Surface Water Body, Discharge to Marine Water (April 2014)

Lab Dup - Laboratory Duplicate

NG - No Guideline

<u>BOLD/UNDERLINE</u> - Exceeds commercial/residential criteria

SHADING - Exceeds NSE PSS

Table 8

Groundwater Analytical Results - Polyaromatic Hydrocarbons (PAHs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PAHs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	NSE PSS - Discharge to Surface Water - >10 m from Marine Surface Water Body [3]	Sample ID	MW-4 [4]	MW-4 Lab Dup [4]	MW-7	MW-9	MW-10	MW-12
					Sample Date	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017
1-Methylnaphthalene	µg/L	38,000	6,200	10		3.4	3.5	260	14	0.54	0.80
2-Methylnaphthalene	µg/L	38,000	6,200	20		0.93	0.99	17	1.5	0.58	0.81
Acenaphthene	µg/L	NG	NG	60		1.5	1.6	150	9.6	0.25	3.5
Acenaphthylene	µg/L	750	36	60		2.0	2.1	240	24	<0.050	1.0
Anthracene	µg/L	NG	NG	NG		6.0	6.7	590	33	0.19	26
Benzo(a)anthracene	µg/L	NG	NG	NG		4.3	4.4	150	23	0.068	49
Benzo(a)pyrene	µg/L	NG	NG	0.1		2.4	2.3	59	11	0.047	40
Benzo(b)fluoranthene	µg/L	NG	NG	NG		1.6	1.7	40	7.7	0.041	27
Benzo(b/j)fluoranthene	µg/L	NG	NG	NG		2.8	NA	70	13	0.058	47
Benzo(g,h,i)perylene	µg/L	NG	NG	NG		0.81	0.79	20	3.5	0.029	17
Benzo(j)fluoranthene	µg/L	NG	NG	NG		1.2	1.2	29	5.3	0.018	20
Benzo(k)fluoranthene	µg/L	NG	NG	NG		1.2	1.1	29	5.3	0.013	20
Chrysene	µg/L	NG	NG	1		3.8	4.0	140	21	0.12	47
Dibenz(a,h)anthracene	µg/L	NG	NG	NG		0.41	0.36	8.5	1.7	0.010	7.7
Fluoranthene	µg/L	NG	NG	110		11	11	630	49	0.14	74
Fluorene	µg/L	NG	NG	120		5.8	6.1	490	34	0.38	5.2
Indeno(1,2,3-cd)pyrene	µg/L	NG	NG	NG		0.94	0.90	22	3.9	<0.020	19
Naphthalene	µg/L	7,000	600	14		4.8	5.5	450	8.0	<0.20	0.82
Perylene	µg/L	NG	NG	NG		0.45	0.46	12	2.4	0.022	9.3
Phenanthrene	µg/L	NG	NG	46		13	14	1300	72	1.3	38
Pyrene	µg/L	NG	NG	0.2		7.6	8.0	410	36	0.17	56

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Commercial Land Use (July 6, 2013)

[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Residential Land Use (July 6, 2013)

[3] Nova Scotia Environment (NSE) Pathway Specific Standards (PSS) for Groundwater - Groundwater Discharging to Surface Water, >10 metres from Surface Water Body, Discharge to Marine Water (April 2014)

[4] Groundwater Samples are compared to NSE Tier I EQS for Groundwater - Non-Potable Coarse-Grained Soil, Residential Land Use as residential properties are located adjacent to MW-4.

Lab Dup - Laboratory Duplicate

NA - Not Analyzed

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial/residential criteria

SHADING - Exceeds NSE PSS

Table 9a

Paint Analytical Results - Metal Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	**Units**	**Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)**	**Sample ID**	**PS-6**	**PS-7**	**PS-9**	**PS-10**	**PS-11**	**PS-13**	**PS-14**	**PS-15**	**PS-16**
			Sample Date	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017
			Colour	Old Grey	New Grey	Yellow	Blue	Green	Green	Blue	Orange	Black
			Substrate	Paint - Steel H Beam-Stairs	Paint - Steel H Beam Supports	Paint - Steel Hand Rail	Paint - Steel Blower	Paint - Steel Reserve Tank	Paint - Steel Pedestal Valve	Paint - Steel Pedestal Valve	Paint - Steel Pedestal Valve	Paint - CW Pipe
			Location	Basement	Basement	Basement	Basement	Basement	Unit 10	Unit 10	Unit 10	Basement
Lead	mg/kg	1,000		**<u>1800</u>**	**<u>4300</u>**	520	**<u>1800</u>**	**<u>1400</u>**	**<u>4200</u>**	**<u>2200</u>**	**<u>5600</u>**	670
Lead Leachate	mg/L	5		0.58	3.6	0.16	NA	0.3	NA	NA	NA	NA
Zinc	mg/kg	1,500		**<u>6700</u>**	630	**<u>8300</u>**	**<u>7300</u>**	**<u>2000</u>**	620	1100	850	240
Zinc Leachate	mg/L	500		38	5	55	NA	51	NA	NA	NA	NA

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9a

Paint Analytical Results - Metal Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	PS-16 Lab Dup	PS-16 Lab Dup	PS-18	PS-20	Eastwall (Steel)	Northwall (Steel)	Southwall (Steel)	Westwall (Steel)
			Sample Date	12/13/2017	12/13/2017	12/13/2017	12/13/2017	1/15/2018	1/15/2018	1/15/2018	1/15/2018
			Colour	Black	Black	Red	Beige	Beige	Beige	Beige	Beige
			Substrate	Paint - CW Pipe	Paint - CW Pipe	Paint - Steel Pipe-sprinkler system	Paint - Structural Steel	Paint - Structural Steel	Paint - Structural Steel	Paint - Structural Steel	Paint - Structural Steel
			Location	Basement	Basement	Basement Unit 10	Pumphouse	Pumphouse	Pumphouse	Pumphouse	Pumphouse
Lead	mg/kg	1,000		440	510	<5.0	160	**<u>1900</u>**	86	760	**<u>31000</u>**
Lead Leachate	mg/L	5		NA	NA	NA	0.015	NA	NA	NA	NA
Zinc	mg/kg	1,500		71	84	140	**<u>120000</u>**	**<u>170000</u>**	**<u>8800</u>**	**<u>17000</u>**	900
Zinc Leachate	mg/L	500		NA	NA	NA	**<u>620</u>**	NA	NA	NA	NA

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9b

Paint Analytical Results - Porous Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	PS-1	PS-2	PS-3	PS-4	PS-5	PS-8	PS-12	PS-17	PS-19	OES Base
			Sample Date	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	1/12/2018
			Colour	Green	Beige	Beige	Grey	White	Black	Orange	Grey	Grey	Grey
			Substrate	Paint - Wood Cabinet	Paint - Wood wall	Paint - Concrete Wall	Paint - Concrete Floor	Paint - Concrete Wall	Paint - Concrete Wall	Paint - Concrete Floor	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack
			Location	Machine Shop	Machine Shop	RT3 Basement	RT3 Basement	RT3 Basement	Basement	Unit 10	Old Stack Outside	New Stack Outside Base	New Stack Outside Base
Lead	mg/kg	1,000		**<u>1700</u>**	**<u>2900</u>**	350	**<u>1800</u>**	810	400	510	18	**<u>12000</u>**	**<u>20000</u>**
Lead Leachate	mg/L	5		1.1	2.6	NA	0.37	0.19	NA	NA	NA	**<u>7.6</u>**	2.2
Zinc	mg/kg	1,500		190	310	420	760	870	**<u>2900</u>**	840	1200	440	250
Zinc Leachate	mg/L	500		2.3	3.7	NA	7.8	3.7	NA	NA	NA	3	17

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9b

Paint Analytical Results - Porous Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	OES 50'	OES 100'	OES 150'	OES 210'	OES Base #1 At Door Ground Level	OES Base #1 At Door Ground Level Lab Dup	OES Base #2 Opp. Door Ground Level	OES 125' Core Samples New Stacks 225'-125'	OES 210' New Stack 225'-225' Level
			Sample Date	1/12/2018	1/12/2018	1/12/2018	1/12/2018 2/7/2018	2/7/2018	2/7/2018	2/7/2018	2/7/2018	2/7/2018
			Colour	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
			Substrate	Paint - Concrete Stack	Paint - Concrete Stack (New Stack)	Paint - Concrete Stack	Paint - Concrete Stack	Concrete Core	Concrete Core	Concrete Core	Concrete Core	Concrete Core
			Location	New Stack Outside 15m Level	New Stack Outside 30.5m Level	New Stack Outside 46m Level	New Stack Outside 64m Level	New Stack Outside Base	New Stack Outside Base	New Stack Outside Base #2	New Stack Outside 38m Level	New Stack Outside 64m Level
Lead	mg/kg	1,000		**<u>20000</u>**	**<u>24000</u>**	**<u>32000</u>**	300	NA	NA	NA	NA	NA
Lead Leachate	mg/L	5		NA	NA	NA	0.089	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/kg	1,500		640	830	640	**<u>2900</u>**	NA	NA	NA	NA	NA
Zinc Leachate	mg/L	500		NA	NA	NA	37	<0.050	<0.050	<0.050	<0.05	<0.050

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9b

Paint Analytical Results - Porous Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	10 Stack Base	10 Stack 50'	10 Stack 100'	10 Stack 150'	10 Stack 210'	Eastwall (Block)	Northwall (Block)	Southwall (Block)	Westwall (Block)
			Sample Date	1/12/2018	1/12/2018	1/12/2018	1/12/2018	1/12/2018	1/15/2018 2/7/2018	1/15/2018 2/7/2018	1/15/2018 2/7/2018	1/15/2018 2/7/2018
			Colour	Grey	Grey	Grey	Grey	Grey	Beige	Beige	Beige	Beige
			Substrate	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Wall	Paint - Concrete Wall	Paint - Concrete Wall	Paint - Concrete Wall
			Location	Old Stack Outside Base	Old Stack Outside 15m Level	Old Stack Outside 30.5m Level	Old Stack Outside 46m Level	Old Stack Outside 64 Level	Pumphouse	Pumphouse	Pumphouse	Pumphouse
Lead	mg/kg	1,000		42	<41	39	88	35	220	**<u>3900</u>**	460	33
Lead Leachate	mg/L	5		NA	NA	NA	NA	NA	0.022	0.84	0.15	**<u>5.1</u>**
Zinc	mg/kg	1,500		**<u>5700</u>**	660	<340	<550	<250	**<u>6600</u>**	190	330	140
Zinc Leachate	mg/L	500		NA	NA	NA	NA	NA	41	9.6	15	12

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 10

Concrete Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T #6	T #6 Lab Dup	T #13	T #14	T #20	T #24	T #157	T #159	T #161	T #164	T #166	T #168
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1221	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1232	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1248	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1242	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1254	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1260	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Calculated Total PCB	µg/g	33		<0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Notes:
[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)
"-" - Not Applicable/Not Analyzed
Lab Dup - Laboratory Duplicate
PCB - Polychlorinated Biphenyls
NG - No Guideline
BOLD/UNDERLINE - Exceeds criteria

Table 11

PILC Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	PCB Regulations SOR/2008 273 [1]	Sample ID	4160 (OLD END) Oil	4160 (OLD END) Lab Dup Oil	4160 (OLD END) Paper
			Sample Date	12/18/2017	12/18/2017	12/18/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		7.0	6.3	2.8
Aroclor 1260	µg/g	NG		<0.050	<0.050	<0.050
Calculated Total PCB	µg/g	2		**7.0**	-	**2.8**

Notes:

[1] Part 2 of the PCB regulations (SOR/2008 273) of the Canadian Environmental Protection Act, 2008 and amended in 2015

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

PCB - Polychlorinated Biphenyls

NG - No Guideline

BOLD /UNDERLINE - Exceeds criteria

Appendix B (Decommissioning Study) Material Quantity Calculations

APPENDIX B1

SUMMARY OF ACM QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Asset ID	Location	Level	System Component	Component Material	Friability	Listed Quantity		Estimated Volume		Comments
						Qty	Unit	Qty	Units	
No. 4 Boiler	Ground Level - No. 4 GA Compressor area	Ground Level	Wall	Corrugated Transite Panel	Non-friable	25.1	m^2	0.251	m^3	Assumed thickness = 10 mm, (Johns-Manville Building Products Corrugated Transite (1947) - thickness is approximately 7/16" at ridge and valley of corrugations and approximately 5/16" on tangent) - an average thickness of 3/8" (0.01m).
No. 4 Boiler	All levels, Boiler insulation, under original steel casing	All Levels	Boiler	Mechanical Insulation	Friable	60	m^3	60	m^3	PACM
No. 4 Boiler	Top Level	Top Level	Steam Drum	Mechanical Insulation	Friable	0.5	m^3	0.5	m^3	
No. 4 Boiler	Turbine Level (north side)	Turbine Level	Steam Drum	Mechanical Insulation	Friable	0.5	m^3	0.5	m^3	
No. 4 Boiler	Turbine/Top Levels	Turbine/Top Levels	Stack breeching (blue)	Mechanical Insulation	Friable	10.5	m^3	10.5	m^3	
Misc	All levels	All Levels	Electrical Cable Trays	Dust/Debris	Friable		m		m^3	PACM. Unable to quantify until further destructive testing is completed.
No. 4 Boiler	North side - 1st platform to top, Main feed (orange canvas - 18" diameter)	1st platform to top	Pipe	Pipe Insulation	Friable	10.7	m	0.36	m^3	Outside diameter is 457.2 mm (18"), Assumed insulation thickness = 25 mm, A = π (do /2)2 - π (di /2)2
No. 5 Boiler	Turbine Level - No. 5 Boiler area outside offices (west side)	Turbine Level	Wall	Transite Panel	Non-friable	15	m^2	0.375	m^3	Assumed thickness = 25 mm
No. 5 Boiler	Turbine Level - No. 5 Boiler area outside offices (east side)	Turbine Level	Wall	Transite Panel	Non-friable	4.5	m^2	0.1125	m^3	Assumed thickness = 25 mm
No. 6 Boiler	Interior wall between No. 6 Boiler and CT3		Wall	Mechanical Insulation/Parging on Wall	Friable	0.5	m^2	0.0125	m^3	Assumed thickness = 25 mm
No. 7 Turbine	Main feed to No. 7 Turbine (18" diameter), Ground Level	Ground Level	Pipe	Pipe Insulation	Friable	2	m	0.07	m^3	Outside diameter is 457.2 mm (18"), Assumed insulation thickness = 25 mm
No. 8 Turbine	Pipe Insulation (orange wrap) (4" diameter)		Pipe	Pipe Insulation	Friable	13.7	m	0.08	m^3	Outside diameter is 102 mm (4"), Assumed insulation thickness = 25 mm
No. 9 Boiler	Deaerator Level	Deaerator Level	Wall	Transite Panel	Non-friable	15.8	m^2	0.395	m^3	Assumed thickness = 25 mm
No. 9 Boiler	Turbine Level - No. 9 Turbine side next to No. 10 Turbine	Turbine Level	Wall	Transite Panel	Non-friable	227.6	m^2	5.69	m^3	Assumed thickness = 25 mm
No. 9 Boiler	Ground Level - No. 9 Turbine side next to No. 10 Turbine	Ground Level	Wall	Transite Panel	Non-friable	61.3	m^2	1.5325	m^3	Assumed thickness = 25 mm

APPENDIX B1

SUMMARY OF ACM QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Asset ID	Location	Level	System Component	Component Material	Friability	Listed Quantity		Estimated Volume		Comments
						Qty	Unit	Qty	Units	
No. 9 Boiler	Ground Level - No. 9 boiler (south wall) adjacent to MGOH Room	Ground Level	Wall	Transite Panel	Non-friable	83.6	m^2	2.09	m^3	Assumed thickness = 25 mm
No. 9 Boiler	Ground Level - MGOH Room	Ground Level	Wall	Corrugated Transite Panel	Non-friable	83.6	m^2	0.836	m^3	Assumed thickness = 10 mm
No. 9 Boiler	Upper Level - No. 9 boiler (south wall)	Upper Level	Wall	Transite Panel	Non-friable	174.0	m^2	4.35	m^3	Assumed thickness = 25 mm
No. 9 Boiler	Upper Level (no access) - East wall No. 9 turbine/No. 9 boiler	Upper Level	Wall	Transite Panel	Non-friable	45.0	m^2	1.125	m^3	Assumed thickness = 25 mm
No. 9 Boiler/Turbine	Deaerator Level	Deaerator Level	VGNT Condenser Tank (green)	Mechanical Insulation	Friable	1.2	m^3	1.2	m^3	
No. 9 Boiler/Turbine	Turbine Level	Turbine Level	Feed water heater (brown)	Mechanical Insulation	Friable	0.54	m^3	0.54	m^3	
No. 9 Boiler/Turbine	Turbine Level	Turbine Level	Feed water heater No. 2 (brown)	Mechanical Insulation	Friable	0.54	m^3	0.54	m^3	
No. 9 Boiler/Turbine	Turbine Level	Turbine Level	Feed water heater No. 1 (blue) - brown lower level	Mechanical Insulation	Friable	0.79	m^3	0.79	m^3	
No. 9 Boiler/Turbine	Turbine Level	Turbine Level	Feed water heater No. 2 (blue) - brown lower level	Mechanical Insulation	Friable	0.79	m^3	0.79	m^3	
No. 9 Boiler/Turbine	Turbine Level	Turbine Level	Feed water heater No. 3 (blue) - brown lower level	Mechanical Insulation	Friable	0.79	m^3	0.79	m^3	
No. 9 Boiler/Turbine	Ground Level	Ground Level	DFC Flashbox (yellow)	Mechanical Insulation	Friable	0.4	m^3	0.4	m^3	
No. 9 Boiler/Turbine	Ground Level - Main feed (orange wrap) to No. 9 turbine (18" diameter)	Ground Level	Pipe	Pipe Insulation	Friable	22.9	m	0.78	m^3	Outside diameter is 457 mm (18"), Assumed insulation thickness = 25 mm
No. 9 Boiler/Turbine	Ground Level - Secondary feed (metal clad/orange) to No. 9 turbine (16" diameter)	Ground Level	Pipe	Pipe Insulation	Friable	11.0	m	0.33	m^3	Outside diameter is 406 mm (16"), Assumed insulation thickness = 25 mm
No. 10 Boiler	Deaerator Level	Deaerator Level	Wall	Transite Panel	Non-friable	21.0	m^2	0.525	m^3	Assumed thickness = 25 mm
No. 10 Boiler	Turbine Level - No. 10 turbine side next to No. 9 Turbine	Turbine Level	Wall	Corrugated Transite Panel	Non-friable	227.6	m^2	2.276	m^3	Assumed thickness = 10 mm

APPENDIX B1

SUMMARY OF ACM QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Asset ID	Location	Level	System Component	Component Material	Friability	Listed Quantity		Estimated Volume		Comments
						Qty	Unit	Qty	Units	
No. 10 Boiler	Ground Level - No. 10 turbine side next to No. 9 Turbine	Ground Level	Wall	Corrugated Transite Panel	Non-friable	61.3	m^2	0.613	m^3	Assumed thickness = 10 mm
No. 10 Boiler/Turbine	Deaerator Level	Deaerator Level	High Level Reserve Tank (HLRTK10)	Mechanical Insulation	Friable	3.7	m^3	3.7	m^3	
No. 10 Boiler/Turbine	All levels [Boiler Insulation (under original steel casing)]	All levels	Boiler	Mechanical Insulation	Friable	25.3	m^3	25.3	m^3	
No. 10 Boiler/Turbine	Ground Level [Boiler Insulation (inside windbox)]	Ground Level	Boiler	Mechanical Insulation	Friable	22.46	m^3	22.46	m^3	PACM
No. 10 Boiler/Turbine	Mezzanine Level above Ground Level	Mezzanine Level	Turbine Drain flash condenser (TDFC10)	Mechanical Insulation	Friable	0.54	m^3	0.54	m^3	
No. 10 Boiler/Turbine	Mezzanine Level above Ground Level	Mezzanine Level	Low pressure heater No. 1 (LPHTR101)	Mechanical Insulation	Friable	0.79	m^3	0.79	m^3	
No. 10 Boiler/Turbine	Mezzanine Level above Ground Level	Mezzanine Level	Turbine Gland heater (TGHTR10)	Mechanical Insulation	Friable	0.54	m^3	0.54	m^3	
No. 10 Boiler/Turbine	Mezzanine Level above Ground Level	Mezzanine Level	Low pressure heater No. 2 (LPHTR102)	Mechanical Insulation	Friable	0.79	m^3	0.79	m^3	
No. 10 Boiler/Turbine	Mezzanine Level above Ground Level	Mezzanine Level	High pressure heater (HPHTR10)	Mechanical Insulation	Friable	0.79	m^3	0.79	m^3	
No. 10 Boiler/Turbine	Ground Level	Ground Level	Low level reserve tank (LLRTP10)	Mechanical Insulation	Friable	3.7	m^3	3.7	m^3	
No. 10 Boiler/Turbine	Deaerator Level - Main line underneath HLRTK10 (12" diameter)	Deaerator Level	Pipe	Pipe Insulation	Friable	0.3	m	0.01	m^3	Outside diameter is 305 mm (12"), Assumed insulation thickness = 25 mm
No. 10 Boiler/Turbine	1st platform (south end) - HP steam pipe insulation (18"diameter)	1st platform	Pipe	Pipe Insulation	Friable	9.0	m	0.31	m^3	Outside diameter is 457 mm (18"), Assumed insulation thickness = 25 mm

APPENDIX B1

SUMMARY OF ACM QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Asset ID	Location	Level	System Component	Component Material	Friability	Listed Quantity		Estimated Volume		Comments
						Qty	Unit	Qty	Units	
Misc	Throughout	Throughout	Arc chutes	Fibreboard	Non-friable	135	EACH	4.46	m^3	Field measurement of one arch chute: 2.5" x 22" x 37" = 2035 in3 = 0.033 m3
Misc	Throughout	Throughout	Gaskets	Unknown	Friable		EACH		m^3	PACM. Unable to quantify until further destructive testing is completed.
Misc	Exterior NE stack (roof)	Roof	Duct	Black Mastic	Non-friable	0.5	m^3	0.5	m^3	
SUB-TOTAL Volume of Non-Friable ACM								**25.13**	m^3	
10 % Contingency for additional asbestos								**2.51**	m^3	
TOTAL Volume of Non-Friable ACM								**27.64**	m^3	
TOTAL Bulked Volume of Non-Friable ACM (assuming bulking factor of 1.5)								**41.46**	m^3	
SUB-TOTAL Volume of Friable ACM								**137.10**	m^3	
10 % Contingency for additional asbestos								**13.71**	m^3	
TOTALVolume of Friable ACM								**150.81**	m^3	
TOTAL Bulked Volume of Friable ACM (assuming bulking factor of 1.5)								**226.22**	m^3	

Notes:
All data obtained from Asbestos Reassessment Report, All-Tech Environmental Services Limited, January 4, 2018
Thickness of materials based on Site photos and manufacturer data for similar materials.
Friability of materials not included in Asbestos Reassessment Report. For costing purposes only, friability assumed based on Site observations and experience with asbestos.
PACM - Presumed Asbestos Containing Material

APPENDIX B2.1

CRUSHED CONCRETE VOLUME (SUMMARY)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description of Item	Volume of Concrete (m^3)	Total Bulked Volume of Concrete (m^3) [1]	Mass of Concrete (MT)
Steam Plant			
Building Concrete (Slabs, Foundation Walls, Building Walls)	1,842	2,800	4,078
Building Concrete Block	36	67	50
Other Concrete Structures (Stacks, Pads, Pedestals, etc.)	1,587	2,539	3,809
Provisional Quantity for Stairs, smaller misc. exterior structures	100	160	240
TOTAL	**3,566**	**5,567**	**8,178**
Circulating Water Facilities			
Building Concrete (Slabs, Foundation Walls, Building Walls)	476	762	1,143
Building Concrete Block	0	0	0
Other Concrete Structures (CW Piping, Outfall Structure, etc.)	307	491	1,179
Provisional Quantity for Stairs, misc. floor slabs etc.	20	32	48
TOTAL	**803**	**1,285**	**2,369**
Bulk Storage Tank Farm			
Building Concrete (Slabs, Foundation Walls, Building Walls)	0	0	0
Building Concrete Block	0	0	0
Other Concrete Structures (Tank Foundation, Pipeline Supports, etc.)	222	356	533
Provisional Quantity for Stairs, misc. floor slabs etc.	0	0	0
TOTAL	**222**	**356**	**533**
Summary			
Building Concrete (Slabs, Foundation Walls, Building Walls)	2,318	3,562	5,221
Building Concrete Block	36	70	52
Other Concrete Structures	2,116	3,386	5,521
Provisional Quantity for Stairs, misc. floor slabs etc.	120	192	288
TOTAL	**4,591**	**7,210**	**11,082**

Notes:

1-Bulking factor of 1.6 assumed

APPENDIX B2.2

CRUSHED CONCRETE VOLUME (BUILDING CONCRETE)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Concrete	Density of Concrete (MT/m^3)	Length (m)	Width (m)	Thickness/ Height (m)	Volume For Concrete Type (m^3)	Bulking Factor	Total Bulked Volume (m^3)	Total Weight (MT)	Data Source	Comments
Steam Plant											
Unit 10 Turbine/Boiler Zone											
	Footing Piers/ Column Pedestals	2.4	--	--	--	7.1	1.6	11.4	17.0	MECL Unit # 10 Powerhouse Concrete Details: Boiler Area Sheets 1 and 2, Turbine Area Sheets 1, 2 and 3.	Assumed to be removed to 0.9m below finished grade
	Foundation walls	2.4	--	--	--	33.5	1.6	53.5	80.3	MECL Unit # 10 Powerhouse Concrete Details: Boiler Area Sheets 1 and 2, Turbine Area Sheets 1, 2 and 3.	Assumed to be removed to 0.9m below finished grade
	Equipment Foundations - Boiler Area	2.4	--	--	--	91.3	1.6	146.1	219.2	MECL Unit # 10 Powerhouse Concrete Details: Boiler Area Sheets 1 and 2, Turbine Area Sheets 1, 2 and 3.	Assume will be completely removed
	Floor Slab (300 mm (12") Thick) - Boiler Area	2.4	--	--	--	58.9	1.6	94.3	141.4	MECL Unit # 10 Powerhouse Concrete Details: Boiler Area Sheets 1 and 2, Turbine Area Sheets 1, 2 and 3.	Assume will be completely removed
	Concrete walls and slabs in Turbine area	2.4	--	--	--	60.2	1.6	96.3	144.5	MECL Unit # 10 Powerhouse Concrete Details: Boiler Area Sheets 1 and 2, Turbine Area Sheets 1, 2 and 3.	Includes loading bay slab and slabs at EL 13' and 15', walls of screen well and discharge well. Assumed to be removed to 0.9m below finished grade
	Exterior Brick Wall - North Elevation	1.924	22.7	1.4	0.1	3.3	1.6	5.3	6.4	MECL Drawing Unit # 10 Powerhouse Elevations	100 mm (4") Brick, south elevation adjoins Unit 9 Powerhouse, Height of Brick wall assumed to be the same as Unit 9 Powerhouse
	Exterior Brick Wall - West Elevation	1.924	31.3	1.4	0.1	4.6	1.6	7.4	8.9		
	Exterior Brick Wall - East Elevation	1.924	35.0	1.4	0.1	5.1	1.6	8.2	9.9		

APPENDIX B2.2

CRUSHED CONCRETE VOLUME (BUILDING CONCRETE)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Concrete	Density of Concrete (MT/m^3)	Length (m)	Width (m)	Thickness/ Height (m)	Volume For Concrete Type (m^3)	Bulking Factor	Total Bulked Volume (m^3)	Total Weight (MT)	Data Source	Comments
Unit 9 Turbine/Boiler Zone											
	Footing Piers/ Column Pedestals	2.4	--	--	--	5.4	1.6	8.7	13.0	MECL Drawings MA-18102-1 and MA-18102-2	Assumed to be removed to 0.9m below finished grade
	Foundation walls	2.4	--	--	--	31.5	1.6	50.4	75.6	MECL Drawings MA-18102-1 and MA-18102-2	Assumed to be removed to 0.9m below finished grade
	Equipment Foundations/ Pedestals	2.4	--	--	--	66.2	1.6	105.9	158.9	MECL Drawing MA-18265	Assume will be completely removed
	Footing block next to turbine	2.4	--	--	--	8.1	1.6	12.9	19.4	MECL Drawings MA-18102-1	Assume will be completely removed, between Gridlines F to E, 9 to 10 on plan, shown by section G-G
	Floor Slab (200 mm (8") Thick)	2.4	--	--	--	119.8	1.6	191.7	287.5	MECL Drawings MA-18102-1 and MA-18102-2, MA-18265	Assume will be completely removed
	Boiler Foundation	2.4	--	--	--	57.2	1.6	91.6	137.4	MECL Drawing MA-18265	Assume will be completely removed
	Exterior Brick Wall - West Elevation	1.924	36.0	1.4	0.1	5.3	1.6	8.5	10.2	MECL Drawing No. MA-18114	100 mm (4") Brick, east elevation adjoins older building, north elevation adjoins unit 10
	Exterior Brick Wall - South Elevation	1.924	22.1	1.4	0.1	3.3	1.6	5.2	6.3		
MgOH Building											
	Concrete Floor Slab 150 mm (6") thick	2.4	17.9	8.2	0.15	22.0	1.6	35.2	52.8	MECL Drawing 10414	Assume will be completely removed
	Perimeter Foundation Wall	2.4	34.3	0.25	0.9	7.7	1.6	12.3	18.5		Assumed to be removed to 0.9m below finished grade
	Silo Foundation Pads	2.4	--	--	--	8.2	1.4	11.5	19.6		100 mm thick brick wall
Unit 5 Boiler Zone											
	Concrete Floor Slab 150 mm (6") thick	2.4	20.1	15.3	0.15	46.1	1.6	73.8	110.7	MECL Drawings 00787, 00799	Assume will be completely removed
	Water Treatment Slab	2.4	3	4.2	0.3	3.8	1.6	6.0	9.1		Assume will be completely removed
	Office Columns	2.4	--	--	--	0.7	1.6	1.1	1.6		Assumed to be removed to 0.9m below finished grade
	Boiler Footings	2.4	--	--	--	8.8	1.6	14.1	21.1		Assumed to be removed to 0.9m below finished grade
	Perimeter Foundation Wall	2.4	55.5	0.31	1.05	18.1	1.6	28.9	43.4		Perimeter wall extends 0.15m above grade, Assumed to be removed to 0.9m below finished grade
	Exterior Brick Wall	1.924	20.1	1.72	0.1	3.5	1.4	4.8	6.7		100 mm thick brick wall

APPENDIX B2.2

CRUSHED CONCRETE VOLUME (BUILDING CONCRETE)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Concrete	Density of Concrete (MT/m^3)	Length (m)	Width (m)	Thickness/ Height (m)	Volume For Concrete Type (m^3)	Bulking Factor	Total Bulked Volume (m^3)	Total Weight (MT)	Data Source	Comments
Unit 8 Turbine Zone											
	Concrete Floor Slab	2.4	--	--	--	0.0	1.6	0.0	0.0	MECL Drawing 00799	Floor slab is greater than 0.9m below finished grade, therefore will be left in place
	Perimeter Foundation Wall	2.4	20	0.2	1.96	7.8	1.6	12.5	18.8		Assumed to be removed to 0.9m below finished grade
	Exterior Brick Wall	1.924	20	0.68	0.1	1.4	1.4	1.9	2.6		100 mm thick brick wall
	Unit 8 Screen & Discharge Well Walls	2.4	26	0.3	2.1	16.4	1.4	22.9	39.3	MECL Drawing 00683	Well walls extend 1.2 m above finished grade. Assumed to be removed to 0.9m below finished grade
Unit 4 Boiler Zone											
	Concrete Floor Slab 150 mm (6") thick	2.4	9.3	14.9	0.15	20.8	1.6	33.3	49.9	MECL Drawing 00617	Assume will be completely removed
	Concrete Floor Slab	2.4	11.9	25	0.15	44.6	1.6	71.4	107.1		Assume will be completely removed
	Perimeter Foundation Wall	2.4	39.1	0.33	1.05	13.5	1.6	21.7	32.5		Perimeter wall extends 0.15m above grade, Assumed to be removed to 0.9m below finished grade
	Exterior Brick Wall	1.924	39.1	0.76	0.1	3.0	1.4	4.2	5.7		100 mm thick brick wall
Unit 7 Turbine Zone											
	Concrete Floor Slab 150 mm (6") thick	2.4	12.3	16.3	0.15	30.1	1.6	48.1	72.2	MECL Drawings 00687, 00691, 01237	Assume will be completely removed
	Perimeter Foundation Wall	2.4	40.9	0.3	0.9	11.0	1.6	17.7	26.5		Assumed to be removed to 0.9m below finished grade
	Exterior Brick Wall	1.924	--	--	0.1	2.2	1.4	3.1	4.2		100 mm thick brick wall
	Unit 7 Screen Well Walls	2.4	7	0.3	2.1	4.4	1.4	6.2	10.6	MECL Drawing 00683	Well walls extend 1.2 m above finished grade. Assumed to be removed to 0.9m below finished grade
	Unit 6 Screen Well Walls	2.4	13	0.2	2.1	5.5	1.4	7.6	13.1		Well walls extend 1.2 m above finished grade. Assumed to be removed to 0.9m below finished grade
Wastewater Treatment Plant Zone (Original Boilerhouse, including 1940's addition)											
	Concrete Floor Slab	2.4	23.2	15.7	0.15	54.6	1.6	87.4	131.1	MECL Drawings 00605, 00399, 00373	Assumed slab is 150mm thick
	Perimeter Foundation Wall	2.4	87.8	0.42	0.9	33.2	1.6	53.1	79.7		Assumed to be removed to 0.9m below finished grade
	Exterior Brick Wall	1.924	--	--	0.3	327.9	1.4	459.1	630.9		300 mm thick brick wall
Maintenance Stores Room Addition to Wastewater Treatment Plant											
	Concrete Floor Slab 150 mm (6") thick	2.4	7.6	6.6	0.15	7.5	1.6	12.0	18.1	MECL Drawing 00373	Slab, foundation walls and exterior walls are assumed to be the same construction as Wastewater Treatment Plant (Original Boilerhouse)
	Perimeter Foundation Wall	2.4	21.8	0.42	0.9	8.2	1.6	13.2	19.8		
	Exterior Brick Wall	1.924	--	--	0.3	69.0	1.4	96.6	132.8		

APPENDIX B2.2

CRUSHED CONCRETE VOLUME (BUILDING CONCRETE)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Concrete	Density of Concrete (MT/m^3)	Length (m)	Width (m)	Thickness/ Height (m)	Volume For Concrete Type (m^3)	Bulking Factor	Total Bulked Volume (m^3)	Total Weight (MT)	Data Source	Comments
CT3 Balance of Plant Equipment Zone (Original Turbine Building)											
	Concrete Floor Slab 150 mm (6") thick	2.4	28.8	16.3	0.175	82.2	1.6	131.4	197.2	MECL Drawings 00392, 00373, 00426	Assume will be completely removed
	Perimeter Foundation Wall	2.4	119	0.42	0.9	45.0	1.6	72.0	108.0		Assumed to be removed to 0.9m below finished grade, assumed original exterior wall foundation is still present, as columns are still intact. Assumed wall is the same thickness as Original Boilerhouse
	Exterior Brick Wall	1.924	--	--	0.3	166.6	1.4	233.2	320.5		300 mm thick brick wall. Southern exterior wall along Wastewater Treatment Plant (Original Boilerhouse) is calculated in the Wastewater Treatment Plant exterior brick wall quantity
	Discharge Well Walls	2.4	14	0.2	0.9	2.5	1.4	3.5	6.0	Field Observations	Assumed to be removed to 0.9m below finished grade
Lube Oil Stores Area Addition to CT3 Balance of Plant Equipment											
	Concrete Floor Slab 150 mm (6") thick	2.4	17.3	5.2	0.15	13.5	1.6	21.6	32.4	MECL Drawing 00373	Slab, foundation walls and exterior walls are assumed to be the same construction as Wastewater Treatment Plant (Original Boilerhouse)
	Perimeter Foundation Wall	2.4	22.5	0.42	0.9	8.5	1.6	13.6	20.4		
	Exterior Brick Wall	1.924	--	--	0.3	35.3	1.4	49.4	67.9		
Welding Shop											
	Concrete Floor Slab 150 mm (6") thick	2.4	11.5	5.7	0.15	9.8	1.6	15.7	23.6	MECL Drawing 00395	Assume will be completely removed
	Concrete Floor Slab 150 mm (6") thick	2.4	1.97	2.36	0.15	0.7	1.6	1.1	1.7		Assume will be completely removed
	Elevator Shaft Concrete Beams	2.4	--	--	--	0.3	1.6	0.5	0.8		Assume will be completely removed
	Perimeter Foundation Wall	2.4	29.2	0.35	0.9	9.2	1.6	14.7	22.1		Assumed to be removed to 0.9m below finished grade
	Exterior Brick Wall	1.924	--	--	0.3	90.5	1.4	126.7	174.1		300 mm thick brick wall.
Mechanical Maintenance Shop											
	Concrete Floor Slab	2.4	18	9	0.15	24.3	1.6	38.9	58.3	Field Observations	Assumed to be 0.15m thick
	Perimeter Foundation Wall	2.4	54	0.2	1.2	13.0	1.6	20.7	31.1		Assumed to be 0.2m wide and removed to 0.9m below finished grade
			Total Concrete For Steam Plant			**1842**		**2800**	**4078**		

APPENDIX B2.2

CRUSHED CONCRETE VOLUME (BUILDING CONCRETE)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Concrete	Density of Concrete (MT/m^3)	Length (m)	Width (m)	Thickness/ Height (m)	Volume For Concrete Type (m^3)	Bulking Factor	Total Bulked Volume (m^3)	Total Weight (MT)	Data Source	Comments
Circulating Water Facilities											
River Pumphouse											
	Base Slab	2.4	--	--	0.38	75.5	1.6	120.8	181.2	MECL Drawings 03173, 03172, 00749, 03160	Assume complete removal of sub-structure concrete
	Operating Room Floor Slab	2.4	--	--	0.25	18.0	1.6	28.8	43.2		
	Operating Room Floor Slab	2.4	--	--	0.2	4.4	1.6	7.0	10.6		
	Operating Room Floor Slab	2.4	--	--	0.175	12.2	1.6	19.5	29.3		
	Interior Sub-Structure Walls	2.4	--	--	--	89.9	1.6	143.8	215.8		
	Exterior Sub-Structure Walls	2.4	95.8	0.44	6.55	276.1	1.6	441.8	662.6		
	Total Concrete For Circulating Water Facilities					**476**		**762**	**1143**		

Notes:
1- Only total area shown for various infrastructure due to irregular dimensions.

APPENDIX B2.3

CRUSHED CONCRETE VOLUME (BUILDING CONCRETE BLOCK)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Concrete Block	Length (m)	Height (m)	Thickness (m)	Total Volume For Concrete Block Type (m^3)	Data Source	Comments
Steam Plant							
Unit 10 Boiler/Turbine Zone							
	Exterior Wall - North Elevation	22.7	1.4	0.2	6.67	MECL Drawing Unit # 10 Powerhouse Elevations	200mm Concrete Block, south elevation adjoins Unit 9 Powerhouse, Height of brick wall assumed to be the same as Unit 9 Powerhouse
	Exterior Wall - West Elevation	31.3	1.4	0.2	9.22		
	Exterior Wall - East Elevation	35.0	1.4	0.2	10.29		
Transformer Pad near #10 Day Tank	Transformer Separation Block Walls	17.3	1.5	0.2	5.2	MECL Drawing 01293	200mm thick walls
Unit 9 Boiler/Turbine Zone							
	Exterior Wall - West Elevation	36.0	1.4	0.2	10.60	MECL Drawing No. MA-18114	200mm Concrete Block, east elevation adjoins older building, north elevation adjoins unit 10 - exterior brick and block wall no longer in place.
	Exterior Wall - South Elevation	22.1	1.4	0.2	6.50		
Unit 5 Boiler Zone							
	Exterior Block Wall	20.1	1.72	0.2	6.9	MECL Drawing 00799	200mm thick walls. North and east elevation adjoins Units 4 and 8 - exterior brick and block wall no longer in place.
Unit 8 Turbine Zone							
	Exterior Block Wall	20	0.68	0.2	2.7	MECL Drawing 00799	200mm thick walls. East and west elevation adjoins Units 7 and 10 - exterior brick and block wall no longer in place.
Unit 4 Boiler Zone							
	Exterior Block Wall	39.1	0.76	0.2	5.9	MECL Drawing 00617	200mm thick walls. North and East elevation adjoins Unit 7 and WWTP - exterior brick and block wall no longer in place.

APPENDIX B2.3

CRUSHED CONCRETE VOLUME (BUILDING CONCRETE BLOCK)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Concrete Block	Length (m)	Height (m)	Thickness (m)	Total Volume For Concrete Block Type (m^3)	Data Source	Comments
Unit 7 Turbine Zone							
	Exterior Block Wall	12.3	1.8	0.2	4.4	MECL Drawings 00687, 00691, 01237	200mm thick walls. East elevation adjoins CT3 Balance of Plant - exterior brick and block wall no longer in place.
	Sub-Total Volume of concrete block in Steam Plant (m^3)				**68**		
	Total Volume of concrete in Steam Plant (m^3)[1]				**36**		
	Total including allowance for concrete reinforcement (assuming 15 % additional concrete for grout and reinforced blocks)[2]				**42**		
	Total Mass of concrete in Steam Plant (MT)[3]				**50**		
	Total Bulked Volume of Concrete in Steam Plant (m^3)[4]				**67**		

Notes:
1 - Assumes 53% solid concrete in masonry block
2 - Assuming every 1 of 4 concrete block cores are filled for reinforcement
3 - Using density of 1.2 MT/m^3 for concrete in masonry block
4 - Using a bulking factor of 1.6

APPENDIX B2.4

CRUSHED CONCRETE VOLUME (OTHER CONCRETE STRUCTURES)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Density of Concrete (MT/m^3)	Dimensions of Concrete			Initial Volume (m^3)	Quantity Adjustment Factor	Adjusted Volume (m^3)	Bulked Volume[1] (m^3)	Mass (MT)	Data Source	Comments
		Length (m)	Width (m)	Thickness (m)							
Steam Plant											
Unit 10 Boiler/Turbine Zone											
Unit 10 Turbine Pedestal Concrete	2.4	--	--	--	414.5	1	415	663	995	-	Assumed to be the same as Unit 9
Former Carbogel Tank Concrete Foundation and Dyke Walls	2.4	--	--	--	46.9	1	47	75	113	MECL Drawing 04465	Assumed to be removed to 0.9m below finished grade
Unit 10 Day Tank Concrete Foundation and Dyke Walls	2.4	--	--	--	20.5	1	20	33	49	MECL Drawing 04465	Assumed to be removed to 0.9m below finished grade
Transformer Pad near Unit 10 Day Tank	2.4	--	--	--	8.8	1	9	14	21	MECL Drawing 01293	Assumed to be removed to 0.9m below finished grade
Unit 9 Boiler/Turbine Zone											
Unit 9 Turbine Pedestal Concrete	2.4	--	--	--	414.5	1	415	663	995	MECL Drawings 01041, 01042	Assume pedestal will be completely removed
Unit 9 Day Tank Concrete Foundation and Dyke Walls	2.4	--	--	--	20.5	1	20	33	49	MECL Drawing 01077	Assumed to be removed to 0.9m below finished grade
# 9 Transformer	2.4	1.8	1.8	0.1	0.3	1	0.3	0.5	0.8	Field Measurements	Assumed to be removed to 0.9m below finished grade
Unit 8 Turbine Zone											
Unit 8 Turbine Pedestal Concrete	2.4	--	--	--	97.4	1	97	156	234	MECL Drawings 00863, 00865, 00868	Assume pedestal will be completely removed
Unit 7 Turbine Zone											
Unit 7 Turbine Pedestal Concrete	2.4	--	--	--	61.7	1	62	99	148	MECL Drawing 04101	Assume pedestal will be completely removed
Transformer X3-2 Transformer Pad	2.4	--	--	--	3.9	1	4	6	9	MECL Drawings 04910, 04911	Assumed to be removed to 0.9m below finished grade
CT3 Balance of Plant Equipment Zone											
Former Unit 3 Turbine Pedestal Concrete	2.4	--	--	--	65.8	1	66	105	158		Assumed to be similar volume as Former Unit 5 Turbine Pedestal. Assumed pedestal will be completely removed.
Former Unit 5 Turbine Pedestal Concrete	2.4	--	--	--	65.8	1	66	105	158	MECL Drawing 00432	Assume pedestal will be completely removed
Former Unit 6 Turbine Pedestal Concrete	2.4	--	--	--	58.3	1	58	93	140	MECL Drawing 00528, Field Observations	Assume pedestal will be completely removed
Dorman Diesel Concrete Pad	2.4	5.5	4.5	0.38	9.4	1	9.4	15.0	22.6	Field Measurements	Assumed to be removed to 0.9m below finished grade

APPENDIX B2.4

CRUSHED CONCRETE VOLUME (OTHER CONCRETE STRUCTURES)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Density of Concrete (MT/m^3)	Dimensions of Concrete			Initial Volume (m^3)	Quantity Adjustment Factor	Adjusted Volume (m^3)	Bulked Volume[1] (m^3)	Mass (MT)	Data Source	Comments
		Length (m)	Width (m)	Thickness (m)							
Old End Day Tank Concrete Foundation and Dyke Walls	2.4	--	--	--	20.2	1	20	32	48	Field Measurements	Assumed to be removed to 0.9m below finished grade
# 3 Transformer Concrete Pad	2.4	1.8	1.8	0.1	0.3	1	0.3	0.5	0.8	Field Measurements	Assumed to be removed to 0.9m below finished grade
Old Stack											
Concrete Shell	2.4	--	--	--	160	1	160	256	384	MECL Drawing 01313	5.2 m diameter x 61 m high stack
Concrete Foundation	2.4	--	--	--	50.1	1	50.1	80	120	MECL Drawing 01289	Assumed to be removed to 0.9m below finished grade
New Stack											
Concrete Foundation	2.4	--	--	--	51.1	1	51.1	82	123	MECL Drawing 03203	Assumed to be removed to 0.9m below finished grade
Old Brick Stack (Only Foundation Remains)											
Concrete Foundation	2.4	--	--	--	16.3	1	16.3	26	39	Field Measurements	Assumed to be removed to 0.9m below finished grade
Substation											
Transformer X1 Foundation	2.4	3.6	1.8	0.1	0.6	1	0.6	1.0	1.6	Field Measurements	Assumed to be removed to 0.9m below finished grade
Transformer X2 Foundation	2.4	3.6	1.8	0.025	0.2	1	0.2	0.3	0.4	Field Measurements	Assumed to be removed to 0.9m below finished grade
						Total Concrete For Steam Plant	**1,587**	**2,539**	**3,809**		
Circulating Water Facilities											
Circulating Water Outfall Diverter Box											
Concrete CW Outfall Diverter Box	2.4	--	--	--	6.4	1	6.4	10	25	MECL Drawing 08627, Site observations	Assume structure will be completely removed
Concrete CW Chamber	2.4	--	--	--	2.2	2	4.4	7	17	MECL Drawing 08627	Assume chamber will be removed to 0.9m below finished grade
Circulating Water Piping											
48" Hyprescon Pipe	2.4	97	--	--	40.8	1	40.8	65	157	MECL Drawing 00590	Length of piping based on assumption of excavating and crushing cooling water lines
42" Hyprescon Pipe	2.4	635	--	--	212.7	1	212.7	340	817		
36" Hyprescon Pipe	2.4	164	--	--	42.6	1	42.6	68	164		
						Total Concrete For Circulating Water Facilities	**307**	**491**	**1,179**		
Bulk Storage Tank Farm											
Bunker C Bulk Storage Tank											
Tank Foundation	2.4	--	--	--	213.8	1	213.8	342	513	MECL Drawing 00814	Assumed to be removed to 0.9m below finished grade

APPENDIX B2.4

CRUSHED CONCRETE VOLUME (OTHER CONCRETE STRUCTURES)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Density of Concrete (MT/m^3)	Dimensions of Concrete			Initial Volume (m^3)	Quantity Adjustment Factor	Adjusted Volume (m^3)	Bulked Volume[1] (m^3)	Mass (MT)	Data Source	Comments
		Length (m)	Width (m)	Thickness (m)							
Off-loading Area Slab	2.4	6	4.5	0.15	4.1	1	4.1	6.5	9.7	Field Measurements	Assumed to be removed to 0.9m below finished grade
Bunker C/Steam Heat Pipelines											
10" Fill Line Pipe Supports	2.4	--	--	--	0.06	9	0.5	1	1	MECL Drawings 12533, 00830	Height of concrete support aboveground varies, average assumed to be 0.3m. Assumed to
6" Bunker/3" Steam Line Pipe Supports	2.4	--	--	--	0.06	65	3.9	6	9		
						Total Concrete For Bulk Storage Tank Farm	**222**	**356**	**533**		

Notes:
1- Using Bulking Factor of 1.6
2- Only total area shown for various infrastructure due to irregular dimensions.

APPENDIX B3

SUMMARY OF STEEL AND OTHER ALLOY QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Plate and Structural Carbon Steel (MT)	Standard Carbon Steel (MT)	Cast Iron (MT)	Wrought Iron (MT)	Standard Stainless Steel (MT)	Bare Copper (MT)	Aluminum (MT)	Alum Brass (MT)	Brass (MT)
Steam Plant									
Building Structural Steel (Appendix B4)	741								
Building Non-Structural Steel (Appendix B5)		193							
Boiler Materials (Appendix B6)	101	435					2		
Process Equipment (Appendix B7)	526	116	66	18	5	4	5	37	13
Turbine Units (Appendix B9)		161				--[1]			
SUB-TOTAL	**1,368**	**905**	**66**	**18**	**5**	**4**	**7**	**37**	**13**
Circulating Water Facilities & Infrastructure									
Building Structural Steel (Appendix B4)	29								
Building Non-Structural Steel (Appendix B5)		36							
Process Equipment (Appendix B7)	31	35	90						
SUB-TOTAL	**60**	**71**	**90**	**0**	**0**	**0**	**0**	**0**	**0**
Bulk Storage Tank Farm									
Process Equipment (Appendix B7)	1								
Tanks & Piping Systems (Appendix B8)	146	20					0.5		
SUB-TOTAL	**147**	**20**	**0**	**0**	**0**	**0**	**0.5**	**0**	**0**

1 - Quantity of bare copper from turbines is included Appendix B12 - Copper Estimate

APPENDIX B4.1

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUMMARY)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Structural Carbon Steel (MT) Columns	Structural Carbon Steel (MT) Support Beams	Estimated Total Structural Carbon Steel (MT)
Steam Plant Buildings			
Unit # 10 Boiler/Turbine Zone	60.3	138.4	198.8
Unit # 9 Boiler/Turbine Zone	35.5	103.8	139.3
MGOH Room	4.1	13.6	17.7
Unit # 5 Boiler Area	7.8	46.9	54.6
Turbine #8 Area	10.1	57.6	67.7
Unit # 4 Boiler Area	27.8	37.4	65.2
Turbine #7 Area	5.6	33.6	39.2
Wastewater Treatment Plant	2.6	8.2	10.8
RO-EDI Plant	2.7	2.7	5.5
CT3 Balance of Plant Equipment Zone	5.6	25.8	31.4
Welding Shop Area	0.6	3.3	3.9
Mechanical Maintenance Shop	1.9	8.7	10.6
Sub-total (MT)	**164.6**	**480.1**	**645**
15% contingency for stairs, pipe hangers, etc..	**25**	**72**	**97**
Total (MT)	**189**	**552**	**741**
Cooling Water Facilities & Infrastructure			
River Pumphouse	7.0	17.3	24.3
Sub-total (MT)	**7.0**	**17.3**	**24**
20% contingency for stairs, metal grates, pipe hangers, etc.	**1**	**3**	**5**
Total (MT)	**8**	**21**	**29**

APPENDIX B4.2

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (COLUMNS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Column	Nominal Mass of Column (kg/m)	Total Length For Column Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Steam Plant Buildings							
Unit # 10 Boiler/Turbine Zone							
	14WF53	79	67	5293	5.3	Drawing MA-24360 Drawing MA-24421 Drawing MA-24432	
	10WF49	73	168	12264	12.3		
	24WF76	113	34	3842	3.8		
	14WF87	130	34	4420	4.4		
	27WF160	238	82	19516	19.5		
	14WF119	177	24	4248	4.2		
	6WF15.5	23	139	3197	3.2		
	12WF58	86	24	2064	2.1		
			Sub-Total (MT)		**54.8**		
	Misc. (base plates, bolts, etc. - 10%)				5.5		
				Total (MT)	**60.3**		
Unit # 9 Boiler/Turbine Zone							
	10WF49	73	22	1606	1.6	Drawing MA-18041-1 Drawing MA-18041-2 Drawing MA-18041-3	
	27WF160	238	49	11662	11.7		
	14WF119	177	19	3363	3.4		
	10WF33	49	27	1323	1.3		
	14WF53	79	57	4503	4.5		
	24WF76	113	17	1921	1.9		
	14WF87	130	34	4420	4.4		
	6WF15.5	23	40	920	0.9		
	14WF142	212	12	2544	2.5		
			Sub-Total (MT)		**32.3**		
	Misc. (base plates, bolts, etc. - 10%)				3.2		
				Total (MT)	**35.5**		

APPENDIX B4.2

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (COLUMNS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Column	Nominal Mass of Column (kg/m)	Total Length For Column Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
MGOH Room							
	W8X14	21	33	693	0.7	Pre-Built Structures Drawing No. S1 Pre-Built Structures Drawing No. S2	
	W8X28	42	55	2310	2.3		
	6WF15.5	23	27	621	0.6		
	HSS 7X7X188	25.4	5	127	0.1		
			Sub-Total (MT)		**3.8**		
	Misc. (base plates, bolts, etc. - 10%)				0.4		
				Total (MT)	**4.1**		
Unit # 5 Boiler Area							
	14BP89	133	12	1596	1.6	Drawing MA-14247	
	15.5X7/16+4L s4X3X5/8"	101	54	5454	5.5		
			Sub-Total (MT)		**7.1**		
	Misc. (base plates, bolts, etc. - 10%)				0.7		
				Total (MT)	**7.8**		
Turbine #8 Area							
	6UB25	37	24	888	0.9	Drawing MA-14953	
	18UB60	89	30	2670	2.7		
	10X8X55#	82	51	4182	4.2		
	6X3X12.4#	18	20	360	0.4		
	12UB31	46	13	598	0.6		
	8UB35	52	10	520	0.5		
			Sub-Total (MT)		**9.2**		
	Misc. (base plates, bolts, etc. - 10%)				0.9		
				Total (MT)	**10.1**		

APPENDIX B4.2

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (COLUMNS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Column	Nominal Mass of Column (kg/m)	Total Length For Column Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Unit # 4 Boiler Area							
	14WF68	101	49	4949	4.9	Drawing MA-16925 Drawing MA-8308	
	14WF78	116	33	3828	3.8		
	14WF127	189	66	12474	12.5		
	21WF62	92	33	3036	3.0		
	8WF31	46	22	1012	1.0		
				Sub-Total (MT)	**25.3**		
			Misc. (base plates, bolts, etc. - 10%)		2.5		
				Total (MT)	**27.8**		
Turbine #7 Area							
	14WF30	45	35	1575	1.6	Drawing MA-8452 Drawing MA-8525	
	16WF45	67	31	2077	2.1		
	8WF24	36	30	1080	1.1		
	10WF25	37	10	370	0.4		
				Sub-Total (MT)	**5.1**		
			Misc. (base plates, bolts, etc. - 10%)		0.5		
				Total (MT)	**5.6**		
Wastewater Treatment Plant							
	8H32	48	32	1536	1.5	Drawing MA-8308	
	10I25.4	38	22	836	0.8		
				Sub-Total (MT)	**2.4**		
			Misc. (base plates, bolts, etc. - 10%)		0.2		
				Total (MT)	**2.6**		

APPENDIX B4.2

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (COLUMNS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Column	Nominal Mass of Column (kg/m)	Total Length For Column Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
RO-EDI Plant							
	8H32	48	43	2064	2.1	Drawing MA-8308	
	10I25.4	38	11	418	0.4		
			Sub-Total (MT)		**2.5**		
	Misc. (base plates, bolts, etc. - 10%)				0.2		
				Total (MT)	**2.7**		
CT3 Balance of Plant Equipment Zone							
	14x1/4"x2Ls @4x3x1/4"	33	117	3861	3.9	Drawing MA-8308	
	10I25.4	38	32	1216	1.2		
			Sub-Total (MT)		**5.1**		
	Misc. (base plates, bolts, etc. - 10%)				0.5		
				Total (MT)	**5.6**		
Welding Shop Area							
	6H20	30	18	540	0.5	Drawing MA-2510	
			Sub-Total (MT)		**0.5**		
	Misc. (base plates, bolts, etc. - 5%)				0.0		
				Total (MT)	**0.6**		
Mechanical Maintenance Shop							
	W200X36	36	49	1764	1.8	Field Measurements	
			Sub-Total (MT)		**1.8**		
	Misc. (base plates, bolts, etc. - 5%)				0.1		
				Total (MT)	**1.9**		

APPENDIX B4.2

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (COLUMNS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Column	Nominal Mass of Column (kg/m)	Total Length For Column Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Cooling Water Facilities & Infrastructure							
River Pumphouse							
	8WF24	36	44	1584	1.6	Drawing MA-10152	No as-built drawings for original half of building so steel for that portion extrapolated from new half
	BH31	46	52	2392	2.4		
	12WF40	60	22	1320	1.3		
	6WF15.5	23	22	506	0.5		
	8WF17	25	22	550	0.6		
			Sub-Total (MT)		**6.4**		
	Misc. (base plates, bolts, etc. - 10%)				0.6		
				Total (MT)	**7.0**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Steam Plant Buildings							
Unit # 10 Boiler/Turbine Zone							
	12WF27	40	491	19640	19.6	Drawing MA-24360 Drawing MA-24421 Drawing MA-24432 Drawing MA24387	Includes steel for superstructure and supports for Turbine Operating Floor/Heater Platform
	16WF40	60	886	53160	53.2		
	18WF50	75	96	7200	7.2		
	24WF130	194	66	12804	12.8		
	21WF73	109	15	1635	1.6		
	4x3x1/4" angle	16.5	67	1105.5	1.1		
	4x4x3/8" dbl ang.	29.8	274	8165.2	8.2		
	4x3x1/2" dbl ang.	33.1	37	1224.7	1.2		
	3x2x5/16 dbl ang.	14.7	31	455.7	0.5		
	6x4x1/2" dbl ang.	48.4	5	242	0.2		
	ST8WF39	58	16	928	0.9		
	ST8WF44	66	16	1056	1.1		
	ST8WF48	72	32	2304	2.3		
	21WF62	92	27	2484	2.5		
	18WF80	119	15	1785	1.8		
	24WF76	113	8	904	0.9		
	10WF21	31	119	3689	3.7		
	16WF36	54	125	6750	6.8		
	8Cx11.5	17	18	306	0.3		
				Sub-Total (MT)	**125.8**		
				Misc. (cross bracing, etc. - 10%)	12.6		
				Total (MT)	**138.4**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Unit # 9 Boiler/Turbine Zone							
	12WF27	40	368	14720	14.7	Drawing MA-18041-1 Drawing MA-18041-2 Drawing MA-18041-3	Includes steel for superstructure and supports for Turbine Operating Floor/Heater Platform. No drawings available for Unit 9 Turbine Operating Floor/Heater Platform. However, from field measurements this area is identical to Unit 10 so it has been assumed that steel quantities are the same.
	16WF40	60	250	15000	15.0		
	10B11.5	17	61	1037	1.0		
	18WF50	75	96	7200	7.2		
	10WF21	31	164	5084	5.1		
	24WF130	194	45	8730	8.7		
	21WF62	92	34	3128	3.1		
	6WF15.5	23	557	12811	12.8		
	21WF73	109	14	1526	1.5		
	4x3x1/2" dbl ang.	33.1	37	1224.7	1.2		
	3x2x5/16 dbl ang.	14.7	31	455.7	0.5		
	6x4x1/2" dbl ang.	48.4	5	242	0.2		
	6x6x1/2" dble ang.	58.6	31	1816.6	1.8		
	6x4x3/4" dbl ang.	58.8	31	1822.8	1.8		
	4x3x5/16" angle	12.1	155	1875.5	1.9		
	3x2x1/4" angle	5.6	49	274.4	0.3		
	2x4x3/8" dbl ang.	22.8	36	820.8	0.8		
	3x2.5x1/4" dbl ang.	12.6	219	2759.4	2.8		
	18WF80	119	15	1785	1.8		
	24WF76	113	8	904	0.9		
	16WF36	54	125	6750	6.8		
	8Cx11.5	17	18	306	0.3		
				Sub-Total (MT)	**90.3**		
	Misc. (cross bracing, etc. - 15%)				13.5		
				Total (MT)	**103.8**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
MGOH Room							
	W6X26	39	52	2028	2.0	Pre-Built Structures Drawing No. S1 Pre-Built Structures Drawing No. S2	
	W8X14	21	16	336	0.3		
	C8X3.91	6	22	132	0.1		
	Z8X4.91 girt	7	256	1792	1.8		
	Z8X5.86 girt	9	30	270	0.3		
	W16X36	54	7.5	405	0.4		
	W8X18	27	31	837	0.8		
	C6X8.2	12	49	588	0.6		
	C8X11.5	17	24	408	0.4		
	W10X22	33	8.5	280.5	0.3		
	C8X3.15	22	241	5302	5.3		
				Sub-Total (MT)	**12.4**		
				Misc. (cross bracing, etc. - 10%)	1.2		
				Total (MT)	**13.6**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Unit # 5 Boiler Area							
	10WF25	37	87	3219	3.2	Drawing MA 14247 Drawing MA 14580	
	10BP42	63	142	8946	8.9		
	6WF15.5	23	289	6647	6.6		
	5x3.5x1/4" dbl ang.	17.3	80	1384	1.4		
	3.5x3.5x1/4" dbl ang	16.4	56	918.4	0.9		
	5x3.5x5/16" dbl ang.	50	40	2000	2.0		
	8WF31	46	15	690	0.7		
	5x5x5/16" angle	58	88	5104	5.1		
	6CX8.2	12	52	624	0.6		
	12CX20.7	31	20	620	0.6		
	18WF60	89	8	712	0.7		
	14WF87	130	8	1040	1.0		
	15.5x1/2"+4Ls @5x3.5x1/2"	119.4	32	3820.8	3.8		
	21WF68	101	20	2020	2.0		
	18WF55	82	20	1640	1.6		
	ST6WF20	30	31	930	0.9		
	4x3.5x5/16" dbl ang.	36.1	8	288.8	0.3		
	3x2x1/4" dbl ang.	11.2	30	336	0.3		
	ST6WF32	48	31	1488	1.5		
	2.5x2x1/4" dbl ang.	10.3	16	164.8	0.2		
				Sub-Total (MT)	**42.6**		
				Misc. (cross bracing, etc. - 10%)	4.3		
				Total (MT)	**46.9**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Turbine #8 Area							
	9X4X21#	31	103	3193	3.2	Drawing MA-14953 Drawing MA-14955 Drawing MA-15303	
	16UB40	60	41	2460	2.5		
	18UB50	75	17	1275	1.3		
	8X6X35#	52	32	1664	1.7		
	18UB60	89	44	3916	3.9		
	8UB17	25	2	50	0.1		
	2.5x2.5x1/4" dbl ang	5.84	88	513.92	0.5		
	3x3x1/4" angle	6.74	109	734.66	0.7		
	5x3x1/4" angle	9.14	39	356.46	0.4		
	1.2x1.2x1/8" angle	1.58	60	94.8	0.1		
	ST4B5	7	20	140	0.1		
	20L12 joists	34.2	122	4172.4	4.2		
	8WF55	82	14	1148	1.1		
	14UB43	64	6	384	0.4		
	6WF20	30	269	8070	8.1		
	14UB30	45	16	720	0.7		
	24UB84	125	28	3500	3.5		
	21UB68	101	80	8080	8.1		
	6X3X12.41#	61	6	366	0.4		
	6CX8.2	12	38	456	0.5		
	12X3X25.25#	38	45	1710	1.7		
	16X8X75#	112	26	2912	2.9		
	7X4X16#	24	30	720	0.7		
	14UB30	45	107	4815	4.8		
	12X8X65#	97	9	873	0.9		
				Sub-Total (MT)	**52.3**		
	Misc. (cross bracing, etc. - 10%)				5.2		
				Total (MT)	**57.6**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Unit # 4 Boiler Area							
	10WF21	31	210	6510	6.5	Drawing MA-16925 Drawing MA-8308	Includes steel for superstructure and structural steel for hanging boiler from roof structure.
	16WF40	60	28	1680	1.7		
	10WF25	32	11	352	0.4		
	10WF45	67	17	1139	1.1		
	6WF15.5	23	445	10235	10.2		
	6CX8.2	12	36	432	0.4		
	14WF30	45	11	495	0.5		
	5I10	15	18	270	0.3		
	5x5x3/8" angle	18.8	213	4004.4	4.0		
	12WF40	60	5	300	0.3		
	18WF96	143	10	1430	1.4		
	36WF170	253	7	1771	1.8		
	12WF31	46	12	552	0.6		
	12C21.7	32	5	160	0.2		
	20I85	127	26	3302	3.3		
	12WF65	97	14	1358	1.4		
				Sub-Total (MT)	**34.0**		
				Misc. (cross bracing, etc. - 10%)	3.4		
				Total (MT)	**37.4**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Turbine #7 Area							
	16WF40	60	74	4440	4.4	Drawing MA-8452 Drawing MA-8525 Drawing MA-15271	
	12WF36	54	26	1404	1.4		
	6WF20	30	32	960	1.0		
	18WF50	74	65	4810	4.8		
	6CX8.2	12	121	1452	1.5		
	18WF60	89	6	534	0.5		
	21WF62	92	29	2668	2.7		
	3x3x1/4" angle	6.78	258	1749.24	1.7		
	24WF73	109	4	436	0.4		
	10B11.5	17	109	1853	1.9		
	8I10	15	95	1425	1.4		
	8WF17	25	46	1150	1.2		
	21WF68	101	6	606	0.6		
	14WF30	45	16	720	0.7		
	12WF27	40	59	2360	2.4		
	9X3X7.46#	11	41	451	0.5		
	12X3.5X25.5#	38	5	190	0.2		
	6X3X12.41#	18	17	306	0.3		
	5x3x1/4" dbl ang.	18.3	10	183	0.2		
	3.5x2.5x3/4" dbl ang	33.1	45	1489.5	1.5		
	2.5x2x1/4" dbl ang.	10.3	18	185.4	0.2		
	2x1.5x3/8" dbl ang.	6.72	35	235.2	0.2		
	3.5x2.5x5/16" db ang	18.5	50	925	0.9		
				Sub-Total (MT)	**30.5**		
	Misc. (cross bracing, etc. - 10%)				3.1		
				Total (MT)	**33.6**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Wastewater Treatment Plant							
	10CX20	30	117	3510	3.5	Drawing MA-8308	
	3.5x2.5x3/4" dbl ang	33.1	62	2052.2	2.1		
	2.5x2x1/4" dbl ang.	10.3	25	257.5	0.3		
	2x1.5x3/8" dbl ang.	6.72	49	329.28	0.3		
	3.5x2.5x5/16" db ang	18.5	69	1276.5	1.3		
				Sub-Total (MT)	**7.4**		
				Misc. (cross bracing, etc. - 10%)	0.7		
				Total (MT)	**8.2**		
RO-EDI Plant							
	10CX20	30	83	2490	2.5	Drawing MA-8308	
				Sub-Total (MT)	**2.5**		
				Misc. (cross bracing, etc. - 10%)	0.2		
				Total (MT)	**2.7**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
CT3 Balance of Plant Equipment Zone							
	10Cx15.3	23	74	1702	1.7	Drawing MA-8308	
	8Cx11.5	17	70	1190	1.2		
	3.5x3.5x1/4" angle	7.49	169	1265.81	1.3		
	3.5x2.5x1/4" dbl ang	14	56	784	0.8		
	20I65.4	97	56	5432	5.4		
	12I31.8	47	56	2632	2.6		
	12C20.7	31	28	868	0.9		
	4x3x1/4" angle	7.96	28	222.88	0.2		
	4I7.7	26	14	364	0.4		
	5I10	15	14	210	0.2		
	12I38	57	61	3477	3.5		
	15I42.9	64	17	1088	1.1		
	3.5x2.5x3/4" dbl ang	33.1	67	2217.7	2.2		
	2.5x2x1/4" dbl ang.	10.3	27	278.1	0.3		
	2x1.5x3/8" dbl ang.	6.72	52	349.44	0.3		
	3.5x2.5x5/16" db ang	18.5	75	1387.5	1.4		
				Sub-Total (MT)	**23.5**		
	Misc. (cross bracing, etc. - 10%)				2.3		
				Total (MT)	**25.8**		
Welding Shop Area							
	10I25.4	38	42	1596	1.6	Drawing MA-2510	
	10C15.3	23	63	1449	1.4		
				Sub-Total (MT)	**3.0**		
	Misc. (cross bracing, etc. - 10%)				0.3		
				Total (MT)	**3.3**		

APPENDIX B4.3

PLANT SITE BUILDING STRUCTURAL STEEL QUANTITIES (SUPPORT BEAMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Beam	Nominal Mass of Beam (kg/m)	Total Length For Beam Type (m)	Total Weight (kg)	Total Mass (MT)	Data Source	Comments
Mechanical Maintenance Shop							
	W360X72	72	34	2448	2.4	Field Measurements	
	MC310X15.8	15.8	198	3128.4	3.1		
	MC150X12	12	198	2376	2.4		
				Sub-Total (MT)	**8.0**		
	Misc. (cross bracing, etc. - 10%)				0.8		
				Total (MT)	**8.7**		
Cooling Water Facilities & Infrastructure							
River Pumphouse							
	12WF40	60	26	1560	1.6	Drawing MA-10152	
	12I31.8	47	28	1316	1.3		
	14WF30	45	36	1620	1.6		
	3x2x1/4" dbl ang.	11.2	14	156.8	0.2		
	6L Joist x 12.5#	19	14	266	0.3		
	15I42.9	64	28	1792	1.8		
	6WF15.5	23	16	368	0.4		
	16WF36	54	14	756	0.8		
	12I20.7	31	14	434	0.4		
	W360XX72	72	76	5472	5.5		
	21WF62	92	22	2024	2.0		
				Sub-Total (MT)	**15.8**		
	Misc. (cross bracing, etc. - 10%)				1.6		
				Total (MT)	**17.3**		

APPENDIX B5

PLANT SITE BUILDING MATERIAL NON-STRUCTURAL STEEL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Total Weight (MT)	Data Source	Comments
Steam Plant Buildings							
Unit # 10 Boiler/Turbine Zone							
	Metal Roof Decking	13.0	857	11141	11.1	Drawing MA-24387 Field Measurements	Weight of metal grate flooring was obtained from dead load details provided on Drawing MA-15271 for Turbine #7 area. All other metal grate flooring for steam plant assumed to be similar in design and weight.
	Metal Grate Flooring	49.0	350	17150	17.2		
	Metal Siding	9.0	1731	15579	15.6		
				Sub-Total (MT)	**43.9**		
Unit # 9 Boiler/Turbine Zone							
	Metal Roof Decking	13.0	848	11024	11.0	Drawing MA-18041-1 Drawing MA-18114 Field Measurements	Weight of metal grate flooring was obtained from dead load details provided on Drawing MA-15271 for Turbine #7 area. All other metal grate flooring for steam plant assumed to be similar in design and weight.
	Metal Grate Flooring	49.0	350	17150	17.2		
	Metal Siding	9.0	1288	11592	11.6		
				Sub-Total (MT)	**39.8**		
MGOH Room							
	Metal Roof Decking	13.0	283	3679	3.7	Pre-Built Structures Drawing No. S1 Pre-Built Structures Drawing No. S2	
	Metal Siding	9.0	436	3924	3.9		
				Sub-Total (MT)	**7.6**		

APPENDIX B5

PLANT SITE BUILDING MATERIAL NON-STRUCTURAL STEEL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Total Weight (MT)	Data Source	Comments
Unit # 5 Boiler Area							
	Metal Roof Decking	13.0	331	4303	4.3	Drawing MA-14247 Drawing MA-14460 Field Measurements	Weight of metal grate flooring was obtained from dead load details provided on Drawing MA-15271 for Turbine #7 area. All other metal grate flooring for steam plant assumed to be similar in design and weight.
	Metal Grate Flooring	49.0	33	1617	1.6		
	Metal Siding	9.0	270	2430	2.4		
			Sub-Total (MT)		**8.4**		
Turbine #8 Area							
	Metal Roof Decking	13.0	325	4225	4.2	Drawing MA-14935 Field Measurements	Weight of metal grate flooring was obtained from dead load details provided on Drawing MA-15271 for Turbine #7 area. All other metal grate flooring for steam plant assumed to be similar in design and weight.
	Metal Grate Flooring	49.0	260	12740	12.7		
	Metal Siding	9.0	215	1935	1.9		
			Sub-Total (MT)		**18.9**		

APPENDIX B5

PLANT SITE BUILDING MATERIAL NON-STRUCTURAL STEEL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Total Weight (MT)	Data Source	Comments
Unit # 4 Boiler Area							
	Metal Roof Decking	13.0	287	3731	3.7	Drawing MA-7086 Drawing MA-7135 Field Measurements	Weight of metal grate flooring was obtained from dead load details provided on Drawing MA-15271 for Turbine #7 area. All other metal grate flooring for steam plant assumed to be similar in design and weight.
	Metal Grate Flooring	49.0	29	1421	1.4		
	Metal Siding	9.0	480	4320	4.3		
			Sub-Total (MT)		**9.5**		
Turbine #7 Area							
	Metal Roof Decking	13.0	289	3757	3.8	Drawing MA-8430 Drawing MA-15271 Field Measurements	
	Metal Grate Flooring	49.0	193	9457	9.5		
	Metal Siding	9.0	231	2079	2.1		
			Sub-Total (MT)		**15.3**		
Wastewater Treatment Plant							
	Metal Roof Decking	13.0	244	3172	3.2	Drawing MA-8308 Field Measurements	Weight of metal grate flooring was obtained from dead load details provided on Drawing MA-15271 for Turbine #7 area. All other metal grate flooring for steam plant assumed to be similar in design and weight.
	Metal Grate Flooring	49.0	24	1176	1.2		
	Metal Siding	9.0	149	1341	1.3		
			Sub-Total (MT)		**5.7**		

APPENDIX B5

PLANT SITE BUILDING MATERIAL NON-STRUCTURAL STEEL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Total Weight (MT)	Data Source	Comments
RO-EDI Plant							
	Metal Roof Decking	13.0	175	2275	2.3	Drawing MA-8308	
	Metal Siding	9.0	423	3807	3.8		
			Sub-Total (M		**6.1**		
CT3 Balance of Plant Equipment Zone							
	Metal Roof Decking	13.0	552	7176	7.2	Drawing MA-8308 Field Measurements	Weight of metal grate flooring was obtained from dead load details provided on Drawing MA-15271 for Turbine #7 area. All other metal grate flooring for steam plant assumed to be similar in design and weight.
	Metal Grate Flooring	49.0	386	18914	18.9		
	Metal Siding	9.0	657	5913	5.9		
			Sub-Total (MT)		**32.0**		
Welding Shop Area							
	Metal Siding	9.0	286	2574	2.6	Drawing MA-2510	
			Sub-Total (MT)		**2.6**		
Mechanical Maintenance Shop							
	Metal Roofing	11.0	169	1859	1.9	Field Measurements	
	Metal Siding	9.0	221	1989	2.0		
			Sub-Total (MT)		**3.8**		
Total Mass of Recyclable Material (MT)					**193**		

APPENDIX B5

PLANT SITE BUILDING MATERIAL NON-STRUCTURAL STEEL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Total Weight (MT)	Data Source	Comments
Cooling Water Facilities & Infrastructure							
River Pumphouse							
	Metal Roof Decking	13.0	119.0	1547	1.5	Drawing MA-10152 Drawing MA-9118 Field Measurements	
	Metal Sheet Piling	100.0	300.0	30000	30.0		
	Metal Siding	9.0	494.0	4446	4.4		
				Sub-Total (MT)	**36.0**		
Total Mass of Recyclable Material (MT)					**36**		

APPENDIX B6.1

PLANT SITE BOILER MATERIAL QUANTITIES (SUMMARY)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item Description	Total Mass (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Aluminum (MT)	Total Mass of Structural & Plate Steel (MT)
Total Combined Weight of Boiler 2 and 6 (See Appendix B6.2)	69.1	69.1	--	--
Boiler Tubes (Carbon Steel - See Appendix B6.3)	299.9	299.9	--	--
Structural Steel (See Appendix B6.4)	59.8	--	--	59.8
Boiler Drums (See Appendix B6.5)	65.5	65.5	--	--
Boiler Shell (Steel Plate - See Appendix B6.6)	40.7	--	1.7	40.7
TOTAL	535	435	2	101

APPENDIX B6.2

PLANT SITE BOILER MATERIAL QUANTITIES (BOILER COMBINED WEIGHTS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Tubes	Weight of Boiler (kg)	Total Weight (MT)	Data Sources	Comments
Unit 2 Boiler	14515	14.5	Volcano Inc. Keystone Model 5M Cron Arrt + Load Dgm D-86121-00	Total Dry Weight
Unit 6 Boiler	43091	43.1	No. 6 Boiler Bid and Specifications Binder (Foster Wheeler Proposal No. 73-3248)	Total Dry Weight
	Sub-Total (MT)	**57.6**		
	Contingency (20% for misc. pipes and hangers) (MT)	**11.5**		
	Total (MT)	**69.1**		

APPENDIX B6.3

PLANT SITE BOILER MATERIAL QUANTITIES (BOILER TUBES)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Tubes	Number of Tubes	Length of Tube (m)	Tube Outer Diameter (m)	Tube Wall Thickness (m)	Volume per Tube (m^3)	Density (kg/m^3)	Weight of Tubes (kg)	Total weight (MT)	Data Sources	Comments
Unit 4 Boiler Tubes										
Unit 4 Boiler Heating Surface	--	--	--	--	--	--	22962	23.0	Dwg No. 04584, Dwg No. 03371	Tube weights estimated by heating surface areas
Unit 4 Furnace Heating Surface	--	--	--	--	--	--	15251	15.3		
Unit 4 Superheater Heating Surface	--	--	--	--	--	--	12893	12.9		
Unit 4 Air Heater Heating Surface	--	--	--	--	--	--	19586	19.6		
Unit 4 Primary Superheater Outlet Header	1	4.88	0.203	0.019	0.058	7,850	455	0.45	Dwg No. 03371	Weight based on volume of superheater outlet steel multiplied by materials density of 7850 kg/m^3
Boiler 4 Sidewall Headers	2	--	--	--	--	--	--	1.20	Dwg No. 03371	No details, same weight as Unit 5 assumed
Unit 5 Boiler Tubes										
Unit 5 Boiler Heating Surface	--	--	--	--	--	--	29007	29.0	Dwg No. 04212	Tube weights estimated by heating surface areas
Unit 5 Waterwall Heating Surface	--	--	--	--	--	--	5439	5.4		
Unit 5 Superheater Surface	--	--	--	--	--	--	4392	4.4		
Unit 5 Boiler Upper Sidewall Headers	2	4.50	0.271	0.843	--	--	--	1.2	Dwg No. 04274	*Same as superheater intermediate header
Unit 5 Boiler Superheater Outlet Header	1	4.30	0.270	0.019	0.068	7,850	533	0.5	Dwg No. 00834	Weight based on volume of steel multiplied by materials density of 7850 kg/m^3
Unit 5 Superheater Intermediate Header	3	4.50	0.271	0.021	0.080	7,850	1895	1.9	Dwg No. 04307, 04308	Steel pipe, weight based on volume of steel multiplied by materials density of 7850 kg/m^3
Unit 9 Boiler Tubes										
Unit 9 Boiler Heating Surface	--	--	--	--	--	--	18371	18.4	Dwg 01546	Tube weights estimated by heating surface areas
Unit 9 Furnace Heating Surface	--	--	--	--	--	--	25723	25.7		
Unit 9 Superheater Heating Surface	--	--	--	--	--	--	19894	19.9		
Unit 9 Boiler Sidewall Headers	2	6.40	0.270	0.025	0.136	7,850	2131	2.1	Dwg No. 02063	Weight based on volume of steel multiplied by materials density of 7850 kg/m^3
Unit 9 Boiler Upper Sidewall Headers	2	6.40	0.290	0.016	0.092	7,850	1446	1.4	Dwg No. 02063	Weight based on volume of steel multiplied by materials density of 7850 kg/m^3

APPENDIX B6.3

PLANT SITE BOILER MATERIAL QUANTITIES (BOILER TUBES)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Tubes	Number of Tubes	Length of Tube (m)	Tube Outer Diameter (m)	Tube Wall Thickness (m)	Volume per Tube (m^3)	Density (kg/m^3)	Weight of Tubes (kg)	Total weight (MT)	Data Sources	Comments
Unit 10 Boiler Tubes										
Unit 10 Boiler Heating Surface	--	--	--	--	--	--	18371	18.4	Dwg 01546	Tube weights estimated by heating surface areas
Unit 10 Furnace Heating Surface	--	--	--	--	--	--	25723	25.7		
Unit 10 Superheater Heating Surface	--	--	--	--	--	--	19894	19.9		
Unit 10 Boiler Sidewall Headers	2	6.40	0.270	0.025	0.136	7,850	2131	2.1	Dwg No. 02063	Weight based on volume of steel multiplied by materials density of 7850 kg/m^3
Unit 10 Boiler Upper Sidewall Headers	2	6.40	0.290	0.016	0.092	7,850	1446	1.4	Dwg No. 02063	Weight based on volume of steel multiplied by materials density of 7850 kg/m^3
							Sub-Total (MT)	**249.9**		
							Contingency (20% for misc. pipes and hangers) (MT)	**50.0**		
							Total (MT)	**299.9**		

APPENDIX B6.4

PLANT SITE BOILER MATERIAL QUANTITIES (STRUCTURAL STEEL)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Beam	Number of Beams/ Columns	Length of Beam/ Column (m)	Flange depth (m)	Flange width (m)	Unit Weight (kg/m)	Weight of Beams / Columns (kg)	Total weight (MT)	Data Source	Comments
Unit 4 Beams/ Columns									
Unit 4 Columns (12"x12"x3/4" = W310x500)	4	15.9	--	--	500	31,800	31.80	Dwg No. 04584, Dwg No. 03371, Field Measurements	Beams included in Building Structural Steel Quantities
Unit 5 Beams/ Columns									
12 [20.7	--	169.8	--	--	30.8	5,229.8	5.23	Dwg No. 04218	Steel summarized in table on drawing
10 WF 21	--	28.1	--	--	31.3	879.5	0.88		
12 WF 27	--	49.3	--	--	40.2	1,979.1	1.98		
15 [33.9	--	12.2	--	--	50.4	614.9	0.61		
16 WF 40	--	4.2	--	--	59.5	250.5	0.25		
Unit 9 Beams/ Columns									
Columns W150x37	4	10.9	--	--	37.0	1,613	1.61	Dwg No. 01545, 04506, Field Measurements	
BeamsW410x74	8	6.2	--	--	74.0	3,670	3.67		
BeamsW410x74	8	7	--	--	74.0	4,262	4.26		
Unit 10 Beams/ Columns									
Columns W150x37	4	10.9	--	--	37.0	1,613	1.61	Dwg No. 01545, 04506, Field Measurements	Same as Unit 9
BeamsW410x74	8	6.2	--	--	74.0	3,670	3.67		
BeamsW410x74	8	7	--	--	74.0	4,262	4.26		
						Total (MT)	**59.85**		

APPENDIX B6.5

PLANT SITE BOILER MATERIAL QUANTITIES (DRUMS)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Number	Number	Length	Nominal Diameter (m)	Wall Thickness (m)	Density (kg/m^3)	Weight (kg)	Total Weight (MT)	Data Source	Comments
Unit 4 Boiler Steam Drum	1	4.58	1.36	0.0379	7,850	6,686	6.7	Drawing No. 03386	Carbon steel drum - weight estimated by multiplying shell volume by material density
Unit 4 Boiler Mud Drum	1	4.58	1.06	0.0489	7,850	6,532	6.5	Drawing No. 04034	
Unit 5 Boiler Mud Drum	1	4.54	1.06	0.0489	7,850	6,481	6.5	Dwg No. 04212	
Unit 5 Boiler Steam Drum	1	5.3	1.36	0.0489	7,850	9,808	9.8	Dwg No. 04212	
Unit 9 Boiler Steam Drum	1	6.4	1.36	0.0758	7,850	18,000	18.0	Dwg No. 02047	
Unit 10 Boiler Steam Drum	1	6.4	1.36	0.0758	7,850	18,000	18.0	Dwg No. 02048	
						Total (MT)	**65.51**		

APPENDIX B6.6

PLANT SITE BOILER MATERIAL QUANTITIES (BOILER SHELL)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Shell	Height (m)	Width (m)	Length (m)	Shell Wall / Cladding Thickness (m)	Volume (m^3)	Density (kg/m^3) of Shell Wall / Cladding Material	Weight of Shell Wall (kg)	Weight of Cladding (kg)	Total weight of Plate Steel (MT)	Total Weight of Aluminum (MT)	Data Sources	Comments
Unit 4 Boiler Shell	--	--	--	0.00355	1.61	7,850	12,638	--	12.6	--	Dwg No. 04584 Dwg No. 03371	Volume based on shell thickness multiplied by total surface area
Unit 5 Boiler												
Unit 5 Boiler Steel Shell	10.5	6.0	4.4	0.0036	0.87	7,850.0	6,791.9	--	6.8	--	Dwg No. 04210, 04211, 04212, 04292, Field Investigations	Volume based on shell thickness multiplied by total surface area
Unit 5 Boiler Cladding	--	--	--	0.0006	0.16	2,640.0	--	413.7	--	0.4		Aluminum cladding with same surface area as steel shell

APPENDIX B6.6

PLANT SITE BOILER MATERIAL QUANTITIES (BOILER SHELL)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Shell	Height (m)	Width (m)	Length (m)	Shell Wall / Cladding Thickness (m)	Volume (m^3)	Density (kg/m^3) of Shell Wall / Cladding Material	Weight of Shell Wall (kg)	Weight of Cladding (kg)	Total weight of Plate Steel (MT)	Total Weight of Aluminum (MT)	Data Sources	Comments
Unit 9 Boiler												
Unit 9 Boiler Steel Shell	10.9	6.2	7.2	0.0036	1.35	7,850.0	10,628.7	--	10.6	--	Dwg No. 04506	Volume based on shell thickness multiplied by total surface area
Unit 9 Boiler Cladding	--	--	--	0.0006	0.24	2,640.0	--	643.4	--	0.6	Dwg No. 04506	Aluminum cladding with same surface area as steel shell

APPENDIX B6.6

PLANT SITE BOILER MATERIAL QUANTITIES (BOILER SHELL)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Shell	Height (m)	Width (m)	Length (m)	Shell Wall / Cladding Thickness (m)	Volume (m^3)	Density (kg/m^3) of Shell Wall / Cladding Material	Weight of Shell Wall (kg)	Weight of Cladding (kg)	Total weight of Plate Steel (MT)	Total Weight of Aluminum (MT)	Data Sources	Comments
Unit 10 Boiler												
Unit 10 Boiler Steel Shell	10.9	6.2	7.2	0.0036	1.35	7,850.0	10,628.7	--	10.6	--	Dwg No. 04506	Volume based on shell thickness multiplied by total surface area
Unit 10 Boiler Cladding	--	--	--	0.0006	0.24	2,640.0	--	643.4	--	0.6	Dwg No. 04506	Aluminum cladding with same surface area as steel shell
							Total (MT)		**40.7**	**1.7**		

1- Only total volume shown for various infrastructure due to irregular dimensions.

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
Steam Plant																
Unit 10 Boiler/Turbine Zone																
Blowdown Tank	1470.0														1.47	1
Boiler Feed Pumps	1360.0														1.36	2
Low level reserve tank	2568.0														2.57	1
High level reserve tank	2568.0														2.57	1
Ljungstrom air preheater	16420.0														16.42	1
6" Diameter Main Steam Piping	898.02	1.00	21.10	42.56	898.0				0.90							1
8" Diameter Main Steam Piping	1886.03	1.00	29.20	64.59	1886.0				1.89							1
6" Diameter Steam Pipe To Reducer	2336.54	1.00	54.90	42.56	2336.5				2.34							1
FD Fan	2631.0														2.63	1
ID Fan	2631.0														2.63	1
Air Intake Duct	1114.7														1.11	1
Ductwork to Stack (Includes ID Fan Breeching)	15570.0														15.57	1
Unit 10 Baghouse & Ducting	19000.0								2						17.00	1
No. 4 HP Heater	3360.0														3.36	1
No. 1 LP Heater (Brass Tubes)	1000.0	284			650.0						0.65				0.35	1
No. 2 LP Heater (Brass Tubes)	1000.0	284			650.0						0.65				0.35	1
Gland Heater	500.0														0.35	1
Extraction Pumps	1000.00														1.00	2
Boiler Feedwater Tank (Deaerator)	10210.0														10.21	1
Turbine oil tank	826.90														0.83	1
Condenser (Alum Brass Tubes)	52980.0											12.52			40.46	1
Drain cooler	450.0														0.45	1
Oil coolers	900.0														0.90	2
Econocoil Cooling Bank	10.00	13.00	0.30	0.31	1.21	0.01										1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
Steam Plant												
Unit 10 Boiler/Turbine Zone												
Blowdown Tank										1.47	Drawing 01341	
Boiler Feed Pumps										2.72		Assumed to be the same as Unit 5 Boiler Feed Pump
Low level reserve tank										2.57	Drawing 02290	
High level reserve tank										2.57	Drawing 02291	
Ljungstrom air preheater										16.42	Drawing E07551101	
6" Diameter Main Steam Piping				0.9							Drawing 02303	
8" Diameter Main Steam Piping				1.9							Drawing 02303	
6" Diameter Steam Pipe To Reducer				2.3							Field Observations	
FD Fan										2.63	Drawing 02286	
ID Fan										2.63	Drawing 02286 & Prebuilt Structures Drawing 8608-S2	ID Fan is similar size as Unit 10 FD Fan, therefore assume the same weight as Unit 10 FD Fan
Air Intake Duct										1.11	Drawing 04212	
Ductwork to Stack (Includes ID Fan Breeching)										15.57	Drawings 01296, 07388, 07389	
Unit 10 Baghouse & Ducting				2						17.00		
No. 4 HP Heater										3.36	Drawing A1744427	
No. 1 LP Heater (Brass Tubes)						0.65				0.35	Drawing A1744569	
No. 2 LP Heater (Brass Tubes)						0.65				0.35	Drawing A1744570	
Gland Heater										0.35	Drawing 01956	
Extraction Pumps										2.00	Weight of pump provided by MECL	
Boiler Feedwater Tank (Deaerator)										10.21	Drawing 01943	
Turbine oil tank										0.83	Drawing 04702	
Condenser (Alum Brass Tubes)							12.52			40.46	Drawing 04723, AEI Turbine Generator Operating Manual Drawing A1745283	
Drain cooler										0.45	Drawing 01946	
Oil coolers										1.80	Drawing 01945	
Econocoil Cooling Bank	0.01										Drawing 01316	

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
Air Cooler	478.50	135	2.5	0.45	151.88		0.32						0.15			1
Flash Condenser	450.0														0.45	1
CW Pumps	3160.0														3.16	2
10,000 Gallon #10 Day Tank	3608.3												0.07		3.54	1
Carbogel Tank	12926.4												0.14		12.79	1
Surge tank	86.2														0.09	1
50 Ton Crane with 5 Ton Auxiliary Crane	2950.0														2.95	2
Aux. Cooling water expansion tank	271.3									0.27						1
CW Screen	7590.00								8							1
Cast Iron CW Piping within Unit 10 Turbine Zone	18508.07				18508.07		18.51									1
50 Gallon Chemical Tanks throughout Steam Plant	45.00														0.05	5
Various Distribution Transformers located throughout Steam Plant (with < 2ppm PCB transformer oil)	21121.00								21							1
Various Process Piping throughout entire Steam Plant	5750.40	1.00	120.00	28.23	3387.6				3.39							1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
Air Cooler		0.32						0.15			Drawing 01947	
Flash Condenser										0.45	Drawing 01946	
CW Pumps										6.32	Weight provided by MECL	
10,000 Gallon #10 Day Tank								0.07		3.54	Drawing 02294, Field Observations	
Carbogel Tank								0.14		12.79	2009 Technico Inspection Report, tank dimensions provided by MECL, field observations	
Surge tank										0.09	Drawing 02296	
50 Ton Crane with 5 Ton Auxiliary Crane										5.90	Crane trolley weight taken from Munck Total Crane Systems technical specifications for Double Girder Cranes	Crane girder weights have been included in the Building Structural Steel quantities
Aux. Cooling water expansion tank					0.27						Drawing 02297	
CW Screen				8							Weight provided Screen Manufacturer	
Cast Iron CW Piping within Unit 10 Turbine Zone		18.51									Drawing 01249	Unit 10 CW lines assumed to be same material and thickness as Unit 9 CW lines
50 Gallon Chemical Tanks throughout Steam Plant										0.23	Field Observations	
Various Distribution Transformers located throughout Steam Plant (with < 2ppm PCB transformer oil)				21								
Various Process Piping throughout entire Steam Plant				3							Field Observations	Assumed to be Schedule 40 Carbon Steel Pipe

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
Various Switchgear Panels (including 13.8KV and 4KV upper & lower switchgear), MCC Centres and dry transformers located throughout the Plant	27000.00								27.00							1
Unit 9 Boiler/Turbine Zone																
Blowdown Tank	1470.0														1.47	1
Boiler Feed Pumps	1360.0														1.36	2
Low level water tank	2568.0														2.57	1
High level reserve tank	2568.0														2.57	1
Ljungstrom air preheater	16420.0														16.42	1
6" Diameter Main Steam Piping	898.02	1.00	21.10	42.56	898.0				0.90							1
8" Diameter Main Steam Piping	1886.03	1.00	29.20	64.59	1886.0				1.89							1
FD Fan	2631.0														2.63	1
ID Fan	2631.0														2.63	1
Cyclone Dust Separator	4843.0														4.84	1
Deaerator	10210.0														10.21	1
Ductwork to stack	1310.0														1.31	1
No. 4 HP Heater	3360.0														3.36	1
No. 1 LP Heater (Brass Tubes)	1000.0	284			650.0						0.65				0.35	1
No. 2 LP Heater (Brass Tubes)	1000.0	284			650.0						0.65				0.35	1
Air Ejector	2177.0														2.18	1
Gland Heater	500.0														0.50	1
Turbine oil tank	826.9														0.83	1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
Various Switchgear Panels (including 13.8KV and 4KV upper & lower switchgear), MCC Centres and dry transformers located throughout the Plant				27							Field Observations and weights obtained from manufacturer's data for similar sized equipment	Estimated weight
Unit 9 Boiler/Turbine Zone												
Blowdown Tank										1.47	Drawing 01341	
Boiler Feed Pumps										2.72		Assumed to be the same as Unit 5 Boiler Feed Pump
Low level water tank										2.57	Drawing 01734	
High level reserve tank										2.57	Drawing 01733	
Ljungstrom air preheater										16.42	Drawing E07551101	
6" Diameter Main Steam Piping				0.9							Drawing 02303	
8" Diameter Main Steam Piping				1.9							Drawing 02303	
FD Fan										2.63	Drawing 02286	Assume Unit 9 is the same as Unit 10 FD Fan
ID Fan										2.63	Drawings 01811, 02286	ID Fan is similar size as Unit 10 FD Fan, therefore assume the same weight as Unit 10 FD Fan
Cyclone Dust Separator										4.84	Drawings 04468, 04471	
Deaerator										10.21	Drawing 04731	
Ductwork to stack										1.31	Drawings 01783, 01784, 01786	Unit 9 Ducting is constructed of FRP pipe. Steel value for duct support structures
No. 4 HP Heater										3.36	Drawing A1744427	
No. 1 LP Heater (Brass Tubes)						0.65				0.35	Drawing A1744569	
No. 2 LP Heater (Brass Tubes)						0.65				0.35	Drawing A1744570	
Air Ejector										2.18	Drawing 01948	
Gland Heater										0.50	Drawing 01956	
Turbine oil tank										0.83	Drawing 04702	

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
Condenser (Alum Brass Tubes)	52980.0											12.52			40.46	1
Drain cooler	450.0														0.45	1
Oil coolers	900.0														0.90	1
Extractor Pumps	1000.00														1.00	2
Flash Condenser	450.0														0.45	1
Econocoil Cooling Bank	10.00	13	0.30	0.31	1.21	0.01										1
Air Cooler	478.50	135	2.5	0.45	151.88		0.32						0.15			1
Vent Condenser	900.0														0.90	1
Wall Heater	1814.0												1.2	0.4		1
10,000 Gallon #9 Day Tank	3608.3												0.07		3.54	1
Aux. Cooling water expansion tank	271.3									0.27						1
CW Screen	7590.00								8							1
CW Pumps	3160.0														3.16	2
Cast Iron CW Piping within Unit 9 Turbine Zone	19676.1				19676.1		19.68									1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
Condenser (Alum Brass Tubes)							12.52			40.46	Drawing 04723, AEI Turbine Generator Operating Manual Drawing A1745283	
Drain cooler										0.45	Drawing 01946	
Oil coolers										0.90	Drawing 01945	
Extractor Pumps										2.00	Weight of pump provided by MECL	
Flash Condenser										0.45	Drawing 01946	
Econocoil Cooling Bank	0.01										Drawing 01316	
Air Cooler		0.32					0.15				Drawing 01947	
Vent Condenser										0.90	Drawing 01983	
Wall Heater								1.2	0.4		Field Observations	Estimated weights of Copper and Aluminum
10,000 Gallon #9 Day Tank								0.07		3.54	Drawing 02294, Field Observations	
Aux. Cooling water expansion tank					0.27						Drawing 02297	
CW Screen				8							Weight provided Screen Manufacturer	
CW Pumps										6.32	Weight provided by MECL	
Cast Iron CW Piping within Unit 9 Turbine Zone		19.68									Drawing 01081	

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
MgOH Room																
MgOH Silos	308.5														0.31	2
Bulk caustic tank	1138.00														1.14	1
Unit 5 Boiler Zone																
Common Steam Header (Units 4, 5, 6)	5750.40	1.00	60.00	95.84	5750.4				5.75							1
Unit 5 Steam Header	646.91	1.00	15.20	42.56	646.9				0.65							1
Ljungstrom air heater	12180.00														12.18	1
Howden Type Z2.95 FD fan	1760.0														1.76	1
Boiler feed pump	1360.0														1.36	1
Water storage tank	2420.0														2.42	1
Blowdown Tank (vertical pipe)	880.0								0.88							1
Unit 5 Stack	6492.0														6.49	1
Ductwork to New Stack (includes ductwork from Boilers 1, 3, 4, 5)	26030.0												1.42		24.61	1
Space heater ductwork	359.0														0.36	1
Bulk acid tank south of No. 5 boiler	2797.0														2.80	1
# 3 Surge Tank	1170.9														1.17	1
Unit 8 Turbine Zone																
Turbine oil tank	550.0														0.55	1
Turbine Pedestal Structural Steel	10035.5														10.04	1
Air Cooler	478.50	135	2.5	0.45	151.88		0.32						0.15			1
No. 1 LP Feedwater Heater (Brass Tubes)	1360.0				779.0						0.78				0.58	1
No. 2 HP Feedwater Heater (Copper Tubes)	1810.0				1210.0									1.21	0.60	1
Drain cooler (Brass Tubes)	350.9				169.9						0.17				0.18	1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
MgOH Room												
MgOH Silos										0.62	Drawing 02696	
Bulk caustic tank										1.14	Tank Dimensions provided by MECL	
Unit 5 Boiler Zone												
Common Steam Header (Units 4, 5, 6)				5.8							Drawing 00345	Assumed to be Schedule 80 Carbon Steel Pipe
Unit 5 Steam Header				0.6							Field Observations	Assumed to be Schedule 80 Carbon Steel Pipe
Ljungstrom air heater										12.18	Drawing 04200	
Howden Type Z2.95 FD fan										1.76	Drawing 04202	
Boiler feed pump										1.36	Weight provided by MECL	
Water storage tank										2.42	Drawing 00877	
Blowdown Tank (vertical pipe)				0.88							Drawing 00879	Includes exhaust to roof
Unit 5 Stack										6.49	Drawing 00848	
Ductwork to New Stack (includes ductwork from Boilers 1, 3, 4, 5)								1.42		24.61	Drawings 02555 through 02565, 00437, 03196	Thickness of steel duct work not specified, assumed to be 3/16". Thickness of aluminum jacketing assumed to be 0.00079m
Space heater ductwork										0.36	Drawing 00932	
Bulk acid tank south of No. 5 boiler										2.80	MFM Industries Quotation	
# 3 Surge Tank										1.17	Drawing MA-14932	
Unit 8 Turbine Zone												
Turbine oil tank										0.55	Drawing 04030	
Turbine Pedestal Structural Steel										10.04	Drawing 04160	
Air Cooler		0.32						0.15			Drawing 01947	Assumed to be the same weight as Unit 9
No. 1 LP Feedwater Heater (Brass Tubes)						0.78				0.58	Drawing 03296	
No. 2 HP Feedwater Heater (Copper Tubes)									1.21	0.60	Drawing 03294	
Drain cooler (Brass Tubes)						0.17				0.18	Drawing 03289	

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
Extractor Pumps	1000.00														1.00	2
Air Ejector	812.0														0.81	1
Evaporator	4530.0														4.53	1
Condenser (Alum Brass Tubes)	21770.0	2980			6710.0							6.71			21.76	1
CW Pumps	3160.0														3.16	2
CW Screen	7590.00								8							1
Cast Iron CW Piping within Unit 8 Turbine Zone	11088.98				11088.98		11.09									1
Unit 4 Boiler Zone																
Unit 4 Steam Header	1029.95	1.00	24.20	42.56	1030.0				1.03							1
No. 4 Feedwater pump	1360.0														1.36	1
No. 2 Feedwater pump	1360.0														1.36	1
Unit 2 Deaerator tank	2639.9														2.64	1
Surge tank No.2	2639.9														2.64	1
Demin Tanks (800 Gallon)	500.0														0.50	4
Boiler 4 Steel Stack	5220.3														5.22	1
Boiler 2 30" stack	847.2									0.85						1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
Extractor Pumps										2.00	Weight of pump provided by MECL	
Air Ejector										0.81	Drawing 03298	
Evaporator										4.53	Drawing 04178	
Condenser (Alum Brass Tubes)							6.71			21.76	Drawing 03492	
CW Pumps										6.32		Assumed to be the same as Unit 9 CW Pumps
CW Screen				8							Weight provided Screen Manufacturer	
Cast Iron CW Piping within Unit 8 Turbine Zone		11.09									Drawing 00895, 00783	Thickness of Cast Iron pipe based on specification sheet from Mueller Co. for Class 150 Cast Iron pipe
Unit 4 Boiler Zone												
Unit 4 Steam Header				1							Field Observations	Assumed to be Schedule 80 Carbon Steel Pipe
No. 4 Feedwater pump										1.36		Assumed to be the same as Unit 5 Boiler Feed Pump
No. 2 Feedwater pump										1.36		Assumed to be the same as Unit 5 Boiler Feed Pump
Unit 2 Deaerator tank										2.64		Assumed to be the same weight as No. 2 Surge Tank
Surge tank No.2										2.64	Drawing 00643	
Demin Tanks (800 Gallon)										2.00	Field Observations	
Boiler 4 Steel Stack										5.22	Drawing 00621	
Boiler 2 30" stack					0.85						Drawing 03102	

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
12.5 Ton Crane	850.0														0.85	1
Drain tank	894.90														0.89	1
Drain tank	847.80														0.85	1
Unit 7 Turbine Zone																
Turbine oil tank	550.0														0.55	1
Turbine oil purifier	181.4														0.18	1
CS&E Valve	500.0														0.50	1
Oil coolers	900.0														0.90	6
LP Feedwater Heaters (Brass Tubes)	1360.0				779.0						0.78				0.58	2
HP Feedwater Heater (Copper Tubes)	1950.0				1303.0									1.30	0.65	1
Extractor Pumps	1000.00														1.00	2

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
12.5 Ton Crane										0.85	Crane trolley weight taken from Munck Total Crane Systems technical specifications for Double Girder Cranes	Crane girder weights have been included in the Building Structural Steel quantities
Drain tank										0.89	Tank Dimensions provided by MECL	
Drain tank										0.85	Tank Dimensions provided by MECL	
Unit 7 Turbine Zone												
Turbine oil tank										0.55		Assumed to be the same as Unit 8
Turbine oil purifier										0.18	Weight provided by MECL	
CS&E Valve										0.50	Brown Boveri Drawing D202759	
Oil coolers										5.40		Weight assumed to be the same as Unit 9/10 Oil Coolers
LP Feedwater Heaters (Brass Tubes)						1.56				1.16		Assumed to be the same as Unit 8
HP Feedwater Heater (Copper Tubes)									1.30	0.65	Total weight provided by MECL, weight of tubes based on Unit 8 ratio of tube weight versus total heater weight	
Extractor Pumps										2.00	Weight of pump provided by MECL	

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
Condenser (Brass Tubes)	17633.0	1700	3.6	0.89	5431.0						5.43				12.20	1
CW Pump	3160.0														3.16	1
Unit 7 CW Screen	7590.00								7.6							1
Unit 6 CW Screen	0.00															0
Cast Iron CW Piping within Unit 7 Turbine Zone	7512.8				7512.8		7.51									1
12.0 Genset Generator	197.0														0.20	1
Wastewater Treatment Plant Zone																
Unit 6 Steam Header	514.98	1.00	12.10	42.56	515.0				0.51							1
Wall Heater	1814.0												1.2	0.4		1
Old end blowdown tank	683.2														0.68	1
Batch treatment tanks	4291.4														4.29	2
Oil/Water separator	3490.0														3.49	1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
Condenser (Brass Tubes)						5.43				12.20	Details of condenser tubes obtained from 1999 Canspec Eddy Current Inspection Report	Number of tubes estimated from photo of end of condenser. Weight of carbon steel estimated based on ratios of tube weights to overall condenser weight for Units 8, 9, 10
CW Pump										3.16		Assumed to be the same as Unit 9 CW Pumps
Unit 7 CW Screen				7.6							Weight provided Screen Manufacturer	
Unit 6 CW Screen												MECL indicated that the Unit 6 screen has been removed from the CW well
Cast Iron CW Piping within Unit 7 Turbine Zone		7.51									Drawing 00683	
12.0 Genset Generator										0.20	Unit weight taken from CAT technical specifications for DE11E3S for 12.0 kW genset	
Wastewater Treatment Plant Zone												
Unit 6 Steam Header				0.5							Field Observations	Assumed to be Schedule 80 Carbon Steel Pipe
Wall Heater								1.2	0.4		Field Observations	Estimated weights of Copper and Aluminum
Old end blowdown tank										0.68	Drawing 03091	
Batch treatment tanks										8.58	Drawings 04988, 04989	
Oil/Water separator										3.49	Oil/Water Separator (SRC-400) Operating Manual & General Arrangement Drawing	

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
Filter Press	2440.0														2.44	1
Sand filter	1067.6														1.07	1
RO-EDI Plant																
Demineralized Water Storage Tank	2745.2									2.75						1
CT3 Balance of Plant Equipment Zone																
Surge tank above electrical shop	1424.0														1.42	1
15,000 Gallon Old End Day Tank	5014.9												0.1		4.92	1
Old Stack																
Old (200') Stack Wrought Iron Liner	15540.0							15.54								1
New Stack																
New (225') Stack Carbon Steel Liner	24593.0														24.59	1
Sub-Total																
15% allowance for additional pumps, piping, other etc.																
Total																
Circulating Water Facilities																
River Pumphouse																
River pumps	5400.0														5.40	5
Pumphouse screens	7590.00								7.6							4
Circulating Water Piping																
12" Cast Iron Pipe between Steam Plant Foundation and northern limit of Waterside Drive	10281.00	1	115	89.4	10281.00		10.28									1
18" Cast Iron Pipe between Steam Plant Foundation and northern limit of Waterside Drive	18331.04	1	112	163.67	18331.04		18.33									1

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
Filter Press										2.44	JWI Filter Press Specifications	
Sand filter										1.07	Drawing V12-0085 from the Volcano Sand Filter Manual	
RO-EDI Plant												
Demineralized Water Storage Tank					2.7						Drawing 16562ME-023-rB-Water Treatment Area Demin. Tank	Thickness of tank shell assumed to be 3/16"
CT3 Balance of Plant Equipment Zone												
Surge tank above electrical shop										1.42	Drawing 00141	
15,000 Gallon Old End Day Tank								0.1		4.92	Drawing 04189, Field Observations	
Old Stack												
Old (200') Stack Wrought Iron Liner			15.54								Drawing 01313	
New Stack												
New (225') Stack Carbon Steel Liner										24.59	Drawing 03203	
Sub-Total	0	58	16	101	4	11	32	4	3	457		
15% allowance for additional pumps, piping, other etc.	0	9	2	15	1	2	5	1	0	69		
Total	**0**	**66**	**18**	**116**	**5**	**13**	**37**	**5**	**4**	**526**		
Circulating Water Facilities												
River Pumphouse												
River pumps										27.00	Weight provided by MECL	
Pumphouse screens				30							Weight provided Screen Manufacturer	
Circulating Water Piping												
12" Cast Iron Pipe between Steam Plant Foundation and northern limit of Waterside Drive		10.28									Drawing 00590, 1994 Harland Associates MECL Cooling Water Supply Lines	
18" Cast Iron Pipe between Steam Plant Foundation and northern limit of Waterside Drive		18.33										

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Weight (kg)	Number of Tubes / Pipes	Length of Tubes / Pipes (m)	Weight of Tubes / Pipes (kg/m)	Total Mass of Tubes / Pipes per Item (kg)	Mass of Titanium per Item (MT)	Mass of Cast Iron per Item (MT)	Mass of wrought Iron per Item (MT)	Mass of Carbon Steel per Item (MT)	Mass of Stainless Steel per Item (MT)	Mass of Brass per Item (MT)	Mass of Alum Brass per Item (MT)	Mass of Aluminum per Item (MT)	Mass of Copper per Item (MT)	Mass of Plate and Structural Carbon Steel per Item (MT)	Total Quantity
24" Cast Iron Pipe between Steam Plant Foundation and northern limit of Waterside Drive	49733.32	1	182	273.26	49733.32		49.73									1
Sub-Total																
15% allowance for additional pumps, piping, other etc.																
Total																
Bulk Storage Tank Farm																
Bunker C Fuel Oil Heater	1290.0														1.29	1
Sub-Total																
15% allowance for additional pumps, piping, other etc.																
Total																

Notes:
1. Number, Length and Weight of Tubes/Pipes per item not shown for various infrastructure where only total tube or equipment weight was provided or calculated from data source

APPENDIX B7

PLANT PROCESS EQUIPMENT MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description of Item	Total Mass of Titanium (MT)	Total Mass of Cast Iron (MT)	Total Mass of Wrought Iron (MT)	Total Mass of Carbon Steel (MT)	Total Mass of Stainless Steel (MT)	Total Mass of Brass (MT)	Total Mass of Alum Brass (MT)	Total Mass of Aluminum (MT)	Total Mass of Copper (MT)	Total Mass of Plate and Structural Carbon Steel (MT)	Data Source	Comments
24" Cast Iron Pipe between Steam Plant Foundation and northern limit of Waterside Drive		49.73									Relocation Drawing	
Sub-Total	0	78	0	30	0	0	0	0	0	27		
15% allowance for additional pumps, piping, other etc.	0	12	0	5	0	0	0	0	0	4		
Total	**0**	**90**	**0**	**35**	**0**	**0**	**0**	**0**	**0**	**31**		
Bulk Storage Tank Farm												
Bunker C Fuel Oil Heater										1.29	Drawing 04192	
Sub-Total	0	0	0	0	0	0	0	0	0	1.29		
15% allowance for additional pumps, piping, other etc.	0	0	0	0	0	0	0	0	0	0.19		
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**		

Notes:
1. Number, Length and Weight of Tubes/Pipes per item not shown for various infrastructure where only total tube or equipment weight was provided or calculated from data source

APPENDIX B8.1

BULK STORAGE TANK FARM AND PIPELINE QUANTITIES (SUMMARY)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Area	Plate and Structural Steel (MT)	Carbon Steel (MT)	Insulation (m^3)	Aluminum (MT)
Bunker C Bulk Storage Tank	146	0	0	0
All Pipeline and Equipment	0	20	20	0.5
TOTAL (MT)	**146**	**20**	**20**	**0.5**

Note:

Insulation and Aluminum are total quantities for tank area and main pipeline

APPENDIX B8.2

MATERIAL QUANTITY ESTIMATE - MAIN FUEL OIL STORAGE TANK
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description	Part	# Of Parts	Diameter (ft)	Length (ft)	Thickness (ft)	Height (ft)	Volume (ft^3)	Volume (m^3)	Unit Weight of Plate Steel (kg/m^3)	Unit Weight of Piece (kg/m)	Weight of Unit (kg)	Total Weight (kg)	Total Weight (MT)	Reference	Comments
Plate and Structural Steel (Ferrous)															
Steel Plates Welded Together Forming Course 1	Ring #1	1	--	207.3	0.0418	6.00	51.94	1.47	7,850.0	n/a	11,538.72	11,538.72	11.54	2008 Acuren Tank Inspection Report	Shell Thicknesses taken from Table 1 in Acuren Inspection Report
Steel Plates Welded Together Forming Course 2	Ring #2	1	--	207.3	0.0390	6.00	48.52	1.37	7,850.0	n/a	10,778.68	10,778.68	10.78		
Steel Plates Welded Together Forming Course 3	Ring #3	1	--	207.3	0.0298	6.00	37.07	1.05	7,850.0	n/a	8,236.02	8,236.02	8.24		
Steel Plates Welded Together Forming Course 4	Ring #4	1	--	207.3	0.0240	6.00	29.86	0.84	7,850.0	n/a	6,633.04	6,633.04	6.63		
Steel Plates Welded Together Forming Course 5	Ring #5	1	--	207.3	0.0223	6.00	27.74	0.79	7,850.0	n/a	6,163.20	6,163.20	6.16		
Steel Plates Welded Together Forming Course 6	Ring #6	1	--	207.3	0.0222	6.00	27.62	0.78	7,850.0	n/a	6,135.56	6,135.56	6.14		
Steel Plates Welded Together Forming Course 7	Ring #7	1	--	207.3	0.0215	6.00	26.75	0.76	7,850.0	n/a	5,942.10	5,942.10	5.94		
Steel Plates Welded Together Forming Course 8	Ring #8	1	--	207.3	0.0214	6.00	26.62	0.75	7,850.0	n/a	5,914.46	5,914.46	5.91		
Floor - Steel Plates Welded Together	Floor	1	66	--	0.0207	--	70.68	2.00	7,850.0	n/a	15,701.97	15,701.97	15.70	Drawing 03088	Floor thickness not provided, therefore thickness assumed based on tanks of similar size from other thermal generating stations
Roof - Steel Plates Welded Together	Roof	1	66	--	0.0143	--	48.90	1.38	7,850.0	n/a	10,863.00	10,863.00	10.86	2008 Acuren Tank Inspection Report	Roof Thickness taken from Table 1 in Acuren Inspection Report
Short Rafters	10" [@ 15.3#	18	--	20	n/a	n/a	n/a	n/a	n/a	22.7664	455.33	8,195.90	8.20	Drawing 03088	Part lengths or dimensions not provided and were assumed based on tanks of similar size and construction from other thermal generating stations
Long Rafters	10" [@ 15.3#	18	--	33	n/a	n/a	n/a	n/a	n/a	22.7664	751.29	13,523.24	13.52		
Inner Girders	10" [@ 15.3#	6	--	12	n/a	n/a	n/a	n/a	n/a	22.7664	273.20	1,639.18	1.64		
Outer Channel around Interior lip of Roof	10" [@ 15.3#	1	--	207	n/a	n/a	n/a	n/a	n/a	22.7664	4,718.11	4,718.11	4.72		
Support Column Channel Type 1	12" [@ 20.8#	7	--	48	n/a	n/a	n/a	n/a	n/a	30.9504	1,485.62	10,399.33	10.40		
Support Column Channel Type 2	10" [@ 11.4#	7	--	48	n/a	n/a	n/a	n/a	n/a	16.9632	814.23	5,699.64	5.70		
Steam Coil Heaters	2" Diameter Carbon Steel Pipe	2	0.2	195	0.01	--	1.4	0.04	7,850.0	n/a	302.28	604.56	0.60	2008 Acuren Tank Inspection Report, Drawing 03088	Steam coil dimensions assumed based on Acuren Inspection Report, Site Photos, and Drawing 03088
10 % Contingency for Other Components (Shell Nozzles, Roof Nozzles, Stairway, And Roof Manway)	Other Components												13.27		
												Total Steel Main Fuel Oil Tank (MT)	**146**		

Note:
n/a Not Available

APPENDIX B8.3

BULK STORAGE TANK FARM AND PIPELINE QUANTITIES (PIPE THERMAL INSULATION AND JACKETING)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description	Total Length (m)	External Diameter of Pipe (m)	Insulation Thickness (m)	Volume of Insulation (m^3)	External Diameter of Aluminum Jacketing (m)	Aluminum Jacket Thickness (m)	Volume of Aluminum Jacket (m^3)	Density of Aluminum (kg/m^3)	Weight of Aluminum Jacketing (kg)	Weight of Aluminum Jacketing (MT)	Reference
6" Bunker C Pipeline to Plant with 1.25" Steam Tracing	315	0.18	0.05	11.38	0.25	0.0004064	0.101	2640	265.9	0.27	MECL Drawings 00830, 12553, 12552
3" Steam Pipeline	315	0.075	0.05	6.19	0.175	0.0004064	0.071	2640	186.2	0.19	
10" Bunker C Fill Pipeline	57	0.25	0.05	2.69	0.4	0.0004064	0.026	2640	67.3	0.07	
Total				**20**						**0.52**	

Notes:
1. Density of Aluminum based on Handbook of Steel Construction, Canadian Institute of Steel Construction

APPENDIX B8.4

BULK STORAGE TANK FARM AND PIPELINE QUANTITIES (FUEL OIL PIPING)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description	Length (m)	Nominal Diameter (m)	Unit Weight of Pipe (kg/m)	Weight of Carbon Steel Pipe (kg)	Weight of Carbon Steel Pipe (MT)	Reference	Comments
6" Bunker C Pipeline to Plant (Schedule 40)	315	0.15	28.23	8,892	8.89	MECL Drawings 00830, 12553, 12552	Unit weights of steel pipe obtained from Engineeringtoolbox.com. 10" Bunker C Fill Pipeline assumed to be Schedule 40
3" Steam Pipeline (Schedule 80)	315	0.075	15.33	4,829	4.83		
1.25" Steam Tracing (Schedule 40)	315	0.032	3.38	1,065	1.06		
10" Bunker C Fill Pipeline (Schedule 40)	57	0.25	60.24	3,434	3.43		
Subtotal					**18.2**		
10% Contingency for Pipe Supports					**1.82**		
Total (MT)					**20.0**		

APPENDIX B9

TURBINE-GENERATOR MATERIAL QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PE

Description	Total Weight (kg)	Weight of Turbine-Generator Steel (kg)	Weight of Copper Winding / Exciter (kg)	Mass of Steel (MT)	Mass of Copper (MT)	Source
Unit 10 Turbine-Generator (20 MW AEI)	69,626	61,526	8,100	61.53	8.10	AEI Operating and Maintenance Manual
Unit 9 Turbine-Generator (20 MW AEI)	69,626	61,526	8,100	61.53	8.10	AEI Operating and Maintenance Manual
Unit 8 Turbine-Generator (10 MW C.A. Parsons & Co. Ltd.)	20,230	17,150	3,080	17.15	3.08	MECL Drawings 07376, 07377
Unit 7 Turbine-Generator (7.5 MW Brown Boveri)	22,080	20,410	1,670	20.41	1.67	Brown Boveri Operating & Maintenance Manual, MECL Drawing 04867, Brown Boveri Drawing D002987, Weight of copper provided by MECL based on weight of copper recovered from former Turbine #6
TOTAL				**161**	**21**	

APPENDIX B10

NON-RECYCLABLE DEBRIS QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Data Source	Comments
Steam Plant Buildings						
Unit # 10 Boiler/Turbine Zone	Roof Materials	28	857	23,996.0	Drawing F-MA-24360, Drawing F-MA-24421, Drawing F-MA-24432	4-ply Built Up Roofing (BUR)
	Boiler Shell Insulation	1.8	381.4	686.5	Drawing 04506	3" thick block insulation
Unit # 9 Boiler/Turbine Zone	FRP Breeching Duct to Stack			1,057.0	Drawing 01783	2.4m diameter, 9.52mm thick FRP pipe with a debris volume of $0.47m^3$
	Boiler Shell Insulation	1.8	381.4	686.5	Drawing 04506	3" thick block insulation
	Roof Materials	28	848	23,744.0	Drawing MA-18041-1, Drawing MA-18042-2, Drawing MA-18041-3	4-ply BUR
MGOH Room	Roof Materials	14.7	283	4,160.1	Pre-Built Structures Drawing No. S1, Pre-Built Structures Drawing No. S2, Field Observations	2-ply modified bitumen roof

APPENDIX B10

NON-RECYCLABLE DEBRIS QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Data Source	Comments
Unit # 5 Boiler Area	Boiler Shell Insulation	2.4	243.7	584.9	Drawing 04212	4" thick block insulation
	Roof Materials	14.7	331	4,865.7	Dwg MA-14247, Field Observations	2-ply modified bitumen roof
Turbine #8 Area	Roof Materials	14.7	326	4,792.2	Dwg MA-14953, Field Observations	2-ply modified bitumen roof
Unit # 4 Boiler Area	Roof Materials	14.7	287	4,218.9	Dwg MA-6925, Dwg MA-8308, Field Observations	2-ply modified bitumen roof
	Boiler Shell Insulation	1.2	412.6	495.1	Drawing 04584	2" thick block insulation
Turbine #7 Area	Roof Materials	14.7	289	4,248.3	Dwg MA-8452, Dwg MA-8525, Field Observations	2-ply modified bitumen roof
Wastewater Treatment Plant	Roof Materials	14.7	244	3,586.8	Drawing MA-8308, Field Measurements	2-ply modified bitumen roof
RO-EDI Plant	Roof Materials	14.7	175	2,572.5	Drawing MA-8308, Field Observations	2-ply modified bitumen roof

APPENDIX B10

NON-RECYCLABLE DEBRIS QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Building Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Data Source	Comments
CT3 Balance of Plant Equipment Zone	Roof Materials	14.7	552	8,114.4	Dwgs MA-3049, Dwg MA-8308, Dwg MA-2510, Field Observations	2-ply modified bitumen roof
Welding Shop Area	Roof Materials	14.7	74	1,087.8	Drawing MA-2510, Field Observations	2-ply modified bitumen roof
Mechanical Maintenance Shop	Roof Insulation	3	169	507.0	Field Measurements	Vinyl Insulation
Sub -Total Mass of non-recyclable materials (kg)				**89,403.7**		
10% Contingency for Non-ACM Pipe Insulation and lumber for interior partitions (kg)				**8,940.4**		
Total Mass of non-recyclable materials (kg)				**98,344.1**		
Total Mass of non-recyclable materials (MT)				**98**		
Total Volume of non-recyclable materials (m^3)				**1,025**		
10% Contingency for Non-ACM Pipe Insulation and lumber for interior partitions (m^3)				**102**		
Total Bulked Volume of non-recyclable materials (m^3)[1]				**1,578**		

APPENDIX B10

NON-RECYCLABLE DEBRIS QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Type of Debris	Weight of Debris (kg/m^3)	Total Volume For Debris Type (m^3)	Total Weight (kg)	Data Source	Comments
New Stack (225' high)	Concrete with paint containing elevated concentrations of lead	2400	195	468,000.0	MECL Drawing 03203	5.2 m diameter x 61 m high stack
Sub -Total Mass of non-recyclable materials (kg)				**468,000.0**		
Total Mass of non-recyclable materials (MT)				**468**		
Total Volume of non-recyclable materials (m^3)				**195**		
Total Bulked Volume of non-recyclable materials (m^3)[1]				**312**		

Description	Type of Debris	Weight of Debris (kg/m^2)	Total Area For Debris Type (m^2)	Total Weight (kg)	Data Source	Comments
Cooling Water Facilities & Infrastructure						
River Pumphouse	Roof Materials	14.7	119	1,749.3	Dwg MA-10152, Field Observations	2-ply modified bitumen roof
Sub -Total Mass of non-recyclable materials (kg)				**1,749.3**		
10% Contingency for Pipe Insulation and lumber for interior partitions/flooring (kg)				**174.9**		
Total Mass of non-recyclable materials (kg)				**1,924.2**		
Total Mass of non-recyclable materials (MT)				**2**		
Total Volume of non-recyclable materials (m^3)				**30**		
10% Contingency for Non-ACM Pipe Insulation and lumber for interior partitions (m^3)				**3**		
Total Bulked Volume of non-recyclable materials (m^3)[1]				**46**		

APPENDIX B10

NON-RECYCLABLE DEBRIS QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Type of Debris	Weight of Debris (kg/m^3)	Total Volume For Debris Type (m^3)	Total Weight (kg)	Data Source	Comments
River Pumphouse Dock Structure	Creosote timbers & wood	962	76.53	73,621.9	Dwg 041115, Field Observations	Weight developed from overall volumes and includes timber piles, pile caps, decking, stringers and wales
Wooden box culvert	Creosote treated wood	722	73.92	53,370.2	Drawing MAL-41417	
Sub -Total Mass of non-recyclable materials (kg)				**126,992.1**		
10% Contingency (kg)				**12,699.2**		
Total Mass of non-recyclable materials (kg)				**139,691.3**		
Total Mass of non-recyclable materials (MT)				**140**		
Total Volume of non-recyclable materials (m^3)				**150**		
10% Contingency (m^3)				**15**		
Total Bulked Volume of non-recyclable materials (m^3)[1]				**232**		

APPENDIX B10

NON-RECYCLABLE DEBRIS QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Type of Debris	Weight of Debris (kg/m^3)	Total Volume For Debris Type (m^3)	Total Weight (kg)	Data Source	Comments
River Pumphouse Exterior Walls	Concrete block with paint containing elevated concentrations of zinc	1200	99	118,800.0	MECL Drawing 08627	200mm, 250mm & 300mm thick concrete block walls. Allowance for grout in every 4th core and that concrete block is 53% hollow
Sub -Total Mass of non-recyclable materials (kg)				**118,800.0**		
Total Mass of non-recyclable materials (MT)				**119**		
Total Volume of non-recyclable materials (m^3)				**99**		
Total Bulked Volume of non-recyclable materials (m^3)[1]				**158**		

APPENDIX B10

NON-RECYCLABLE DEBRIS QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Type of Debris	Weight of Debris (kg/m^3)	Total Volume For Debris Type (m^3)	Total Weight (kg)	Data Source	Comments
Bunker Storage Tank Farm						
Steam & Fuel Pipe Insulation	Insulation	32	20	640.0	See Appendix B8 for volume calculation	
Sub -Total Mass of non-recyclable materials (kg)				**640.0**		
5% Contingency for elbows, joints, connectors (kg)				**32.0**		
Total Mass of non-recyclable materials (kg)				**672.0**		
Total Mass of non-recyclable materials (MT)				**1**		
Total Volume of non-recyclable materials (m^3)				**20**		
5% Contingency for elbows, joints, connectors(m^3)				**1**		
Total Bulked Volume of non-recyclable materials (m^3)[1]				**29**		

Notes:
1 - Bulking factor of 1.4 assumed
2 - ACM Insulation Quantities included in APP.B1

APPENDIX B11

SUMMARY OF VOIDS CREATED THROUGH INFRASTRUCTURE DECOMMISSIONING
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Void Dimensions					Initial Volume (m^3)	Adjustment Factor	Adjusted Volume (m^3)
	Diameter (m)	Length (m)	Width (m)	Effective Area [1] (m^2)	Height/Depth (m)			
Steam Plant								
Unit 10 Boiler/Turbine Zone								
Slab in Boiler Area (12" Thick, Top EL 10.85')	--	22.1	15.36	193.3	0.30	58.9	1	58.9
Equipment Foundations in Boiler Area	--	--	--	125.4	0.61	76.4	1	76.4
Perimeter Foundation Wall	--	101.3	0.33	--	0.9	30.1	1	30.1
Interior Foundation Walls	--	31.3	0.33	--	0.9	9.3	1	9.3
Loading Bay in Turbine Area		7.4	8.08	59.5	0.5	27.2	1	27.2
Boiler Area Trench	--	49	0.3		0.1	1.5	1	1.5
Boiler Area Trench	--	8.5	0.5		0.25	1.1	1	1.1
Boiler Area Trench	--	12.2	0.2		0.2	0.5	1	0.5
Turbine Area Trench	--	7.3	0.6		0.3	1.3	1	1.3
Turbine Area Trench	--	3	0.5		1.2	1.8	1	1.8
Turbine Area Trench	--	3.7	0.4		0.3	0.4	1	0.4
Turbine Area Basement	--	--	--		1.2	436.4	1	436.4
Turbine Area Sump Pit	--	2.7	0.6		0.3	0.5	1	0.5
Turbine Area Sump Pit	--	5.3	0.9		0.3	1.4	1	1.4
CW Sump Pit	--	3.6	1.5		1.1	5.8	1	5.8
CW Sump Pit	--	4.2	4.2		1.6	28.6	1	28.6
CW Sump Pit	--	5.2	4.5		2.1	49.7	1	49.7
CW Sump Pit	--	0.9	1.8		0.9	1.5	1	1.5
No. 10 Screen Well	--	3.5	5.2		3.0	53.8	1	53.8
Discharge Well	--	--	--		1.2	23.7	1	23.7
Carbogel Tank Foundation	--	8.9	9.1		0.4	30.5	1	30.5
Unit 10 Day Tank Foundation	--	--	--		--	12.55	1	12.6
Transformer Pad near Unit 10 Day Tank	--	--	--		--	5.97	1	6.0
Unit 9 Boiler/Turbine Zone								
Floor Slab (8" thick, top EL 10.85')	--	36.0	22.1	589.6	0.30	179.7	1	179.7
Equipment Foundations in Boiler Area (2 ft thick)	--	--	--	206.3	0.61	125.7	1	125.7
Interior Foundation Walls	--	22.1	0.3		0.9	6.6	1	6.6
Perimeter Foundation Wall	--	80.2	0.3		0.9	23.8	1	23.8
Boiler Area Trench	--	28.5	0.4		0.2	2.5	1	2.5
Boiler Area Trench	--	15.8	0.4		0.3	1.9	1	1.9
Boiler Area Trench	--	5.5	0.4		0.2	0.3	1	0.3
Boiler Area Trench	--	6.7	0.4		0.2	0.4	1	0.4
Turbine Area Trench	--	7.3	0.6		0.3	1.3	1	1.3

APPENDIX B11

SUMMARY OF VOIDS CREATED THROUGH INFRASTRUCTURE DECOMMISSIONING
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Void Dimensions					Initial Volume (m^3)	Adjustment Factor	Adjusted Volume (m^3)
	Diameter (m)	Length (m)	Width (m)	Effective Area [1] (m^2)	Height/Depth (m)			
Turbine Area Trench	--	3	0.5		1.2	1.8	1	1.8
Turbine Area Trench	--	3.7	0.4		0.3	0.4	1	0.4
Turbine Area Basement	--	--	--		1.2	411.5	1	411.5
Turbine Area Sump Pit	--	5.8	2.7		1.2	19.0	1	19.0
CW Sump Pit	--	3.0	0.8		0.8	1.9	1	1.9
CW Sump Pit	--	2.1	2.4		0.8	4.1	1	4.1
CW Sump Pit	--	7.0	3.0		3.3	70.4	1	70.4
CW Sump Pit	--	3.6	3.3		2.1	25.7	1	25.7
No. 9 Screen Well	--	3.0	4.8		1.7	24.5	1	24.5
Unit 10 Day Tank Foundation	--	--	--		--	12.55	1	12.6
MgOH Room								
Equipment Foundations	--	--	--		--	1.5	1	1.5
Building Slab	--	17.9	8.2		0.15	22.0	1	22.0
Perimeter Foundation Wall	--	34.3	0.25		0.9	7.7	1	7.7
Unit 5 Boiler Zone								
Boiler Area Trench	--	20.9	0.4		3.0	25.6	1	25.6
Boiler Area Sump Pit	--	1.5	1.6		1.1	2.6	1	2.6
Equipment Foundations	--	--	--		--	12.3	1	12.3
Building Slab	--	20.1	15.3		0.15	46.1	1	46.1
Perimeter Foundation Wall	--	55.5	0.31		0.9	15.5	1	15.5
Unit 8 Turbine Zone								
Turbine Area Trench	--	2.4	0.2		0.1	0.1	1	0.1
Turbine Area Trench	--	13.9	0.4		0.2	0.8	1	0.8
Turbine Area Basement	--	20.0	16.5		1.2	396.0	1	396.0
Turbine Area Sump Pit	--	0.7	0.7		0.8	0.4	1	0.4
Turbine Area Sump Pit	--	0.7	0.7		1.1	0.5	1	0.5
CW Sump Pit	--	1.2	1.8		0.8	1.8	1	1.8
CW Sump Pit	--	5.5	3.6		1.8	36.1	1	36.1
No. 8 Screen Well	--	4.8	2.0		3.6	34.6	1	34.6
Discharge Well	--	2.5	4.8		2.4	28.8	1	28.8
Perimeter Foundation Wall	--	20.0	0.2		0.9	3.6	1	3.6
Unit 4 Boiler Zone								
Boiler Area Trench	--	4.5	0.8		0.5	1.7	1	1.7
Boiler Area Trench	--	13.3	0.4		0.2	1.0	1	1.0
Boiler Area Trench	--	8.2	0.8		0.4	2.7	1	2.7

APPENDIX B11

SUMMARY OF VOIDS CREATED THROUGH INFRASTRUCTURE DECOMMISSIONING
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Void Dimensions					Initial Volume (m^3)	Adjustment Factor	Adjusted Volume (m^3)
	Diameter (m)	Length (m)	Width (m)	Effective Area [1] (m^2)	Height/Depth (m)			
Boiler Area Trench	--	3.0	0.9		0.4	1.1	1	1.1
Boiler Area Trench	--	29.4	1.0		0.4	11.7	1	11.7
Building Slab	--	9.3	14.9		0.15	20.8	1	20.8
Building Slab	--	11.9	25.0		0.15	44.6	1	44.6
Perimeter Foundation Wall	--	39.1	0.33		0.9	11.6	1	11.6
Unit 7 Turbine Zone								
Turbine Area Trench	--	6.7	0.5		0.2	0.5	1	0.5
Turbine Area Sump Pit	--	9.8	4.0		0.9	35.3	1	35.3
Turbine Area Sump Pit	--	1.2	1.5		1.3	2.4	1	2.4
Turbine Area Sump Pit	--	1.5	1.5		1.5	3.5	1	3.5
CW Sump Pit	--	4.2	2.4		1.2	12.5	1	12.5
CW Sump Pit	--	2.7	1.8		1.2	6.0	1	6.0
No. 7 Screen Well	--	1.8	2.5		3.6	16.2	1	16.2
CW Well 6	--	2.4	4.0		3.6	34.6	1	34.6
Building Slab	--	12.3	16.3		0.15	30.1	1	30.1
Perimeter Foundation Wall	--	40.9	0.3		0.9	11.0	1	11.0
Wastewater Treatment Plant Zone (Original Boilerhouse)								
Building Slab	--	23.2	15.7		0.15	54.6	1	54.6
Perimeter Foundation Wall	--	77.8	0.4		0.9	29.4	1	29.4
WWT Plant Area Trench	--	21.2	0.6		0.4	5.2	1	5.2
WWT Plant Area Sump Pit	--	1.1	1.3		1.0	1.4	1	1.4
Maintenance Stores Room Addition to Wastewater Treatment Plant								
Building Slab	--	7.6	6.6		0.15	7.5	1	7.5
Perimeter Foundation Wall	--	21.8	0.4		0.9	8.2	1	8.2
CT3 Balance of Plant Equipment Zone (Original Turbine Building)								
Building Slab	--	28.8	16.3		0.175	82.2	1	82.2
Perimeter Foundation Wall	--	119.0	0.4		0.9	45.0	1	45.0
Turbine Sump Pit	--	2.4	1.5		2.4	8.9	1	8.9
Turbine Sump Pit	--	1.1	0.6		1.0	0.6	1	0.6
Discharge Well (Located at Building Exterior)	--	5.8	0.9		1.8	9.5	1	9.5
Discharge Well (Located at Building Exterior)	--	1.8	2.1		2.1	8.2	1	8.2
Discharge Well (Located at Building Exterior)	--	4.2	2.4		1.8	18.7	1	18.7
Old End Day Tank Foundation	--	7.3	7.3		0.2	12.3	1	12.3
Lube Oil Stores Area Addition to CT3 Balance of Plant Equipment								
Building Slab	--	5.2	17.3		0.15	13.5	1	13.5

APPENDIX B11

SUMMARY OF VOIDS CREATED THROUGH INFRASTRUCTURE DECOMMISSIONING
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Void Dimensions					Initial Volume (m^3)	Adjustment Factor	Adjusted Volume (m^3)
	Diameter (m)	Length (m)	Width (m)	Effective Area [1] (m^2)	Height/Depth (m)			
Perimeter Foundation Wall	--	22.5	0.42		0.9	8.5	1	8.5
Welding Shop								
Sump Pit	--	0.6	0.6		1.0	0.4	1	0.4
Building Slab	--	11.5	5.7		0.15	9.8	1	9.8
Building Slab	--	2.0	2.4		0.15	0.7	1	0.7
Perimeter Foundation Wall	--	29.2	0.35		0.9	9.2	1	9.2
Mechanical Maintenance Shop								
Building Slab	--	18.0	9.0		0.15	24.3	1	24.3
Perimeter Foundation Wall	--	54.0	0.2		0.9	9.7	1	9.7
Old Stack								
Stack Foundation	--	--	--		--	50.1	1	50.1
Old Brick Stack (Only Foundation Remains)								
Stack Foundation	4.8	--	--		0.9	16.3	1	16.3
New Stack								
Stack Foundation	--	--	--		--	51.1	1	51.1
						Total Voids for Steam Plant (m^3)		**3142**
Circulating Water Facilities								
Circulating Water Piping								
CW Concrete Chambers	--	--	--		--	13.4	2	26.8
48" Hyprescon CW Piping between Steam Plant and MECL Property Boundary north of Waterside Drive	1.422	97.0	--		--	154.0	1	154.0
42" Hyprescon CW Piping between Steam Plant and MECL Property Boundary north of Waterside Drive	1.251	635.0	--		--	780.1	1	780.1
36" Hyprescon CW Piping between Steam Plant and MECL Property Boundary north of Waterside Drive	1.08	164.0	--		--	150.2	1	150.2
24" Cast Iron CW Piping between Steam Plant and MECL Property Boundary north of Waterside Drive	0.6	182.0	--		--	51.4	1	51.4
18" Cast Iron CW Piping between Steam Plant and MECL Property Boundary north of Waterside Drive	0.45	112.0	--		--	17.8	1	17.8
12" Cast Iron CW Piping between Steam Plant and MECL Property Boundary north of Waterside Drive	0.3	115.0	--		--	8.1	1	8.1
3'x4' wooden box culvert		0.9	1.2		178	192.2	1	192.2
						Total Voids for Circulating Water Facilities (m^3)		**1381**
Bulk Storage Tank Farm								
Bunker C Bulk Storage Tank								
Bunker C Tank Foundation	21.3	--	--		0.6	213.7	1	213.7

APPENDIX B11

SUMMARY OF VOIDS CREATED THROUGH INFRASTRUCTURE DECOMMISSIONING
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description	Void Dimensions					Initial Volume (m^3)	Adjustment Factor	Adjusted Volume (m^3)
	Diameter (m)	Length (m)	Width (m)	Effective Area [1] (m^2)	Height/Depth (m)			
Fuel Off-Loading Area Voids	--	5.0	6.1	30.5	0.1	3.1	1	3.1
Bunker C/Steam Heat Pipelines								
Bunker C and Steam Pipeline Culvert beneath access road	0.6	7	--		--	1.978	1	2.0
Bunker C and Steam Pipeline and Fill Line Concrete Pedestal Voids	0.25	--	--		0.9	0.044	74	3.3
Total Voids for Bulk Storage Tank Farm (m^3)								**222**

Notes:
1. Effective area is the void area minus equipment pads. Note that only total volume shown for various infrastructure due to irregular dimensions.

Sources:
Quantities based on various plans supplied by Maritime Electric, field measurements and observations

APPENDIX B12

COPPER SUMMARY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Description of Item	Generators*	Transformers	Other Electrical Equipment **	Total Estimate
Bare Copper (metric tonnes)	21	6	11	38

Description of Item	Insulated Wire****	Misc Equipment***	Total Estimate
Insulated Copper Wire (metric tonnes)	22	8	30

Notes:

*See Appendix B9 - Turbine-Generator Material Quantities

**Includes switch gear, motor control centers, pneumatic control copper tubing, panels and other electrical equipment

***Miscellaneous equipment includes estimated 80 metric tonnes of electrical motors @ 10% copper content

****Based on review of 480V single line drawings and field measurements for cable larger than 500MCM. Contingency of 5MT added for all other smaller wiring. All PILC cable has PCB >2 ppm and will require processing at a specialized facility. Therefore, the weights of PILC cables have not been included in this table. However, processing facility will provide MECL with a credit for salvaged copper and this has been considered in our Decommissioning Cost Estimate.

APPENDIX B12

BARE COPPER
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Transformers	Unit Transformers, Power Transformers, Grounding Transformers & Distribution Transformers[1]	Other (Dry Type Transformers, Building Transformers)	Total Estimate (Metric tonnes)
Bare Copper (kg of copper)	3,859	2,000	**6**

1 - Only transformers that contain transformer oil with < 2ppm PCB can be handled by the demolition contractor. All other transformers (approximately 13 MT of bare copper and 83 MT of steel) will have to be sent to a specialized facility to be processed by that facility. A credit for salvage from the processing facility will be provided to MECL and this has been considered in our Decommissioning Cost Estimate.

Sources: Data provided by MECL from nameplate data and site observations

APPENDIX B12

INSULATED COPPER WIRE
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Insulated Wire Type	Length of Wire (m)	Weight of Wire (kg/m)	Total Estimate (metric tonnes)	Comment
750 MCM	336	3.67	**1.2**	Estimate based on review of 480V single line drawings and filed measurements for cable larger than 500MCM. Contingency of 5MT added for all other smaller wiring.
1250 MCM	2076	6.1	**12.7**	
2000 MCM	300	10	**2.9**	
		Sub-Total	**17**	
		Contingency	**5**	
		Total	**22**	

Sources: Single Line drawings for 480V cable and field measurements

APPENDIX B13

INDUSTRIAL CLEANING QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

	Dimensions				Approximate		Comments	Issues		
Area/Item	**Diameter (m)**	**Length (m)**	**Width (m)**	**Height (m)**	**m^2**	**m^3**		**TPH**	**Hazardous Dust/Residue (Heavy Metals, PAHs, etc.)**	**Light Dust/ Cleaning**
Steam Plant										
Unit 10 Boiler/Turbine Zone										
Washdown of Building Interior (Building Slabs only)	--	22.0	29.0	--	638	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	148	Cleaning of Pits, Sumps, and Trenches	X		
Process Piping (for entire Steam Plant)	--	--	--	--	100	--	Estimate based on Site Observations	X		
Washdown of Ducting	--	--	--	--	155	--	Cleaning of flue gas ducting and Ljungstrom air heaters. Assumes 33% of duct surface area requires cleaning.		X	
Turbine oil tank	--	1.5	1.2	2.4	17	0.4	Tank residue, sludge and piping	X		
Oil coolers (x2)	0.6	--	--	2.2	9	0.1	Tank residue, sludge and piping	X		
10,000 Gallon #10 Day Tank	3.1	--	--	6.1	66	1.0	Clean floor and walls, assume 0.1m thick sludge with a bulking factor of 1.35	X		
Carbogel Tank	6.7	--	--	5.5	151	4.8	Clean floor and walls, assume 0.1m thick sludge with a bulking factor of 1.35	X		
Unit 9 Boiler/Turbine Zone										
Washdown of Building Interior (Building Slabs only)	--	35.8	22.0	--	788	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	154	Cleaning of Pits, Sumps, and Trenches	X		
Washdown of Ducting	--	--	--	--	115	--	Cleaning of flue gas ducting and Ljungstrom air heaters. Assumes 33% of duct surface area requires cleaning.		X	
Washdown of Cyclone Dust Collector	2.4	16	--	--	121	--	Washdown of dust collector		X	
Turbine oil tank	--	1.5	1.2	2.4	17	0.4	Tank residue, sludge and piping	X		

APPENDIX B13

INDUSTRIAL CLEANING QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

	Dimensions				Approximate		Comments	Issues		
Area/Item	Diameter (m)	Length (m)	Width (m)	Height (m)	m^2	m^3		TPH	Hazardous Dust/Residue (Heavy Metals, PAHs, etc.)	Light Dust/ Cleaning
Oil coolers (x2)	0.6	--	--	2.2	9	0.1	Tank residue, sludge and piping	X		
10,000 Gallon #9 Day Tank	3.1	--	--	6.1	66	1.0	Clean floor and walls, assume 0.1m thick sludge with a bulking factor of 1.35	X		
MgOH Room										
Washdown of Building Interior	--	17.7	7.6	--	135	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Washdown of MgOH Silos (x 2)	1.9	--	--	1.9	23	--	MgOH residue			X
Bulk caustic tank	1.8	--	--	1.8	13	0.5	Tank residue, sludge and piping			X
Unit 5 Boiler Zone										
Washdown of Building Interior (Building Slabs only)	--	18.2	14.5	--	264	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	28	Cleaning of Pits, Sumps, and Trenches	X		
Washdown of Ducting	--	--	--	--	157	--	Cleaning of Units 1,3,4,5 flue gas ducting to New Stack and Ljungstrom air heaters. Assumes 33% duct surface area requires cleaning.		X	
Unit 5 Stack	1.6	--	--	25.9	130	--	Washdown of Stack Interior		X	
Bulk acid tank south of No. 5 boiler	2.4	--	--	3.7	33	1.7	Tank residue, sludge and piping			X
Unit 8 Turbine Zone										
Washdown of Building Interior (Building Slab only)	--	18.2	14.5	--	264	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	40	Cleaning of Pits, Sumps, and Trenches	X		
Turbine oil tank	--	1.1	1.1	2.0	11	0.2	Tank residue, sludge and piping	X		
Unit 4 Boiler Zone										
Washdown of Building Interior (Building Slabs only)	--	13.3	24.2	--	322	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	18	Cleaning of Pits, Sumps, and Trenches	X		
Boiler 4 Steel Stack	1.5	--	--	22.3	105	--	Washdown of Stack Interior		X	
Boiler 2 30" stack	0.77	--	--	13.7	33.3	--	Washdown of Stack Interior		X	

APPENDIX B13

INDUSTRIAL CLEANING QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

	Dimensions				Approximate		Comments	Issues		
Area/Item	Diameter (m)	Length (m)	Width (m)	Height (m)	m^2	m^3		TPH	Hazardous Dust/Residue (Heavy Metals, PAHs, etc.)	Light Dust/ Cleaning
Unit 7 Turbine Zone										
Washdown of Building Interior (Building Slab only)	--	15.6	14.5	--	226	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	60	Cleaning of Pits, Sumps, and Trenches	X		
Turbine oil tank	--	1.1	1.1	2.0	11	0.2	Tank residue, sludge and piping	X		
Oil coolers (x2)	0.6	--	--	2.2	9	0.1	Tank residue, sludge and piping	X		
Wastewater Treatment Plant Zone										
Washdown of Building Interior (Building Slab only)	--	21.8	14.5	--	316	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	7	Cleaning of Pits, Sumps, and Trenches	X		
Batch treatment tanks (x 2)	4.1	--	--	5.6	172	15.0	Tank residue, sludge and piping		X	
Oil/Water separator	--	1.8	4.2	1.8	37	1.4	Tank residue, sludge and piping	X		
Filter Press	--	0.8	2.8	0.8	10	0.2	Tank residue, sludge and piping		X	
Sand filter	1.2	--	--	3.8	15	2.2	Tank residue, sludge and piping		X	
CT3 Balance of Plant Equipment Zone										
Washdown of Building Interior (Building Slab only)	--	28.0	14.5	--	406	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Washdown of Oil Pump Rooms	--	7.7	3.0	--	23	--	Cleaning of floors surrounding pumps and motors	X		
Cleaning of Pits, Sumps, and Trenches	--	--	--	--	--	10	Cleaning of Pits, Sumps, and Trenches	X		
15,000 Gallon Old End Day Tank	3.5	--	--	7.1	88	1.3	Clean floor and walls, assume 0.1m thick sludge with a bulking factor of 1.35	X		
Lube Oil Stores										
Washdown of Building Interior (Building Slab only)	--	12.1	3.0	--	36	--	Cleaning of floors	X		
Old Stack										
Old (200') Stack	5.2	--	--	61.0	996	--	Washdown of stack interior		X	
New Stack										
New (225') Stack	5.3	--	--	68.5	1,140	--	Washdown of stack interior		X	

APPENDIX B13

INDUSTRIAL CLEANING QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

	Dimensions				Approximate		Comments	Issues		
Area/Item	Diameter (m)	Length (m)	Width (m)	Height (m)	m^2	m^3		TPH	Hazardous Dust/Residue (Heavy Metals, PAHs, etc.)	Light Dust/ Cleaning
Steam Plant - Cleaning of Pits, Sumps and Trenches (m^3)					**--**	**464**				
Steam Plant - Cleaning of Storage and Process Tanks and Piping (m^3)					**959**	**31**				
Steam Plant - Surface Cleaning (m^2)					**7,224**	**--**				
Circulating Water Facilities										
River Pumphouse										
Washdown of Building Interior (Building Slab only)	--	22.0	10.0	--	220	--	Cleaning of floors surrounding pumps, motors, process equipment			X
Circulating Water Facilities - Cleaning of Pits, Sumps and Trenches (m^3)					--	--				
Circulating Water Facilities - Cleaning of Storage and Process Tanks and Piping (m^3)					--	--				
Circulating Water Facilities - Surface Cleaning (m^2)					**220**	--				
Bulk Storage Tank Farm										
Bunker C Fuel Oil Heater	0.5	--	--	3.0	5	0.1	Heater residue, sludge and piping	X		
Bunker C Bulk Storage Tank	18.1	--	--	14.5	1,081	34.7	Clean floor and walls, assume 0.1m thick sludge with a bulking factor of 1.35	X		
6" Bunker C Pipeline to Plant	0.15	245	--	--	115	0.4	Flushing of piping system, assume volume of sludge to be 10% of total pipe volume	X		
6" Bunker C Pipeline within Unit 9/Unit 10 Buildings	0.15	70	--	--	33	0.1	Flushing of piping system, assume volume of sludge to be 10% of total pipe volume	X		
10" Bunker C Fill Pipeline	0.25	57	--	--	45	0.3	Flushing of piping system, assume volume of sludge to be 10% of total pipe volume	X		

APPENDIX B13

INDUSTRIAL CLEANING QUANTITIES
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

	Dimensions				Approximate		Comments	Issues		
Area/Item	Diameter (m)	Length (m)	Width (m)	Height (m)	m^2	m^3		TPH	Hazardous Dust/Residue (Heavy Metals, PAHs, etc.)	Light Dust/ Cleaning
Tank Farm - Cleaning of Pits, Sumps and Trenches (m^3)					--	--				
Tank Farm - Cleaning of Storage and Process Tanks and Piping (m^3)					1,279	35.6				
Tank Farm - Surface Cleaning (m^2)					1,279	--				
Summary										
Total Cleaning of Pits, Sumps and Trenches (m^3)					--	464				
Total Cleaning of Storage and Process Tanks and Piping (m^3)					2,205.7	66.2				
Total Surface Cleaning (m^2)					8,723	--				

Notes:
1. Only total area shown for various infrastructure due to irregular dimensions.
2. Cleaning for ducting includes total wall area of flue gas duct and Ljungstrom Air Heaters divided by 3.
3. Storage and Process Tank sludge assumed to be 10% of total tank volume

APPENDIX B14

TRANSFORMER OIL SUMMARY (EXTERIOR ONLY)
2018 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Asset	Transformer I.D.	PPM PCB Content	Oil Volume (L)	Oil Weight (MT)
Grounding Transformer	6	14.2	2,059	2
Power Transformer X3-1 Bus Tie	13	6.7	5,072	5
Power Transformer X2	14	3.4	7,949	8
Power Transformer X1	20	7.5	8,025	8
Power Transformer Unit 10 Generator	24	14.1	9,800	10
Power Transformer - X3-2	45	<1	4,921	5
DIST XFMR	157	11.8	1,045	1
DIST XFMR	159	<1.0	1,325	1
Power Transformer	161	11.2	1,100	1
DIST XFMR	164	5.1	1,514	2
DIST XFMR	166	1.7	1,045	1
DIST XFMR	168	2.7	823	1
DIST XFMR	169	<1.0	840	1
		Totals	**45,518**	**48**

Notes
(1) Data supplied by MECL.
(2) Assume 1.0 Litres Oil = 2.3 lbs (1.045 kg)
(3) It is assumed that all transformer oil with PCB content >2ppm will be drained on-site and delivered to a licensed facility for recycling

Appendix C (Decommissioning Study) 2018 Asbestos Inventory Assessment Report – All-Tech (2018)

Asbestos Inventory Assessment Report
Maritime Electric Generating Station
Charlottetown, PEI

Prepared For:

GHD
466 Hodgson Road,
Fredericton, NB,
E3C 2G5

Attn: Troy Small

February 22, 2018

ALL-TECH Project No.: PE7252

ALL-TECH Environmental Services Limited, 92 Queen Street, Suite 201, Charlottetown, PE, C1A 4B1
Phone: (902) 569-0172 Fax: (902) 569-5453 Web: http://www.toalltech.com

Bedford, NS Sydney, NS St. John, NB Moncton, NB Charlottetown, PE St John's, NL Cornerbrook, NL Gander, NL

Table of Contents

EXECUTIVE SUMMARY i

1.0 INTRODUCTION 1
1.1 Survey Objectives 1
2.0 REGULATIONS & GUIDELINES 1
3.0 METHODOLOGY 3
4.0 ASSESSMENT FINDINGS 3
4.1 Friable ACM 4
4.2 Non-Friable ACM 4
5.0 CONCLUSIONS & RECOMMENDATIONS 5
6.0 DISCLAIMER 6

APPENDICES

Appendix 1 **Laboratory Certificates of analysis (2017 sampling event)**

Appendix 2 **Site Photographs – 2017 Asbestos Sampling & Observations**

Appendix 3 **ACM Inventory & Quantities Summary**

Appendix 4 **Site Drawing with ACM Concentration Areas**

EXECUTIVE SUMMARY

ALL-TECH Environmental Services Limited was retained by GHD to conduct an asbestos inventory assessment within the Maritime Electric Generating Station located at 50 Cumberland Street in Charlottetown, Prince Edward Island.

The purpose of the asbestos assessment was to identify materials which may require safe handling procedures and disposal requirements in accordance with their applicable regulations prior to renovations or demolition activity within the building or structure.

The assessment was completed on December 2017. Previous asbestos assessments and re-assessments completed over the years by ALL-TECH were reviewed and updated. Some additional samples were collected as well as previous sample results were used and referenced for quantities for this updated assessment and inventory report.

Based on the findings from the assessment, the following conclusions and recommendations are presented:

A summary of friable ACM for the Maritime Electric generating station is listed in table A below.

TABLE A Summary of Friable ACM		
Material Design	**Locations**	**Estimated Quantities**
Mechanical Insulation	Blr No. 4, 9, 10	**136 m^3**
Pipe Insulation	Blr / Turbine areas No. 4,7, 8, 9, 10	**69.6 m**
Gaskets		Unknown – many gaskets replaced some *PACM
Boiler refractory	Blr No. 2, 4, 5, 6, 9, 10	Unknown - *PACM
Dust / debris in cable trays	Throughout	Unknown – confirmed and presumed ACM

**PACM – Presumed Asbestos Containing Material*

A summary of non-friable ACM for the Maritime Electric generating station is listed in table B below.

TABLE B Summary of Non-Friable ACM		
Material Design	**Location**	**Estimated Quantities**
Electrical Arc chutes	Turbine floor; old control room; below old control room	**135 ea.**
Hardboard Transite panels	Blr No. 4, 5, 9, 10 wall areas	**1045.4 m^2**
Black mastic	Exterior roof (NE stack)	**0.5 m^3**

Based on the findings from the assessment, the following conclusions and recommendations are presented:

For any planned work or demolition involving the alteration or removal of large scale projects, a full scope of work should be developed.

In addition to the scope of work for the handling and / or removal of asbestos containing materials, the following regulations and guidelines must be carried out:

- Pertinent sections of the Prince Edward Island Department of Environment and its regulations and guidelines must be adhered to; as in asbestos disposal.
- Follow the province of Prince Edward Island Occupational Health & Safety regulations for the removal of asbestos containing materials.
- Provide air monitoring and inspection during the removal of asbestos containing materials, to ensure that all government guidelines and regulations are followed throughout the removal.
- Ensure that the asbestos removal contractor is a certified contractor with the PEI Workers Compensation Board / Occupational Health & Safety Division.

It should be noted that the final assessment completed included semi destructive testing where some wall cavities were opened. No destructive testing was conducted inside of boilers. Therefore, presumed ACM may be present in the form of boiler refractory or other internal elements. During demolition of these materials, precautions should be taken such as the use of personal protective equipment in the event of exposing concealed asbestos materials. If suspect materials are revealed, have them tested immediately.

This summary should not be used alone. The report must be read in its entirety.

Larry Koughan, CET, CRSP
Senior Branch Manager
ALL-TECH Environmental Services Limited

1.0 INTRODUCTION

ALL-TECH Environmental Services Limited was retained by GHD to conduct an asbestos inventory assessment within the Maritime Electric Generating Station located at 50 Cumberland Street in Charlottetown, Prince Edward Island.

The purpose of the asbestos assessment was to identify materials which may require safe handling procedures and disposal requirements in accordance with their applicable regulations prior to renovations or demolition activity within the building or structure.

The assessment was completed on December 2017 and additional roofing core samples were collected on January 24, 2018. Previous asbestos assessments and re-assessments completed over the years by ALL-TECH were reviewed and updated. Some additional samples were collected as well as previous sample results were used and referenced for quantities for this updated assessment and inventory report.

1.1 Survey Objectives

The scope of the assessment was to identify any suspect asbestos containing materials (ACM) within the subject building. ALL-TECH inspected both interior and exterior spaces of the subject building to determine whether ACM's may be present. Representative sampling for ACMs was conducted as required based on industry standards and the consultant's experience.

2.0 REGULATIONS & GUIDELINES

A summary table (Table 1) is provided for the applicable regulations, policies, codes, and / or guidelines of hazardous materials assessed for the purpose of this report. This information was used as reference to assess suspect hazardous materials and make recommendations based on the findings.

TABLE 1 Summary of Regulatory Framework	
Asbestos	▪ *Occupational Health and Safety Act* R.S.P.E.I. 1988, Cap. O-1.01 General Regulations – Part 49 (Including any amendments to May 2006) ▪ *Environmental Protection Act Chapter E-9 Waste Management Regulations*, Prince Edward Island ▪ Federal Treasury Board of Canada Secretariat Hazardous Substances Directive –II, Section 2.9 ▪ Transportation of Dangerous Goods Act (TDGA)

The province of Prince Edward Island Workers Compensation Board / Occupational Health & Safety Services (WCB/OSH) require that all employers and principal contractors complete an asbestos assessment for the determination of asbestos containing materials prior to renovations or demolition.

For the purposes of management of asbestos containing materials (ACM) during building maintenance, renovation or demolition the owner must conduct an assessment of suspect materials for the determination of asbestos content. An assessment report must be made available in writing which identifies materials for the management and safe handling of the ACM as well as identifying the responsibilities of the owners, employers and employees.

Asbestos materials can be found in one of two forms; friable asbestos or a non-friable type. Friable asbestos material refers to material that when dry, can be crumbled, pulverized or reduced to a powder by hand pressure. This type of asbestos material is hazardous due to its potential to become airborne, if damaged or disturbed.

Friable asbestos building products used that have been used in the past are sprayed acoustic and fire protection insulation which were installed on mechanical room ceilings, building structures, ceiling finishes, etc., and mechanical insulation on piping, tanks, boilers, vessels, etc. Some non-friable building products are vinyl acoustic floor tiles, gaskets, transite panels, piping and shingles.

Non-friable materials if handled improperly during removal or renovations, such as cutting transite panels with an electrical tool, can cause high fibre releases.

Asbestos is classified as a hazardous material under the TDGA and must adhere to specific requirements for transfer including but not limited to waste transfer manifests and proper placards. All asbestos waste must be disposed of at an approved municipal solid waste disposal site. Recent changes from the Prince Edward Island's Department of Environment's Environmental Protection Act, Waste Resource Management Regulations have defined asbestos as "special waste" as asbestos containing materials containing greater than 1% by weight for the purpose of disposal.

All work should be carried out by personnel trained and licensed with the provincial department of the Workers Compensation Board / Occupational Health and Safety Division for asbestos abatement.

3.0 METHODOLOGY

Previous asbestos assessments and re-assessments completed over the years by ALL-TECH were reviewed and updated. Previous sample results were also used and referenced for quantities for this updated assessment and inventory report.
Maritime Electric has been removing and replacing asbestos containing mechanical and pipe insulation over the years and been replacing with "Asbestos Free" labelled wraps on insulated systems.
Some additional systems have been tested during this assessment to check roofing membranes, adhesives and putty. Some other items not presently labelled were re-checked for verification. Semi-destructive testing was carried out in various block walls to check inside wall cavities for possible insulation.
In addition, the bunker c tank and pump house were also assessed, and any suspect materials were tested and analysed for asbestos content.

Where samples were collected, standard bulk sampling methodologies were followed. Samples were placed in sealed plastic bags and labelled. A chain of custody form was completed, and samples were forwarded to the laboratory via courier for analysis.

The asbestos assessment involved a visual investigation of suspect materials for the presence of asbestos containing materials. If these materials were suspected to contain asbestos, a bulk sample was collected of the representative material to be analysed with Polarized Light Microscopy.

4.0 ASSESSMENT FINDINGS

During the survey, a review of the existing ACM was quantified based on previous re-assessment within the plant.
In addition, the consultant collected individual bulk material samples of other suspect ACM's within the steam plant, bunker c tank and the pump house. Laboratory analysis certificate are presented in Appendix 1 and are itemized in Appendix 2 site photos.
A total of thirty-four (34) additional bulk material samples were collected during the assessment. Some of these samples such as roofing membranes and tars were separated and a total of forty-three (43) samples were analyzed. Of the forty-three samples analyzed, only two (2) were found to be asbestos containing materials.

Asbestos materials can be found in one of two forms; friable asbestos or a non-friable type.

Asbestos containing materials can be properly managed and left in place depending on their location, condition, and friability. Non-friable materials receive less attention than friable materials since the asbestos fibres in the non-friable material are bound or held tightly together, reducing the chance of fibres becoming airborne. This makes the non-friable products safer and easier to manage.

Based on previous assessments and testing and new additional testing completed as noted for this report, a summary of friable and non-friable ACM's is presented under their specific headings below.

4.1 Friable ACM

Based on the final assessment findings, a summary of friable ACM for the Maritime Electric generating station is listed in table 2 below. In addition, itemized inventory and quantities by locations are presented in Appendix 3. Also, a site drawing noting concentrated areas with mechanical ACM's is also available for reference in Appendix 4 but does not include all ACM's listed on inventory summaries.

TABLE 2
Summary of Friable ACM

Material Design	Locations	Estimated Quantities
Mechanical Insulation	Blr No. 4, 9, 10	**136 m^3**
Pipe Insulation	Blr / Turbine areas No. 4,7, 8, 9, 10	**69.6 m**
Gaskets		Unknown – many gaskets replaced some *PACM
Boiler refractory	Blr No. 2, 4, 5, 6, 9, 10	Unknown - *PACM
Dust / debris in cable trays	Throughout	Unknown – confirmed and presumed ACM

**PACM – Presumed Asbestos Containing Material*

4.2 Non-Friable ACM

Based on the final assessment findings, a summary of non-friable ACM for the Maritime Electric generating station is listed in table 3 below. In addition, itemized inventory and quantities by locations are presented in Appendix 3. Also, a site drawing noting concentrated areas with transite hardboard ACM's is also available for reference in Appendix 4 but does not include all ACM's listed on inventory summaries.

TABLE 3 Summary of Non-Friable ACM		
Material Design	**Location**	**Estimated Quantities**
Electrical Arc chutes	Turbine floor; old control room; below old control room	**135 ea.**
Hardboard Transite panels	Blr No. 4, 5, 9, 10 wall areas	**1045.4 m^2**
Black mastic	Exterior roof (NE stack)	**0.5 m^3**

5.0 CONCLUSIONS & RECOMMENDATIONS

Based on the findings from the assessment, the following conclusions and recommendations are presented:

For any planned work or demolition involving the alteration or removal of large scale projects, a full scope of work should be developed.

In addition to the scope of work for the handling and / or removal of asbestos containing materials, the following regulations and guidelines must be carried out:

- Pertinent sections of the Prince Edward Island Department of Environment and its regulations and guidelines must be adhered to; as in asbestos disposal.
- Follow the province of Prince Edward Island Occupational Health & Safety regulations for the removal of asbestos containing materials.
- Provide air monitoring and inspection during the removal of asbestos containing materials, to ensure that all government guidelines and regulations are followed throughout the removal.
- Ensure that the asbestos removal contractor is a certified contractor with the PEI Workers Compensation Board / Occupational Health & Safety Division.

It should be noted that the final assessment completed included semi destructive testing where some wall cavities were opened. No destructive testing was conducted inside of boilers. Therefore, presumed ACM may be present in the form of boiler refractory or other internal elements. During demolition of these materials, precautions should be taken such as the use of personal protective equipment in the event of exposing concealed asbestos materials. If suspect materials are revealed, have them tested immediately.

Retain a copy of this report on-site for future reference of materials tested for asbestos containing materials.

6.0 DISCLAIMER

This report was prepared by ALL-TECH Environmental Services Limited for the sole benefit of our client and their representative. The information in the report is based on information provided or obtained by ALL-TECH. The report is based on ALL-TECH's best judgement of the information provided at the time of the assessment. Any use of this report by a third party, is the responsibility of that third party. ALL-TECH accepts no liability and/or damages occurred by any third party which uses information obtained in this report.

Larry G. Koughan, CET, CRSP
Senior Branch Manager

Appendix 1

Laboratory Certificates of analysis (2017 sampling event)

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited 20 Duke St.,Suite 109 Bedford NS B4A 2Z5	Report Date:	11/30/2017
		Report No.:	552577 - PLM
		Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6395263
Client No.: ME17-01
Analyst Observation: Black Mastic
Client Description: Black Mastic
Location: Exterior NE Stack
Facility:
Percent Asbestos: *20 Chrysotile*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 80

Lab No.: 6395264
Client No.: ME17-02
Analyst Observation: Off-White/Black Roof Material
Client Description: Black Roofing Membrane
Location: Exterior NE Sloped Roof
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 2 Cellulose
Percent Non-Fibrous Material: 98

Lab No.: 6395264(L2)
Client No.: ME17-02
Analyst Observation: Black Tar
Client Description: Black Roofing Membrane
Location: Exterior NE Sloped Roof
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395265
Client No.: ME17-03
Analyst Observation: Grey Caulk
Client Description: Grey Caulking
Location: Exterior Plexiglass Skylight On Roof
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395266
Client No.: ME17-04
Analyst Observation: Black/Green Tar
Client Description: Black Tar - By Breeching On Roof
Location: Exterior Central Flat Roof
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395267
Client No.: ME17-05
Analyst Observation: Grey Caulk
Client Description: Grey Caulking - On Metal Cladding
Location: Exterior Roof
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Analytical Method -**US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 11/24/2017
Date Analyzed: 11/30/2017
Signature:
Analyst: Michael Lagarde

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	11/30/2017
	20 Duke St.,Suite 109	Report No.:	552577 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6395268
Client No.: ME17-06
Analyst Observation: Black/Silver Roof Material
Client Description: Black Roofing Membrane
Location: Exterior South Flat Roof
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 4 Cellulose
Percent Non-Fibrous Material: 96

Lab No.: 6395269
Client No.: ME17-07
Analyst Observation: Tan Fibrous
Client Description: Brown Fiberboard - Under Roofing Membrane
Location: Exterior South Flat Roof
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 60 Cellulose
Percent Non-Fibrous Material: 40

Lab No.: 6395270
Client No.: ME17-08
Analyst Observation: Silver/Black Roof Material
Client Description: Black Roofing Membrane
Location: Exterior South Flat Roof
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 30 Cellulose
Percent Non-Fibrous Material: 70

Lab No.: 6395270(L2)
Client No.: ME17-08
Analyst Observation: Black Roof Material
Client Description: Black Roofing Membrane
Location: Exterior South Flat Roof
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395271
Client No.: ME17-09
Analyst Observation: Silver/Black Roof Material
Client Description: Black Tar
Location: Exterior NE Flat Roof
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 2 Cellulose
Percent Non-Fibrous Material: 98

Lab No.: 6395271(L2)
Client No.: ME17-09
Analyst Observation: Black Tar
Client Description: Black Tar
Location: Exterior NE Flat Roof
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Analytical Method - **US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 11/24/2017
Date Analyzed: 11/30/2017
Signature:
Analyst: Michael Lagarde

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

INTERNATIONAL ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	11/30/2017
	20 Duke St.,Suite 109	Report No.:	552577 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6395272 | **Analyst Observation:** Black Tar | **Location:** Exterior South Flat Roof
Client No.: ME17-10 | **Client Description:** Black Roofing Tar | **Facility:**

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 2 Cellulose
Percent Non-Fibrous Material: 98

Lab No.: 6395273 | **Analyst Observation:** Black Roof Material | **Location:** Exterior South Flat Roof
Client No.: ME17-11 | **Client Description:** Black Roofing Membrane | **Facility:**

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 40 Synthetic
Percent Non-Fibrous Material: 60

Lab No.: 6395274 | **Analyst Observation:** Grey/Tan Caulk | **Location:** Exterior South Roof Cladding
Client No.: ME17-12 | **Client Description:** Grey Caulking | **Facility:**

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395275 | **Analyst Observation:** White/Red/Black Mortar | **Location:** East Side Exterior Wall By No. 6 Blr.
Client No.: ME17-13 | **Client Description:** Brick Mortar | **Facility:**

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395276 | **Analyst Observation:** Brown Mortar | **Location:** East Side Exterior Wall By No. 6 Blr.
Client No.: ME17-14 | **Client Description:** Speed Tile Mortar | **Facility:**

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395277 | **Analyst Observation:** Green/Grey/Black Fibrous | **Location:** Int Wall Between No. 6 Blr. And No. 7 Turbine And CT3
Client No.: ME17-15 | **Client Description:** Wall Patch Cement | **Facility:**

Percent Asbestos: ***40 Chrysotile***
Percent Non-Asbestos Fibrous Material: 2 Cellulose
Percent Non-Fibrous Material: 58

Analytical Method - **US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 11/24/2017
Date Analyzed: 11/30/2017
Signature:
Analyst: Michael Lagarde

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

Dated : 12/1/2017 3:48:56

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 11/30/2017
Report No.: 552577 - PLM
Project: Maritime Electric
Project No.: PE7252

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6395278
Client No.: ME17-16
Analyst Observation: Brown Mortar
Client Description: Speed Tile Mortar
Location: Interior Wall Between No. 6 Blr. And No. 7 Turbine And CT3
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 2 Cellulose
Percent Non-Fibrous Material: 98

Lab No.: 6395279
Client No.: ME17-17
Analyst Observation: White/Tan/Brown Mortar
Client Description: Cinder Block Mortar
Location: South Wall Ground Level By No. 10 Turbine
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395280
Client No.: ME17-18
Analyst Observation: Grey Caulk
Client Description: Grey Caulking
Location: South Wall Ground Level By No. 10 Turbine
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395281
Client No.: ME17-19
Analyst Observation: Grey Caulk
Client Description: Grey Caulking
Location: Around Inner Perimeter Bottom Of Bunker C Tank
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Lab No.: 6395282
Client No.: ME17-20
Analyst Observation: White/Brown Caulk
Client Description: Grey Caulking
Location: Around Outer Perimeter Bottom Of Bunker C Tank
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 2 Cellulose
Percent Non-Fibrous Material: 98

Lab No.: 6395283
Client No.: ME17-21
Analyst Observation: Grey/Brown/Black Caulk
Client Description: Grey Caulking
Location: Around Inner Perimeter Bottom Of Bunker C Tank
Facility:
Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: None Detected
Percent Non-Fibrous Material: 100

Analytical Method -**US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 11/24/2017
Date Analyzed: 11/30/2017
Signature:
Analyst: Michael Lagarde

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

Dated : 12/1/2017 3:48:56

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	11/30/2017
	20 Duke St.,Suite 109	Report No.:	552577 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
		Project No.:	PE7252
Client:	ALL131		

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6395284
Client No.: ME17-22

Analyst Observation: Grey/White/Brown Mortar
Client Description: Cinder Block Mortar

Location: Pumphouse East Wall
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
2 Cellulose

Percent Non-Fibrous Material:
98

Lab No.: 6395285
Client No.: ME17-23

Analyst Observation: Tan/White/Brown Mortar
Client Description: Cinder Block Mortar

Location: Pumphouse West Wall
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
2 Cellulose

Percent Non-Fibrous Material:
98

Analytical Method - **US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 11/24/2017
Date Analyzed: 11/30/2017
Signature:
Analyst: Michael Lagarde

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

iATL INTERNATIONAL ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	11/30/2017
	20 Duke St.,Suite 109	Report No.:	552577 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

Appendix to Analytical Report

Customer Contact:
Analysis: US EPA 600, R93-116

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com
iATL Office Manager: cdavis@iatl.com
iATL Account Representative: Cassie Doherty
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Bulk Building Materials
Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ii our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

- NIST-NVLAP No. 101165-0
- NY-DOH No. 11021
- AIHA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB)

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	11/30/2017
	20 Duke St.,Suite 109	Report No.:	552577 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
		Project No.:	PE7252
Client:	ALL131		

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique – by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com**.

1) Note: No mastic provided for analysis.
2) Note: Insufficient mastic provided for analysis.
3) Note: Insufficient material provided for analysis.
4) Note: Insufficient sample provided for QC reanalysis.
5) Note: Different material than indicated on Sample Log / Description.
6) Note: Sample not submitted.
7) Note: Attached to asbestos containing material.
8) Note: Received wet.
9) Note: Possible surface contamination.
10) Note: Not building material. 1% threshold may not apply.
11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
12) Note: Asbestos detected but not quantifiable.
13) Note: Multiple identical samples submitted, only one analyzed.
14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.

Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional.

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

1)**Analytical Step/Method:** Initial Screening by PLM, EPA 600R-93/116
Requirements/Comments: Minimum of 0.1 g of sample. ~0.25% LOQ for most samples.

2)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.

4)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004

INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	11/30/2017
	20 Duke St.,Suite 109	Report No.:	552577 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only.

LOQ, Limit of Quantitation estimates for mass and volume analyses.
*With advance notice and confirmation by the laboratory.
**Approximately 1 Liter of sample in double-bagged container (~9x6 inch bag of sample).

iATL
INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 12/28/2017
Report No.: 554186 - PLM
Project: GHD/Maritime Electric
Project No.: PE7252

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6411452
Client No.: ME17-24
Percent Asbestos:
None Detected

Analyst Observation: Orange Insulation
Client Description: Insulation
Percent Non-Asbestos Fibrous Material:
95 Fibrous Glass
5 Cellulose

Location: MGOH Room
Facility:
Percent Non-Fibrous Material:
None Detected

Lab No.: 6411453
Client No.: ME17-25
Percent Asbestos:
None Detected

Analyst Observation: Brown Insulation
Client Description: Insulation
Percent Non-Asbestos Fibrous Material:
30 Fibrous Glass
20 Cellulose

Location: Boiler #5 East
Facility:
Percent Non-Fibrous Material:
50

Lab No.: 6411454
Client No.: ME17-26
Percent Asbestos:
None Detected

Analyst Observation: Beige Insulation
Client Description: Insulation
Percent Non-Asbestos Fibrous Material:
30 Fibrous Glass
5 Cellulose

Location: Boiler #5 West
Facility:
Percent Non-Fibrous Material:
65

Lab No.: 6411455
Client No.: ME17-27
Percent Asbestos:
None Detected

Analyst Observation: Beige Insulation
Client Description: Insulation
Percent Non-Asbestos Fibrous Material:
15 Fibrous Glass
5 Cellulose

Location: Boiler #6 West
Facility:
Percent Non-Fibrous Material:
80

Lab No.: 6411456
Client No.: ME17-28
Percent Asbestos:
None Detected

Analyst Observation: Beige Insulation
Client Description: Insulation
Percent Non-Asbestos Fibrous Material:
15 Fibrous Glass
5 Cellulose

Location: Boiler #6 East
Facility:
Percent Non-Fibrous Material:
80

Analytical Method - **US EPA 600, R93-116**. Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 12/20/2017
Date Analyzed: 12/28/2017
Signature:
Analyst: Erik Swanson

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	12/28/2017
	20 Duke St.,Suite 109	Report No.:	554186 - PLM
	Bedford NS B4A 2Z5	Project:	GHD/Maritime Electric
Client:	ALL131	Project No.:	PE7252

Appendix to Analytical Report

Customer Contact:
Analysis: US EPA 600, R93-116

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com
iATL Office Manager: cdavis@iatl.com
iATL Account Representative: Cassie Doherty
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Bulk Building Materials
Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ir our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

This report shall not be reproduced except in full, without written approval of the laboratory.

Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

- NIST-NVLAP No. 101165-0
- NY-DOH No. 11021
- AIHA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB)

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	12/28/2017
	20 Duke St.,Suite 109	Report No.:	554186 - PLM
	Bedford NS B4A 2Z5	Project:	GHD/Maritime Electric
Client:	ALL131	Project No.:	PE7252

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique – by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com**.

1) Note: No mastic provided for analysis.
2) Note: Insufficient mastic provided for analysis.
3) Note: Insufficient material provided for analysis.
4) Note: Insufficient sample provided for QC reanalysis.
5) Note: Different material than indicated on Sample Log / Description.
6) Note: Sample not submitted.
7) Note: Attached to asbestos containing material.
8) Note: Received wet.
9) Note: Possible surface contamination.
10) Note: Not building material. 1% threshold may not apply.
11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
12) Note: Asbestos detected but not quantifiable.
13) Note: Multiple identical samples submitted, only one analyzed.
14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.

Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional.

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

1)**Analytical Step/Method:** Initial Screening by PLM, EPA 600R-93/116
Requirements/Comments: Minimum of 0.1 g of sample. ~0.25% LOQ for most samples.

2)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.

4)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004

INTERNATIONAL ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 12/28/2017
Report No.: 554186 - PLM
Project: GHD/Maritime Electric
Project No.: PE7252

Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only.

LOQ, Limit of Quantitation estimates for mass and volume analyses.
*With advance notice and confirmation by the laboratory.
**Approximately 1 Liter of sample in double-bagged container (~9x6 inch bag of sample).

iATL
INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	2/1/2018
	20 Duke St.,Suite 109	Report No.:	556184 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6432756
Client No.: ME17-29
Analyst Observation: Silver/Black Roof Material
Client Description: Roofing Core
Location: No. 8 Turbine
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 15 Synthetic, 10 Cellulose
Percent Non-Fibrous Material: 75

Lab No.: 6432757
Client No.: ME17-30
Analyst Observation: White/Black Roof Material
Client Description: Roofing Core
Location: No. 7 Turbine
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 25 Cellulose
Percent Non-Fibrous Material: 75

Lab No.: 6432757(L2)
Client No.: ME17-30
Analyst Observation: Brown Fibrous
Client Description: Roofing Core
Location: No. 7 Turbine
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 100 Cellulose
Percent Non-Fibrous Material: None Detected

Lab No.: 6432758
Client No.: ME17-31
Analyst Observation: White/Black Roof Material
Client Description: Roofing Core
Location: Old End (North)
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 20 Cellulose, 5 Synthetic
Percent Non-Fibrous Material: 75

Lab No.: 6432758(L2)
Client No.: ME17-31
Analyst Observation: Brown Fibrous
Client Description: Roofing Core
Location: Old End (North)
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 100 Cellulose
Percent Non-Fibrous Material: None Detected

Lab No.: 6432759
Client No.: ME17-32
Analyst Observation: White/Black Roof Material
Client Description: Roofing Core
Location: No. 4 Boiler
Facility:

Percent Asbestos: *None Detected*
Percent Non-Asbestos Fibrous Material: 25 Cellulose
Percent Non-Fibrous Material: 75

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/26/2018
Date Analyzed: 02/01/2018
Signature:
Analyst: Randy Caran

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited 20 Duke St.,Suite 109 Bedford NS B4A 2Z5	Report Date:	2/1/2018
		Report No.:	556184 - PLM
		Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6432759(L2)
Client No.: ME17-32
Percent Asbestos:
None Detected

Analyst Observation: Brown Fibrous
Client Description: Roofing Core
Percent Non-Asbestos Fibrous Material:
100 Cellulose

Location: No. 4 Boiler
Facility:
Percent Non-Fibrous Material:
None Detected

Lab No.: 6432759(L3)
Client No.: ME17-32
Percent Asbestos:
None Detected

Analyst Observation: Grey Fibrous
Client Description: Roofing Core
Percent Non-Asbestos Fibrous Material:
95 Cellulose
5 Fibrous Glass

Location: No. 4 Boiler
Facility:
Percent Non-Fibrous Material:
None Detected

Lab No.: 6432760
Client No.: ME17-33
Percent Asbestos:
None Detected

Analyst Observation: White/Black Roof Material
Client Description: Roofing Core
Percent Non-Asbestos Fibrous Material:
25 Cellulose

Location: No. 5 Boiler
Facility:
Percent Non-Fibrous Material:
75

Lab No.: 6432760(L2)
Client No.: ME17-33
Percent Asbestos:
None Detected

Analyst Observation: Brown Fibrous
Client Description: Roofing Core
Percent Non-Asbestos Fibrous Material:
100 Cellulose

Location: No. 5 Boiler
Facility:
Percent Non-Fibrous Material:
None Detected

Lab No.: 6432760(L3)
Client No.: ME17-33
Percent Asbestos:
None Detected

Analyst Observation: Grey Fibrous
Client Description: Roofing Core
Percent Non-Asbestos Fibrous Material:
95 Cellulose
5 Fibrous Glass

Location: No. 5 Boiler
Facility:
Percent Non-Fibrous Material:
None Detected

Lab No.: 6432761
Client No.: ME17-34
Percent Asbestos:
None Detected

Analyst Observation: Black Roof Material
Client Description: Roofing Core
Percent Non-Asbestos Fibrous Material:
5 Fibrous Glass

Location: No. 9 Boiler
Facility:
Percent Non-Fibrous Material:
95

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/26/2018
Date Analyzed: 02/01/2018
Signature:
Analyst: Randy Caran

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	2/1/2018
	20 Duke St.,Suite 109	Report No.:	556184 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
		Project No.:	PE7252
Client:	ALL131		

Appendix to Analytical Report

Customer Contact:
Analysis: US EPA 600, R93-116

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com
iATL Office Manager: cdavis@iatl.com
iATL Account Representative: Cassie Doherty
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Bulk Building Materials
Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and in our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

This report shall not be reproduced except in full, without written approval of the laboratory.

Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

- NIST-NVLAP No. 101165-0
- NYSDOH-ELAP No. 11021
- AIHA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB)

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	2/1/2018
	20 Duke St.,Suite 109	Report No.:	556184 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
		Project No.:	PE7252
Client:	ALL131		

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique – by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com**.

1) Note: No mastic provided for analysis.
2) Note: Insufficient mastic provided for analysis.
3) Note: Insufficient material provided for analysis.
4) Note: Insufficient sample provided for QC reanalysis.
5) Note: Different material than indicated on Sample Log / Description.
6) Note: Sample not submitted.
7) Note: Attached to asbestos containing material.
8) Note: Received wet.
9) Note: Possible surface contamination.
10) Note: Not building material. 1% threshold may not apply.
11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
12) Note: Asbestos detected but not quantifiable.
13) Note: Multiple identical samples submitted, only one analyzed.
14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.

Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional.

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

1)**Analytical Step/Method:** Initial Screening by PLM, EPA 600R-93/116
Requirements/Comments: Minimum of 0.1 g of sample. ~0.25% LOQ for most samples.

2)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.

4)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	2/1/2018
	20 Duke St.,Suite 109	Report No.:	556184 - PLM
	Bedford NS B4A 2Z5	Project:	Maritime Electric
Client:	ALL131	Project No.:	PE7252

Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only.

LOQ, Limit of Quantitation estimates for mass and volume analyses.
*With advance notice and confirmation by the laboratory.
**Approximately 1 Liter of sample in double-bagged container (~9x6 inch bag of sample).

Appendix 2

Site Photographs – 2017 Asbestos Sampling & Observations

Maritime Electric Generating Station

2017 Asbestos Sampling and Observations

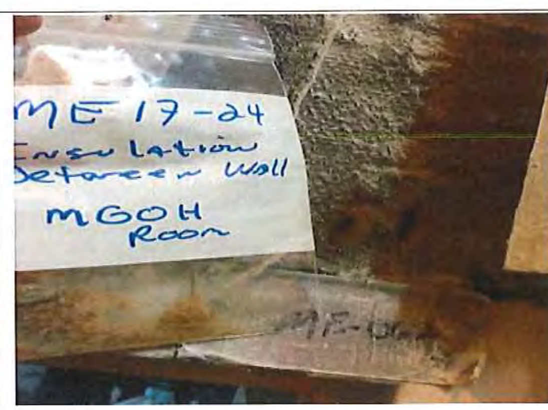
Photo No.	Sample ID#	Location	Sample Description	Asbestos Content	Site Photo
1	ME-17-01	Exterior NE Stack	Black Mastic	20 % Chrysotile	
2	ME-17-02	Exterior NE Sloped Roof	Off-White / Black Roof Material / Black Tar	N/D	
3	ME-17-03	Exterior Plexiglass Skylight on Roof	Grey Caulking	N/D	
4	ME-17-04	Exterior Central flat roof	Black tar	N/D	

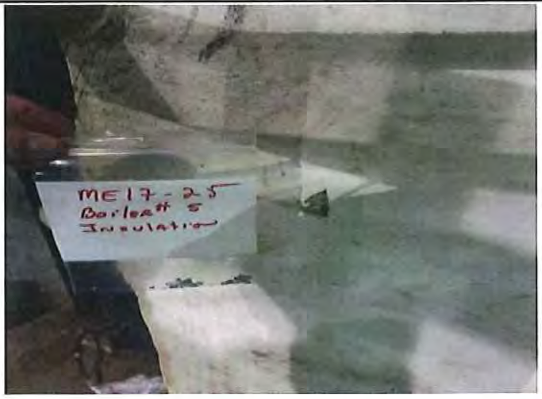
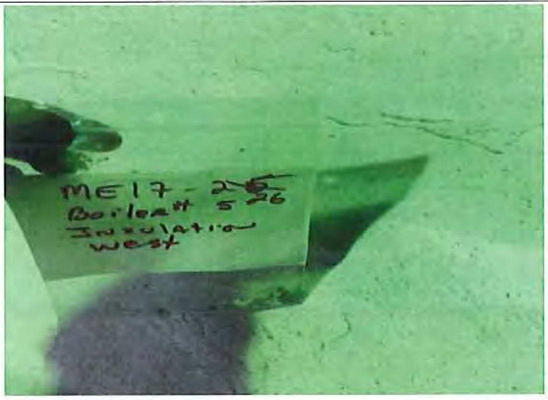
5	ME-17-05	Exterior Roof	Grey Caulking	N/D	
6	ME-17-06	Exterior South Flat Roof	Black roofing membrane	N/D	
7	ME-17-07	Exterior South Flat Roof	Tan Fibrous	N/D	
8	ME-17-08	Exterior South Flat Roof	Black roofing membrane	N/D	

9	ME-17-09	Exterior NE Flat Roof	Black Roofing Tar	N/D	
10	ME-17-10	Exterior South Flat Roof	Black Tar	N/D	
11	ME-17-11	Exterior South Flat Roof	Black Roofing membrane	N/D	
12	ME-17-12	Exterior South Roof	Grey Caulking	N/D	

13	ME-17-13	Exterior Wall East side by No. 6 Boiler	Brick mortar	N/D	
14	ME-17-14	Exterior Wall East side by No. 6 Boiler	Speed tile mortar	N/D	
15	ME-17-15	Interior Wall Between No. 6 Boiler & #7 Turbine & CT3	Grey wall patch cement	40% Chrysotile	
16	ME-17-16	Interior Wall Between No. 6 Boiler & #7 Turbine & CT3	Brown Mortar	N/D	

17	ME-17-17	South Wall Ground Level beside No. 10 Turbine	Cinder block mortar	N/D	
18	ME-17-18	South Wall Ground Level beside No. 10 Turbine	Grey Caulking	N/D	
19	ME-17-19	Around Inner Perimeter Bottom of Bunker C Tank	Grey Caulking	N/D	
20	ME-17-20	Around Inner Perimeter Bottom of Bunker C Tank	Grey caulking	N/D	

21	ME-17-21	Around Inner Perimeter Bottom of Bunker C Tank	Grey Caulking	N/D	
22	ME-17-22	Pump House East Wall	Cinder block mortar	N/D	
23	ME-17-23	Pump House East Wall	Cinder block mortar	N/D	
24	ME-17-24	MGOH Room	Wall insulation	N/D	

25	ME-17-25	Boiler #5 (east side)	breeching insulation	N/D	
26	ME-17-26	Boiler #5 (west side)	breeching insulation	N/D	
27	ME-17-27	Boiler #6 (west side)	breeching insulation	N/D	
28	ME-17-28	Boiler #6 (east side)	breeching insulation	N/D	

29		Behind #5 Reserve Tank	Nothing Observed inside Block Wall		
30		Behind #10 Reserve Tank	Nothing Observed inside Block Wall		
31		West Wall #10 Boiler	Nothing Observed inside Block Wall		
32		North Wall By Shop	Nothing Observed inside Speed tile		

33		Exterior Bunker C Tank	Steel casing (no insulation observed)		
34		Boiler # 6 Speed Tile Wall	Nothing Observed inside Speed tile		
35		Boiler # 6 Speed Tile	Nothing Observed inside Speed tile		
36		Top of Exterior Bunker Tank	Steel casing (no insulation observed)		

37		Pipe Insulation Bunker C	Fibreglass insulation		
38		Exterior Pipe Insulation	Asbestos Free		
39		Switch gear cells	Arc shoots	PACM	
40		Throughout	Electrical cable tray confirmed and suspect ACM dust / debris	PACM	

41		Throughout	Mechanical gaskets	PACM	
42	ME17-29	No. 8 Turbine	Roofing core sample	N/D	
43	ME17-30	No. 7 Turbine	Roofing core sample	N/D	
44	ME17-31	Old end (north)	Roofing core sample	N/D	

45	ME17-32	No. 4 Boiler	Roofing core sample	N/D	
46	ME17-33	No. 5 Boiler	Roofing core sample	N/D	
47	ME17-34	No. 9 Boiler	Roofing core sample	N/D	

Appendix 3

ACM Inventory & Quantities Summary

Unit / Boiler:	No. 3 Turbine Mechanical Insulation					
DESIGN	**DESCRIPTION**	**LOCATION**	**Est. Quantity**	**Units**	**ASBESTOS CONTENT**	**Site Photo**
Mechanical	Dust / debris electrical cable trays	All levels			PACM	
Total est. qty.						
Comments:						

Unit / Boiler: No. 4 Boiler / ACM Hardboard / Transite						
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Wall	Corrugated Transite Panel	Ground Level - No. 4 GA Compressor area	25.1	m^2	35% Chrysotile (ME-033)	
Total est. qty.			25.1	m^2		
Comments:						

Unit / Boiler:	No. 4 Boiler Mechanical Insulation					
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Mechanical	Boiler Insulation (under original steel casing)	All levels	60	m^3	25% Amosite PACM	
Mechanical	Steam drum	Top Level	0.5	m^3	25% Amosite (ME-005)	

Mechanical	Steam drum	Turbine Level (north side)	0.5	m^3	25% Amosite (ME-005)	
Mechanical	Stack breeching (blue)	Turbine / Top Levels	10.5	m^3	60% Chrysotile (ME-047)	
Mechanical	Dust / debris electrical cable trays	All levels			PACM	
Total est. qty.			**71.5**	m^3		
Comments:						

Unit / Boiler:	No. 4 Boiler Mechanical Pipe Insulation					
DESIGN	**DESCRIPTION**	**LOCATION**	**Est. Quantity**	**Units**	**ASBESTOS CONTENT**	**Site Photo**
Pipe	Main feed (orange canvas - 18" diameter)	North side - 1st platform to top	10.7	m	80% Amosite (ME-051)	
Total est. qty.			**10.7**	**m**		
Comments:						

Unit / Boiler:	No. 5 Boiler / ACM Hardboard / Transite					
DESIGN	**DESCRIPTION**	**LOCATION**	**Est. Quantity**	**Units**	**ASBESTOS CONTENT**	**Site Photo**
Wall	Transite Panel	Turbine Level - No. 5 Boiler area outside offices (west side)	15	m^2	35% Chrysotile (ME-034)	
Wall	Transite Panel	Turbine Level - No. 5 Boiler area outside offices (east side)	4.5	m^2	35% Chrysotile (ME-034)	
Total est. qty.			**19.5**	**m^2**		
Comments:						

Unit / Boiler: No. 5 Boiler Mechanical Insulation

DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Mechanical	Dust / debris electrical cable trays	All levels			PACM	
Total est. qty.						
Comments:						

Unit / Boiler: No. 6 Boiler Mechanical Insulation

DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Mechanical	Parging on wall	Interior wall between No. 6 Boiler and CT3	0.5	m^2	40% Chrysotile (ME17-15)	
Mechanical	Dust / debris electrical cable trays	All levels			PACM	
Total est. qty.						
Comments:						

Unit / Boiler:	No. 7 Turbine Mechanical Pipe Insulation					
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Pipe	Main feed (metal cladding) to No. 7 turbine (18" diameter)	Ground Level	2	m	80% Amosite (ME-069)	
Total est. qty.			**2**	**m**		
Comments:						

Unit / Boiler:	No. 8 Turbine Mechanical Insulation					
DESIGN	**DESCRIPTION**	**LOCATION**	**Est. Quantity**	**Units**	**ASBESTOS CONTENT**	**Site Photo**
Pipe	Pipe insulation (orange wrap) (4" diameter)	Ground Level (extends to between Turbines (9 & 10)	13.7	m	80% Amosite (ME-076)	
Mechanical	Dust / debris electrical cable trays	All levels			PACM	
Total est. qty.			**13.7**	**m**		
Comments:						

Unit / Boiler: No. 9 Boiler / ACM Hardboard / Transite						
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Wall	Transite Panel	Deaerator Level	15.8	m^2	35% Chrysotile (ME-033)	
Wall	Transite Panel	Turbine Level - No. 9 turbine side next to No. 10 Turbine	227.6	m^2	35% Chrysotile (ME-033)	

Wall	Transite Panel	Ground Level - No. 9 turbine side next to No. 10 Turbine	61.3	m^2	35% Chrysotile (ME-033)	
Wall	Transite Panel	Ground Level - No. 9 boiler (south wall) adjacent to MGOH Room	83.6	m^2	35% Chrysotile (ME-033)	
Wall	Corrugated Transite Panel	Ground Level - MGOH Room	83.6	m^2	35% Chrysotile (ME-033)	

Wall	Transite Panel	Upper Level - No. 9 boiler (south wall)	174	m^2	35% Chrysotile (ME-033)	
Wall	Transite Panel	Upper Level (no access)- East wall No. 9 turbine / No 9 boiler	45	m^2	35% Chrysotile (ME-033)	
Total est. qty.			**690.9**	m^2		
Comments:						

Unit / Boiler:	No. 9 Boiler / Turbine Mechanical Insulation					
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Mechanical	VGNT Condenser Tank (green)	Deaerator Level	1.2	m^3	45% Chrysotile (ME-023)	
Mechanical	Feed water heater (brown)	Turbine Level	0.54	m^3	55% Chrysotile (ME-028)	

Mechanical	Feed water heater No. 2 (brown)	Turbine Level	0.54	m^3	55% Chrysotile (ME-028)	
Mechanical	Feed water heater No. 1 (blue) - brown lower level	Turbine Level	0.79	m^3	55% Chrysotile (ME-028)	
Mechanical	Feed water heater No. 2 (blue)- brown lower level	Turbine Level	0.79	m^3	55% Chrysotile (ME-028)	

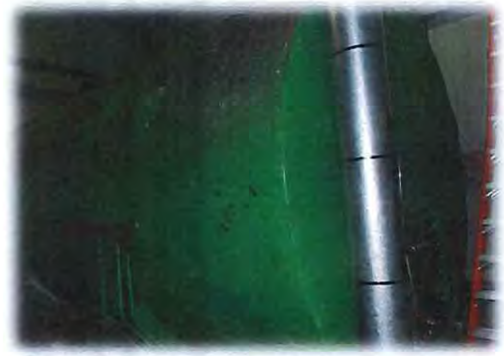
Mechanical	Feed water heater No. 3 (blue)- brown lower level	Turbine Level	0.79	m^3	55% Chrysotile (ME-028)
Mechanical	DFC Flashbox (yellow)	Ground Level	0.4	m^3	80% Amosite (ME-070)
Mechanical	Dust / debris electrical cable trays	All levels			PACM
Total est. qty.			**5.05**	m^3	
Comments:					

Unit / Boiler:	No. 9 Boiler / Turbine Pipe Insulation					
DESIGN	**DESCRIPTION**	**LOCATION**	**Est. Quantity**	**Units**	**ASBESTOS CONTENT**	**Site Photo**
Pipe	Main feed (orange wrap) to No. 9 turbine (18" diameter)	Ground Level	22.9	m	80% Amosite (ME-069)	
Pipe	Secondary feed (metal clad / orange) to No. 9 turbine (16" diameter)	Ground Level	11	m	80% Amosite (ME-069)	
Total est. qty.			**33.9**	**m**		
Comments:						

Unit / Boiler: No. 10 Boiler / ACM Hardboard / Transite						
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Wall	Transite Panel	Deaerator Level	21	m^2	35% Chrysotile (ME-033)	
Wall	Corrugated Transite Panel	Turbine Level - No. 10 turbine side next to No. 9 Turbine	227.6	m^2	35% Chrysotile (ME-033)	

Wall	Corrugated Transite Panel	Ground Level - No. 10 turbine side next to No. 9 Turbine	61.3	m^2	35% Chrysotile (ME-033)	
Total est. qty.			**309.9**	**m^2**		
Comments:						

Unit / Boiler: No. 10 Boiler / Turbine Mechanical Insulation

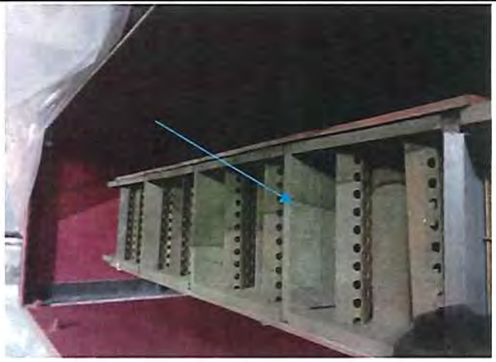
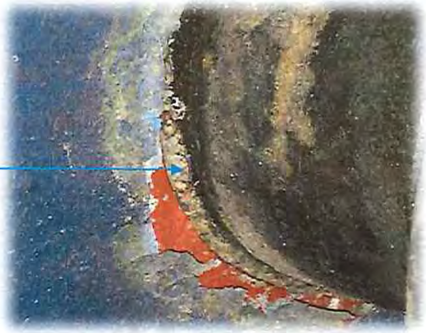
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Mechanical	High level reserve tank (HLRTK10)	Deaerator Level	3.7	m^3	60% Chrysotile (ME-001)	
Mechanical	Boiler Insulation (under original steel casing)	All levels	25.3	m^3	25% Amosite (ME-005)	

Mechanical	Boiler Insulation (inside windbox) (LUHTR10A)	Ground Level	22.46	m^3	25% Amosite PACM	
Mechanical	Turbine Drain flash condenser (TDFC10)	Mezzanine Level above Ground Level	0.54	m^3	45% Amosite ; 25% Chrysotile (ME-010)	
Mechanical	Low pressure heater No. 1 (LPHTR101)	Mezzanine Level above Ground Level	0.79	m^3	45% Amosite ; 25% Chrysotile (ME-010)	

Mechanical	Turbine Gland heater (TGHTR10)	Mezzanine Level above Ground Level	0.54	m^3	45% Amosite ; 25% Chrysotile (ME-010)	
Mechanical	Low pressure heater No. 2 (LPHTR102)	Mezzanine Level above Ground Level	0.79	m^3	45% Amosite ; 25% Chrysotile (ME-010)	
Mechanical	High pressure heater (HPHTR10)	Mezzanine Level above Ground Level	0.79	m^3	45% Amosite ; 25% Chrysotile (ME-010)	

Mechanical	Low level reserve tank (LLRTP10)	Ground Level	3.7	m^3	60% Chrysotile (ME-008)	
Mechanical	Dust / debris electrical cable trays	All levels			PACM	
Total est. qty.			**58.61**	**m^3**		
Comments:						

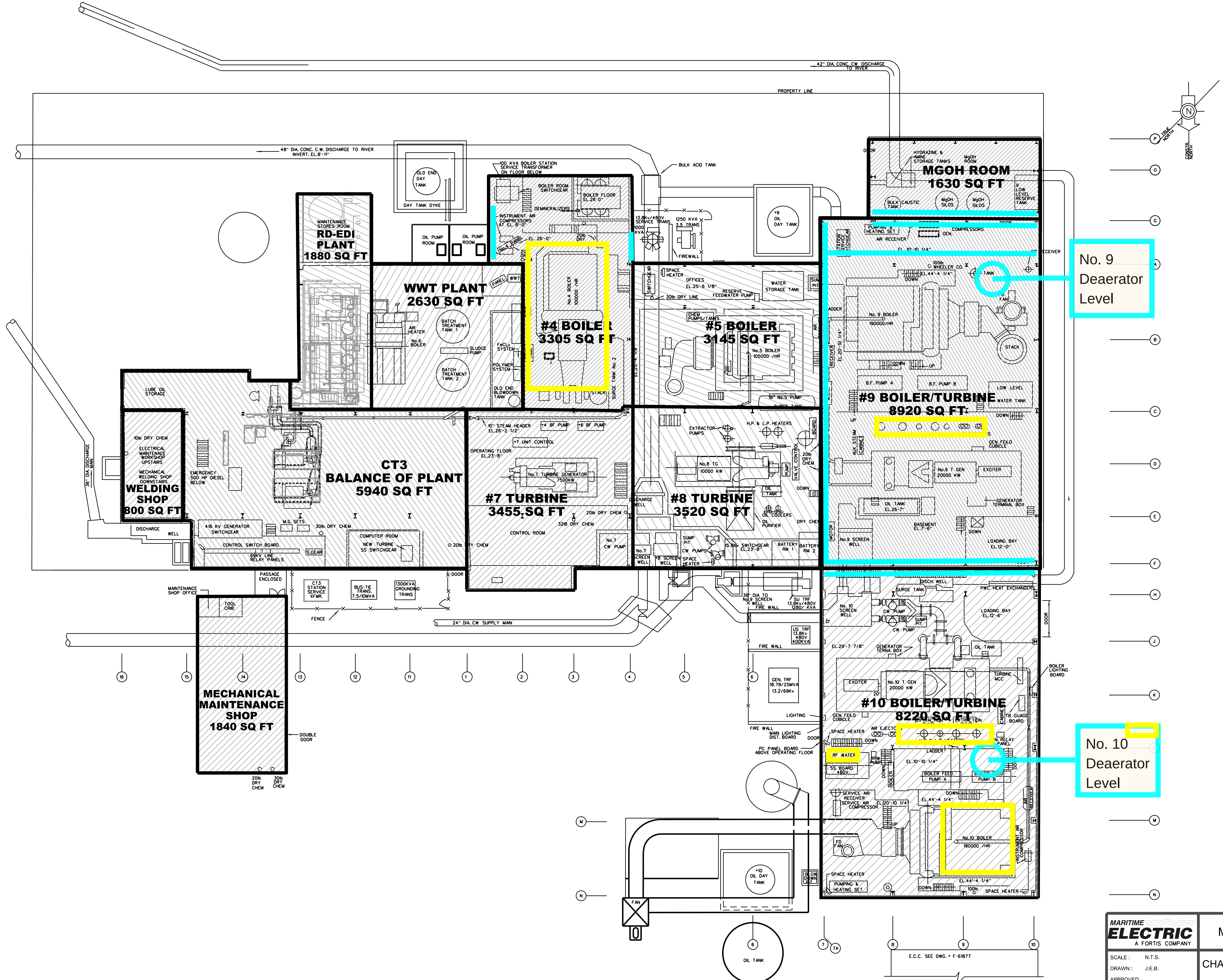
Unit / Boiler: No. 10 Boiler / Turbine Pipe Insulation						
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Pipe	Main Line underneath HLRTK10 (12" diameter)	Deaerator Level	0.3	m	80% Amosite (ME-069)	
Pipe	HP Steam pipe insulation (18" diameter)	1st platform (south end)	9	m	80% Amosite (ME-069)	
Total est. qty.			**9.3**	**m**		
Comments:						

Unit / Boiler: Misc. (arc chutes/ mastic / gaskets)						
DESIGN	DESCRIPTION	LOCATION	Est. Quantity	Units	ASBESTOS CONTENT	Site Photo
Electrical	Arc chutes	throughout	135	ea	PACM	
Mechanical	Gaskets	throughout			PACM	

Duct	Black mastic	Exterior NE stack (roof)	0.5	m^3	20% Chrysotile (ME17-01)	
Mechanical	Boiler Refractory	Blrs 2; 4; 5; 6; 9; 10			PACM	NA
Total est. qty.						
Comments:	PACM - Presumed Asbestos Containing Material					

Appendix 4

Site Drawing with ACM Concentration Areas



Legend

(cyan line)	ACM transite / hardboard panels concentrated areas
(yellow line)	ACM mechanical insulation concentrated areas

MARITIME ELECTRIC A FORTIS COMPANY	MARITIME ELECTRIC COMPANY, LIMITED	
SCALE : N.T.S. DRAWN : J.E.B. APPROVED:	CHARLOTTETOWN STEAM PLANT ZONES	DATE : SEPT 13, '96 REVISED : JUNE 23, '17 DWG. No. : G-96-05

Appendix D (Decommissioning Study) Inventory Summaries

Table D-1: Inventory of Equipment Containing Ozone Depleting Substances

Equipment	Quantity	Refrigerant Type	Refrigerant Amount
Rooftop HVAC Unit	1	R22	16lbs
Rooftop HVAC Unit	1	R22	
Window Mounted Air Conditioning	3	R22	

Table D-2: Inventory of Mercury Containing Devices

Location	Instrument	Approximate Weight (lbs)
Boiler #2	Deareator - high/low water level switches	<1
	Water Level Switches	<1
Boiler #6	Air Flow Transmitter	2
Boiler #4	Drum Level Indicator	11
	Steam Flow	14
	Feed Water Flow	14
	Air Flow (Open Top)	2
Boiler #5	Drum Level Indicator	11
	Steam Flow	14
	Feed Water Flow	14
	Air Flow (Open Top)	2
	Low Level water Tank - High/Low Level Switches	<1
Turbine #7	Vacuum Indicator, Turbovisory Panel	2
Turbine #8	Vacuum Indicator, Turbovisory Panel	2
Turbine #9	Vacuum Indicator, Turbovisory Panel	2
Turbine #10	Vacuum Indicator, Turbovisory Panel	2
Instrument Shop	Vacuum Indicator (Spare)	2
Instrument Shop	U-Tube Tester/Calibrator	4
Instrument Shop	5 gallon plastic pail containing a variety of used mercury containing instruments	5
		Total: 103 lbs

Table D-3: Inventory of Oil Filled Transformers (exterior)

XFMR	Serial #	Size	Oil Volume (L)	Manufacturer	Asset	Year Purchased	PPM PCB	Tester	Test Date	Substation/Location	Grams	Liters to Release 1 Gram
6	02/T/1408	1500 KVA	2,059	Bonar Long	Grounding Transformer	1957	14.2	AB & DN	8-Oct-15	Charlottetown Plant	26.3	78
13	21037	7.5/10 MVA	5,072	Brown Boveri	Power Transformer X3-1 Bus Tie	1960	6.7	AB & DN	8-Oct-15	Charlottetown Plant	30.6	166
14	291682	10/13.3 MVA	7,949	WESTINGHOUSE	Power Transformer X2	1961	3.4	AB & DN	8-Oct-15	Charlottetown Plant	24.3	327
20	292579	10/13.3 MVA	8,025	WESTINGHOUSE	Power Transformer X1	1964	7.5	AB & DN	8-Oct-15	Charlottetown Plant	54.2	148
24	293744	18.75/25 MVA	9,800	WESTINGHOUSE	Power Transformer Unit 10 Generator	1967	14.1	AB & DN	8-Oct-15	Charlottetown Plant	124.4	79
45	3165-1	10/13.3 MVA	4,921	Moloney	Power Transformer - X3-2	1978	<1	AB & DN	8-Oct-15	Charlottetown Plant	0	N/A
157	3203-1	1.1/1.23 MVA	1,045	Pioneer Electric	DIST XFMR	1967	11.8	AB & DN	8-Oct-15	Charlottetown Plant	11.1	94
159	02-R-280	1000 KVA	1,325	Bonar Long	DIST XFMR	1954	<1.0	AB & DN	8-Oct-15	Charlottetown Plant	0	N/A
161	22P14656-1	1.25/1.6 MVA	1,100	English Electric	Power Transformer	1962	11.2	AB & DN	8-Oct-15	Charlottetown Plant	11.1	99
164	21041	1 MVA	1,514	Brown Boveri	DIST XFMR	1960	5.1	AB & DN	8-Oct-15	Charlottetown Plant	6.9	218
166	3204-1	1.25/1.4 MVA	1,045	Pioneer Electric	DIST XFMR	1967	1.7	AB & DN	8-Oct-15	Charlottetown Plant	1.6	654
168	G 6042	750 KVA	823	Pioneer Electric	DIST XFMR	1980	2.7	AB & DN	14-Nov-14	River Pumphouse	2.0	412
169	1534-1	750 KVA	840	Pioneer Electric	DIST XFMR	1964	<1.0	AB & DN	8-Oct-15	River Pumphouse	0	N/A

Notes:

1 Oil filled Current Transformers are numerous but they do not have asset IDs, so records are lacking but most have NONPCB stickers so they have been tested for PCBs

2 All spare Bushings not energized are being tested by Steam Plant Maintenance staff. Most oil filled bushings have NONPCB stickers but some have not been tested yet. In some cases the oil sampling process could destroy the bushing.

Table D-4: Inventory of Smoke Detectors

Location Description	Device	Model	Address
Zone 1-Second Floor ECC			
Control Room	Smoke Detector	FSP-851-A	D4
Control Room	Smoke Detector	FSP-851-A	D5
Control Room	Smoke Detector	FSP-851-A	D6
Control Room	Smoke Detector	FSP-851-A	D7
Top of Front Stairs	Smoke Detector	FSP-851-A	D8
Zone 1-Ground Floor ECC			
File Storage Room	Smoke Detector	FSP-851-A	D11
File Storage Room	Smoke Detector	FSP-851-A	D12
Communications Room (SCADA)	Smoke Detector	FSP-851-A	D13
Battery Room	Smoke Detector	FSP-851-A	D14
Communications Room (SCADA)	Smoke Detector	FSP-851-A	D15
Server Room	Smoke Detector	FSP-851-A	D9
Zone A- Conventional Turbine Hall			
Above Diesel Generator (low)	Smoke Detector	EDW2400A	M002
Above Diesel Generator (low)	Smoke Detector	EDW2400A	M002
Above GE Water Tech Equipment	Smoke Detector	EDW2400A	M002
Above GE Water Tech Equipment	Smoke Detector	EDW2400A	M002
Above Demin Water Tank	Smoke Detector	EDW2400A	M002
Above Demin Water Tank	Smoke Detector	EDW2400A	M002
Old End Control Room	Smoke Detector	C2W-BA	M002
Old End Control Room	Smoke Detector	C2W-BA	M002
Control Room	Smoke Detector	C2W-BA	M002
Control Room	Smoke Detector	C2W-BA	M002
Control Room	Smoke Detector	C2W-BA	M002
Control Room	Smoke Detector	C2W-BA	M002
Control Room W/R	Smoke Detector	C2W-BA	M002
Blue Computer Room	Smoke Detector	C2W-BA	M002
Blue Computer Room	Smoke Detector	C2W-BA	M002
Control Room Lunch Room	Heat Detector	5603A	M002
Zone B Conventional Turbine Hall			
Above Diesel Generator (High)	Smoke Detector	EDW2400A	M003
Above GE Water Tech Equipment	Smoke Detector	EDW2400A	M003
Above Demin Truck Entry	Smoke Detector	EDW2400A	M003
Above Demin Water Tank	Smoke Detector	EDW2400A	M003
Avobe Diesel Generator (High)	Smoke Detector	EDW2400A	M003
Steam Plant			
Battery Room By #10 Turbine	Smoke Detector	FSP-851-A	D16
Battery Room By #8 Turbine	Smoke Detector	FSP-851-A	D17
Mechanical shop North	Heat Detector	FST-51A	D18
Mechanical shop South	Heat Detector	FST-51A	D19
Welding Shop	Heat Detector	FST-51A	D20
Men's Locker Room	Smoke Detector	FSP-851-A	D21
Men's Washroom	Smoke Detector	FSP-851-A	D22
Electrical Shop North	Heat Detector	FST-51A	D23
Electrical Shop South	Heat Detector	FST-51A	D24
Electrical Storage	Heat Detector	FST-51A	D25
Top of Elevator Shaft	Smoke Detector	FSP-851-A	D26
Chem Lab/Office	Smoke Detector	FSP-851-A	D27
Maintenance Planner Office	Smoke Detector	FSP-851-A	D28

Table D-5: Inventory of Paper Insulated Lead Cables (Potentical PCB Containing)

13.8kV Single Line											
Feed	**Quantity**	**# Conductor**	**Gauge**	**Outside Diam.mm**	**Length (ft)**	**Length (m)**	**Total Length(m)**	**Cable weight kg/m**	**Cable weight (kg)**	**copper (kg)**	**lead (kg)**
Pumphouse	1	3c	4/0 AWG	55	103	31.39	31.39	10.1	317.09	142.69	139.52
X-1	3	1c	750 MCM	40	103	31.39	94.18	6.3	593.36	267.01	261.08
X-1 underground	3	1c	750 MCM	40	250	76.20	228.60	6.3	1440.20	648.09	633.69
X-2	3	1c	750 MCM	40	103	31.39	94.18	6.3	593.36	267.01	261.08
X-2 underground	3	1c	750 MCM	40	250	76.20	228.60	6.3	1440.20	648.09	633.69
Euston	3	1c	750 MCM	40	103	31.39	94.18	6.3	593.36	267.01	261.08
X3-1 Bus Tie	3	1c	500 MCM	33	217	66.14	198.43	4.3	853.24	383.96	375.42
#3 Station Service	3	1C	4/0 AWG	26	190	57.91	173.74	2.6	451.72	203.27	198.76
Riverside Drive	3	1C	750MCM	40	103	31.39	94.18	6.3	593.36	267.01	261.08
#9 Station Service	3	1C	4/0 AWG	26	180	54.86	164.59	2.6	427.94	192.57	188.30
Generator #8	3	1c	500 MCM	33	91	27.74	94.18	4.3	404.99	182.25	178.20
Generator#9	6	1C	750MCM	40	150	45.72	94.18	6.3	593.36	267.01	261.08
4.16kV Single Line											
	Quantity	**# Conductor**	**Gauge**	**Outside Diam.mm**	**Length (ft)**	**Length (m)**	**Total Length (m)**	**Cable weight Kg/m**	**Cable weight (kg)**	**copper (kg)**	**lead (kg)**
Longworth	2	3c	350 MCM	60	590	179.83	359.66	13.2	4747.512	2136.3804	2088.905
Queen	2	3c	350 MCM	60	590	179.83	359.67	13.2	4747.62	2136.43	2088.95
Spare#3	1	3c	350 MCM	60	560	170.69	170.69	13.2	2253.11	1013.90	991.37
Spare #4	1	3c	350 MCM	60	600	182.88	182.88	13.2	2414.05	1086.32	1062.18
Central Underground	4	1C	750 MCM	40	250	76.00	304.00	6.3	1915.20	861.84	842.69
#2 Station Service	1	3C	2/0 AWG	49	120	36.00	36.00	7.6	273.60	123.12	120.38

D-6: List of Chemicals

Product Name	Manufacturer Name	Mgf Part#	Location	Product Code
3M Bondo Fiberglass Resin, P.N. 401, 401C, 402, 402C, 402ES, 402T, 402Z, 404, 404C, 404Z	3M General Office	LB-K100-0410-9	CTGS - CAGE STORES (MARI15)	2696850
Alkyd Paint Coatings: House Paint, Barn Paint, Floor Enamels, Equipment Enamels, Flat, Semi Gloss, Low Lustre, High Gloss Enamels, Oil & Alkyd Primers	House of Excellence		CTGS - CAGE STORES (MARI15)	317642
Arcair Air Carbon ARC Electrodes	Tweco/ArcairProducts Inc.	20-Series	CTGS - CAGE STORES (MARI15)	3985187
Ardrox 996 Aerosol	Oakite Canada Limited	N996AER	CTGS - CAGE STORES (MARI15)	1559
Ardrox 996 Penetrant	Oakite Canada Limited	N996	CTGS - CAGE STORES (MARI15)	966
Ardrox 9D1B	Oakite Canada Limited		CTGS - CAGE STORES (MARI15)	1973050
Ardrox 9PR50	Chemetall Oakite		CTGS - CAGE STORES (MARI15)	999832
Ardrox 9PR50 Aerosol	Chemetall Oakite		CTGS - CAGE STORES (MARI15)	3768428
Barnes Distribution Barnes Hi d Temperature Anti-Seize Thread Compound	Henkel Loctite Canada Inc.	51132	CTGS - CAGE STORES (MARI15)	1333009
Barnes High Strength Thread Locker Heavy Duty	Barnes Group Inc.	22006	CTGS - CAGE STORES (MARI15)	2445449
Barnes Medium Strength ThreadLocker Removable	Henkel Corporation	22804	CTGS - CAGE STORES (MARI15)	2926034
Blueshield Excelarc 18; LA 7018; LA 18 LMP; LA 18 Plus; LA 18 Plus LMP; Nuclearc LA 7018; LA 7028; LA 18 Plus Complete	Air Liquide Canada Inc	AL-J-002-0	CTGS - CAGE STORES (MARI15)	855789
Blueshield LA 6010; LA Ultra 11; LA 6013; LA 6013P; LA 7014; LA 7024; LA 24-HD	Air Liquide Canada Inc	AL-J-001-0	CTGS - CAGE STORES (MARI15)	2732064
Carbon Dioxide (Dry Ice)	Air Liquide Canada Inc		CTGS - CAGE STORES (MARI15)	57632
Carbon Dioxide/Inert Gas Mixture	Praxair Canada Inc.		CTGS - CAGE STORES (MARI15)	4760
Cement Mixes	King Packaged Materials Company		CTGS - CAGE STORES (MARI15)	409137
Chain Lube w/Moly	Radiator Specialty Co. of Canada Ltd.	L716	CTGS - CAGE STORES (MARI15)	329777

D-6: List of Chemicals

Cutting Tool Coolant	Barnes Group Inc.	BD1128	CTGS - CAGE STORES (MARI15)	3082445
D'Limokleen	Leyson Chemical Products	338	CTGS - CAGE STORES (MARI15)	727755
Euclid NS Grout	The Euclid Chemical Company	88 50	CTGS - CAGE STORES (MARI15)	675266
Fel-Pro Moly Paste	Henkel Corporation	21890	CTGS - CAGE STORES (MARI15)	595282
Fiberglass Material	Fibre Glass-Evercoat Co. Inc.	100370C	CTGS - CAGE STORES (MARI15)	342559
Fiberglass-Auto Resin	Fibre Glass-Evercoat Co. Inc.	100498	CTGS - CAGE STORES (MARI15)	36562
Flat Black Enamel	Seymour of Sycamore, Inc.	BD1332-1	CTGS - CAGE STORES (MARI15)	3075317
Gloss White Enamel	Seymour of Sycamore, Inc.	BD13330000	CTGS - CAGE STORES (MARI15)	2091425
Graffiti Remover	CRC Industries	3194	CTGS - CAGE STORES (MARI15)	2584960
Hi D Temperature Anti-Seize Thread Compound	Henkel Corporation	270827	CTGS - CAGE STORES (MARI15)	661755
High Heat Gel-Lube	Barnes Group Inc.	BD1080	CTGS - CAGE STORES (MARI15)	577784
In-Pakt Precision Grout	King Packaged Materials Company		CTGS - CAGE STORES (MARI15)	5227
Jointex Gasket Sealant	Robco Inc.		CTGS - CAGE STORES (MARI15)	81492
Kast-Set Plus	ANH Refractories Company		CTGS - CAGE STORES (MARI15)	42684
Mobilube HD Plus 85W-140	Exxonmobil Canada		CTGS - CAGE STORES (MARI15)	19648
Non-Flammable Loosen-It	American Jetway	BD1110	CTGS - CAGE STORES (MARI15)	1318024
Phillyclad 6470 Hardener	ITW Polymers Coatings North America	2556U	CTGS - CAGE STORES (MARI15)	621062
Pipe Sealant	Barnes Group Inc.	22829	CTGS - CAGE STORES (MARI15)	3636

D-6: List of Chemicals

Prostar Mild Steel and Low Hydrogen Covered Electrodes	Groupe Esab Canada Inc		CTGS - CAGE STORES (MARI15)	18480
Prostar S6	Sidergas SRL	850001	CTGS - CAGE STORES (MARI15)	19375
Quad-Cut Cutting and Tapping Fluid	Remi Corporation	19483	CTGS - CAGE STORES (MARI15)	814822
Quick Plug Hydraulic Cement	Dap Inc.	70798140844	CTGS - CAGE STORES (MARI15)	2917702
Repair Compound Hardener	ITW Polymers Coatings North America	DM004H	CTGS - CAGE STORES (MARI15)	2033176
Safe-T-Salt	The Canadian Salt Company Ltd.		CTGS - CAGE STORES (MARI15)	2283658
Sikadur 35 Hi Mod LV - Part A	Sika Corporation	350130	CTGS - CAGE STORES (MARI15)	31256
Sikadur 35 Hi Mod LV - Part B	Sika Corporation	350140	CTGS - CAGE STORES (MARI15)	492437
SLH II (Clear)	Barnes Group Inc.	21533	CTGS - CAGE STORES (MARI15)	595225
Sonolastic SL2	BASF Admixtures		CTGS - CAGE STORES (MARI15)	577269
Sureweld 10P	Groupe Esab Canada Inc		CTGS - CAGE STORES (MARI15)	2451844
WD-40 Aerosol	WD-40 Company		CTGS - CAGE STORES (MARI15)	3578772
"All Weather Paintstik " "All Weather Hot Climate Paintstik" "B", "B-3/8", "B-E", "B-16", "C", "E", "F", & "N" Paintstiks "Lacquer Stik"	LA-CO Industries Inc.- Markal Company		CTGS - CHEMICAL LAB (MARI9)	3429471
1000 G/Ml Vanadium in 2% Hno3	High-Purity Standards		CTGS - CHEMICAL LAB (MARI9)	907366
725 Nickel Anti-Seize Compound (Aerosol)	A.W. Chesterton Company		CTGS - CHEMICAL LAB (MARI9)	2745482
725 Nickel Anti-Seize Compound (Bulk)	A.W. Chesterton Company		CTGS - CHEMICAL LAB (MARI9)	113
Amino Acid F Reagent for 25 mL Sample	GE Water & Process Technologies Canada	L2351	CTGS - CHEMICAL LAB (MARI9)	21944
Amino Acid Reagent for 25 mL Sample	GE Water & Process Technologies Canada	L2012	CTGS - CHEMICAL LAB (MARI9)	376160

D-6: List of Chemicals

Aquamag SW	Premier Refractories & Chemical Inc.		CTGS - CHEMICAL LAB (MARI9)	479143
Aquamag SW	Premier Magnesia, LLC		CTGS - CHEMICAL LAB (MARI9)	727577
Bottom Ash/Flyash (From Heavy Oil Combustion) Produced at Charlottetown Thermal Generating Station	Maritime Electric		CTGS - CHEMICAL LAB (MARI9)	727876
Buffer Solution, pH 4.0	Ge Betz Canada GE WATER & Process Tech	L623	CTGS - CHEMICAL LAB (MARI9)	16663
Buffer Solution, pH 7.0	Ge Betz Canada GE WATER & Process Tech	L624	CTGS - CHEMICAL LAB (MARI9)	11716
Buffer Solution, pH 9.0	GE Water & Process Technologies Canada	L6563	CTGS - CHEMICAL LAB (MARI9)	1949836
Catalyzed Molybdate Reagent	GE Water & Process Technologies Canada	L6131	CTGS - CHEMICAL LAB (MARI9)	3814274
Citric Acid F Reagent Solution	Ge Betz Canada GE WATER & Process Tech	L2350	CTGS - CHEMICAL LAB (MARI9)	1380720
Conductivity Std. Sol. 50 Umhos @ 25 C	Ge Betz Canada GE WATER & Process Tech	L6502	CTGS - CHEMICAL LAB (MARI9)	1572714
Copper Masking Reagent Powder Pillows	Ge Betz Canada GE WATER & Process Tech	L2345	CTGS - CHEMICAL LAB (MARI9)	179
Cortrol OS5035	GE Water & Process Technologies Canada		CTGS - CHEMICAL LAB (MARI9)	387853
Deionized Water	Ge Betz Canada GE WATER & Process Tech	L243	CTGS - CHEMICAL LAB (MARI9)	18928
Energizer, Energizer e2, Industrial ZMA, Hercules, Eveready, Wonder	Energizer Holdings		CTGS - CHEMICAL LAB (MARI9)	3047802
Graffiti Remover	CRC Industries	3194	CTGS - CHEMICAL LAB (MARI9)	2584960
Hardness Indicator	Ge Betz Canada GE WATER & Process Tech	L290	CTGS - CHEMICAL LAB (MARI9)	240
Hardness Indicator SC Black	GE Water & Process Technologies Canada	L6116	CTGS - CHEMICAL LAB (MARI9)	3814254
Hardness Titrant 1ml=1mg CACO3	Ge Betz Canada GE WATER & Process Tech	L292	CTGS - CHEMICAL LAB (MARI9)	211
Hardness Titrating Solution 0.001M	Ge Betz Canada GE WATER & Process Tech	L6443	CTGS - CHEMICAL LAB (MARI9)	12031

D-6: List of Chemicals

Hardness Titrating Solution, 0.096N	Ge Betz Canada GE WATER & Process Tech	L6394	CTGS - CHEMICAL LAB (MARI9)	19492
Hydraver 2 Hydrazine Reagent	GE Water & Process Technologies Canada	L2047	CTGS - CHEMICAL LAB (MARI9)	50266
Hydrazine Buffer	GE Water & Process Technologies Canada	L6373	CTGS - CHEMICAL LAB (MARI9)	727886
Hydrochloric Acid 50% Solution	GE Water & Process Technologies Canada	L247	CTGS - CHEMICAL LAB (MARI9)	1803914
Ignition Sealer	Barnes Group Inc.	21906	CTGS - CHEMICAL LAB (MARI9)	303638
Industrial Gray Enamel	Barnes Group Inc.	MSDS24708	CTGS - CHEMICAL LAB (MARI9)	3677
Iodine Reagent - Low	Ge Betz Canada GE WATER & Process Tech	L6066	CTGS - CHEMICAL LAB (MARI9)	378945
Iron Vacu-Vials and Activator Solution	Chemetrics Inc.	A-6000	CTGS - CHEMICAL LAB (MARI9)	2548920
Irsol	Coastal Blending & Packaging		CTGS - CHEMICAL LAB (MARI9)	310205
Liquid Paper Correction Fluid -- Water Base	NewellRubbermaid		CTGS - CHEMICAL LAB (MARI9)	2542312
LPS Strong Steel Sticks	LPS Laboratories Inc.	60159	CTGS - CHEMICAL LAB (MARI9)	52664
Methyl Purple Indicator	Ge Betz Canada GE WATER & Process Tech	L297	CTGS - CHEMICAL LAB (MARI9)	1395
Molybdate 3+ Reagent Solution	Ge Betz Canada GE WATER & Process Tech	L2322	CTGS - CHEMICAL LAB (MARI9)	1619
Molybdate Powder Pillows F/ 25 ML Sample	Ge Betz Canada GE WATER & Process Tech	L2010	CTGS - CHEMICAL LAB (MARI9)	1278
Molybdovanadate Reagent F/ Ortho-PO4	Ge Betz Canada GE WATER & Process Tech	L2326	CTGS - CHEMICAL LAB (MARI9)	14838
Mr. Clean Finished Floor Cleaner Professional Line (All Scents: Lemon) (All Variations Except Mr. Clean Disinfecting Floor Cleaner)	Procter & Gamble		CTGS - CHEMICAL LAB (MARI9)	750263
Optisperse HP9420	Ge Betz Canada GE WATER & Process Tech		CTGS - CHEMICAL LAB (MARI9)	21720
Phenolphthalein Indicator Solution	Ge Betz Canada GE WATER & Process Tech	L212	CTGS - CHEMICAL LAB (MARI9)	772057

D-6: List of Chemicals

Porphyrin 1 Reagent Powder Pillows	Ge Betz Canada GE WATER & Process Tech	L2343	CTGS - CHEMICAL LAB (MARI9)	727543
Potassium Chromate Indicator Sol. 5%	GE Water & Process Technologies Canada	L213	CTGS - CHEMICAL LAB (MARI9)	4686
Potassium Iodide-Iodate N/63 (0.0158 N)	GE Water & Process Technologies Canada	L6577	CTGS - CHEMICAL LAB (MARI9)	10590
Procell	Procter & Gamble	PC1300	CTGS - CHEMICAL LAB (MARI9)	3454023
Reducing Reagent Powder	GE Water & Process Technologies Canada	L6383	CTGS - CHEMICAL LAB (MARI9)	11388
Silica Standard Solution 50 ppm as SIO2	Ge Betz Canada GE WATER & Process Tech	L253	CTGS - CHEMICAL LAB (MARI9)	382
Sodium Hydroxide N/50 (0.02N)	Ge Betz Canada GE WATER & Process Tech	L6101	CTGS - CHEMICAL LAB (MARI9)	11723
Starch Reagent Stabilized	Ge Betz Canada GE WATER & Process Tech	L275	CTGS - CHEMICAL LAB (MARI9)	11721
Sulfuric Acid Reagent 15% Solution	GE Water & Process Technologies Canada	L338	CTGS - CHEMICAL LAB (MARI9)	389537
Sulfuric Acid Titrant N/50 (0.02 N)	GE Water & Process Technologies Canada	L202	CTGS - CHEMICAL LAB (MARI9)	11718
Sulphuric Acid N/7	GE Water & Process Technologies Canada	L6070	CTGS - CHEMICAL LAB (MARI9)	5820
Super Star	Gulfstar Chemicals Inc.		CTGS - CHEMICAL LAB (MARI9)	727535
Tranelec Conventional Transformer Oil	Cooper Power Systems		CTGS - CHEMICAL LAB (MARI9)	
Universal Hardness Buffer Solution	Ge Betz Canada GE WATER & Process Tech	L1566	CTGS - CHEMICAL LAB (MARI9)	16291
Valco Hylomar Universal Blue 710XX251, 710XX253, 710XX255, 710XX260, 710XX274, 710XX283, 710XX285, 710XX286, 710XX326, 710XX327, 710XX329, 710XX337	Hylomar Limited	HBS-1	CTGS - CHEMICAL LAB (MARI9)	38694
44 Lead Free Flux Cored Solder	Litton Kester Solder	44 Coat LF	CTGS - E & I STORES (MARI10)	805647
7656 Series Qt-III Cold Shrink Silicone Rubber Skirted Termination Kits	3M Canada Inc.	80-6109-2009-4	CTGS - E & I STORES (MARI10)	392336
AK377 - ArmorCoat Roof Patch	Henry Company	AK377	CTGS - E & I STORES (MARI10)	169164

D-6: List of Chemicals

Aluminum Oxide Bear Tex Product	Saint Gobain North America	22062	CTGS - E & I STORES (MARI10)	1100057
Barnes Black RTV Silicone	Dynatex Chemical	BD1486	CTGS - E & I STORES (MARI10)	2377949
Barnes Distribution Barnes Hi d Temperature Anti-Seize Thread Compound	Henkel Loctite Canada Inc.	51132	CTGS - E & I STORES (MARI10)	1333009
Barnes High Strength Thread Locker Heavy Duty	Barnes Group Inc.	22006	CTGS - E & I STORES (MARI10)	2445449
Battery Terminal Coating (BD1072)	Barnes Group Inc.	21908	CTGS - E & I STORES (MARI10)	31427
BD1012 All Purpose Clnr	Sherwin Williams	BD1012	CTGS - E & I STORES (MARI10)	727564
BD1077 Red Grease	Barnes Group Inc.	BD1077	CTGS - E & I STORES (MARI10)	1878424
BD1100 4-Way Lube-20 oz.	Barnes Group Inc.	21910	CTGS - E & I STORES (MARI10)	27657
Beauti-Tone Acryl-Lok 118-00	Home Hardware	1850-786	CTGS - E & I STORES (MARI10)	569936
Bolt-Out (Aerosol)	J. Walter Company Ltd.	53-D 892	CTGS - E & I STORES (MARI10)	13813
Break-Free CLP-E Liquid	Break-Free Incorporated		CTGS - E & I STORES (MARI10)	1904710
C-100 Molybdenum Anti-Sieze	Henkel Corporation	51032	CTGS - E & I STORES (MARI10)	826
CC-2 Prep Kit (Cable Cleaner)	3M Canada Inc.	78-8061-7605-9	CTGS - E & I STORES (MARI10)	35980
Clear Wood Preservative	Recochem Inc.	13-718	CTGS - E & I STORES (MARI10)	43230
Crown 6084 Red Insulating Varnish - Aerosol	Aervoe Industries Inc		CTGS - E & I STORES (MARI10)	656920
Crown Cold Galvanize Coating 93% Zinc Rich - Bulk	Aervoe Industries Inc		CTGS - E & I STORES (MARI10)	
Cutting Tool Coolant	Barnes Group Inc.	BD1128	CTGS - E & I STORES (MARI10)	3082445
Cutting Tool Coolant	American Jetway		CTGS - E & I STORES (MARI10)	2262984

D-6: List of Chemicals

Dry Graphite Lubricant	Barnes Group Inc.	BD1089	CTGS - E & I STORES (MARI10)	2216694
ETP Cutting Fluid	Lawson Products Inc	P93215	CTGS - E & I STORES (MARI10)	385549
E-Z Clean Cloth	Kar Products / Distributor	C122066	CTGS - E & I STORES (MARI10)	322854
Galv Coat	Barnes Group Inc.	MSDS21915	CTGS - E & I STORES (MARI10)	3655
Glass Cleaner	Barnes Group Inc.	BD1039	CTGS - E & I STORES (MARI10)	314621
Gloss Black	Seymour of Sycamore, Inc.	BD1202	CTGS - E & I STORES (MARI10)	762068
Gloss Black Enamel	Seymour of Sycamore, Inc.	BD13300000	CTGS - E & I STORES (MARI10)	3674
Graffiti Remover	CRC Industries	3194	CTGS - E & I STORES (MARI10)	2584960
Harris American LFB / FC (Formerly Welco 15 and Welco 15FC)	The Harris Products Group		CTGS - E & I STORES (MARI10)	2029904
Heavy Duty Electric Motor Cleaner	Barnes Group Inc.	21958	CTGS - E & I STORES (MARI10)	3643
Heavy Load Red Grease	Barnes Group Inc.	MSDS21418	CTGS - E & I STORES (MARI10)	547
Hi D Temperature Anti-Seize Thread Compound	Henkel Corporation	270827	CTGS - E & I STORES (MARI10)	661755
Hi-Heat Aluminum Enamel Paint	Barnes Group Inc.	24710	CTGS - E & I STORES (MARI10)	36533
IDO Premium 10W30 &15W40	Irving Blending and Packing		CTGS - E & I STORES (MARI10)	13130
Improved Formula Comm-Plete Degreaser	Morgan AM&T	N201	CTGS - E & I STORES (MARI10)	656817
Lacquer Thinner	Recochem Inc.	83-551	CTGS - E & I STORES (MARI10)	15172
Latex Paint Coatings: House Paint, Barn Paint, Floor Enamel, Celing Flat, Super Silk, Semi Gloss, Block Filler, Primer Sealer	House of Excellence		CTGS - E & I STORES (MARI10)	317658
Leak Detecting Battery Cleaner	Barnes Group Inc.	21942	CTGS - E & I STORES (MARI10)	333778

D-6: List of Chemicals

Lepage 5 Minute Epoxy (Hardener)	Henkel Consumer Adhesives		CTGS - E & I STORES (MARI10)	302432
Lepage Contact Cement Thinner/Cleaner	Henkel Consumer Adhesives		CTGS - E & I STORES (MARI10)	1841117
Lepage Pres-Tite Contact Cement	Henkel Loctite Canada Inc.		CTGS - E & I STORES (MARI10)	4675
Lime-A-Way Cleaner - Toggle	Reckitt Benckiser	268114	CTGS - E & I STORES (MARI10)	1389551
Loctite 243 ThreadLocker 50mL	Henkel Corporation	1329467	CTGS - E & I STORES (MARI10)	3004001
Loctite 263 Threadlocker	Henkel Corporation	1330585	CTGS - E & I STORES (MARI10)	3004011
Loctite Pipe Joint Compound	Henkel Corporation	234953	CTGS - E & I STORES (MARI10)	390430
LPS PF Solvent	LPS Laboratories Inc.	61400	CTGS - E & I STORES (MARI10)	1375587
Medium Dry Aqueous Recorder Ink	Graphic Controls Inc.		CTGS - E & I STORES (MARI10)	24285
Metal Protec BD1117	Barnes Group Inc.	L-13756	CTGS - E & I STORES (MARI10)	3724065
Mobil Polyrex EM	Exxonmobil Canada	2015A020G010	CTGS - E & I STORES (MARI10)	169294
Mono Acrylic Exterior Clear 12Ctg	Rust-Oleum Consumer Brands Canada (RCBC)	897800 312	CTGS - E & I STORES (MARI10)	47767
Mono Acrylic Exterior White 12CTG	Rust-Oleum Consumer Brands Canada (RCBC)	897806 312	CTGS - E & I STORES (MARI10)	335278
Moovit	Lloyds Laboratories Inc.	11008	CTGS - E & I STORES (MARI10)	52498
Moovit (Liquid)	Lloyds Laboratories Inc.	12004	CTGS - E & I STORES (MARI10)	4635
MRO Gloss White	Seymour of Sycamore, Inc.	6201413	CTGS - E & I STORES (MARI10)	887144
Oatey Canadian PVC Heavy Duty Clear or Grey Cement	Oatey Co.	31011	CTGS - E & I STORES (MARI10)	2580869
Oatey CPVC Solvent Cement	Oatey Co.		CTGS - E & I STORES (MARI10)	1496097

D-6: List of Chemicals

Oil Eater Degreaser/Cleaner	Kafko International		CTGS - E & I STORES (MARI10)	3819409
Open Gear and Fifth Wheel Lube	Barnes Group Inc.	19464	CTGS - E & I STORES (MARI10)	32284
Penetrating Red Grease	Barnes Group Inc.	21419	CTGS - E & I STORES (MARI10)	1232
Primer Surfacer	Barnes Group Inc.	MSDS24721	CTGS - E & I STORES (MARI10)	3678
Procell	Procter & Gamble	PC1300	CTGS - E & I STORES (MARI10)	3454023
Quad-Cut Cutting and Tapping Fluid	Remi Corporation	19483	CTGS - E & I STORES (MARI10)	814822
Quick Set	Henkel Corporation	440488_151030	CTGS - E & I STORES (MARI10)	577835
Red Gage Oil	Dwyer Instruments Inc.	71-440133-00	CTGS - E & I STORES (MARI10)	6040
Red Insulating Varnish	Barnes Group Inc.	BD1133-1	CTGS - E & I STORES (MARI10)	1266
RFP500 RFP300 RFP100 REP28-DP RFP14P RFP328-DP RFP314P	Sorbent Products Co. Inc.		CTGS - E & I STORES (MARI10)	2262986
Ridgid Nu-Clear Thread Cutting Oill	Ridge Tool Company	41565	CTGS - E & I STORES (MARI10)	2745668
Shell Turbo Oil T 32	Shell Canada Products Ltd.	001A9782	CTGS - E & I STORES (MARI10)	20725
Shrink-Kon Heavy Wall Insulation Tubing	Thomas & Betts	HSMHF2362-48	CTGS - E & I STORES (MARI10)	865476
Sikaflex 221	Sika Corporation		CTGS - E & I STORES (MARI10)	843315
Silicone Lubricant (BD1091)	Barnes Group Inc.	21946	CTGS - E & I STORES (MARI10)	16589
Slic-Tite PTFE Thread Tape, PTFE Thread Seal Tape	Barnes Group Inc.	21495	CTGS - E & I STORES (MARI10)	3902309
Solder	Multicore Solders Inc.		CTGS - E & I STORES (MARI10)	393096
Solder Paste CMC no. 50 or no. 504	The Canada Metal Company		CTGS - E & I STORES (MARI10)	2418082

D-6: List of Chemicals

Spray Nine 4 fl.oz	Permatex USA	26705	CTGS - E & I STORES (MARI10)	10937
Superlock Penetrating Grade 2290	ITW Devcon Corporation	22905	CTGS - E & I STORES (MARI10)	24038
Tranelec Conventional Transformer Oil	Cooper Power Systems		CTGS - E & I STORES (MARI10)	
Ultra Dawn Liquid Hand Dishwashing Detergents and Antibacterial Hand Soaps Finished Product	Procter & Gamble	95435353	CTGS - E & I STORES (MARI10)	3814944
VC100 Primer Cleaner	Schwartz Chemical of Canada Ltd.	4T174	CTGS - E & I STORES (MARI10)	2657307
"All Weather Paintstik " “All Weather Hot Climate Paintstik” "B", "B-3/8", "B-E", "B-16", "C", "E", "F", & "N" Paintstiks "Lacquer Stik"	LA-CO Industries Inc.- Markal Company		CTGS - GENERAL (MARI74)	3429471
102, 104, 108 Mold Release	Hastings Fiber Glass Products	3638	CTGS - GENERAL (MARI74)	3577484
11111-F-Series Fluorescent Colours (100,101,102,103,104,105,1	K-G Packaging - Spray Pak	F100	CTGS - GENERAL (MARI74)	2030832
2000.71030 710S9100 Ht10 Aluminum G - Aluminum	Deco Paints U.S. HQE	2000.7103	CTGS - GENERAL (MARI74)	878156
3500 Valvelon	A.W. Chesterton Company		CTGS - GENERAL (MARI74)	3622
370	A.W. Chesterton Company		CTGS - GENERAL (MARI74)	54665
389 Synthetic Tapping Compound	A.W. Chesterton Company		CTGS - GENERAL (MARI74)	333073
5415A Series QSIII Splice Kits	3M Canada Inc.	80-6112-1780-5	CTGS - GENERAL (MARI74)	727987
706 FG Rustsolvo	A.W. Chesterton Company		CTGS - GENERAL (MARI74)	727697
706 Rustsolvo	A.W. Chesterton Company		CTGS - GENERAL (MARI74)	114
710 Anti-Seize Compound (Bulk)	A.W. Chesterton Company		CTGS - GENERAL (MARI74)	333355
7656 Series Qt-III Cold Shrink Silicone Rubber Skirted Termination Kits	3M Canada Inc.	80-6109-2009-4	CTGS - GENERAL (MARI74)	392336
77 % - 100 % Sulfuric Acid	Norfalco LLC/Norfalco Sales Inc.		CTGS - GENERAL (MARI74)	350133
Absorbent GP Particulate	ITW Devcon Corporation	48210	CTGS - GENERAL (MARI74)	1486
ACE Methyl Hydrate	Kleen-Flo Tumbler Industries Ltd.	984	CTGS - GENERAL (MARI74)	13929
Alkyd Paint Coatings: House Paint, Barn Paint, Floor Enamels, Equipment Enamels, Flat, Semi Gloss, Low Lustre, High Gloss Enamels, Oil & Alkyd Primers	House of Excellence		CTGS - GENERAL (MARI74)	317642
Aluminum Alloy	Marmon Keystone Canada Inc.	1000	CTGS - GENERAL (MARI74)	7968
Amino Acid F Reagent	Hach Company	2253869	CTGS - GENERAL (MARI74)	
Ammonium Bifluoride	GE Betz USA		CTGS - GENERAL (MARI74)	727574
Ammonium Fluoride 36%	GE Water & Process Technologies Canada		CTGS - GENERAL (MARI74)	727572
Ammonium Hydroxide 50%	GE Water & Process Technologies Canada	L1600	CTGS - GENERAL (MARI74)	376774
Anti-Fog / Anti-Static Lens Cleaner	Canadian Custom Packaging		CTGS - GENERAL (MARI74)	2449802

D-6: List of Chemicals

Aquafloc 403	GE Betz USA		CTGS - GENERAL (MARI74)	10137
Aquafloc 403	Ge Betz Canada GE WATER & Process Tech		CTGS - GENERAL (MARI74)	480084
Ardrox 9PR50	Chemetall Oakite		CTGS - GENERAL (MARI74)	999832
Argon	Praxair Canada Inc.		CTGS - GENERAL (MARI74)	1028
Atom Arc 7018	Groupe Esab Canada Inc	7018	CTGS - GENERAL (MARI74)	18956
ATP Standard 1.0 NG/mL Vial	GE Water & Process Technologies Canada	L6386	CTGS - GENERAL (MARI74)	23592
Babbitt Putty	The Canada Metal Company		CTGS - GENERAL (MARI74)	624519
Barium Chloride 10%	GE Betz USA	L249	CTGS - GENERAL (MARI74)	34702
Bar-Rust 235 235K	Deco Paints U.S. HQE	235B1642	CTGS - GENERAL (MARI74)	30757
BD1065 Paint Remover	American Jetway	BD1065	CTGS - GENERAL (MARI74)	3497282
BD1091 Silicone Lube	Sherwin Williams	BD1091	CTGS - GENERAL (MARI74)	414523
Betzdearborn DCL30	Ge Betz Canada GE WATER & Process Tech		CTGS - GENERAL (MARI74)	81495
Bottom Ash/Flyash (From Heavy Oil Combustion) Produced at Charlottetown Thermal Generating Station	Maritime Electric		CTGS - GENERAL (MARI74)	727876
C6 Epcon Adhesive	ITW Ramset / Redhead	C6	CTGS - GENERAL (MARI74)	35982
Calcium Magnesium Buffer	GE Water & Process Technologies Canada	L6501	CTGS - GENERAL (MARI74)	3814278
CC-3 Cable Cleaning Pads (Cable Cleaner)	3M Canada Inc.	78-8018-9838-4	CTGS - GENERAL (MARI74)	5095
Chrome-plated bar and tubing (Chromerod and Chromerod Extreme)	Enduro Industries, Inc.		CTGS - GENERAL (MARI74)	7969
CLR Pro Calcium Lime & Rust Remover Enhanced Formula - DFE	Jelmar		CTGS - GENERAL (MARI74)	3685277
Concrete Mix, Sand Mix, Mortar Mix	Shaw Resources		CTGS - GENERAL (MARI74)	456227
Conductivity STD. SOL. 2,000 Umhos @ 25	GE Water & Process Technologies Canada	L6508	CTGS - GENERAL (MARI74)	751
Conductivity Std. Sol. 4,000 UMHOS @ 25	Ge Betz Canada GE WATER & Process Tech	L1919	CTGS - GENERAL (MARI74)	900
Contrac All-Weather Blox	Bell Laboratories Inc.		CTGS - GENERAL (MARI74)	
Copper Masking Reagent Powder Pillows	Ge Betz Canada GE WATER & Process Tech	L2345	CTGS - GENERAL (MARI74)	179
Cortrol IS1050	Ge Betz Canada GE WATER & Process Tech		CTGS - GENERAL (MARI74)	16660
Cortrol OS5035	GE Water & Process Technologies Canada		CTGS - GENERAL (MARI74)	387853
Crown 5055 All Purpose Cleaner - Aerosol	Aervoe Industries Inc		CTGS - GENERAL (MARI74)	522793
Crown 6075 Dry Film Lubricant	Aervoe Industries Inc		CTGS - GENERAL (MARI74)	1539914

D-6: List of Chemicals

Crown 6084 Red Insulating Varnish - Aerosol	Aervoe Industries Inc		CTGS - GENERAL (MARI74)	656920
Curap 20	ISK Biocides		CTGS - GENERAL (MARI74)	642754
Deep Base Mach. Enamel	Ferox Inc.	1303	CTGS - GENERAL (MARI74)	727972
Deflect SPF 33 Professional Sunscreen	Creative Cosmetics Inc.		CTGS - GENERAL (MARI74)	3678844
D'Limokleen	Leyson Chemical Products	338	CTGS - GENERAL (MARI74)	727755
Drano Clog Remover	SC Johnson		CTGS - GENERAL (MARI74)	179446
Ecoline Flux Remover	Tech Spray Inc.	1621-10S/EUR	CTGS - GENERAL (MARI74)	933403
Enerfill 2288 Hollow Core Cable Oil	OMG Belleville Limited	T02288	CTGS - GENERAL (MARI74)	282877
Epcon Ceramic 6 Hardener	ITW Polymers Coatings North America	3600H	CTGS - GENERAL (MARI74)	35983
E-Z Clean Cloth	Kar Products / Distributor	C122066	CTGS - GENERAL (MARI74)	322854
Fiesta Conc. Stain Remover	Avmor Ltd.	1394	CTGS - GENERAL (MARI74)	692725
Flexane 80 Putty Resin	ITW Devcon Corporation	15820	CTGS - GENERAL (MARI74)	14915
Food Grade Silicone (Aerosol)	CRC Industries	3040	CTGS - GENERAL (MARI74)	2001363
Foodrex FG 1	Exxon Mobil	7415100-00	CTGS - GENERAL (MARI74)	88133
GE Fluorescent Lamps	GE Lighting		CTGS - GENERAL (MARI74)	3825658
Gld Ultra Hi-Hide Sealer	PPG Architect Coatings		CTGS - GENERAL (MARI74)	1919596
Gloss Black Enamel	Seymour of Sycamore, Inc.	BD1330	CTGS - GENERAL (MARI74)	41625
Graffiti Remover	CRC Industries	3194	CTGS - GENERAL (MARI74)	2584960
H.D. Enamel Orange D-8	Ferox Inc.	322	CTGS - GENERAL (MARI74)	727883
Harris American LFB / FC (Formerly Welco 15 and Welco 15FC)	The Harris Products Group		CTGS - GENERAL (MARI74)	2029904
Heavy Duty Electric Motor Cleaner	Barnes Group Inc.	21958	CTGS - GENERAL (MARI74)	3643
Hi-Heat Aluminum Enamel Paint	Barnes Group Inc.	24710	CTGS - GENERAL (MARI74)	36533
HP	J. Walter Company Ltd.		CTGS - GENERAL (MARI74)	3989538
Hydrochloric Acid 20° Baume - 31.45% (Muriatic Acid)	Kencro Chemicals Limited		CTGS - GENERAL (MARI74)	1007066
Industrial Gray Enamel	Barnes Group Inc.	MSDS24708	CTGS - GENERAL (MARI74)	3677
Intertuf Bituminous Black	International Paint LLC	JBA016	CTGS - GENERAL (MARI74)	727881
Iron Vacu-Vials and Activator Solution	Chemetrics Inc.	A-6000	CTGS - GENERAL (MARI74)	2548920
Javex Liquid Bleach	Colgate Palmolive Canada		CTGS - GENERAL (MARI74)	768
Jet Blue	Future Transfer Co. Inc.		CTGS - GENERAL (MARI74)	
K-33 (C-60) Wood Preservative	Timber Specialties Ltd.		CTGS - GENERAL (MARI74)	727544
K-732	Von Roll USA, Inc.	K-732 K-732	CTGS - GENERAL (MARI74)	728964
Kleen MCT103	GE Betz USA		CTGS - GENERAL (MARI74)	299975
Kleen MCT511	GE Water & Process Technologies Canada		CTGS - GENERAL (MARI74)	320503
Lidok Lotemp Moly Grease Lonax Lotemp Moly (Former Name)	Exxonmobil Canada		CTGS - GENERAL (MARI74)	325570
Liquid Paper Correction Fluid -- Water Base	NewellRubbermaid		CTGS - GENERAL (MARI74)	2542312
LPS Strong Steel Sticks	LPS Laboratories Inc.	60159	CTGS - GENERAL (MARI74)	52664

D-6: List of Chemicals

Lysol Brand III Disinfectant Spray (All sizes, All scents)	Reckitt & Benckiser	242193	CTGS - GENERAL (MARI74)	3497992
Mag Hydroxide 93/96HS	Redland Magnesia Limited		CTGS - GENERAL (MARI74)	728949
Magnesium Hydroxide	Avantor Performance Materials/Macron	5984	CTGS - GENERAL (MARI74)	139825
Magnesium Hydroxide	Sigma Aldrich Chemical Company Inc. / SAFC	63081	CTGS - GENERAL (MARI74)	245283
Magnesium Hydroxide Laboratory Grade, Powder	Science Stuff Inc	C2023	CTGS - GENERAL (MARI74)	728951
Magnesium Hydroxide Powder PSH	Manson CAT Corporation		CTGS - GENERAL (MARI74)	2506141
Metal Protec BD1117	Barnes Group Inc.	L-13756	CTGS - GENERAL (MARI74)	3724065
Methyl Hydrate	Recochem Inc.	13-391	CTGS - GENERAL (MARI74)	15173
Mineral Wool Insulation	Fibrex Insulation Inc.		CTGS - GENERAL (MARI74)	16240
Mobil DTE Oil Light	Exxonmobil Canada	2.01561E+11	CTGS - GENERAL (MARI74)	325650
Molybdate 3+ Reagent Solution	Ge Betz Canada GE WATER & Process Tech	L2322	CTGS - GENERAL (MARI74)	1619
Msa P/N 10045035 Calibration Check Gas, 60 Ppm Carbon Monoxide, 1.45% Methane, 15% Oxygen, 20 Ppm Hydrogen Sulfide, Balance Nitrogen	Mine Safety Appliances Co.	10045035	CTGS - GENERAL (MARI74)	3144954
Nickel Based Alloy Steel	Marmon Keystone Canada Inc.		CTGS - GENERAL (MARI74)	31177
Oatey Canadian PVC Heavy Duty Clear or Grey Cement	Oatey Co.	31011	CTGS - GENERAL (MARI74)	2580869
Oceanite	Resco Products Inc.	MIX1007	CTGS - GENERAL (MARI74)	480204
OilSnare	Parker Systems, Inc.	OS-15/B	CTGS - GENERAL (MARI74)	664428
Optisperse ADJ5150	GE Water & Process Technologies Canada		CTGS - GENERAL (MARI74)	16713
Optisperse HP9420	Ge Betz Canada GE WATER & Process Tech		CTGS - GENERAL (MARI74)	21720
Optisperse PQ4657	Ge Betz Canada GE WATER & Process Tech		CTGS - GENERAL (MARI74)	16714
Orange Silica Gel	UnKnown		CTGS - GENERAL (MARI74)	2520946
Oran-Gel (Bulk)	State Industrial Products		CTGS - GENERAL (MARI74)	235845
Oxygen, Medipure	Praxair Canada Inc.	E-4638	CTGS - GENERAL (MARI74)	1937237
P40	Produits Asphalte du Québec (PAQCO Ltée)		CTGS - GENERAL (MARI74)	809459
PC 26C Red Hi Temp RTV Silicone Gasket Maker 300 mL	Permatex Canada	81312	CTGS - GENERAL (MARI74)	3838009
Pentachlorophenol Pressure Treated Wood	Stella-Jones Inc.		CTGS - GENERAL (MARI74)	
Phenolphthalein Indicator Solution	Ge Betz Canada GE WATER & Process Tech	L212	CTGS - GENERAL (MARI74)	772057
Phillyclad 6470 Resin	ITW Polymers Coatings North America	2556U	CTGS - GENERAL (MARI74)	621067
Porelon Ink - Black	Canadian Willamette Industries Inc.	7005090	CTGS - GENERAL (MARI74)	20903

D-6: List of Chemicals

Product 326	A.W. Chesterton Company		CTGS - GENERAL (MARI74)	458754
Propane LPG	Superior Propane Inc.		CTGS - GENERAL (MARI74)	1840493
Prostar S6	Sidergas SRL	850001	CTGS - GENERAL (MARI74)	19375
Purple Power	Leysons Chemical Products	330	CTGS - GENERAL (MARI74)	366705
Pyro-Chem ABC	Tyco Fire Suppression And Building Products	2001-2-012 ANa	CTGS - GENERAL (MARI74)	487837
Q-Seal	Zophar Mills, Inc		CTGS - GENERAL (MARI74)	727576
RD Encapsulant Part A- Mercury Free	Preformed Line Products Co		CTGS - GENERAL (MARI74)	727560
RD Encapsulant Part B- Mercury Free	Preformed Line Products Co		CTGS - GENERAL (MARI74)	727562
Resinoid Bonded Abrasive Products	Abmast Inc. / Abmast Abrasives Corp.		CTGS - GENERAL (MARI74)	3059980
Robco 1275	Robco Inc.		CTGS - GENERAL (MARI74)	727569
Rockwell 147 Sealant (Bulk Grade)	Arvin Meritor		CTGS - GENERAL (MARI74)	340896
S.O.S Steel Wool Soap Pads	The Clorox Company		CTGS - GENERAL (MARI74)	14659
S9 Preservation Soln	GE Betz USA		CTGS - GENERAL (MARI74)	
SAE 15W-40 Super Duty Diesel Motor Oil	Ford Motor Company	173582	CTGS - GENERAL (MARI74)	809524
Scotchseal Compound 2229	3M Canada Inc.	80-6105-9441-0	CTGS - GENERAL (MARI74)	37189
SF6 – Sulfur Hexafluoride	Concorde Specialty Gases, Inc.		CTGS - GENERAL (MARI74)	2596038
Sikaflex 221	Sika Corporation		CTGS - GENERAL (MARI74)	843315
Silica Sand (No. 2, 1, 0, 00 Sizes, Glass Sand)	Shaw Resources		CTGS - GENERAL (MARI74)	2120159
Silver Nitrate N/58.45 (0.017N)	Ge Betz Canada GE WATER & Process Tech	L6123	CTGS - GENERAL (MARI74)	4687
SLH II (Clear)	Barnes Group Inc.	21533	CTGS - GENERAL (MARI74)	595225
Smooth Kote Insulating Cement, Finishing Cement	Insulco Division of MFS, Inc		CTGS - GENERAL (MARI74)	33058
Sodium Hydroxide N/50 (0.02N)	Ge Betz Canada GE WATER & Process Tech	L6101	CTGS - GENERAL (MARI74)	11723
Spray Nine 4 fl.oz	Permatex USA	26705	CTGS - GENERAL (MARI74)	10937
Stainless Steel Filler Inco-Weld 308, 308H, 308L, 308LSi	Special Metals Welding Products Co	308	CTGS - GENERAL (MARI74)	3129040
Steamate NA0280	Ge Betz Canada GE WATER & Process Tech	NA0280	CTGS - GENERAL (MARI74)	300847
Steel Red Layout Fluid, Transparent Red Staining Color	ITW Dymon	80296	CTGS - GENERAL (MARI74)	2385610
Style 866	John Crane Americas		CTGS - GENERAL (MARI74)	727935
Style C1065	John Crane Americas	C1065	CTGS - GENERAL (MARI74)	577527
Sulfuric Acid Reagent 15% Solution	GE Water & Process Technologies Canada	L338	CTGS - GENERAL (MARI74)	389537
Sullube	DOW CIG North America/Angus Chemical		CTGS - GENERAL (MARI74)	2071364
Sulphuric Acid 51 - 100 %	Brenntag Canada Inc.		CTGS - GENERAL (MARI74)	6431

D-6: List of Chemicals

Sulphuric Acid 66 Baume	Canada Colors & Chemical Ltd.	899005	CTGS - GENERAL (MARI74)	9966
Super G Bond Plus	ANH Refractories Company		CTGS - GENERAL (MARI74)	304178
Sureweld 10P	Groupe Esab Canada Inc		CTGS - GENERAL (MARI74)	2451844
Tana All Protector	Sara Lee Household & Body Care	104000	CTGS - GENERAL (MARI74)	22067
Tilex Fresh Shower Daily Shower Cleaner	Clorox Company of Canada Ltd		CTGS - GENERAL (MARI74)	749462
Titeseal Medium Weight	Radiator Specialty Co. of Canada Ltd.	T2575	CTGS - GENERAL (MARI74)	19820
Torpedo Liquid Drain Opener	Avmor Ltd.	1428	CTGS - GENERAL (MARI74)	20880
Tranelec Conventional Transformer Oil	Cooper Power Systems		CTGS - GENERAL (MARI74)	
Type HP Cleaner/Degreaser Aerosol	Polywater Europe BV	HPY-12	CTGS - GENERAL (MARI74)	4097748
UHU Stic Envelope Sealer	UHU GmbH & Co. KG		CTGS - GENERAL (MARI74)	241781
Ultra Coolant	Ingersoll Rand		CTGS - GENERAL (MARI74)	1064
Ultrex Daily Washroom Cleaner	Avmor Ltd.	1384	CTGS - GENERAL (MARI74)	692706
Unirex EP 2	Exxonmobil Canada	2015A0207210	CTGS - GENERAL (MARI74)	2805463
Universal Antifreeze	Coastal Blending & Packaging		CTGS - GENERAL (MARI74)	2033168
Universal Hardness Buffer Solution	Ge Betz Canada GE WATER & Process Tech	L1566	CTGS - GENERAL (MARI74)	16291
Unleaded Gasoline	Exxonmobil Canada		CTGS - GENERAL (MARI74)	2413715
Utp Af 706	Bohler Thyssen Welding Canada Ltd		CTGS - GENERAL (MARI74)	20153
VA78 Heat Resistant Varnish Semi Gloss Grey	Sterling Technology Limited	VA78	CTGS - GENERAL (MARI74)	726855
Valve Action Paint Marker - Brown, Purple, White, Yellow, Red, Black, Orange, Blue, Green, Gold, Light Green, Pink, Silver, Light Blue, Fluorescent Yellow, Fluorescent Green, Fluorescent Orange, Fluorescent Pink, Fluorescent Invisible UV.	LA-CO Industries Inc.- Markal Company	96809	CTGS - GENERAL (MARI74)	661189
Vandex 500-9710012	Mega-Lab Manufacturing Co. Ltd		CTGS - GENERAL (MARI74)	1146849
Varsol 3139 Solvent	Exxonmobil Canada	201560B05660	CTGS - GENERAL (MARI74)	1594
Viper	Avmor Ltd.	1445	CTGS - GENERAL (MARI74)	296955
WD-40 Aerosol	WD 40 Products Canada Ltd.		CTGS - GENERAL (MARI74)	397
Windex Original Glass Cleaner	SC Johnson		CTGS - GENERAL (MARI74)	3153651
Wires (Electrodes) OK Autrod 16.95	Groupe Esab Canada Inc		CTGS - GENERAL (MARI74)	23393
Yellow 77 Plus Wire Pulling Lubricant	Ideal Industries Inc.	ALL "31" SERIES	CTGS - GENERAL (MARI74)	3206845
Absorbent W Particulate	ITW Devcon Corporation	48230	CTGS - GREEN SHED (MARI14)	21136
Ball Paint Marker	LA-CO Industries Inc.- Markal Company	84626	CTGS - GREEN SHED (MARI14)	2269355
Basiflux DCM	Vesuvius	LLA30084	CTGS - GREEN SHED (MARI14)	388740

D-6: List of Chemicals

Bulk Safe-T-Salt	The Canadian Salt Company Ltd.		CTGS - GREEN SHED (MARI14)	726929
Calmax	Isolation Manson Inc.		CTGS - GREEN SHED (MARI14)	4508
Damit	Zophar Mills, Inc		CTGS - GREEN SHED (MARI14)	313669
Dry Graphite	Radiator Specialty Co. of Canada Ltd.	BGS1	CTGS - GREEN SHED (MARI14)	15179
Fiberglass-Auto Resin	Fibre Glass-Evercoat Co. Inc.	100498	CTGS - GREEN SHED (MARI14)	36562
Graffiti Remover	CRC Industries	3194	CTGS - GREEN SHED (MARI14)	2584960
Inswool-Hp Blanket 8	ANH Refractories Company		CTGS - GREEN SHED (MARI14)	3169869
Ks-4 Plus	ANH Refractories Company		CTGS - GREEN SHED (MARI14)	3013596
Lidok EP 2 Grease	Exxonmobil Canada		CTGS - GREEN SHED (MARI14)	10784
Masters No-Leak	GF Thompson Co. Ltd.		CTGS - GREEN SHED (MARI14)	17102
Mobil White Oil 12	Exxonmobil Canada		CTGS - GREEN SHED (MARI14)	1186
Nashua 398 Spray Adhesive	Berry Plastics - Flexible Packaging		CTGS - GREEN SHED (MARI14)	809426
Pcp-C	ANH Refractories Company		CTGS - GREEN SHED (MARI14)	640897
Poly Stickfast Wallpaper Paste	Henkel Consumer Adhesives		CTGS - GREEN SHED (MARI14)	15444
Polyfilla	Henkel Loctite Canada Inc.		CTGS - GREEN SHED (MARI14)	2996012
Primer Surfacer	Barnes Group Inc.	MSDS24721	CTGS - GREEN SHED (MARI14)	3678
Thermal Kote Cements	Pro-Tec-T-Kotes		CTGS - GREEN SHED (MARI14)	479483
Thermo-12 Gold	Industrial Insulation Group, LLC	20501	CTGS - GREEN SHED (MARI14)	2525740

D-6: List of Chemicals

Tranelec Conventional Transformer Oil	Cooper Power Systems		CTGS - GREEN SHED (MARI14)	
2 Cycle +	Irving Blending and Packing		CTGS - LUBSTORES /OIL /PAINT (MARI7)	22879
2000.71030 710S9100 Ht10 Aluminum G - Aluminum	Deco Paints U.S. HQE	2000.7103	CTGS - LUBSTORES /OIL /PAINT (MARI7)	878156
333 Ure Liq Plastic Clr Semi-Gloss	Deco Paints U.S. HQE	333	CTGS - LUBSTORES /OIL /PAINT (MARI7)	686054
500S Imron Polyurethane Enamel Tints and 500S Enamel Clear	Axalta Coating Systems LLC	500S	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2384169
770 Primer Prism	Henkel Corporation	18397	CTGS - LUBSTORES /OIL /PAINT (MARI7)	387723
amerlock 2 cure	PPG Industries, Inc.	AK2-B	CTGS - LUBSTORES /OIL /PAINT (MARI7)	
Amerlock 2 Cure	PPG Coatings and Resins	AK2-B	CTGS - LUBSTORES /OIL /PAINT (MARI7)	
Apexior #1	Dampney Co. Inc.		CTGS - LUBSTORES /OIL /PAINT (MARI7)	19191
Arcan 1 Grease	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	274
Arox EP 100	Exxon Mobil	201560B02210	CTGS - LUBSTORES /OIL /PAINT (MARI7)	8341
ATF D/M	Exxonmobil Canada	8054	CTGS - LUBSTORES /OIL /PAINT (MARI7)	3519304
Biogenic Regent, Solvent Degreaser	Rochester Midland Creative Chemistry	4124	CTGS - LUBSTORES /OIL /PAINT (MARI7)	458025
Burmastic Adhesive SF - 5 Gal	Rust-Oleum Consumer Brands Canada (RCBC)	365600 805	CTGS - LUBSTORES /OIL /PAINT (MARI7)	1932443
Carboguard 890 Part A	Carboline Company		CTGS - LUBSTORES /OIL /PAINT (MARI7)	11400
Carboguard 890 Part B	Carboline Company	0986B1NL	CTGS - LUBSTORES /OIL /PAINT (MARI7)	23534
Castrol Grand Prix 2T	Castrol Canada Inc.	463489-CA01	CTGS - LUBSTORES /OIL /PAINT (MARI7)	304072
Ceilcote 680 Part A	International Coatings UK	NCA059	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2387631

D-6: List of Chemicals

Ceilcote Ur Corocrete Slurry Part A	International Paint LLC	NCA825	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2507619
Ceilcote Ur Corocrete Trowel Part A	International Paint LLC	NCA824	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2507621
Concrete Mix, Sand Mix, Mortar Mix	Shaw Resources		CTGS - LUBSTORES /OIL /PAINT (MARI7)	456227
Crown 6075 Dry Film Lubricant	Aervoe Industries Inc		CTGS - LUBSTORES /OIL /PAINT (MARI7)	1539914
Crown Cold Galvanize Coating 93% Zinc Rich - Bulk	Aervoe Industries Inc		CTGS - LUBSTORES /OIL /PAINT (MARI7)	
Cylesstic Tk 680	Exxonmobil Canada	2010605010D0	CTGS - LUBSTORES /OIL /PAINT (MARI7)	18833
D&E (All)	Coastal Blending & Packaging		CTGS - LUBSTORES /OIL /PAINT (MARI7)	513390
Damit	Zophar Mills, Inc		CTGS - LUBSTORES /OIL /PAINT (MARI7)	313669
Devtar 5A Jet Black Base	Deco Paints U.S. HQE	221B9963	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2325228
Diala A X	Shell Canada Products Ltd.	407-651	CTGS - LUBSTORES /OIL /PAINT (MARI7)	21934
Diesel Fuel (3092)	Irving Oil Ltd.		CTGS - LUBSTORES /OIL /PAINT (MARI7)	124
Double Boiled Linseed oil	R.K. & J. Jones Ltd.		CTGS - LUBSTORES /OIL /PAINT (MARI7)	728958
Easy-Off Heavy Duty Oven Cleaner - Aerosol	Reckitt & Benckiser		CTGS - LUBSTORES /OIL /PAINT (MARI7)	838311
Essolube HDX Plus Engine Oil 30	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	17234
Fero-Gard Clear Base	Ferox Inc.	274	CTGS - LUBSTORES /OIL /PAINT (MARI7)	729001
Fisherman's Paint 66-41	Home Hardware	66-41	CTGS - LUBSTORES /OIL /PAINT (MARI7)	315918
Graffiti Remover	CRC Industries	3194	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2584960
H.D. Enamel Black	Ferox Inc.	331	CTGS - LUBSTORES /OIL /PAINT (MARI7)	727882

D-6: List of Chemicals

HT-10 Modified Silicone High Heat Coating-Aluminum	Deco Paints U.S. HQE	710S9100	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2325409
Hylomar Non-Setting Gasket and Jointing	Hylomar Limited		CTGS - LUBSTORES /OIL /PAINT (MARI7)	15399
Ice Coating White 5 Glice Coating White 5 GL	Rust-Oleum Consumer Brands Canada (RCBC)	34427000 805	CTGS - LUBSTORES /OIL /PAINT (MARI7)	3806840
Impervo Alkyd High Gloss Enamel	Benjamin Moore & Company Ltd.	133-60	CTGS - LUBSTORES /OIL /PAINT (MARI7)	316115
Interior Wood Finishes Polyurethane Finish - High Gloss	Benjamin Moore & Company Ltd.	428-00	CTGS - LUBSTORES /OIL /PAINT (MARI7)	5722
Interthane 990Hs/870Hs Part B	International Paint LLC	990B	CTGS - LUBSTORES /OIL /PAINT (MARI7)	285182
Intralok Bonding Agent	WR Meadows du Canada Ltée	3300-501	CTGS - LUBSTORES /OIL /PAINT (MARI7)	293886
Irsol	Coastal Blending & Packaging		CTGS - LUBSTORES /OIL /PAINT (MARI7)	310205
Kutwell 45 (Previous Formulation)	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	706237
Latex Paint Coatings: House Paint, Barn Paint, Floor Enamel, Celing Flat, Super Silk, Semi Gloss, Block Filler, Primer Sealer	House of Excellence		CTGS - LUBSTORES /OIL /PAINT (MARI7)	317658
Lidok EP 2 Grease	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	10784
Lidok EP 2 Moly Grease	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	352485
Loctite 565 PST Pipe Sealant h PTFE Thread Sealant	Henkel Loctite Canada Inc.	56531	CTGS - LUBSTORES /OIL /PAINT (MARI7)	5769
Machinery Enamel Clear Bas	Ferox Inc.	1304	CTGS - LUBSTORES /OIL /PAINT (MARI7)	729014
Magic Sorb Sock	ITW Devcon Corporation	48100	CTGS - LUBSTORES /OIL /PAINT (MARI7)	175
Meltblown Polypropylene Absorbent Material	Spill Textile Corporation/Worldwide Sorbent Produc		CTGS - LUBSTORES /OIL /PAINT (MARI7)	2981716
Metal Finishes Aerosol Rust Paint	Benjamin Moore & Company Ltd.	492-02	CTGS - LUBSTORES /OIL /PAINT (MARI7)	316848
Mobil Delvac 1240	Exxonmobil Canada	2.01521E+11	CTGS - LUBSTORES /OIL /PAINT (MARI7)	48207

D-6: List of Chemicals

Mobil Delvac 1300 Super 15W40	Exxonmobil Canada	2.0152E+11	CTGS - LUBSTORES /OIL /PAINT (MARI7)	227472
Mobilube HD Plus 80W-90	Exxonmobil Canada	2.01521E+11	CTGS - LUBSTORES /OIL /PAINT (MARI7)	352149
Mobilube HD Plus 85W-140	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	19648
Nuto A 10	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	13561
Nuto A 22	Exxonmobil Canada	8261	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2415395
Nuto H-C 32	Exxonmobil Canada	20156010H570	CTGS - LUBSTORES /OIL /PAINT (MARI7)	4649
Oatey LO-V.O.C PVC Regular Clear Cement	Oatey Co.	31655	CTGS - LUBSTORES /OIL /PAINT (MARI7)	38903
Performance Plus Chain Oil	Safety-Kleen Canada Inc.	34	CTGS - LUBSTORES /OIL /PAINT (MARI7)	1092791
Polyroof LV CDN 3 US GL.Polyroof LV CDN 3 US GL.	Rust-Oleum Consumer Brands Canada (RCBC)	361590C803	CTGS - LUBSTORES /OIL /PAINT (MARI7)	5857
Polyroof S.f. (Solvent Free) 3 Us Gal	Rust-Oleum Consumer Brands Canada (RCBC)	361592 803	CTGS - LUBSTORES /OIL /PAINT (MARI7)	1898422
Rem Oil (Aerosol)	Remington Arms Company, Inc.	26610	CTGS - LUBSTORES /OIL /PAINT (MARI7)	3165858
Rotella T XLA 10W-30	Shell Canada Products Ltd.		CTGS - LUBSTORES /OIL /PAINT (MARI7)	13676
Rotella T* 30	Shell Canada Products Ltd.		CTGS - LUBSTORES /OIL /PAINT (MARI7)	18780
Shell Tellus S2 M 46	Shell Canada Products Ltd.	001D7744	CTGS - LUBSTORES /OIL /PAINT (MARI7)	16100
Sonolastic SL2	BASF Admixtures		CTGS - LUBSTORES /OIL /PAINT (MARI7)	577269
SP Primer 5 GALSP Primer 5 GAL	Rust-Oleum Consumer Brands Canada (RCBC)	22180 805	CTGS - LUBSTORES /OIL /PAINT (MARI7)	3806814
Spartan EP-C 1000 (Spartan EP 1000)	Exxonmobil Canada	2.0156E+11	CTGS - LUBSTORES /OIL /PAINT (MARI7)	84362
Spartan EP-C 150 (Spartan EP 150)	Exxonmobil Canada	8202	CTGS - LUBSTORES /OIL /PAINT (MARI7)	8342

D-6: List of Chemicals

Spartan EP-C 220 (Spartan EP 220)	Exxonmobil Canada	8203	CTGS - LUBSTORES /OIL /PAINT (MARI7)	1666
Spartan EP-C 320 (Spartan EP 320)	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	1667
Spartan EP-C 680 (Spartan EP 680)	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	366
Spic & Span Disinfecting All-Purpose Spray & Glass Cleaner - Ready to Use	Procter & Gamble	15154243	CTGS - LUBSTORES /OIL /PAINT (MARI7)	3210815
Spray Belt Dressing	ITW Dymon	10095	CTGS - LUBSTORES /OIL /PAINT (MARI7)	2605066
Stalube (All)	Irving Blending and Packing		CTGS - LUBSTORES /OIL /PAINT (MARI7)	22918
Stove Oil	Irving Oil Ltd.		CTGS - LUBSTORES /OIL /PAINT (MARI7)	726934
STP Oil Treatment	The Clorox Company		CTGS - LUBSTORES /OIL /PAINT (MARI7)	13393
Teresso 46	Exxonmobil Canada	8192	CTGS - LUBSTORES /OIL /PAINT (MARI7)	13575
Thermal Kote Cements	Pro-Tec-T-Kotes		CTGS - LUBSTORES /OIL /PAINT (MARI7)	479483
Tinrite Powder CMC No. 41	The Canada Metal Company		CTGS - LUBSTORES /OIL /PAINT (MARI7)	16126
Toluene	Exxonmobil Canada		CTGS - LUBSTORES /OIL /PAINT (MARI7)	1971601
TRMCLD +6X340GM Real Orange	Rust-Oleum Consumer Brands Canada (RCBC)	27007B522	CTGS - LUBSTORES /OIL /PAINT (MARI7)	1069217
Trmcld 6X340Gm Clear Gloss	Rust Oleum Corporation	27073B522	CTGS - LUBSTORES /OIL /PAINT (MARI7)	374233
Unirex EP 0	Exxonmobil Canada	8386	CTGS - LUBSTORES /OIL /PAINT (MARI7)	302444
Valvoline General MultiPurpose Grease	Ashland Specialty Chemical Inc.	VV608	CTGS - LUBSTORES /OIL /PAINT (MARI7)	3059484
Vocomp-20 Water-Base Curing and Sealing Compound	WR Meadows du Canada Ltée	3300-191	CTGS - LUBSTORES /OIL /PAINT (MARI7)	380178
Weather Shield Rust Coat 84-41	Home Hardware	1865-315	CTGS - LUBSTORES /OIL /PAINT (MARI7)	286503

D-6: List of Chemicals

Weathershield Minimal Expanding 340g HC	DOW CIG North America/Angus Chemical		CTGS - LUBSTORES /OIL /PAINT (MARI7)	286688
Wipe Out, DZ, CN NC	National ChemSearch	309	CTGS - LUBSTORES /OIL /PAINT (MARI7)	41000
Wolman End Cut Preservative Brown	U.S.E. Hickson Products		CTGS - LUBSTORES /OIL /PAINT (MARI7)	339944
Yellow Hazmat Sonic Bonded Sorbents	Spilltech Industries Inc.		CTGS - LUBSTORES /OIL /PAINT (MARI7)	2953404
"All Weather Paintstik " “All Weather Hot Climate Paintstik” "B", "B-3/8", "B-E", "B-16", "C", "E", "F", & "N" Paintstiks "Lacquer Stik"	LA-CO Industries Inc.- Markal Company		CTGS - MACHINE SHOP (MARI8)	3429471
010-Wire Lube Pads	KCI, Inc.		CTGS - MACHINE SHOP (MARI8)	806591
387 Tapping Coolant (Aerosol)	A.W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	8605
388 Synthetic Tapping Fluid (Bulk)	A.W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	3596790
390 Cutting Oil (Aerosol)	A.W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	3614
390 Cutting Oil (Bulk)	A.W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	305604
44 Lead Free Flux Cored Solder	Litton Kester Solder	44 Coat LF	CTGS - MACHINE SHOP (MARI8)	805647
723 Sprasolvo	A. W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	
725 Nickel Anti-Seize Compound (Aerosol)	A.W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	2745482
725 Nickel Anti-Seize Compound (Bulk)	A.W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	113
730 Spragrip	A. W. Chesterton Company		CTGS - MACHINE SHOP (MARI8)	
ABS 55Y (Solvent Cement)	Sluyter Company Ltd.		CTGS - MACHINE SHOP (MARI8)	4931
Acetylene	Praxair Canada Inc.		CTGS - MACHINE SHOP (MARI8)	967
Aluminum Oxide Bear Tex Product	Saint Gobain North America	22062	CTGS - MACHINE SHOP (MARI8)	1100057

D-6: List of Chemicals

Anti-Fog Lens Cleaner	Canadian Custom Packaging		CTGS - MACHINE SHOP (MARI8)	6381
Argon	Praxair Canada Inc.		CTGS - MACHINE SHOP (MARI8)	1028
Barnes Distribution Barnes Hi d Temperature Anti-Seize Thread Compound	Henkel Loctite Canada Inc.	51132	CTGS - MACHINE SHOP (MARI8)	1333009
Barnes High Strength Thread Locker Heavy Duty	Barnes Group Inc.	22006	CTGS - MACHINE SHOP (MARI8)	2445449
Barnes Medium Strength ThreadLocker Removable	Henkel Corporation	22804	CTGS - MACHINE SHOP (MARI8)	2926034
BD7-77 Plus Penetrant	Sherwin-Williams Automotive Finishes	BD1108	CTGS - MACHINE SHOP (MARI8)	699910
Belzona 1111 (Super Metal) - Base	Belzona Polymerics Ltd		CTGS - MACHINE SHOP (MARI8)	3446918
Belzona 1311 (Ceramic R-Metal) Base	Belzona Polymerics Ltd		CTGS - MACHINE SHOP (MARI8)	25173
Belzona 8111 (Mouldable Wood) Liquid	Belzona Polymerics Ltd	1407/0559/04	CTGS - MACHINE SHOP (MARI8)	938284
Belzona 9111 (Cleaner/Degreaser)	Belzona Polymerics Ltd	OW9111US	CTGS - MACHINE SHOP (MARI8)	7784
Blast-O-Lite Industrial Beads	Potters Industries		CTGS - MACHINE SHOP (MARI8)	4177991
C5 PVC Cement	Schwartz Chemical of Canada Ltd.	10C5	CTGS - MACHINE SHOP (MARI8)	165054
Cafco Ceramospray IIA	Isolatek International		CTGS - MACHINE SHOP (MARI8)	473520
Canadian Fast Orange Pumice Hand Cleaner w/Corn Huskers Lotion	Henkel Loctite Canada Inc.	20857	CTGS - MACHINE SHOP (MARI8)	22463
Carbon Dioxide/Inert Gas Mixture	Praxair Canada Inc.		CTGS - MACHINE SHOP (MARI8)	4760
Chain Lube w/Moly	Radiator Specialty Co. of Canada Ltd.	L716	CTGS - MACHINE SHOP (MARI8)	329777
Copaslip Lead Free	Moly Slip (Canada) Inc.	3470	CTGS - MACHINE SHOP (MARI8)	3106373
Cutting Tool Coolant	Barnes Group Inc.	BD1128	CTGS - MACHINE SHOP (MARI8)	3082445

D-6: List of Chemicals

Cutting Tool Coolant	American Jetway		CTGS - MACHINE SHOP (MARI8)	2262984
Diesel Fuel (3092)	Irving Oil Ltd.		CTGS - MACHINE SHOP (MARI8)	124
D'Limokleen	Leyson Chemical Products	338	CTGS - MACHINE SHOP (MARI8)	727755
Dry Graphite Lubricant	Barnes Group Inc.	BD1089	CTGS - MACHINE SHOP (MARI8)	2216694
Energizer, Energizer e2, Industrial ZMA, Hercules, Eveready, Wonder	Energizer Holdings		CTGS - MACHINE SHOP (MARI8)	3047802
Exxsol D60 Solvent	Exxonmobil Canada		CTGS - MACHINE SHOP (MARI8)	287815
Fel-Pro Moly Paste	Henkel Corporation	21890	CTGS - MACHINE SHOP (MARI8)	595282
Fiesta Conc. Stain Remover	Avmor Ltd.	1394	CTGS - MACHINE SHOP (MARI8)	692725
Flat Black Enamel	Seymour of Sycamore, Inc.	BD1332-1	CTGS - MACHINE SHOP (MARI8)	3075317
Fluorescing Agent: GPC DYE	Glo-Mark Systems Inc.	16-24-84	CTGS - MACHINE SHOP (MARI8)	
Foamglas Insulation, Foamglas One Insulation, Foamglas HLB Insulation	Pittsburgh Corning Corporation		CTGS - MACHINE SHOP (MARI8)	15224
Formazin Turbidity Standard 4000 NTU	Hach Co.	246149	CTGS - MACHINE SHOP (MARI8)	2973187
FrixTec 19850	Eutectic Castolin		CTGS - MACHINE SHOP (MARI8)	7612
Gloss Black	Seymour of Sycamore, Inc.	BD1202	CTGS - MACHINE SHOP (MARI8)	762068
Gloss Black Enamel	Seymour of Sycamore, Inc.	BD13300000	CTGS - MACHINE SHOP (MARI8)	3674
Gloss Blue	Seymour of Sycamore, Inc.	CC00024797	CTGS - MACHINE SHOP (MARI8)	1881167
Gloss White Enamel	Seymour of Sycamore, Inc.	BD13330000	CTGS - MACHINE SHOP (MARI8)	2091425
GP II Touch-Up Component: A	Madison Chemical Industries Incorporated	Z000	CTGS - MACHINE SHOP (MARI8)	728976

D-6: List of Chemicals

Graffiti Remover	CRC Industries	3194	CTGS - MACHINE SHOP (MARI8)	2584960
Grinding and Cutting Wheels, Resinoid (Type 1, Type 27, Type 28, Type 29), Cup Wheels (Type 11) Cones and Plugs (Type 16, Type 17 and Type 18), Mounted Points, UA-MTX, UA-GFX, A36F, A54F	United Abrasives Inc.		CTGS - MACHINE SHOP (MARI8)	3836064
Harris American LFB / FC (Formerly Welco 15 and Welco 15FC)	The Harris Products Group		CTGS - MACHINE SHOP (MARI8)	2029904
Heavy Load Red Grease	Barnes Group Inc.	MSDS21418	CTGS - MACHINE SHOP (MARI8)	547
Heavy Residual Fuel	Exxonmobil Canada		CTGS - MACHINE SHOP (MARI8)	577679
Hi D Temperature Anti-Seize Thread Compound	Henkel Corporation	270827	CTGS - MACHINE SHOP (MARI8)	661755
High Heat Gel-Lube	Barnes Group Inc.	BD1080	CTGS - MACHINE SHOP (MARI8)	577784
Hi-Spot	ITW Dymon	83307	CTGS - MACHINE SHOP (MARI8)	3552756
Hornet and Wasp Blaster	Scotts Canada	21,834	CTGS - MACHINE SHOP (MARI8)	36164
Industrial RD-90	Claire-Sprayway Incorporated	090-001	CTGS - MACHINE SHOP (MARI8)	2087243
Ipex Primer (PVC & CPVC Primer)	Sluyter Company Ltd.		CTGS - MACHINE SHOP (MARI8)	2219259
Jiffy Dish Washing Liquid	Johnson Diversey Canada		CTGS - MACHINE SHOP (MARI8)	57888
Jointex Gasket Sealant	Robco Inc.		CTGS - MACHINE SHOP (MARI8)	81492
Lidok EP 2 Moly Grease	Exxonmobil Canada		CTGS - MACHINE SHOP (MARI8)	352485
Lidok Lotemp Moly Grease Lonax Lotemp Moly (Former Name)	Exxonmobil Canada		CTGS - MACHINE SHOP (MARI8)	325570
Loctite 620 Retaining Compound	Henkel Loctite Canada Inc.	234787	CTGS - MACHINE SHOP (MARI8)	894235
Loctite Orange Hand Cleaner Pumice Lotion	Henkel Corporation	25108	CTGS - MACHINE SHOP (MARI8)	36333
Loctite Superflex Blue RTV Silicone Adhesive Sealant	Henkel Corporation	270642	CTGS - MACHINE SHOP (MARI8)	2035612

D-6: List of Chemicals

Loctite Superflex Blue RTV Silicone Adhesive Sealant	Henkel Loctite Canada Inc.	30533	CTGS - MACHINE SHOP (MARI8)	168589
Loctite Superflex Red High Temp RTV V Silicone Adhesive Sealant Silicone Adhesive Sealant	Henkel Loctite Canada Inc.	59675	CTGS - MACHINE SHOP (MARI8)	895267
LPS PF Solvent	LPS Laboratories Inc.	61400	CTGS - MACHINE SHOP (MARI8)	1375587
LPS Tapmatic #1 Gold	LPS Laboratories Inc.	40312	CTGS - MACHINE SHOP (MARI8)	330629
Magic Mist Sunshine	Agrium Advance Technology	65001	CTGS - MACHINE SHOP (MARI8)	331805
Magic Sorb	ITW Devcon Corporation	48000	CTGS - MACHINE SHOP (MARI8)	176
Magnesium Hydroxide Powder PSH	Manson CAT Corporation		CTGS - MACHINE SHOP (MARI8)	2506141
Metal Protec BD1117	Barnes Group Inc.	L-13756	CTGS - MACHINE SHOP (MARI8)	3724065
Moly Dry Film Lubricant	Henkel Loctite Canada Inc.	39895	CTGS - MACHINE SHOP (MARI8)	54532
New Rapid Tap (#393)	Relton Corporation	393	CTGS - MACHINE SHOP (MARI8)	3103578
Non-Flammable Loosen-It	American Jetway	BD1110	CTGS - MACHINE SHOP (MARI8)	1318024
Oatey ABS Medium Special Milky Clear or Black Cement	Oatey Co.	30889	CTGS - MACHINE SHOP (MARI8)	16304
Oatey Canadian PVC Heavy Duty Clear or Grey Cement	Oatey Co.	31011	CTGS - MACHINE SHOP (MARI8)	2580869
Oatey CPVC Solvent Cement	Oatey Co.		CTGS - MACHINE SHOP (MARI8)	1496097
Oatey Epoxy Putty	Oatey Co.	31270	CTGS - MACHINE SHOP (MARI8)	328993
Oil Eater Degreaser/Cleaner	Kafko International		CTGS - MACHINE SHOP (MARI8)	3819409
Oxygen, Medipure	Praxair Canada Inc.	E-4638	CTGS - MACHINE SHOP (MARI8)	1937237
Pf 600 General Purpose Adhesive Cleaner	Pro-Form Products Ltd.	PF 600	CTGS - MACHINE SHOP (MARI8)	1945400

D-6: List of Chemicals

Phenolphthalein Indicator Solution	Ge Betz Canada GE WATER & Process Tech	L212	CTGS - MACHINE SHOP (MARI8)	772057
Pipe Sealant	Barnes Group Inc.	22829	CTGS - MACHINE SHOP (MARI8)	3636
Plasti Dip and Plasti Dip UV (F-698, 819, 820)	Plasti Dip International		CTGS - MACHINE SHOP (MARI8)	4108711
Procell	Procter & Gamble	PC1300	CTGS - MACHINE SHOP (MARI8)	3454023
Purple Power	Leysons Chemical Products	330	CTGS - MACHINE SHOP (MARI8)	366705
PX High Tack Spray-A-Gasket Sealant	Henkel Loctite Canada Inc.	99MA	CTGS - MACHINE SHOP (MARI8)	6137
Quad-Cut Cutting and Tapping Fluid	Remi Corporation	19483	CTGS - MACHINE SHOP (MARI8)	814822
Quick Set	Henkel Corporation	440488_151030	CTGS - MACHINE SHOP (MARI8)	577835
Repair Compound Resin	ITW Polymers Coatings North America	DM004R	CTGS - MACHINE SHOP (MARI8)	329400
RFP500 RFP300 RFP100 REP28-DP RFP14P RFP328-DP RFP314P	Sorbent Products Co. Inc.		CTGS - MACHINE SHOP (MARI8)	2262986
SBS 46 Protective Cream - Solvent Resistant	Deb USA, Inc	46131	CTGS - MACHINE SHOP (MARI8)	2429474
Sight Savers Brand Anti-Fog Liquid without Silicone	Bausch & Lomb Inc.	68GM	CTGS - MACHINE SHOP (MARI8)	3842684
Sikaflex 221	Sika Corporation		CTGS - MACHINE SHOP (MARI8)	843315
SLH II (Clear)	Barnes Group Inc.	21533	CTGS - MACHINE SHOP (MARI8)	595225
Slic-Tite PTFE Thread Tape, PTFE Thread Seal Tape	Barnes Group Inc.	21495	CTGS - MACHINE SHOP (MARI8)	3902309
Solder Paste CMC no. 50 or no. 504	The Canada Metal Company		CTGS - MACHINE SHOP (MARI8)	2418082
Sonolastic SL2	BASF Admixtures		CTGS - MACHINE SHOP (MARI8)	577269
Stainless Steel Welding Electrodes	Avesta Welding AB Chemicals Division		CTGS - MACHINE SHOP (MARI8)	327829

D-6: List of Chemicals

Starrett Kleenscribe Blue Layout Dye	AllCoat Technology	1610	CTGS - MACHINE SHOP (MARI8)	5851
Steel Red Layout Fluid, Transparent Red Staining Color	ITW Dymon	80296	CTGS - MACHINE SHOP (MARI8)	2385610
STP Four Cylinder Oil Treatment	Clorox Company of Canada Ltd	70425P	CTGS - MACHINE SHOP (MARI8)	727320
STP Oil Treatment	The Clorox Company		CTGS - MACHINE SHOP (MARI8)	13393
Tool Lubricant	A.B. Chance Co	M1909	CTGS - MACHINE SHOP (MARI8)	977244
Tubular Welding Wire	Hobart Brothers of Canada Ltd		CTGS - MACHINE SHOP (MARI8)	922238
Valve Action Paint Marker - Brown, Purple, White, Yellow, Red, Black, Orange, Blue, Green, Gold, Light Green, Pink, Silver, Light Blue, Fluorescent Yellow, Fluorescent Green, Fluorescent Orange, Fluorescent Pink, Fluorescent Invisible UV.	LA-CO Industries Inc.- Markal Company	96809	CTGS - MACHINE SHOP (MARI8)	661189
WD-40 Aerosol	WD-40 Company		CTGS - MACHINE SHOP (MARI8)	3578772
Weathershield T313-10	Home Hardware	2034-355	CTGS - MACHINE SHOP (MARI8)	315601
Weld-On 702, 707, 710, 711, 717 and 719 for PVC Plastic Pipe	IPS Corp.		CTGS - MACHINE SHOP (MARI8)	2926874
Weld-On P-72 Primer for PVC and CPVC Plastic Pipe	IPS Corp.		CTGS - MACHINE SHOP (MARI8)	299895
White Powdered Chalk	Evans Rule Company	SC8W	CTGS - MACHINE SHOP (MARI8)	2698217
Y2 ABS Cement	Schwartz Chemical of Canada Ltd.	38Y2	CTGS - MACHINE SHOP (MARI8)	2339804

Table D-7: Inventory of Batteries

Location	Type	Quantity
Battery Room #8	Lead Based Batteries	20
Battery Room #10	Lead Based Batteries	15
Throughout Plant	Batteries in Exit Signs	15

Note:

There are also a number of uninterrupted power supply batteries located in the DCS9 & 10, Burner Management system 9, 5, 4, 6 and #10 ID Fan

Appendix E (Decommissioning Study) Scrap Metal Pricing – Supporting Documentation

Appendix E
Scrap Metal Pricing - Supporting Documentation
2018 Decommissioning Study
Charlottetown Thermal Generating Station
Charlottetown, PEI

Material	**Stainless Steel**		**Aluminum (Mixed low-copper clips)**		**No. 1 Heavy Copper & Wire**		**No. 1 Heavy Melt Scrap**		**Red Brass**	
Year	**CAD ¢/lb**	**CAD $/tonne**	**CAD ¢/lb**	**CAD $/tonne**	**CAD ¢/lb**	**CAD $/tonne**	**CAD $/net ton**	**CAD $/tonne**	**CAD ¢/lb**	**CAD $/tonne**
	Average Price		**Average Price**		**Average Price**		**Average Price**		**Average Price**	
2017	82.08	1805.76	55.60	1223.20	275.25	6055.50	240.96	265.61	185.39	4078.58
2016	68.07	1497.54	51.10	1124.20	239.27	5263.94	155.14	171.01	164.02	3608.44
2015	56.51	1243.22	51.41	1131.02	268.47	5906.34	169.54	186.88	173.95	3826.90
2014	69.90	1537.80	54.72	1203.84	299.95	6598.90	263.33	290.27	192.41	4233.02
2013	71.90	1581.80	50.65	1114.30	288.08	6337.76	238.60	263.01	193.47	4256.34
5 Year Average	**69.69**	**1533.22**	**52.70**	**1159.31**	**274.20**	**6032.49**	**213.51**	**235.36**	**181.85**	**4000.66**
February 2018 Spot Check	65	1430.00	65	1430.00	341	7502.00	---	205	268	5896.00
Relative Percent Difference (%)	7.0		20.9		21.7		13.8		38.3	

Notes:

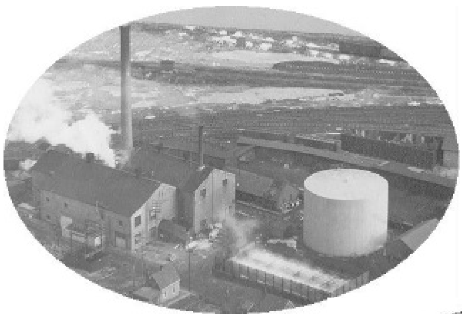
1 - Prices based on materials delivered to Montreal market

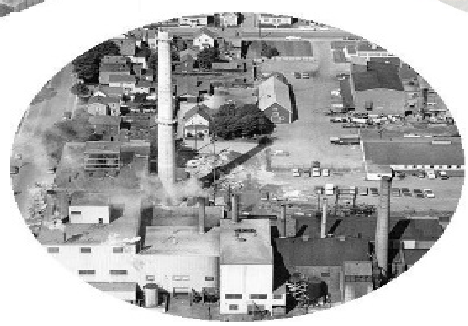
2 - Sources of scrap metal pricing based on information obtained from on-line resources such as American Metals Market, American Iron & Metals and scrap metal values obtained from other decommissioning/demolition projects completed in Eastern Canada

3 - Relative Percent Difference is calculated based on difference in average price over specific metal over the last five years versus current spot price

www.ghd.com

Final





Updated Phase II Environmental Site Assessment

Charlottetown Thermal Generation Station
50 Cumberland Street
Charlottetown, Prince Edward Island

Maritime Electric Company, Limited

GHD | 466 Hodgson Road Fredericton New Brunswick E3C 2G5

11149943| Report No 3 | June 12 2018

Table of Contents

1. Introduction 1
   1.1 Site Description 1
   1.2 Previous Studies 3
   1.3 Study Objectives and Scope of Work 4
2. Field Investigation Methodology 6
   2.1 Borehole Program 6
   2.2 Monitoring Well Installation 7
   2.3 Test Location Survey 7
   2.4 Soil Sample Collection 7
      2.4.1 Drilling Program 7
      2.4.2 Surface Soil Sampling Program 8
      2.4.2.1 Metals 8
      2.4.2.2 PCBs 9
   2.5 Groundwater Sample Collection 9
   2.6 Paint Sample Collection 10
   2.7 Concrete Sample Collection 11
   2.8 PILC Cable Sample Collection 11
   2.9 Analytical Program 12
3. Physical Characteristics of the Site 12
   3.1 Regional Geology 12
   3.2 Local Geology 13
   3.3 Hydrology 13
   3.4 Hydrogeology 13
4. Analytical Findings 13
   4.1 Assessment Criteria 13
   4.2 Soil Analytical Results 17
      4.2.1 Hydrocarbons 17
      4.2.2 Metals 18
      4.2.3 PAHs 18
      4.2.4 PCBs 19
   4.3 Groundwater Analytical Results 19
      4.3.1 Hydrocarbons 19
      4.3.2 Metals 19
      4.3.3 PAHS 19
   4.4 Paint Analytical Results 20
      4.4.1 Lead and Zinc 20

Table of Contents

4.5 Concrete Core PCB Analytical Results 22
4.6 PILC Cable PCB Analytical Results 22
4.7 QA/QC Variability 22

5. Conclusions 22

6. Closure 25

7. References 26

Figure Index

Figure 1 Site Location
Figure 2 Property Plan
Figure 3A Site Plan with Sample Locations - Soil and Groundwater
Figure 3B Site Plan with Sample Locations - Transformer Pads (Concrete)
Figure 4A Site Plan – Paint Sample Locations – Steam Plant Area
Figure 4B Site Plan – Paint Sample Locations – River Pumphouse Area
Figure 5 Soil Exceedances
Figure 6 Groundwater Exceedances

Table Index

Table 1 Groundwater Elevations
Table 2 Soil Analytical Results - Petroleum Hydrocarbons
Table 3 Soil Analytical Results – Metals
Table 4 Soil Analytical Results - Polyaromatic Hydrocarbons (PAHs)
Table 5 Soil Analytical Results - Polychlorinated Biphenyls (PCBs)
Table 6 Groundwater Analytical Results - Petroleum Hydrocarbons
Table 7 Groundwater Analytical Results – Metals
Table 8 Groundwater Analytical Results - Polyaromatic Hydrocarbons (PAHs)
Table 9a Paint Analytical Results -– Metal
Table 9b Paint Analytical Results – Porous Media
Table 10 PILC Analytical Results - Polychlorinated Biphenyls (PCBs)
Table 11 Concrete Analytical Results - Polychlorinated Biphenyls (PCBs)

Appendix Index

Appendix A Site Photographs
Appendix B Borehole Logs
Appendix C Laboratory Certificates
Appendix D Geotechnical Report – Fundy Engineering

Glossary of Terms

AST	Aboveground Storage Tank
BOP	Balance of Plant
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CDA	Comprehensive Development Area
C&D	Construction and Demolition
CHAI	Charlottetown Harbour Authority Inc.
CT3	Combustion Turbine 3
CTGS	Charlottetown Thermal Generating Station
CW	Circulating Water
ECC	Energy Control Centre
ECD	Electron Capture Detector
EQS	Environmental Quality Standards
ESA	Environmental Site Assessment
ESL	Ecological Screening Levels
Fundy	Fundy Engineering & Consulting Ltd.
GC	Gas Chromatography
GHD	GHD Limited
ICP	Inductively Coupled Plasma
JWEL	Jacques Whitford Environment Limited
m	Metre
masl	Metres Above Sea Level
MECL	Maritime Electric Company, Limited
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per litre
MgOH	Magnesium Hydroxide
MS	Mass Spectrometry
mTPH	modified Total Petroleum Hydrocarbon
MWe	Megawatts of electricity
NSE	Nova Scotia Environment
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEI	Prince Edward Island
PID	Property Identification Number

Glossary of Terms

PILC	Paper Insulated Lead Covered
PSS	Pathway Specific Standards
RBCA	Risk Based Correction Action
RBSL	Risk-Based Screening Level
RO/EDI	Reverse Osmosis/Electrodeionization
TPE	Total Potency Equivalents
TPH	Total Petroleum Hydrocarbons
UST	Underground Storage Tank
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1. Introduction

GHD was retained by Maritime Electric Company, Limited (MECL) to conduct an Updated Phase II Environmental Site Assessment (ESA) of the Charlottetown Thermal Generation Station (CTGS) located at 50 Cumberland Street, Charlottetown, Prince Edward Island (PEI). This facility will be referred to as the “Site” throughout this report. A Site location map is included as Figure 1 and a property plan for the Site is presented as Figure 2. Photographs of the facility are included in Appendix A.

The Updated Phase II ESA is being completed as part of the decommissioning and closure cost forecasting study (“Decommissioning Study”) for the CTGS (referred to as the “Decommissioning Study”). The Updated Phase II ESA program focused on evaluating current environmental conditions in soil and groundwater at the Site (exterior to the existing buildings) with the intent to supplement information presented in the Phase I ESA completed in 1995 and the Phase II ESA completed in 2002. As part of the Updated Phase II ESA scope of work development, GHD completed a Site walk over and hazardous materials inventory review the week of October 30, 2017. During the preliminary Site walk over and data collection activities, it was also determined that the hazardous materials inventory currently available for the Site adequately represents current building conditions for the purpose of developing a decommissioning cost estimate excluding the minor data gaps noted below.

Additional hazardous materials requiring analysis and included in the Updated Phase II ESA was limited to the following:

- Collection of paint samples from porous and non-porous materials for metals and leachate analysis
- Collection of concrete core samples from transformer pads (exterior to building) for Polychlorinated biphenyl (PCB) analysis
- Analysis of paper insulated lead covered (PILC) cables for PCB analysis (samples provided to GHD by MECL)

The Updated Phase II ESA has been conducted in general accordance with the document entitled, "CSA Standard Z769-00 (Reaffirmed 2013), Phase II Environmental Site Assessment" for conducting environmental assessments and was completed consistent with the work plan outlined in GHD’s proposal letter dated November 16, 2017.

1.1 Site Description

The CTGS is a fossil fuel-fired generating station that was originally commissioned nearly 100 years ago (exact date is unknown) and generates up to 55 megawatts of electricity (MW) from the combustion of heavy fuel oil (Bunker C oil) from steam driven thermal generation units located in the Steam Plant Building as well as 50 MW from a combustion turbine identified as CT3. The Steam Plant Building and associated thermal generation equipment is approaching the end of its useful life, and is, therefore, the focus of the Decommissioning Study and this Updated Phase II ESA.

The CTGS property consists of 14 parcels of land and four waterlot parcels with a total area of approximately 11.65 hectares (28.8 acres). The Site is identified by the Province of PEI Department of Provincial Treasury-Geomatics Information Centre as provincial property identification numbers (PIDs) #338921, 679381, 341396, 341503, 341511 and 341529 (Figure 2). A review of property title records indicates that MECL has a 999 year lease agreement with the Cumberland Trust for a portion of the Site (PID #338921), which began in 1853 with the Charlottetown Gas Light Company. MECL also has a lease agreement with the Charlottetown Harbour Authority Inc. (CHAI) for water lot property (PID #671628), which began in 1990. The water lot is located on the Hillsborough River on the southeastern portion of the Site.

Primary infrastructure associated with the Site includes:

- Steam Plant Building and Associated Infrastructure: Boiler/Turbine Zones, Magnesium Hydroxide (MgOH) Room, Wastewater Treatment Plant (WWTP), Reverse Osmosis/Electrodeionization (RO/EDI) Water Treatment Plant (WTP), CT3 Balance of Plant (BOP) Equipment Zone, Welding and Mechanical Maintenance Shops
- Two concrete stacks: New Stack (69 metres [m]) and Old Stack (61 m)
- River Pumphouse and associated circulating water (CW) intake/outfall structures located in the water lot of the Hillsborough River
- Combustion Turbine (CT3) and associated infrastructure
- Bulk Storage Tank Farm containing a Bunker C bulk storage tank, Diesel Bulk Storage Tank and Fuel Off-Loading Area
- Energy Control Centre (ECC) Building and associated infrastructure
- Switch Yard
- Numerous aboveground storage tanks (ASTs) used for storage of Bunker C fuel oil, diesel oil, turbine lubricating oil and waste oil
- One underground storage tank (UST) for collection of waste oil (CT3 Waste Collection Tank).

The Site is located within the southeastern limits of the City of Charlottetown in a mixed use area zoned as Comprehensive Development Area (CDA). The main access route to the Site is via Cumberland Street and Richmond Street which are asphalt paved roads maintained by the City of Charlottetown. The Charlottetown Harbour (Hillsborough River) is located directly adjacent the Site to the southeast.

The area surrounding the Plant Site is a mixture of commercial and residential development. A Shell Canada bulk plant that was decommissioned in the mid-1980s and an Imperial Oil bulk plant were formerly located on the property northeast of the Site, which is now occupied by the Charlottetown Event Grounds. Wash World Auto Detailing followed by Grafton Street and then the Joseph A. Ghiz Memorial Park, Glendenning Hall, new student residence and Holland College are located to the north and northwest of the Site. Cumberland Street followed by residential properties are located to the southwest of the Site, and the Hillsborough River is located to the southeast of the Site. The Site is intersected by Water Street, which divides the River Pumphouse and associated CW infrastructure located along the Hillsborough River from the remainder of the Site.

The Site is serviced by municipal water and sewer systems supplied by the City of Charlottetown.

1.2 Previous Studies

A Phase I ESA was completed for the Site by Jacques Whitford Environment Limited (JWEL) in 1995 (report dated October 31, 1995). The Phase I ESA was completed to identify, through a non-intrusive investigation, the existence of any significant actual or potential areas of environmental impairment associated with the Site. The work included a review of the Site's history, a review of property title records, a Site inspection, a document review, interviews with persons knowledgeable of historical and current Site operations and communication with regulatory agencies. The following summarizes the findings from the 1995 Phase I ESA completed by JWEL:

- Adjacent properties – several ASTs and USTs located in the vicinity of the subject property
- Historical land use – Site and surrounding properties have a long history of industrial usage including petroleum service stations, bulk plants, an abattoir and rail yards
- Aboveground fuels and chemicals – numerous ASTs and chemicals on-Site
- Spill and stain areas – hydrocarbons and vanadium pentoxide contaminated bottom ash staining apparent at various locations around the exterior of the Steam Plant Building
- Wastewater/air – caustic and acidic effluent discharged to concrete ditch area southeast of Steam Plant Building
- Asbestos – Significant quantity of asbestos pipe insulation noted in Steam Plant Building, asbestos also present on interior and exterior walls of Steam Plant Building
- Lead based paint and potential lead piping used throughout the interior of the Steam Plant Building

Based on the findings in the Phase I ESA, a Phase II ESA was completed in November 2002 (report dated Nov 2002) by Fundy Engineering & Consulting Ltd. (Fundy). The Phase II ESA consisted of an intrusive investigation to evaluate areas of potential concerns identified during the Phase I ESA. The Phase II ESA included the construction of eight test pits and 14 boreholes, six of which were constructed as monitoring wells. The following summarizes the findings from the 2002 Phase II ESA completed by Fundy:

- Petroleum hydrocarbons were observed in ten of the 20 samples analyzed for these constituents. The highest concentrations of petroleum hydrocarbon constituents were observed in two locations; in the vicinity of the boundary line with a neighboring property (BH-1) with large ASTs and in vicinity of a former AST (BH9-M).
- Four samples were analyzed for trace metal and general chemistry constituents. There are a total of thirty one parameters reported, with criteria established for 18 of these. The applicable criteria was marginally exceeded for the following parameters (number of samples exceeding in brackets); arsenic (2), boron (4), tin (1) and zinc (1).

The following summarizes the recommendations:

- Additional investigations of petroleum hydrocarbon constituents in the vicinity of BH-1 to fully delineate the impacts observed and to gather additional information to confirm that impacts observed originated from a neighboring property.
- Additional investigations in the vicinity of BH9-M of petroleum hydrocarbon constituents to fully delineate impacts observed in vicinity of the former AST.
- Investigations of a similar nature from within the building footprint to determine the soil and groundwater quality below the floor.

It was recommended that further investigations be undertaken to determine if general chemistry and trace metal parameters occur naturally at the Site or if activities at the Site have elevated the concentrations as reported.

1.3 Study Objectives and Scope of Work

As previously indicated, the work plan for the Updated Phase II ESA was developed to supplement previous investigations completed at the Site and to aid in the development of the Decommissioning Study being completed concurrently. The work plan development also included a file review and Site walk-over including hazardous materials inventory review that was completed the week of October 30, 2017. The following actual or potential areas of environmental impairment were identified to exist on the Site and identified for evaluation as part of the Updated Phase II ESA:

1. Historic Plant Site Operations:
    - Potential metal impacts to soil on-Site from historical burning of Bunker C and atmospheric deposition of vanadium rich fly ash.
    - Potential for metal impacts to soil in the vicinity of the New Stack (69 m) as this area was historically used for the off-loading of coal.
    - Potential for petroleum hydrocarbon and polycyclic aromatic hydrocarbons (PAHs) impacts to soil and groundwater from historical on-Site coal gasification process.
    - Potential for petroleum hydrocarbon impacts to soil and groundwater from off-Site property located directly northeast of the Site that formerly operated as a bulk petroleum storage facility.
2. AST Locations:
    - Potential petroleum hydrocarbon-impacted soil and groundwater near the existing Bulk Storage Tank Farm.
    - Potential petroleum hydrocarbon-impacted soils or groundwater in the vicinity of four active fuel day tanks (diesel and Bunker C) located on exterior of the Steam Plant Building.
3. Spills/Releases/Surface Staining:
    - Metal concentrations in soils previously collected from the Site exceeded applicable Canadian Council of Minister of Environment (CCME) guidelines.

- Potential (surface) soil and groundwater impacts related to historical staining at the base of Unit Transformers and the Station Services transformer may exist.
- Potential metal impacts in surface soil related to historical releases of vanadium-rich fly ash in the vicinity of the Stacks.

4. Polychlorinated Biphenyls (PCBs):
   - Several on-Site transformers known to contain oils with PCB concentrations greater than 2 mg/kg.
   - PILC cables are electrical cables that have the potential to contain paper impregnated with PCB oils and are potentially present in numerous areas of the Site, specifically lines extending to and from the 13.8 kV and 4.16 kV switchgear.

6. Lead Based Paint:
   - Lead based paint is potentially present throughout the original Site buildings, specifically the Steam Plant Building, River Pumphouse and concrete stacks.

The objectives of the Updated Phase II ESA were:

- Assess soil and groundwater quality in areas of potential concern for the following contaminants:
  - o Petroleum hydrocarbons, including benzene, toluene, ethyl benzene, xylene (BTEX) and modified total petroleum hydrocarbon (mTPH)
  - o PCBs
  - o Metals
  - o PAHs
- Evaluate paint conditions for metal content (lead and zinc), including leachate testing as required, specifically focusing on the Steam Plant Building, River Pumphouse and stacks that are scheduled for decommissioning in the near future
- Evaluate potential oil leakage from transformers through PCB testing of the concrete transformer pads and surrounding soil
- Evaluate the presence/absence of potential PCBs in the PILC cables

The Updated Phase II ESA scope of work therefore included:

- Review the previous reports that have been completed for the Site
- Construction of boreholes to assess the on-Site soil conditions
- Installation of monitoring wells in select boreholes to assess on-Site groundwater conditions
- Collection of surface soil samples from various locations around the Site to assess soil conditions
- Collection of paint samples from the interior and exterior of the Steam Plant Building and associated buildings and structures
- Collection of concrete core samples from transformer pads
- Preparation of a Updated Phase II ESA report detailing the study findings

It is noted that the 2002 Phase II ESA completed by Fundy recommended that investigations be completed to determine soil and groundwater quality beneath the floor in the Steam Plant building footprint. Several monitoring wells were located at the building perimeter at numerous locations as part of the Updated Phase II ESA which are considered likely to be representative of conditions beneath the building floor.

2. Field Investigation Methodology

The assessment program was completed according to the work plan outlined in GHD's proposal dated November 2017. The fieldwork portion of the Updated Phase II ESA program was completed between December 2017 and February 2018 and involved the following:

- The construction of 12 monitoring wells and three boreholes around the Site to evaluate the geological stratigraphy and assess soil and groundwater conditions
- The sampling of soil from the newly constructed monitoring wells and boreholes
- The sampling of groundwater from the newly installed and existing on-Site monitoring wells
- The collection of surface soil samples from a total of eight locations at the Site
- The collection of surface soil samples around transformer pads at a total of 24 locations at the Site
- The collection of concrete cores from existing transformer pads at a total of 11 locations at the Site
- The initial collection of paint samples from 20 locations at the Site followed by the collection of additional paint samples based on a review of the initial results.
- Surveying of the newly constructed monitoring wells

2.1 Borehole Program

Prior to proceeding with the subsurface investigation, various public utility representatives were contacted to identify underground utility locations. In addition, GHD retained the services of RL Dennis and Associates (RL Dennis) from Halifax, NS, to verify the location of buried utilities. RL Dennis is a privately owned utility locate company that specializes in the identification of buried services.

Atlantic Industrial Cleaners (a subsidiary of Envirosystems) were retained by GHD for the hydro-excavation (daylighting) at some of the borehole locations. A total of six boreholes were daylighted between December 11 and December 12, 2017 using a vacuum truck. Boreholes at the Site were daylighted to depths ranging from 1.8 to 2.4 metres below ground surface (mbgs).

Meg Drilling Services Ltd. (MEG) was retained by GHD for the drilling and monitoring well installation program. A total of 15 boreholes were drilled between December 11 and December 13, 2017 using a geotechnical CME 55 rubber track mounted rig equipped with 100 mm outside diameter (82 mm ID) standard stem augers. The boreholes were constructed to depths ranging from 4.3 to 6.1 mbgs.

A total of 15 boreholes were constructed at the Site during the Updated Phase II ESA. Monitoring wells were installed in 12 of the boreholes (MW-1 to MW-12) with three boreholes (SP-1 to SP-3) constructed without monitoring wells. The locations of the boreholes are identified on Figure 3a and included:

- Four monitoring wells (MW-2, MW-5, MW-8 and MW-11) installed in the area of the Bulk Storage Tank Farm and Switch Yard.
- Two monitoring wells and one borehole (MW-1, MW-3 and SP-1) installed near other petroleum storage tank areas.
- One monitoring well (MW-12) installed in the former coal unloading area.
- Five monitoring wells (MW-4, MW-6, MW-7, MW-9 and MW-10) installed along the property boundaries.
- One borehole (SP-3) was located in the vicinity of the CT3 infrastructure primarily to obtain geotechnical information related to a potential new building location. Similarly, borehole SP-2 was located directly adjacent to the Old Stack to obtain geotechnical information from this area of the Site. This information, combined with geotechnical information from two other wells (MW-5 and MW-12) in the area, is presented in a separate report prepared by Fundy Engineering. A copy of this report is included in Appendix D.

2.2 Monitoring Well Installation

Groundwater monitoring wells were installed in 12 of the newly constructed boreholes (MW-1 to MW-12). The monitoring wells consist of 50 mm diameter polyvinyl chloride (PVC) flush threaded 10 slot screen and unslotted riser pipe. The well materials arrived at the Site factory-wrapped in plastic and were only handled with disposable nitrile gloves after being unwrapped to prevent contamination.

The annular space around the PVC and borehole wall was backfilled to approximately 0.3 m above the top of the screen with #2 silica sand, and then with hydrated bentonite pellets to approximately 0.1 mbgs. All monitoring wells were capped with a locking j-plug and protected with a flush-mount casing (with the exception of MW-2 which was protected with a steel, lockable stick-up casing).

The monitoring well construction details are provided on the borehole logs presented in Appendix B.

2.3 Test Location Survey

GHD personnel conducted an elevation survey, on December 14, 2017. The newly constructed and previous monitoring wells were surveyed relative to benchmark (north corner of the concrete pad for the diesel generator adjacent to the ECC building). This benchmark was assigned an assumed elevation of three metres above sea level (masl) for the purposes of the relative elevation survey.

2.4 Soil Sample Collection

2.4.1 Drilling Program

Soil samples were collected on a continuous basis (at 0.6 m intervals), where possible, using a split spoon sampler during the borehole drilling activities. A spatula was used to remove the soil from the split spoon. The split spoon sampler and spatula were washed with a detergent solution, followed by several rinses with distilled water and then air-dried between sample collection. The soil samples were then split, with one portion placed in sealable plastic bags for soil headspace analysis and the other portion placed into appropriate laboratory supplied glass jars with Teflon lined lids for laboratory analysis.

Soil headspace analysis was performed on collected soil samples using a Gastechtor Model 1238ME instrument equipped with methane elimination. On the basis of the headspace reading and visual/olfactory field observations, selected samples from the boreholes were submitted to the laboratory for various chemical analyses. The sample containers intended for laboratory analysis were maintained in cool dark storage for shipment to the laboratory.

The soil samples submitted for BTEX and TPH fraction (C_6-C_{10}) analysis were measured using a 10 mL Terra Core™ Sampler to collect an approximate 10 gram soil core. The soil core was immediately field preserved by placing it into a 40 ml clear glass vial containing 10 ml of purge and trap grade methanol. Samples collected for modified TPH analysis were collected with zero headspace in 60 ml glass jars with Teflon lined lids. Samples collected for PAHs, PCBs and metals analysis were placed in 250 ml glass jars with Teflon lined lids. All sample containers were supplied by the laboratory.

The soil samples were submitted to Maxxam Analytics Inc. (Maxxam) in Bedford, Nova Scotia for mTPH/BTEX, metal, PAH, and/or PCB analyses. The soil laboratory results are discussed in Section 4.0 of this report.

2.4.2 Surface Soil Sampling Program

Between December 11 and 14, 2017, a total of 38 surface soil samples were collected from the Site for metals and/or PCB analysis. The surface soil samples collected for metal analysis were collected from areas of the Site to evaluate potential atmospheric deposition of fly ash as well as to investigate areas of potential ash handling. Surface soil samples collected for PCB analysis (24 locations) were collected near 12 existing transformer pads located on the exterior of the Steam Plant Building and the River Pumphouse.

The majority of the surface soil samples were collected using a stainless steel hand auger or placed into 250 ml glass jars with Teflon lined lids for laboratory analysis. Several soil samples for metals analysis were also collected from the split spoon sampler during the drilling activities. To prevent any cross contamination, all soil sampling equipment was thoroughly cleaned between soil samples using a detergent solution, followed by several rinses with distilled water and then air-dried. Disposable nitrile gloves were worn by the field staff during sample collection and cleaning procedures.

The surface soil sampling program specific to metals and PCBs is further discussed in the following sections.

2.4.2.1 Metals

A total of 14 sample locations were chosen to assess potential metal impacts in surface soil from the possible deposition of ash from flue emissions or ash handling areas. Five soil samples were collected from boreholes constructed as part of the 2017 drilling program. The soil samples collected from the boreholes and analyzed for metals were generally collected from 0 to 1.8 metres (m) depth. A total of eight surface soil samples (SS-1 to SS-8) were collected at 0-0.15 m depths from areas across the Site, focusing on grass areas that are not likely to be disturbed during future Site operations. One additional soil sample (Spoil Pile) was collected from the material produced during the daylighting activities that was stockpiled on-Site in the vicinity of the Switch Yard. The sample locations were dispersed across the Site in an effort to characterize the entire Site, not just areas in the vicinity of on-Site buildings.

The soil sample locations are shown on Figure 3a.

2.4.2.2 PCBs

Twenty four sample locations were chosen to assess potential PCB impacts in surface soil adjacent to exterior transformers at the Site. The surface sample locations were allocated directly adjacent to exterior concrete transformer pads and in areas with visible surface staining (if present). Two soil samples were collected per transformer (samples collected from two sides of each transformer pad). The surface soil sample locations specific to PCB analysis correspond to the concrete transformer pad sample locations shown on Figure 3b.

2.5 Groundwater Sample Collection

The newly constructed wells and one existing well were monitored on December 14 and sampled on December 15, 2017. The monitoring included measurements of subsurface vapour concentrations, water levels, and the presence or absence of free product. The monitoring results are presented in Table 1.

Immediately after removing the well cap, the maximum subsurface vapour concentrations in the wells were measured using the combustible gas detector that was operated in the methane elimination mode. This was done by inserting the collection tube of the instrument into the riser pipe and recording the peak instrument reading.

The depth to the water table and presence or absence of free product in the wells were determined with a Solinst electronic interface probe that was cleaned with a non-toxic, biodegradable cleaner/degreaser, then rinsed with clean tap water, between monitoring wells.

The monitoring wells were also purged on December 14th prior to sampling on December 15th. The wells were purged until a minimum of three standing well water volumes were removed or until dry. This purging procedure is intended to obtain a representative sample of formation groundwater. The water level in the monitoring well was allowed to recover to 90% of its static level prior to collecting the groundwater sample. The groundwater purging and sampling program was completed using dedicated polyethylene bailers.

Samples for BTEX and TPH fraction C_6-C_{10} analysis were collected in 40 ml clear glass vials (with zero headspace), pre-charged with sodium bisulfate preservative. Samples for TPH fractions >C_{10}-C_{16}, >C_{16}-C_{21}, >C_{21}-C_{32} and modified TPH analysis were collected in 250 ml clear glass bottles pre-charged with sodium bisulfate preservative. Select samples located nearest the Hillsborough River were also collected for the analysis of PAHs and dissolved metals, including mercury. Samples collected for metals were field filtered and preserved with nitric acid. All sample bottles were supplied by the laboratory. The groundwater samples were placed in coolers with ice immediately after they were collected.

2.6 Paint Sample Collection

Based on the age of the Steam Plant building (>100 years old) and the presence of painted surfaces, lead-based paint may be present in the Steam Plant Building as well as other on-Site structures. If present, such paint would require special handling during future demolition activities.

In general, if a paint sample contains less than 1,000 mg/kg lead, the painted material is suitable for disposal in a provincially approved Construction and Demolition (C & D) site or for re-use on the Site as backfill material. If the paint exceeds 1,000 mg/kg lead content but has a leachate concentration of less than 5 mg/L (by USEPA TCLP Method 1311), the material can be disposed of in a provincially approved municipal landfill (e.g., East Prince Waste Management Facility in Wellington, PE). If the leachate concentration exceeds 5 mg/L, disposal of the material must be at an approved hazardous waste disposal site. There are no commercial hazardous waste disposal sites in Prince Edward Island accepting third party wastes.

In addition to lead, there is the potential for zinc-based paints to have been historically applied to structural steel columns/beams as a corrosion inhibitor and the paint can be highly leachable when exposed to acid rain.

Paint samples were collected from the substrate surface with a commercial paint scraper over a minimum area of 100 cm^2 and stored in sealable plastic bags. Substrate surfaces sampled included:

- Wood, steel and concrete from the Steam Plant Building
- Concrete from the New Stack and Old Stack
- Concrete and steel from the River Pumphouse

Paint samples were also collected from metal surfaces within the Steam Plant Building and River Pumphouse for information purposes as metalloid infrastructure at the Site will be transported off-Site for recycling as part of future facility demolition activities.

The type of substrate surfaces, colours and locations were recorded during the sampling process. The paint samples were submitted to Maxxam for analysis of lead and zinc content. Several samples were also selected for leachate analysis. Maxxam is a Standards Council of Canada accredited laboratory for the selected analysis.

During the initial paint sampling program completed in December 2017 several paint samples were identified to contain elevated lead and zinc concentrations. As such, additional sampling was required in January/February 2018 to confirm the initial results. An overview of the 2017 and 2018 paint sampling program is outlined below. Paint sample locations included in the 2017/2018 sampling program are shown on Figures 4a and 4b.

December 2017 Sampling

GHD collected 20 paint samples from various surfaces in the Steam Plant Building, New and Old Stacks and River Pumphouse in December 2017. The samples were selected to represent the various paint colours, locations and painted surfaces at the Site that are likely to be included in future decommissioning and demolition activities. Following receipt of the bulk sample analytical results, an additional 10 samples were selected for leachate analysis. In general, the samples selected for leachate analysis corresponded to lead in paint content exceeding 1,000 mg/kg.

January 2018 Sampling

Following a review of the December 2017 paint sample analytical results, additional paint samples were collected from the two concrete stacks as well as the River Pumphouse to validate previous results. The samples were collected by MECL representatives and included collection of paint samples from various elevations of each stack [stack base, 15 m (50'), 30.5 m (100'), 46 m (150') and 64 m (210') levels] as well as paint from painted steel structures and block walls from each side of the River Pumphouse (east wall, north wall, west wall and south wall).

Leachate testing was not completed on the stack or River Pumphouse samples collected in January 2018 as there was not enough sample remaining to complete the additional leachate analyses.

February 2018 Sampling

In an effort to obtain sufficient sample to complete leachate testing of paint on concrete surfaces of the New Stack and the River Pumphouse, MECL representatives collected additional paint samples from these two structures in February 2018. As a sufficient quantity of paint could not be obtained from the New Stack in numerous locations, concrete core samples were obtained from several elevations of the stack. The concrete core samples were collected using a hand-held drill equipped with a 50 mm diameter diamond drill bit that extended to a depth of approximately 75 to 100 mm. The core samples with the painted exterior were crushed at the laboratory prior to leachate testing of both the paint and the concrete. The intent of the core samples was to obtain leachate results on stack material that would be representative of the material to be transported off-Site for disposal.

2.7 Concrete Sample Collection

On December 14, 2017, 11 samples were collected from the concrete transformer pads that house the on-Site transformers. A sample from the transformer pad that houses transformer T #45 was not able to be safely accessed due to it elevated height and therefore no sample was collected at this location. The samples were collected from areas of visible surface staining or as close as possible to the drain spigots on the transformers. The samples of the concrete transformer pads were collected by advancing a 50 mm diameter diamond tip core saw to a depth of approximately 50 mm into the concrete surface. The concrete core was placed in laboratory-supplied jars for shipment to the laboratory. Locations of the concrete slab samples are identified on Figure 3b.

Disposable nitrile gloves were worn by the field staff during sample collection. The concrete samples were submitted to Maxxam for PCB analysis.

2.8 PILC Cable Sample Collection

During the file review and Site reconnaissance completed in 2017, it was identified that the Steam Plant Building contained numerous electrical cables that were identified as PILC cables and potentially contain PCBs (in oil). These electrical cables are generally related to the 13.8 kV and 4.16 kV switchgear. During the December 2017 sampling program, a de-energized electrical cable associated with the 4.16 kV switch gear identified to be PILC and potentially contain PCB was extracted from the building by MECL staff and provided to GHD. The electrical cable was obtained from a service entrance from Cumberland Street into #9 Boiler/Turbine Zone and is intended to be representative of other PILC cables located in the Steam Plant Building.

GHD submitted the electrical cable to Maxxam for PCB analysis with the instruction to only analyze free oil and oil impregnated paper from within the cable (if present). Results of the electrical cable analysis are discussed in Section 4.

2.9 Analytical Program

Selected soil samples were submitted to Maxxam for chemical analysis based on vapour headspace concentrations, odour, appearance, depth of groundwater and sample collection location. The laboratory analysis included:

- BTEX/mTPH by Atlantic PIRI method
- Metal scan by Inductively Coupled Plasma (ICP) method
- PCBs by Gas Chromatography (GC)/Electron Capture Detector (ECD) method
- PAHs by the GC/Mass Spectrometry (MS) Solvent Extraction method

Selected groundwater samples were analyzed for:

- BTEX/mTPH by Atlantic PIRI method
- Metal scan by ICP method
- PAHs by the GC/MS Solvent Extraction method

Paint samples were analyzed for:

- Lead and Zinc by Acid Extractable ICP method
- Lead and Zinc Leachate by TCLP/CGSB extraction method

Concrete samples were analyzed for:

- PCBs by GC/ECD method

PILC cable sample was analyzed for:

- PCBs by GC/ECD method

3. Physical Characteristics of the Site

3.1 Regional Geology

Based on a review of available records, the geology in the vicinity of the Site typically consists of soils of the Charlottetown map unit. Charlottetown soils occupy the largest extent of any soil in the province.

They intermingle with Alberry soils, which they closely resemble. The Charlottetown soils have developed on strongly acidic fine sandy loam glacial till or residual material. These Charlottetown soils are underlain by bedrocks of the Pictou Group (PEI Redbeds), of the Lower Permian age Megacyclic sequence II, consisting of conglomerate, sandstone and siltstone.

3.2 Local Geology

The overburden stratigraphy at the Site generally consists loose to compact, reddish brown silty sand with minor sandstone cobbles to depths of greater than 6 m. Reddish brown friable sandstone was intersected in some of the borehole locations at depths ranging from 3.1 to 5.35 mbgs.

3.3 Hydrology

The Site is relatively flat with a slight slope to the south, towards the Hillsborough River. Some areas of the Site have been built up as berms. The ground elevation ranges from approximately 0.3 masl to 1.5 masl based on an assumed on-Site benchmark elevation.

The area is serviced by municipal water and sanitary sewer systems. There are no known potable water wells on or adjacent to the Site. Surface runoff is collected by catch basins located across the Site and discharges directly to the Hillsborough River.

3.4 Hydrogeology

Groundwater levels were measured in the newly constructed monitoring wells as well as available existing monitoring wells at the Site using an electronic water/product interface probe on December 14, 2017. An elevation survey of the wells was conducted by GHD and relative groundwater elevations were calculated as presented in Table 1.

Static water levels for the monitoring wells ranged from 0.18 to 3.76 mbgs.

Due to the limited stabilization time in the wells between construction and monitoring, the potential for some tidal influence and localized disturbed soil areas, a groundwater flow diagram was not generated for the Site. The local groundwater flow direction is expected to be towards the Hillsborough River, which is located approximately 50 m southeast of the Site.

4. Analytical Findings

4.1 Assessment Criteria

The analytical data collected during the Updated Phase II ESA program will be compared to applicable guidelines to define potentially impacted areas at the Sites. The guidelines selected are those used in standard industry practice in Atlantic Canada, which are most appropriate for the current and intended future land use of the Sites.

The Contaminated Sites Registry Regulations for the Province of PEI under the Environmental Protection Act indicate that the guidelines provided in the Atlantic Risk-Based Corrective Action (RBCA) document for Petroleum Impacted Sites should be applied for petroleum hydrocarbons and

Canadian Council of Ministers of the Environment (CCME) guidelines should be used for non-petroleum contaminants. However, the Nova Scotia Environment (NSE) Tier I Environmental Quality Standards (EQS) were used for screening purposes as these standards were adopted from CCME, where available, and are based on multiple pathway analysis considering both human and ecological health. The NSE Tier I EQS also include screening values from other jurisdictions for parameters that do not have CCME guidelines.

The various guidelines used in this study are described below.

Soil

Parameters: Petroleum Hydrocarbons (BTEX/mTPH).

Guideline: RBCA Tier 1, Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance, Appendix 3 – Table 4a: Tier I Risk-Based Screening Level (RBSL), July 2012, revised January 2015. Commercial and/or Residential Receptor, non-potable groundwater use, coarse-grained soil type (as applicable based on soil stratigraphy) for the protection of human health.

Rationale: The Tier I RBSL are based on multiple pathway analyses considering human health in a commercial setting which includes toddler receptors. This is the standard guideline for petroleum hydrocarbons used throughout Atlantic Canada. Non-potable groundwater use has been chosen as the Site and surrounding properties are supplied with potable water by the City of Charlottetown. Samples collected from the southwestern property boundary were compared to the Tier I RBSL for a residential land use to be protective of the residential properties located in this area of the Site.

Parameters: Metals and PCBs.

Guideline: NSE Tier 1 EQS for soil at a non-potable sites – coarse-grained soil, commercial and/or residential/parkland land use (July 6, 2013).

Rationale: The NSE Tier I EQS were used for screening purposes as these standards were adopted from CCME, where available, and are based on multiple pathway analysis considering both human and ecological health. Samples collected from the southwestern property boundary were compared to the NSE Tier I EQS for a residential land use to be protective of the residential properties located in this area of the Site.

Parameters: PAHs.

Guideline: NSE Tier 1 EQS for soil at non-potable sites – coarse-grained soil, commercial and/or residential/parkland land use (July 6, 2013).

Rationale: The NSE Tier I EQS were used for screening purposes as these standards were adopted from CCME, where available, and are based on multiple pathway analysis considering both human and ecological health. Samples collected from the southwestern property boundary were compared to the NSE Tier I EQS for a residential land use to be protective of the residential properties located in this area of the Site.

Groundwater

Parameters: Petroleum Hydrocarbons (BTEX/mTPH).

Guideline: RBCA Tier 1, Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance, Appendix 3 – Table 4b: Tier I RBSL, July 2012, revised January 2015, Commercial and/or Residential Receptor, non-potable groundwater use, coarse-grained soil type for human health.

Rationale: The Tier I RBSL are based on multiple pathway analyses considering human health in a commercial setting which includes toddler receptors. This is the standard guideline for petroleum hydrocarbons used throughout Atlantic Canada. Non-potable groundwater use has been chosen as the Site and surrounding properties are supplied with potable water by the City of Charlottetown. Samples collected from the southwestern property boundary were compared to the Tier I RBSL for a residential land use to be protective of the residential properties located in this area of the Site.

Parameters: Petroleum Hydrocarbons (BTEX/mTPH).

Guideline: RBCA Tier 1, Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance, Appendix 2 – Table 2: Tier I Groundwater Ecological Screening Levels (ESLs) for Plant and Invertebrate Direct Contact with Shallow Groundwater – Commercial Land Use, Course-Grained Soil Type (July 2012, revised January 2015).

Rationale: The Tier I Groundwater ESLs for Plant and Invertebrate Direct Contact with Shallow Groundwater, were used as the groundwater levels in several monitoring wells were less than three metres from the ground surface.

Parameters: Petroleum Hydrocarbons (BTEX/mTPH).

Guideline: RBCA Tier 1, Atlantic RBCA for Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance, Appendix 2 – Table 3b: Tier I Groundwater ESLs for Protection of Marine Aquatic Life – Distance to Surface Water of 50 metres (July 2012, revised January 2015).

Rationale: Groundwater samples collected along the southeastern property boundary were screened using the RBCA Tier I Groundwater ESLs for the Protection of Freshwater and Marine Aquatic Life were used adjusted for the distance to the receiving aquatic environment and soil type. As MW-10 is located within 50 metres of the Hillsborough River, this distance was used as it is the most conservative guideline. The Tier I Groundwater ESL are protective of the aquatic environment to which the groundwater wells are discharging.

Parameters: Metals, PCBs and PAHs.

Guideline: NSE Tier 1 EQS for Groundwater at a Non-Potable Site – coarse grained soil, commercial and /or residential/parkland land use (July 6, 2013).

Rationale: The NSE EQS were used for screening purposes as these standards were adopted from CCME, where available, and are based on multiple pathway analysis considering both human and ecological health. Samples collected from the southwestern property boundary were compared to the NSE Tier I EQS for a residential land use to be protective of the residential properties located in this area of the Site.

Parameters: Metals and PAHs.

Guideline: NSE Pathway Specific Standards (PSS) for Groundwater – Groundwater Discharging to Surface Water, >10 metres from surface water body - marine discharge to marine water (April 2014).

Rationale: Groundwater data for the monitoring well locations located nearest the Hillsborough River for metals and PAHs were compared to the NSE Pathway Specific Standards (PSS) for Groundwater Discharging to Surface Water (Marine), due to the proximity of the Site to the Hillsborough River. MW-10 is located approximately 50 m to the east of the Hillsborough River. The NSE PSS are protective of the aquatic environment to which the groundwater from the wells are discharging.

Paint

Parameters: Lead and Zinc.

Guideline: Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE 2005).

Rationale: The Province of PEI do not have environmental guidelines specific to the disposal of lead and/or zinc based products. Disposal of materials coated with lead (or zinc) based paint in the Province of PEI requires a Special Waste Disposal Permit under the Waste Resource Management Regulations of the Environmental Protection Act. Under this regulation, “special waste” includes metal-containing soils that pass a leachate test as well as lumber and wood covered in a protective coating containing concentrations of lead that does not pass a lead leachate test. However, the regulation does not define the lead leachate criteria. Guidance documents are available from New Brunswick and Nova Scotia that outline the disposal requirements for lead painted materials and have been referenced for the purposes of this report.

Paper Insulated Lead Covered (PILC) Cables

Parameters: PCBs

Guideline: Part 2 of the PCB regulations (SOR/2008-273) of the Canadian Environmental Protection Act, 2008 and amended in 2015.

Rationale: The purpose of the regulations is to protect the health of Canadians and the environment by preventing the release of PCBs to the environment, and by accelerating the phasing out of these substances. In accordance with the PCB regulations (SOR/2008-273) of the Canadian Environmental Protection Act (2008 and amended in 2015), equipment containing oil with PCB concentrations greater than 2 mg/kg (but less than 50 mg/kg) require special handling by a licensed handling facility before being recycled. Equipment containing PCB concentrations greater than or equal to 50 mg/kg requires special handling by a licensed handling facility before destruction.

Concrete

Parameters: PCBs.

Guideline: NSE Tier 1 EQS for soil at a Non-Potable Site – coarse grained soil type, for commercial land use (July 6, 2013).

Rationale: As there are no guidelines specific to allowable limits of PCB in concrete, the soil quality guideline for PCB was used as a screening tool. As noted above the Province of PEI or Atlantic RBCA do not have environmental guidelines specific to PCBs. The NSE EQS were used for screening purposes as these standards were adopted from CCME, where available, and are based on multiple pathway analysis considering both human and ecological health.

The applicable screening levels are identified in Tables 2 to 11 (following the text).

4.2 Soil Analytical Results

4.2.1 Hydrocarbons

A total of 21 soil samples from the 15 boreholes were submitted for petroleum hydrocarbon (BTEX/mTPH) analysis. The soil samples had mTPH levels within the applicable Tier I RBSLs (for a commercial site with non-potable water use and coarse grained soil), with concentrations ranging from non-detect to 3,600 mg/kg in the weathered fuel oil to lube oil range. Soil samples collected near the southwestern property boundary (MW-4 and MW-6) contained mTPH levels within the Tier I RBSL for both commercial and residential land use. The BTEX concentrations were also within the applicable Tier I RBSL in all samples.

The soil hydrocarbon analytical data is presented in Table 2 and the laboratory certificates of analysis are included in Appendix C.

4.2.2 Metals

A total of 14 soil samples were submitted for metal analysis. Analytical results were compared to the NSE Tier I EQS (commercial land use, coarse-grained soil). Samples SS-7 and SS-8 were compared to the NSE Tier I EQS for residential land use to be protective of the residential properties located to the southwest of the Site.

The majority of the soil samples collected from the Site had metal concentrations below NSE Tier I EQS, excluding iron. All soil samples collected and analyzed from the Site (with the exception of the spoil pile samples) contained concentrations of iron exceeding applicable NSE Tier I EQS. However, concentrations of iron are naturally elevated in the Province of PEI and the concentrations of iron observed at the Site are considered to be representative of background soil quality conditions based on a review of the published background iron concentrations (Dillon, 2011). Other metal parameters exceeding applicable NSE Tier I EQS were limited to the following:

- Arsenic and lead were detected above the NSE Tier I EQS for commercial land use at locations MW-11 and MW-7, respectively.
- Vanadium was detected above the NSE Tier I EQS for residential land use at location SS-8 (this sample is located on the southwestern property boundary)
- Vanadium was detected above the NSE Tier I EQS for commercial land use at location MW-12.

The soil metal analytical results are presented in Table 3 and the laboratory certificates of analysis are included in Appendix C. Concentrations of metals in soil exceeding applicable NSE Tier I EQS are shown on Figure 5.

4.2.3 PAHs

A total of six soil samples were submitted for PAH analysis. Note that concentrations at MW-4 were compared to residential criteria (due to the proximity to residential properties), while the remaining samples were compared to the commercial criteria.

Non-carcinogenic PAH compounds were below the applicable NSE Tier I EQS with the exception of samples from MW-3 and MW-4 that contained concentrations of naphthalene above the NSE Tier I EQS. This naphthalene standard is protective of the indoor air pathway. The PAH concentrations in three of the six samples analyzed were below the NSE Tier I EQS for carcinogenic PAHs based on benzo(a)pyrene total potency equivalents (B(a)P TPE), with soil samples collected from MW-3, MW-4 and MW-12 exceeding the NSE Tier I EQS for B(a)P TPE. It is noted that the soil samples with elevated concentrations of B(a)P TPE were collected at depths ranging from 1.2 to 3.3 mbgs.

The PAH analytical results are presented in Table 4 and the laboratory certificates of analysis are included in Appendix C. Concentrations of PAHs in soil exceeding applicable NSE Tier I EQS values are shown on Figure 5.

4.2.4 PCBs

A total of 24 surface soil samples were collected from locations adjacent to the exterior transformer pads and submitted for PCB analysis. All soil samples submitted contained PCB levels within the NSE Tier I EQS for a commercial site with non-potable water use and coarse grained soil with PCB concentrations ranging from non-detect to 1 mg/kg.

The PCB analytical results are presented in Table 5 and the laboratory certificates of analysis are included in Appendix C.

4.3 Groundwater Analytical Results

4.3.1 Hydrocarbons

A total of 13 groundwater samples were submitted for petroleum hydrocarbons (BTEX/mTPH) analysis. The mTPH levels in the groundwater samples ranged from non-detect to 3.7 mg/L. The BTEX and mTPH levels were within the applicable Atlantic RBCA Tier I RBSLs and Tier I ESLs for the protection of human and ecological health.

The BTEX/mTPH analytical results are presented in Table 6 and the laboratory certificates of analysis for the groundwater analytical data are included in Appendix C.

4.3.2 Metals

A total of five groundwater samples were submitted for metal analysis. The groundwater samples selected for metal analyses are located on the southeastern property boundary, nearest the Hillsborough River. It is noted that there are no NSE Tier I EQS for the protection of human health for metals at non-potable sites. The groundwater samples contained metal concentrations within the applicable NSE PSS for groundwater discharge to a marine surface water at a distance >10m with the exception of samples from MW-10 (zinc exceedance) and MW-12 (vanadium exceedance) as shown on Figure 6.

The groundwater metal analytical results are presented in Table 7 and the laboratory certificates of analysis are included in Appendix C.

4.3.3 PAHS

A total of five groundwater samples were submitted for PAH analysis. The groundwater samples selected for PAH analyses are located on the southeastern property boundary, nearest the residential receptors and/or the Hillsborough River. All of the groundwater samples analyzed contained concentrations of PAHs within the applicable NSE Tier I EQS for protection of human health at a non-potable commercial Site. In addition, the sample collected from monitoring well MW-4 (nearest well to the off-Site residential properties) was also compared to and within the NSE Tier I EQS for residential land use. However, concentrations of PAHs in monitoring wells MW-4, MW-7, MW-9 and MW-12 exceeded the NSE PSS for groundwater discharge to a marine surface water at a distance >10 m. Concentrations of PAHs in groundwater exceeding applicable NSE PSS are shown on Figure 6.

The groundwater PAH analytical results are presented in Table 8 and the laboratory certificates of analysis are included in Appendix C.

4.4 Paint Analytical Results

4.4.1 Lead and Zinc

Metal Surfaces

In December 2017, a total of ten paint samples were collected from metal surfaces within the Steam Plant Building. Seven of the ten samples collected had lead concentrations above the 1,000 mg/kg threshold. Several of these samples were also analyzed for leachable lead and contained concentrations below applicable disposal guidelines.

One sample was also collected from the River Pumphouse during the December 2017 sampling event. This paint sample was a composite of beige paint from the steel frame structures. The concentration of lead in the sample collected was well below the 1,000 mg/kg threshold. However, the sample collected had an elevated concentration of zinc (120,000 mg/kg). Leachate testing completed on the River Pumphouse sample also indicated that the zinc is leachable with a zinc concentration of 620 mg/L.

Paint from the steel frame structures on each wall of the River Pumphouse (4 walls) was re-sampled in January of 2018. Each of the confirmatory paint samples collected from the steel structures contained concentrations of lead or zinc exceeding threshold guidelines for disposal at landfills. Leachate analysis was not completed on these paint samples due to insufficient sample volume.

It is noted that lead and/or zinc concentrations in several of the paint samples collected from metal surfaces significantly exceed applicable landfill disposal threshold limits. However these painted metal surfaces will be recycled as part of future facility demolition, and lead/zinc concentrations are provided for information purposes only.

The paint analytical results from the metal surfaces are presented in Table 9a and the laboratory certificates of analysis are included in Appendix C.

Porous Surfaces

December 2017 Sampling

As indicated in Section 2.6, GHD collected 20 paint samples from various surfaces in the Steam Plant Building and River Pumphouse during the Updated Phase II ESA activities completed in December 2017. A total of nine samples were collected from porous surfaces (i.e., wood and concrete) within the Steam Plant Building. Paint samples collected from the on-Site porous media generally had metal concentrations approximately equal to the threshold guideline of 1,000 mg/kg or contained low concentrations of leachable metals (<0.5 mg/L) excluding:

- Substantially elevated concentrations of lead identified in paint samples collected from the New Stack concrete shell. Leachable lead concentrations marginally exceeded applicable disposal guidelines in one of the two paint samples with a concentration of 7.6 mg/L. The New Stack is currently painted grey but historical photographs provided by MECL indicate this stack was historically painted red and white.

- Elevated concentrations of lead were identified in paint samples collected from wood cabinets/walls in the Mechanical Maintenance Shop. The elevated concentrations of lead and zinc in the paint of these structures indicate that this demolition debris may not be suitable for disposal at a C&D site. However, the concentrations of lead and zinc leachate in these paint samples were below the applicable municipal landfill disposal guidelines.

January 2018 Sampling

Additional paint samples were collected from the two concrete stacks as well as the concrete block walls of the River Pumphouse in January 2018 to validate previous results.

- Analytical results obtained from paint samples collected from the New Stack (69 m) identified elevated lead concentrations significantly exceeding the 1,000 mg/kg threshold at each level sampled except for the 64 m level (Sample ID QES 210'). These results are consistent with the December 2017 sampling event. Similarly, the samples collected from the Old Stack (61 m) had lead concentrations well below the 1,000 mg/kg threshold. Leachate testing was not completed on the stack samples collected in January 2018 as the samples did not contain enough mass to complete the analysis.

- Analytical results obtained from the paint samples collected from the River Pumphouse in January 2018 identified lead and zinc concentrations on concrete block walls below applicable thresholds excluding:
    - Zinc concentration (6,600 mg/kg) on inside east wall of River Pumphouse
    - Lead concentration (3,900 mg/kg) on inside north wall of River Pumphouse

Similar to the stack samples, leachate analysis was not completed on the River Pumphouse samples as the samples collected did not contain enough mass to complete the analysis.

February 2018 Sampling

In an effort to obtain sufficient sample to complete leachate testing of paint on concrete surfaces of the New Stack (69 m) and the River Pumphouse, MECL representatives collected another round of paint samples from these two structures in February 2018. As a sufficient quantity of paint could not be obtained from the New Stack (69 m) at several elevations locations, concrete core samples were obtained from several elevations of the stack.

Analytical results from the paint and concrete samples collected during the February 2018 sampling event indicated the following:

- Paint samples collected from the concrete cinder block wall of the River Pumphouse and the concrete of the New Stack (69 m) had lead and zinc leachate concentrations equal to or well below applicable landfill guidelines

- Concrete core samples collected from the New Stack (69 m) did not contain detectable concentrations of lead or zinc leachate

The paint analytical results from the porous surfaces are presented in Table 9b, and the laboratory certificates of analysis are included in Appendix C.

4.5 Concrete Core PCB Analytical Results

A total of 11 concrete core samples from exterior transformer pads were submitted for PCB analysis. Detectable concentrations of PCBs were not identified in the samples collected and the detection limits were below the NSE Tier I EQS for commercial land use, non-potable water and coarse-grained soil.

The analytical results for PCBs are presented in Table 10 and the laboratory certificates of analysis are included in Appendix C.

4.6 PILC Cable PCB Analytical Results

A piece of electrical cable associated with the 4.16 kV switchgear and identified to be PILC [labeled 4160 (OLD END)] was collected by MECL and provided to GHD as part of the Updated Phase II ESA. The laboratory identified that the internal portion of the cable contained a small volume of free phase oil as well as oil impregnated paper. Laboratory analysis of the oil and paper identified concentrations of PCBs of 7 mg/kg and 2.8 mg/kg, respectively. As noted in the PCB Regulations, these cables will require special handling by a licensed handling facility before being recycled/removed.

The analytical results for PCBs in PILC cables are presented in Table 11 and the laboratory certificates of analysis are included in Appendix C.

4.7 QA/QC Variability

A QA/QC program was implemented to reduce and quantify potential issues introduced during sample collection, handling, shipping and analysis. The program included, but was not limited to using dedicated sampling equipment, using sample specific identification and labeling procedures, and using chain of custody records.

The results of the laboratory QA/QC analysis are presented in the laboratory certificates of analysis in Appendix C. The analyses included instrument and extraction surrogate recovery, method blanks, matrix duplicates, matrix spikes and laboratory quality control samples. No laboratory QA/QC issues were identified that call into question the reliability of the laboratory data reported.

5. Conclusions

An Updated Phase II ESA investigation was completed at the CTGS to investigate potential sources of environmental impairment identified during the Phase I ESA and to supplement existing Phase II ESA information previously gathered for the Site. The Updated Phase II ESA was specifically completed to provide information for the decommissioning and closure cost forecasting study being prepared concurrently with this investigation.

The Updated Phase II ESA consisted of the following:

- Advancement of 15 boreholes with 12 of the boreholes completed as monitoring wells.

- Collection of soil and/or groundwater samples from each of the newly constructed boreholes/monitoring wells as well as existing monitoring wells for selected chemical analysis including petroleum hydrocarbons (BTEX/mTPH), PAHs and metals.
- Collection of concrete core samples as well as surface soil samples in the vicinity of existing exterior transformers on the Site for analysis of PCBs.
- Collection of surface soil samples from selected areas of the Site for metals analysis.
- Collection of paint and/or concrete core samples from the interior of the Steam Plant Building and River Pumphouse as well as the exterior of each concrete stack [New Stack (69 m) and Old Stack (61 m)] for lead and zinc analysis as well as leachable metals analysis.
- Collection of a piece of electrical cable identified to be PILC for PCB analysis.

The results of the Updated Phase II ESA are summarized as follows:

- The stratigraphic profile encountered in the boreholes constructed across the Site generally consisted of loose to compact reddish brown silty sand with minor sandstone cobbles. Reddish brown sandstone bedrock was encountered at depths ranging from 3.1 to 5.35 mbgs in nine of the 15 boreholes constructed at the Site.
- The depth to groundwater ranged from 0.18 mbgs to 3.76 mbgs. The inferred direction of groundwater flow at the Site is the southeast towards the Hillsborough River.
- Free phase product was not observed in the monitoring wells monitored at the Site in December 2017.
- Concentrations of petroleum hydrocarbons (BTEX/mTPH) in soil were within the RBCA Tier I RBSL for a commercial site with non-potable water use and coarse-grained soil. The soil samples collected from the southwestern property boundary were screened against and were within the RBCA Tier I RBSL for a residential land use given the presence of residential properties adjacent to the Site.
- Concentrations of metals in soil were generally within NSE Tier I EQS excluding arsenic, iron, lead and vanadium. However, the concentrations of iron observed in soil at the Site are considered to be representative of regional background levels in PEI. Concentrations of arsenic and lead exceeding the NSE Tier I EQS for commercial land use were limited to locations MW-7 and MW-11, respectively. Concentrations of vanadium exceeding applicable NSE Tier I EQS was also limited to MW-12 and SS-8.
- Concentrations of PAHs in soil (specifically B(a)P TPE or naphthalene) were identified to exceed the NSE Tier I EQS for commercial land use at MW-3 and MW-12. Concentrations of PAHs (specifically B(a)P TPE or naphthalene) exceeding NSE Tier I EQS for residential land use were also identified at monitoring well MW-4 that is located at the property boundary along Cumberland Street. It is noted that the NSE Tier I EQS for naphthalene is based on the protection of indoor air for both land uses. Concentrations of PAHs in soil exceeding commercial and residential guidelines were located at depths greater than 1.0 mbgs.
- Concentrations of PCBs in the surface soil samples collected in the vicinity of the on-Site transformer pads ranged from non-detect to 1 mg/kg and are within the NSE Tier I EQS for commercial land use.

- Detectable concentrations of PCBs were not detected in the concrete core samples collected from the on-Site transformer pads.
- Concentrations of petroleum hydrocarbons (BTEX/mTPH) in groundwater were within the applicable RBCA Tier I RBSL and Tier I ESLs.
- Concentrations of metals dissolved in groundwater were within the NSE PSS for discharge to a surface water body greater than 10 metres from the Site with the exception of vanadium at MW-12 and zinc at MW-10. The samples submitted for analysis of metals were collected from on-Site wells located nearest to the Hillsborough River.
- Concentrations of PAHs in groundwater exceeded the NSE PSS for discharge to a surface water body greater than 10 metres from the Site in four of the five groundwater samples submitted for analyses. The samples submitted for PAH analysis were collected from on-Site wells located nearest to the Hillsborough River.
- Lead and/or zinc concentrations in several of the paint samples collected from metal surfaces at the Site exceed landfill disposal criteria but these painted metal surfaces will be recycled as part of future facility demolition activities. The lead/zinc concentrations for metal surfaces are provided for information purposes only.
- Paint samples collected from the majority of the on-Site porous media generally had metal concentrations approximately equal to the threshold guideline of 1,000 mg/kg or contained low concentrations of leachable metals (<0.5 mg/L) excluding the following:
    - Paint samples collected from the New Stack (69 m) concrete shell and River Pumphouse block walls had substantially elevated concentrations of lead and/or zinc. Moderately elevated concentrations of lead were also identified in paint samples collected from wood cabinets/walls in the Mechanical Maintenance Shop. The elevated concentrations of lead and zinc in paint of these structures indicate that this demolition debris may not be suitable for disposal at a C&D site or for re-use as backfill on-Site.
    - Concentrations of metals in leachate of the paint samples collected from the New Stack (69 m), River Pumphouse and Mechanical Maintenance Shop were below NSE Guidelines for Disposal of Contaminated Solids in Landfills indicating that this material is likely suitable for disposal at a municipal solid waste landfill (i.e., East Prince Waste Management Facility in Wellington, PEI). It is noted that one paint sample collected from the New Stack (69 m) in December 2017 had a leachable lead concentration of 7.6 mg/L which marginally exceeds the landfill disposal guideline of 5 mg/L. However, re-sampling of this location in January 2018 identified a leachate concentration below applicable landfill guidelines and concrete core samples collected from the New Stack (69 m) at varying elevations did not contain detectable concentrations of lead or zinc leachate. The concrete core samples collected from the New Stack (69 m) are considered to be representative of the concrete debris requiring disposal following demolition of the stack as the paint is well adhered and generally not flaking.
- The electrical cable supplied by MECL (PILC cables) contained concentrations PCBs in oil and oil impregnated paper of 7 and 2.8 mg/kg, respectively. As noted in the PCB Regulations, these cables will require special handling by a licensed handling facility before being recycled/removed.

6. Closure

All of Which is Respectfully Submitted,

GHD

Troy Small, M.Sc., CE

Leslie Williams, P.Eng.

7. References

Agriculture Canada, Soils of Prince Edward Island, Prince Edward Island Soil Survey, 1988.

Atlantic RBCA (Risk-Based Corrective Action) V For Petroleum Impacted Sites in Atlantic Canada, Version 3, User Guidance (July 2012, revised January 2015).

Canadian Standards Association 2013. Phase II Environmental Site Assessment, 2000, Revised 2013, Z769-00 (R2013).

Conestoga-Rovers & Associates, Environmental Audit, Charlottetown Thermal Generating Station, 50 Cumberland Street, Charlottetown, Prince Edward Island, prepared for Maritime Electric Company, Limited, October, 2007.

Dillon Consulting Limited, Review of Environment Canada's Background Soil Database (2004-2009), Version No. 1, March 2011.

Environment Canada, PCB Regulations, SOR/2008-273, Canadian Environmental Protection Act, 2008 (amended in 2015).

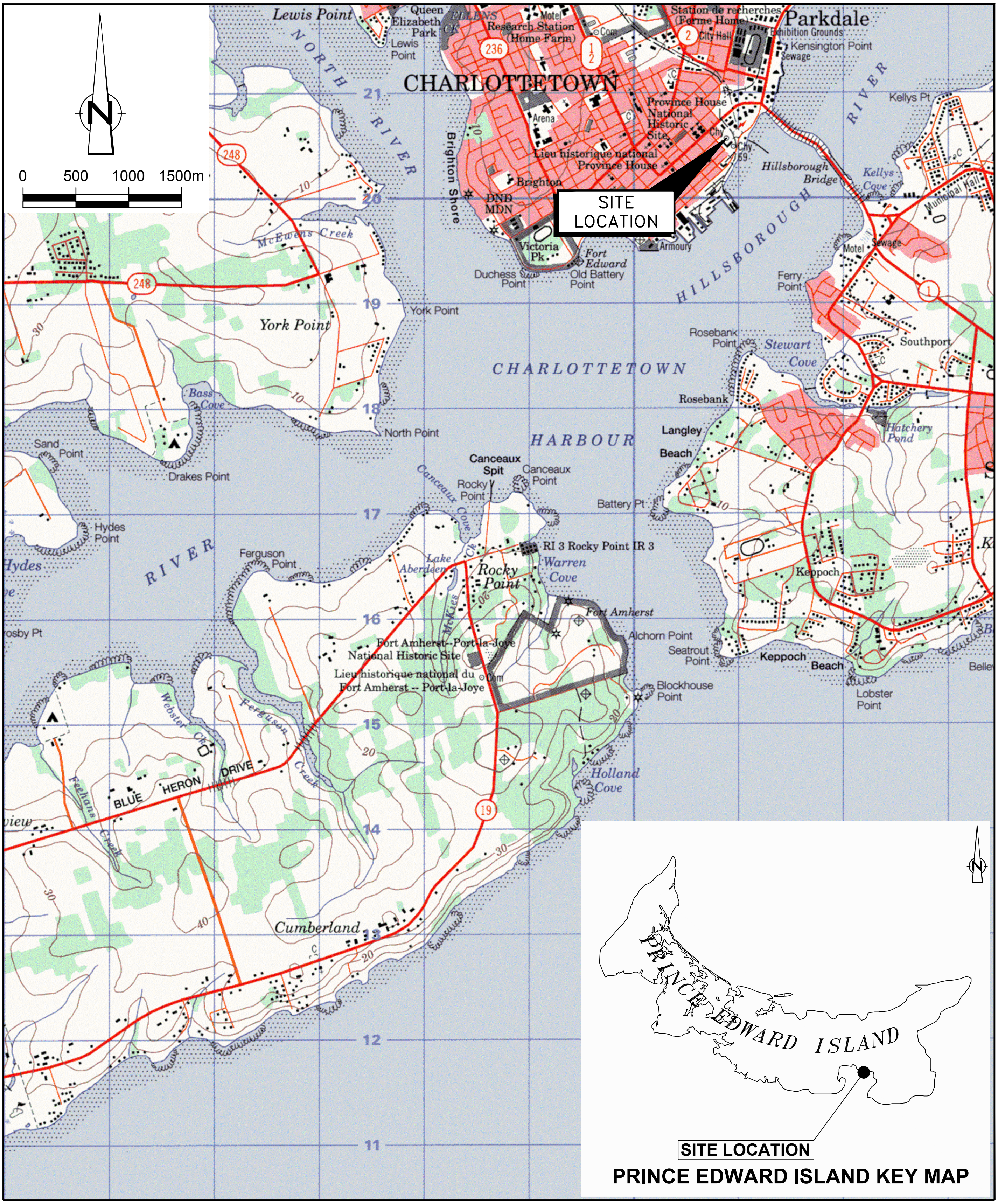
Jacques Whitford Environment Limited, Phase I Environmental Site Assessment, Charlottetown Thermal Generating Station, 50 Cumberland Street, Charlottetown, Prince Edward Island, prepared for Maritime Electric Company, Limited, October 31, 1995.

Fundy Engineering & Consulting Ltd., Phase II Environmental Site Assessment, Charlottetown Thermal Generating Station, 50 Cumberland Street, Charlottetown, Prince Edward Island, prepared for Maritime Electric Company, Limited, November, 2002.

Fundy Engineering & Consulting Ltd., Geotechnical Investigation Report, Stack Demolition Project, Maritime Electric Generating Station, 50 Cumberland Street, Charlottetown, Prince Edward Island, January 2018.

Nova Scotia Environment, Environmental Quality Standards for Contaminated Sites, Rationale and Guidance Document, April 2014.

Nova Scotia Environment and Labour, Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills, 2005.



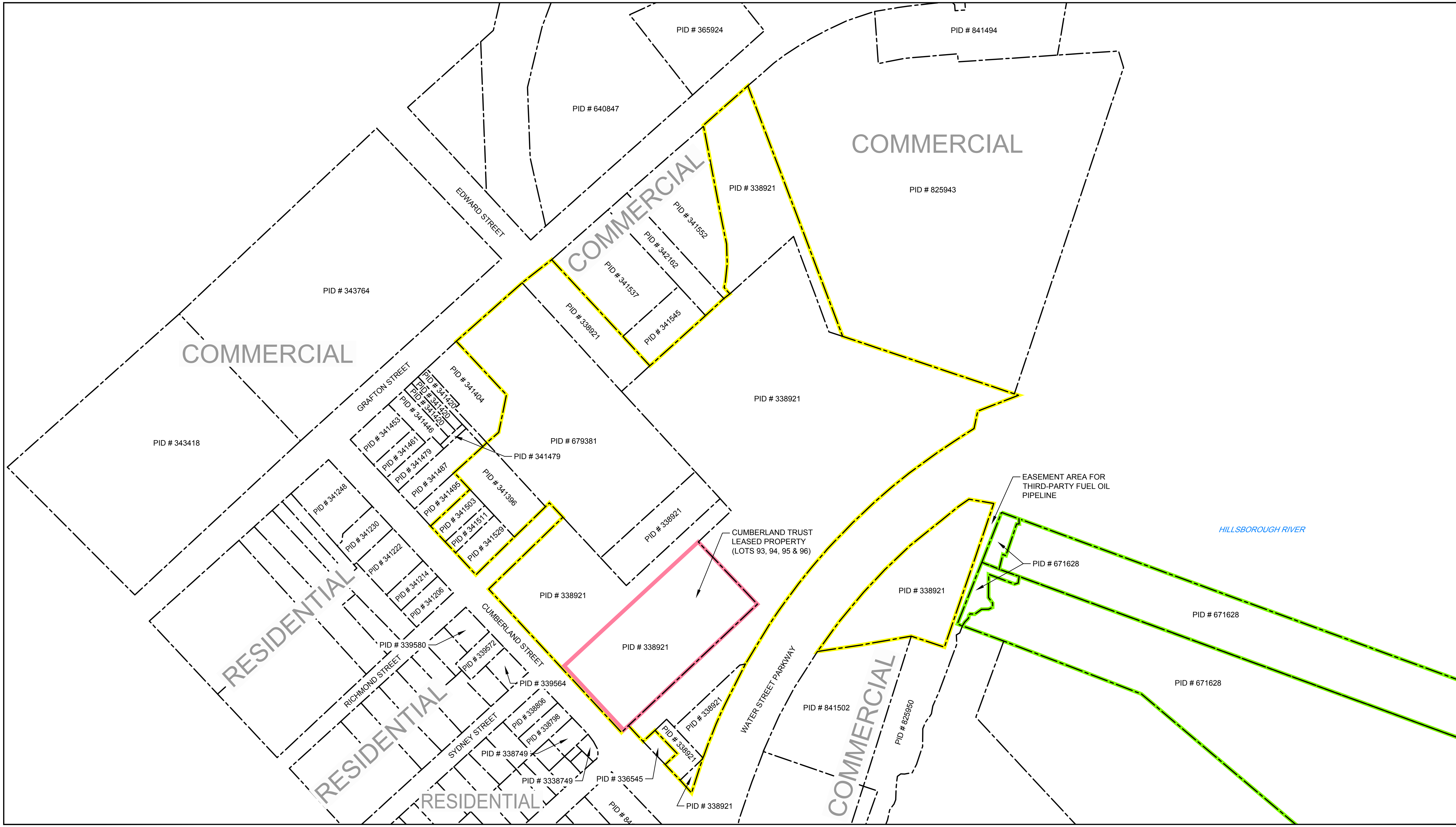
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Mar 19, 2018

SITE LOCATION

FIGURE 1

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR001.dwg



0 20 40 60m

N

LEGEND

SUBJECT SITE BOUNDARY

LEASED WATERLOT BOUNDARY

CUMBERLAND TRUST LEASED PROPERTY BOUNDARY

PROPERTY LINES

GHD

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

PROPERTY PLAN

11149943-07(003)
Mar 20, 2018

FIGURE 2

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR002.dwg

Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed January, 2018.

0 15 30 45m

LEGEND:

- PROPERTY BOUNDARY (APPROX.)
- TP2 / BH10 — 2002 HISTORICAL BOREHOLE / TESTPIT LOCATION
- BH5-M — 2002 HISTORICAL MONITOR WELL LOCATION
- MW — 2017 MONITOR WELL LOCATION
- SP — 2017 SOIL PROBE LOCATION
- SS — 2017 SURFACE SOIL SAMPLE LOCATION

NOTE: SOIL SAMPLE LOCATIONS SPECIFIC TO PCB ANALYSIS CORRESPOND TO TRANSFORMER PAD LOCATIONS SHOWN ON FIGURE 3B.

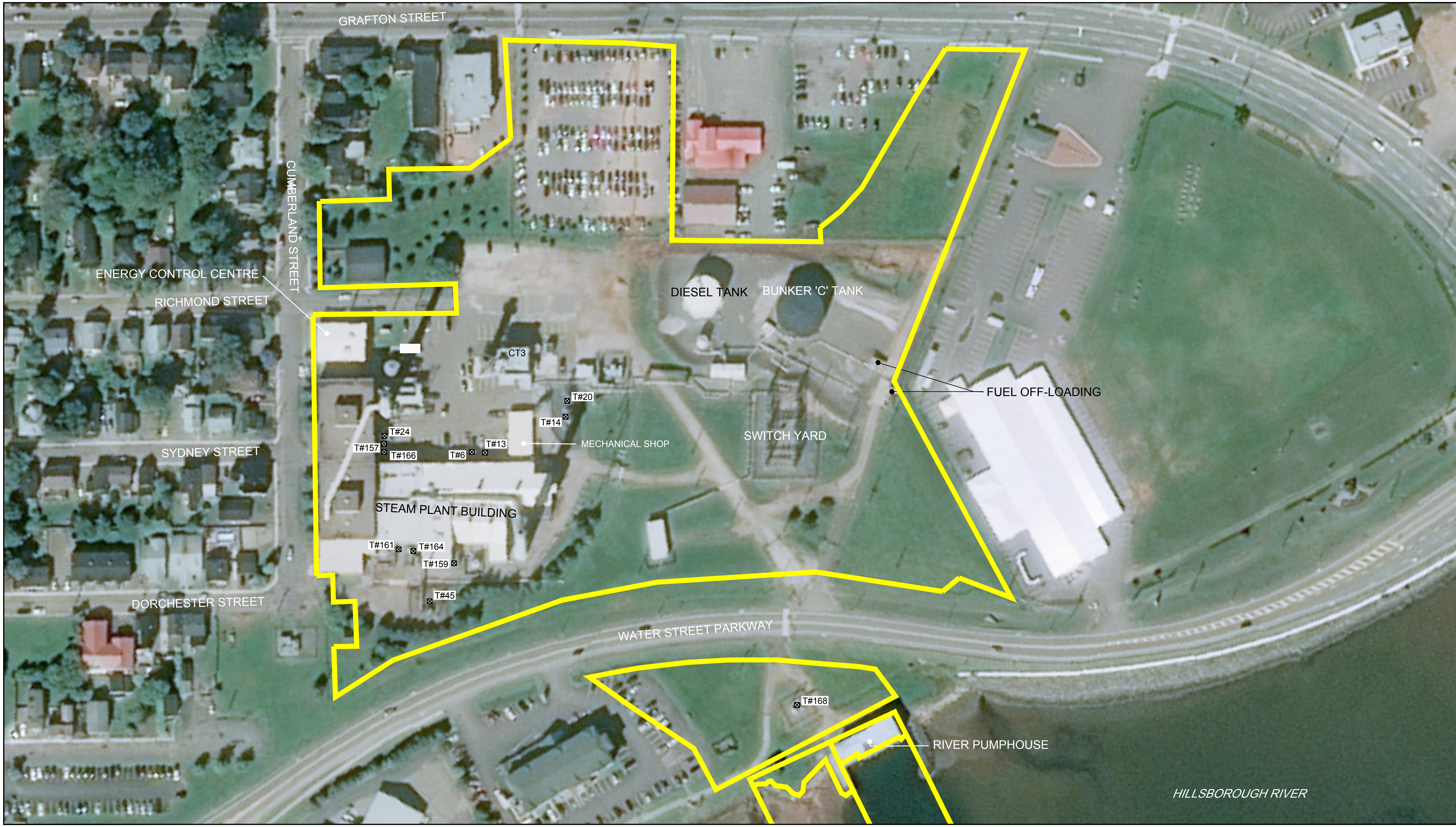
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

SITE PLAN WITH SAMPLE LOCATIONS
- SOIL AND GROUNDWATER

11149943-07(003)
Mar 19, 2018

FIGURE 3A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR003.dwg



Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed January, 2018.

0 15 30 45m

LEGEND:

PROPERTY BOUNDARY (APPROX.)

T#168 ⊠ TRANSFORMER PAD SAMPLE LOCATION

NOTE: SOIL SAMPLE LOCATIONS SPECIFIC TO PCB ANALYSIS CORRESPOND TO TRANSFORMER PAD LOCATIONS.

GHD

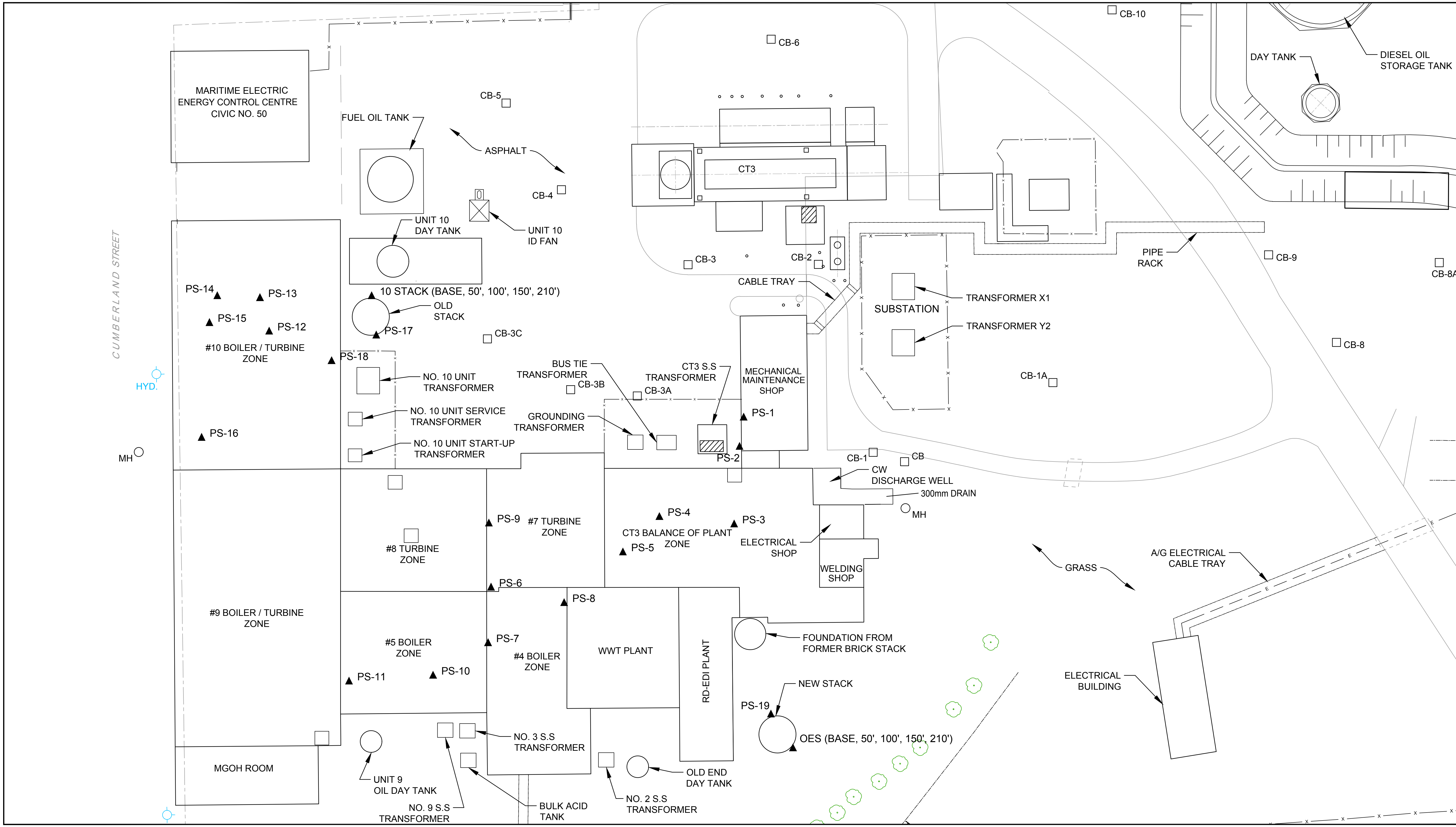
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

SITE PLAN WITH SAMPLE LOCATIONS
- TRANSFORMER PADS (CONCRETE)

11149943-07(003)
Mar 19, 2018

FIGURE 3B

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR003.dwg



0 5 10 15m

LEGEND:

PROPERTY LINE
EXISTING CULVERT
DITCH
EXISTING FENCE LINE
CB-1 EXISTING CATCHBASIN
MH EXISTING STORM MANHOLE
HYDRANT
TREE
PAINT SAMPLE LOCATION

GHD

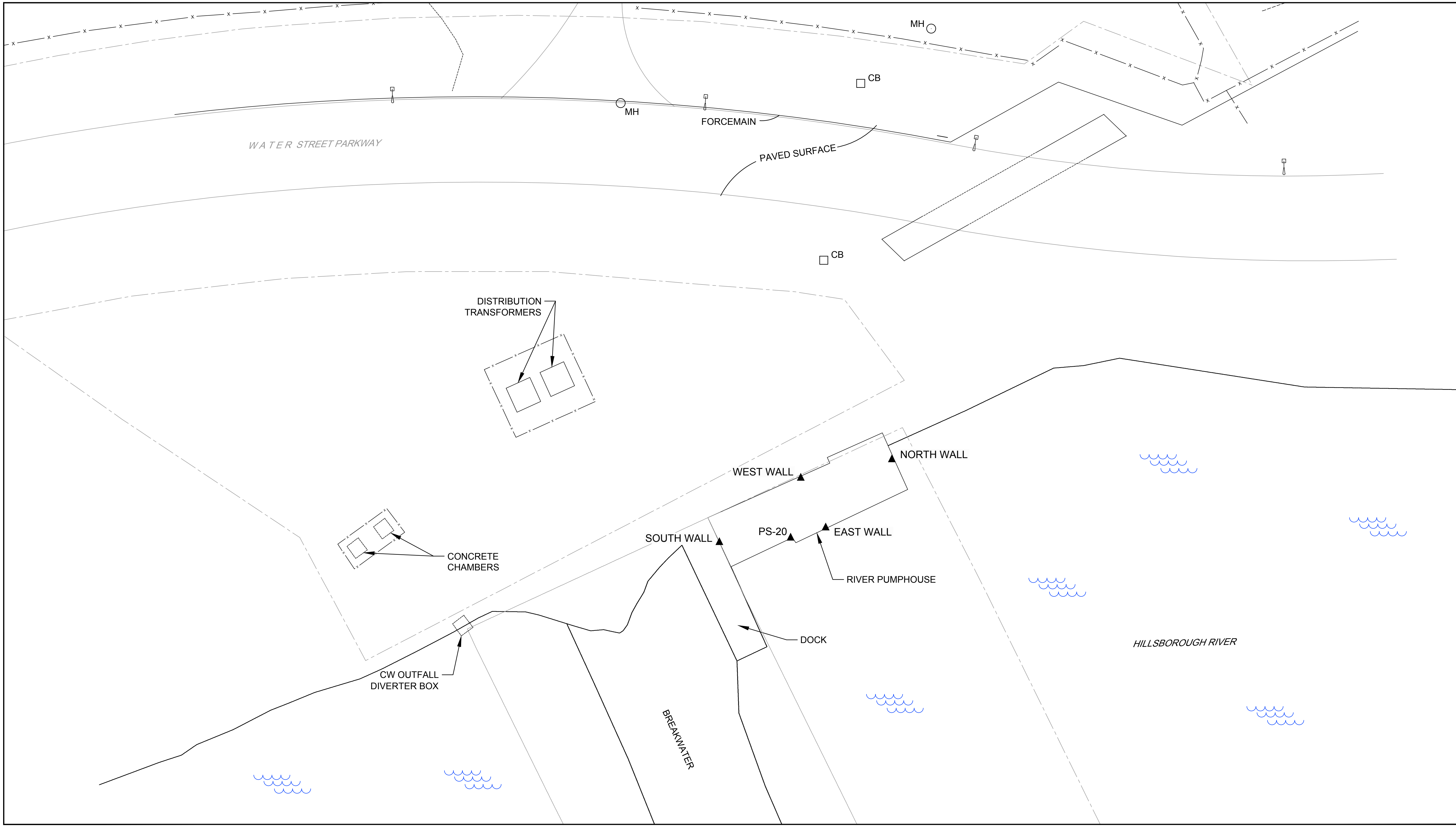
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Mar 19, 2018

SITE PLAN - PAINT SAMPLE LOCATIONS STEAM PLANT AREA

FIGURE 4A

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR004.dwg



0 5 10 15m

LEGEND:

PROPERTY LINE
EXISTING CULVERT
DITCH
EXISTING FENCE LINE
CB-1 EXISTING CATCHBASIN
MH EXISTING STORM MANHOLE
PAINT SAMPLE LOCATION

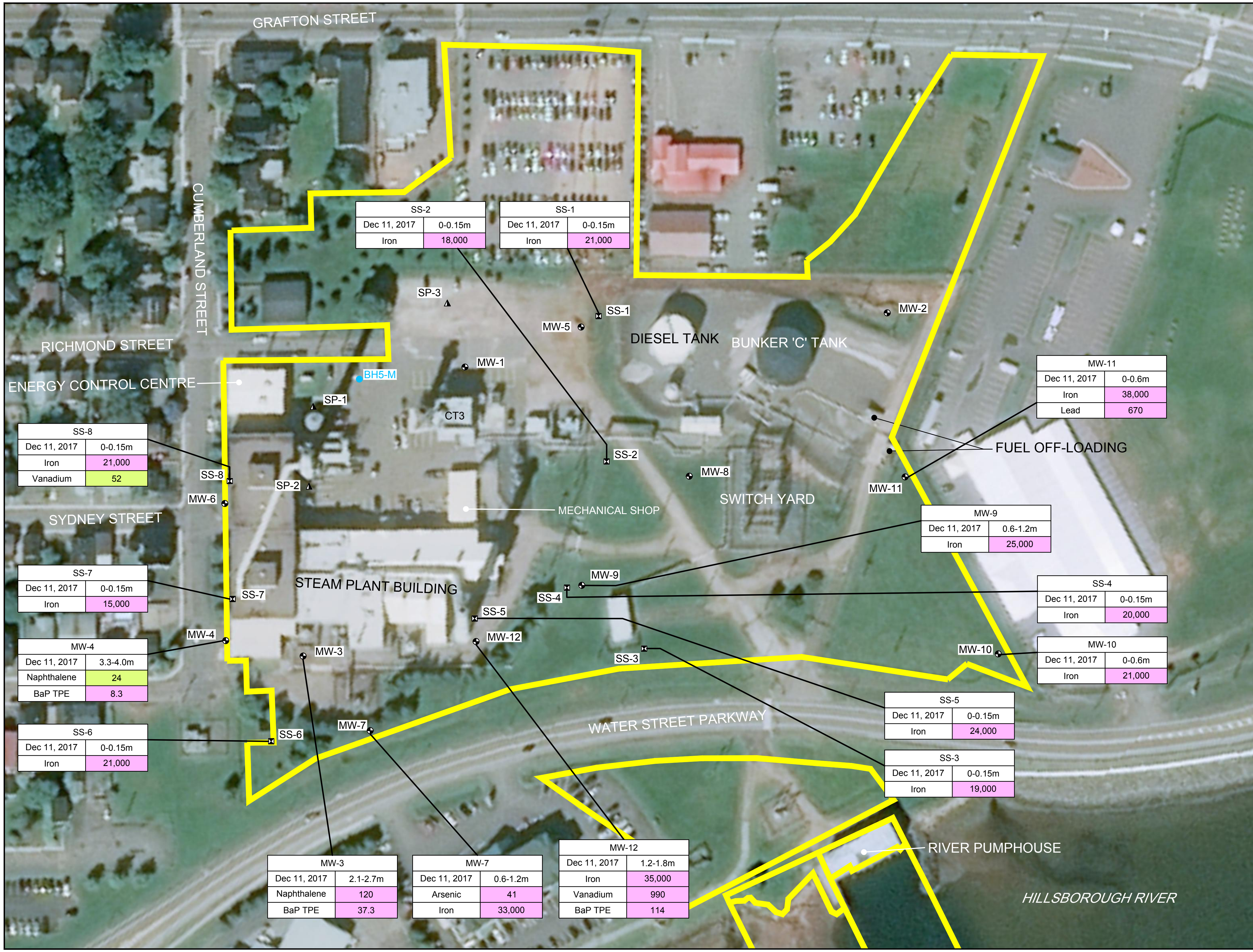
GHD

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Mar 19, 2018

SITE PLAN - PAINT SAMPLE LOCATIONS RIVER PUMPHOUSE AREA FIGURE 4B

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR004.dwg



REGULATORY CRITERIA (mg/kg)		
PARAMETER	CRITERIA 'a'	CRITERIA 'b'
Arsenic	31	31
Iron	11,000	11,000
Lead	260	140
Vanadium	160	39
Naphthalene	25	2.2
BaP TPE	5.3	5.3

'a' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR SOIL AT A NON-POTABLE SITE - COARSE SOIL TYPE, COMMERCIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'b' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR SOIL AT A NON-POTABLE SITE - COARSE SOIL TYPE, RESIDENTIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

CONCENTRATIONS IN SOIL EXCEEDING COMMERCIAL CRITERIA

CONCENTRATIONS IN SOIL EXCEEDING RESIDENTIAL CRITERIA

CONCENTRATIONS IN SOIL EXCEEDING COMMERCIAL AND RESIDENTIAL CRITERIA

0 15 30 45m

LEGEND:
- PROPERTY BOUNDARY (APPROX.)
- BH5-M 2002 HISTORICAL MONITOR WELL LOCATION
- MW 2017 MONITOR WELL LOCATION
- SP 2017 SOIL PROBE LOCATION
- SS 2017 SURFACE SOIL SAMPLE LOCATION

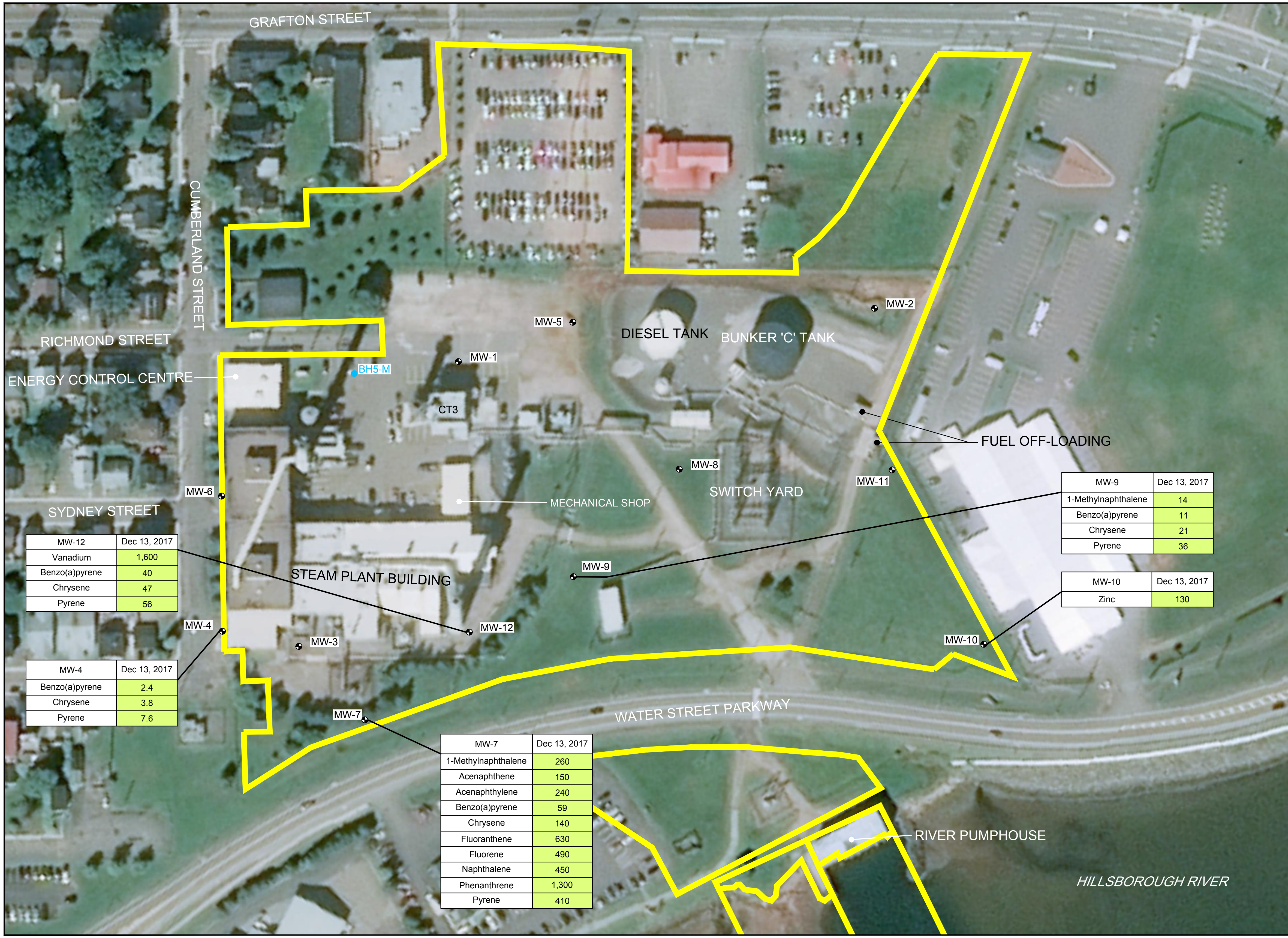
MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

11149943-07(003)
Mar 19, 2018

SOIL EXCEEDENCES (mg/kg)

FIGURE 5

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR005.dwg



MW-12	Dec 13, 2017
Vanadium	1,600
Benzo(a)pyrene	40
Chrysene	47
Pyrene	56

MW-4	Dec 13, 2017
Benzo(a)pyrene	2.4
Chrysene	3.8
Pyrene	7.6

MW-7	Dec 13, 2017
1-Methylnaphthalene	260
Acenaphthene	150
Acenaphthylene	240
Benzo(a)pyrene	59
Chrysene	140
Fluoranthene	630
Fluorene	490
Naphthalene	450
Phenanthrene	1,300
Pyrene	410

MW-9	Dec 13, 2017
1-Methylnaphthalene	14
Benzo(a)pyrene	11
Chrysene	21
Pyrene	36

MW-10	Dec 13, 2017
Zinc	130

Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Accessed February, 2018.

REGULATORY CRITERIA (µg/L)			
PARAMETER	CRITERIA 'a'	CRITERIA 'b'	CRITERIA 'c'
Vanadium	NG	NG	500
Zinc	NG	NG	100
1-Methylnaphthalene	38,000	6,200	10
Acenaphthene	NG	NG	60
Acenaphthylene	750	36	60
Benzo(a)pyrene	NG	NG	0.1
Chrysene	NG	NG	1
Fluoranthene	NG	NG	110
Fluorene	NG	NG	120
Naphthalene	7,000	600	14
Phenanthrene	NG	NG	46
Pyrene	NG	NG	0.2

'a' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR GROUNDWATER AT A NON-POTABLE SITE - COARSE SOIL TYPE, COMMERCIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'b' - NOVA SCOTIA ENVIRONMENT (NSE) TIER 1 ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR GROUNDWATER AT A NON-POTABLE SITE - COARSE SOIL TYPE, RESIDENTIAL LAND USE (JULY 6, 2013) (HUMAN HEALTH)

'c' - NOVA SCOTIA ENVIRONMENT (NSE) PATHWAY SPECIFIC STANDARDS (PSS) FOR GROUNDWATER (µg/L) - GROUNDWATER DISCHARGE TO SURFACE WATER - >10 METRES FROM SURFACE WATER BODY - DISCHARGE TO MARINE WATER (APRIL 2014) (ECOLOCICAL).

CONCENTRATIONS IN GROUNDWATER EXCEEDING ECOLOGICAL CRITERIA

0 15 30 45m

LEGEND:

PROPERTY BOUNDARY (APPROX.)

BH5-M 2002 HISTORICAL MONITOR WELL LOCATION

MW 2017 MONITOR WELL LOCATION

MARITIME ELECTRIC COMPANY, LIMITED
CHARLOTTETOWN THERMAL GENERATING STATION, CHARLOTTETOWN, PEI
UPDATED PHASE II ENVIRONMENTAL SITE ASSESSMENT

GROUNDWATER EXCEEDENCES (µg/L)

11149943-07(003)
Feb 27, 2018

FIGURE 6

CAD File: I:\CAD\8-chars\11------\1114----\111499--\11149943\11149943-REPORTS\11149943-07(003)\11149943-07(003)GN\11149943-07(003)GN-FR006.dwg

Table 1

Groundwater Elevations
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Monitor Well ID	Measured Monitor Well Depth (mbgs)	Eastings	Northings	Elevation Top of Casing (masl)	Ground Elevation (masl)	Monitor Well Stick-up above Ground Surface (m)	Subsurface Vapour Concentration (PPM)	Free Phase Product Thickness (mm)	Static Water Level (m below TOC)	Static Water Level (mbgs)	Groundwater Elevation (masl)
December 14, 2017											
MW-1	4.55	490858.8	5120605.4	2.13	2.23	0	150	0	1.85	1.95	0.28
MW-2	4.35	490958.3	5120721.1	3.50	2.81	0.69	35	0	0.87	0.18	2.63
MW-3	5.53	490884.9	5120489.6	2.24	2.37	0	150	0	1.12	1.25	1.12
MW-4	4.96	490858.9	5120473.2	1.80	1.87	0	70	0	1.37	1.44	0.43
MW-5	5.91	490880.1	5120643.9	2.50	2.59	0	0	0	2.22	2.36	0.23
MW-6	5.80	490826.0	5120509.9	2.35	2.50	0	860	0	2.05	2.20	0.30
MW-7	5.26	490920.7	5120485.8	2.30	2.44	0	520	0	1.85	1.99	0.45
MW-8	5.78	490944.7	5120630.1	2.66	2.75	0	100	0	1.73	1.82	0.93
MW-9	5.95	490942.3	5120575.2	4.48	4.55	0	55	0	3.69	3.76	0.79
MW-10	4.43	491069.7	5120656.9	2.75	2.83	0	45	0	0.46	0.54	2.29
MW-11	4.45	491002.4	5120681.8	3.71	3.78	0	95	0	2.10	2.17	1.61
MW-12	5.62	490927.6	5120534.9	1.77	1.88	0	300	0	1.44	1.55	0.33
BH5-M	9.08	490833.5	5120576.8	2.04	2.14	0	0	0	1.89	1.99	0.15
SP-1	---	490831.0	5120555.0	---	0.92	---	---	0	---	---	---
SP-2	---	490846.0	5120536.0	---	0.91	---	---	0	---	---	---
SP-3	---	490839.0	5120618.0	---	1.07	---	---	0	---	---	---

Notes: Assigned Benchmark Elevation of 3m (north corner of the CT3 Generator concrete pad)

TOC Top of Casing
masl Metres Above Sea Level
mbgs Metres Below Ground Surface
--- Not Applicable

Eastings and Northings taken in the NBNAD83 coordinate system.

Table 2

Soil Analytical Results - Petroleum Hydrocarbons
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Petroleum Hydrocarbons			Benzene	Toluene	Ethylbenzene	Total Xylenes	F1	F2	F3		mTPH	Hydrocarbon Resemblance
							C_6 - C_{10} (less BTEX)	$>C_{10}$-C_{16}	$>C_{16}$-C_{21}	$>C_{21}$-$<C_{32}$		
Atlantic RBCA Tier I RBSLs - Commercial, Non-Potable, Coarse Grained [1]			2.5	10,000	10,000	110	NG	NG	NG	NG	870	Gasoline
											4,000	Diesel/No. 2 Fuel Oil
											10,000	No. 6 Oil/Lube Oil
Atlantic RBCA Tier I RBSLs - Residential, Non-Potable, Coarse Grained [2]			0.099	77	30	8.8	NG	NG	NG	NG	74	Gasoline
											270	Diesel/No. 2 Fuel Oil
											1,100	No. 6 Oil/Lube Oil
Sample ID	Sample Depth (m)	Sample Date										
SP-1	2.4-3.0	12/11/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
SP-2	2.1-2.7	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
SP-2	3.3-4.0	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
SP-3	2.4-3.0	12/12/2017	<0.025	0.13	<0.025	0.14	<2.5	<10	<10	<15	<15	-
MW-1	2.7-3.3	12/11/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-1 Lab Dup	2.7-3.3	12/11/2017	-	-	-	-	-	<10	<10	<15	-	-
MW-2	4.9-5.5	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-3	2.1-2.7	12/13/2017	0.11	0.24	<0.025	0.25	<2.5	750	930	1000	2700	One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
MW-3	4.6-5.2	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-4 [3]	3.3-4.0	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	180	240	310	720	One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
MW-5	3.0-3.7	12/12/2017	0.039	0.14	<0.025	0.15	<2.5	<10	<10	<15	<15	-
MW-6 [3]	2.7-3.3	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-7	2.4-3.0	12/13/2017	0.078	0.20	<0.025	0.10	<2.5	<10	<10	<15	<15	-
MW-7	3.7-4.3	12/13/2017	<0.025	0.070	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-8	3.7-4.3	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-8	4.9-5.5	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-
MW-9	3.0-3.7	12/13/2017	0.27	0.89	0.066	0.92	7.0	31	59	220	320	One product in fuel oil range. Lube oil fraction.
MW-9	4.9-5.5	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	14	46	74	130	One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
MW-10	0.6-1.2	12/13/2017	<0.025	0.070	0.29	1.7	65	800	1300	1500	3600	Weathered fuel oil fraction. Lube oil fraction.
MW-10	4.3-4.9	12/13/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	36	36	Possible lube oil fraction.
MW-11	1.8-2.4	12/13/2017	<0.025	0.071	<0.025	<0.050	<2.5	<10	13	38	51	Possible lube oil fraction.
MW-12	4.9-5.5	12/12/2017	<0.025	<0.025	<0.025	<0.050	<2.5	<10	<10	<15	<15	-

Notes:
[1] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Soil - Commercial Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)
[2] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Soil - Residential Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)
[3] Soil Samples are compared to Atlantic RBCA Tier I RBSLs for Residential Land Use as residential properties are located adjacent to MW-4 and MW-6.
Results for all parameters are reports in milligrams per kilogram (mg/kg)
"-" - Not Applicable/Not Analyzed
Lab Dup - Laboratory Duplicate
NG - No Guideline
m - Metres
mTPH - Modified Total Petroleum Hydrocarbons
BOLD/UNDERLINE - Exceeds commercial criteria
SHADING - Exceeds residential criteria

Table 3

Soil Analytical Results - Metals
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	Sample ID	SS-1	SS-2	SS-3	SS-4	SS-4 Lab Dup	SS-5	SS-6 [3]	SS-7 [3]	SS-8 [3]	MW-7	MW-9	MW-10	MW-11	MW-12	SPOIL PILE
				Sample Depth (m)	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.0-0.15**	**0.6-1.2**	**0.6-1.2**	**0.0-0.6**	**0.0-0.6**	**1.2-1.8**	**-**
				Sample Date	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/11/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/12/2017	12/15/2017
Aluminum	mg/kg	15,400	15,400		9900	7600	8600	8800	9100	7200	9600	6000	11000	4600	8000	9300	9900	13000	3500
Antimony	mg/kg	63	7.5		<2.0	<2.0	2.7	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.7	<2.0	<2.0	3.0	<2.0	<2.0
Arsenic	mg/kg	31	31		4.3	3.1	4.3	5.0	5.2	3.5	3.6	3.5	3.5	**<u>41</u>**	18	5.2	31	19	3.8
Barium	mg/kg	15,000	10,000		45	21	29	48	53	27	30	27	26	110	110	32	320	120	12
Beryllium	mg/kg	320	38		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bismuth	mg/kg	NG	NG		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	mg/kg	24,000	4,300		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	mg/kg	49	14		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.38	<0.30	1.1	0.36	<0.30
Chromium	mg/kg	630	220		19	14	16	17	18	27	20	13	19	12	18	18	28	26	9.0
Cobalt	mg/kg	250	22		7.9	5.7	6.6	6.6	6.9	8.0	7.3	5.1	7.4	4.7	7.2	7.5	9.5	10	3.2
Copper	mg/kg	4,000	1,100		11	9.3	13	16	17	27	12	8.9	13	25	35	14	76	77	6.3
Iron	mg/kg	11,000	11,000		**<u>21000</u>**	**<u>18000</u>**	**<u>19000</u>**	**<u>20000</u>**	**<u>20000</u>**	**<u>24000</u>**	**<u>21000</u>**	**<u>15000</u>**	**<u>21000</u>**	**<u>33000</u>**	**<u>25000</u>**	**<u>21000</u>**	**<u>38000</u>**	**<u>35000</u>**	10000
Lead	mg/kg	260	140		16	11	31	64	69	18	25	16	14	87	130	36	**<u>670</u>**	62	9.2
Lithium	mg/kg	NG	NG		22	20	21	22	23	13	22	15	22	10	20	24	21	21	10
Manganese	mg/kg	NG	NG		560	370	480	440	430	530	480	340	400	220	450	450	700	480	190
Mercury	mg/kg	24	6.6		<0.10	<0.10	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	0.29	<0.10	0.67	0.27	<0.10
Molybdenum	mg/kg	1,200	110		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	5.7	3.6	<2.0	4.3	5.3	<2.0
Nickel	mg/kg	2,200	330		17	14	18	21	21	29	17	13	20	19	26	18	25	180	24
Rubidium	mg/kg	NG	NG		9.7	6.7	8.5	8.8	8.9	4.0	10	5.9	11	5.2	7.1	9.3	9.8	5.1	2.7
Selenium	mg/kg	125	80		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.3	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	mg/kg	490	77		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50
Strontium	mg/kg	9,400	9,400		13	<5.0	7.0	7.9	8.3	20	6.4	6.3	6.2	33	24	7.5	37	64	<5.0
Thallium	mg/kg	1	1		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.40	0.19	<0.10	0.31	0.13	<0.10
Tin	mg/kg	9,400	9,400		<2.0	<2.0	<2.0	2.6	5.8	<2.0	<2.0	6.4	<2.0	4.3	4.3	<2.0	24	4.5	<2.0
Uranium	mg/kg	33	23		1.0	0.57	0.54	0.55	0.57	0.73	0.57	0.72	0.90	0.36	0.58	0.71	0.71	0.81	0.26
Vanadium	mg/kg	160	39		25	24	50	59	62	73	25	20	52	75	83	34	35	**<u>990</u>**	77
Zinc	mg/kg	47,000	5,600		64	38	64	100	100	650	78	47	56	94	200	61	450	280	25

Notes:
[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)
[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Residential Land Use (July 6, 2013)
[3] Soil Samples are compared to NSE Tier I EQS for Residential Land Use as residential properties are located adjacent to SS-6, SS-7 and SS-8.
"-" - Not Applicable/Not Analyzed
Lab Dup - Laboratory Duplicate
NG - No Guideline
<u>BOLD/UNDERLINE</u> - Exceeds commercial criteria
SHADING - Exceeds residential/parkland criteria where applicable

Table 4

Soil Analytical Results - Polyaromatic Hydrocarbons (PAHs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PAHs	Units	RDL	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	CCME PEFs [for B(a)P TPE calculations - NOT Guidelines] [3]	Sample ID	MW-3	MW-4 [3]	MW-7	MW-9	MW-10	MW-12
						Sample Depth (m)	2.1-2.7	3.3-4.0	2.4-3.0	0.6-1.2	0.6-1.2	1.2-1.8
						Sample Date	12/13/2017	12/12/2017	12/13/2017	12/13/2017	12/13/2017	12/12/2017
1-Methylnaphthalene	mg/kg	0.01	560	72			46	9.2	<0.010	0.083	1.7	0.65
2-Methylnaphthalene	mg/kg	0.01	560	72			36	2.9	<0.010	0.11	2.0	1.0
Acenaphthene	mg/kg	0.01	8,000	3,900			12	2.6	<0.010	0.083	0.77	5.1
Acenaphthylene	mg/kg	0.01	66	4.5			4.1	3.0	<0.010	0.018	0.099	0.36
Anthracene	mg/kg	0.01	37,000	24,000			61	9.1	<0.010	0.23	0.32	16
Benzo(a)anthracene	mg/kg	0.01	NG	NG	0.1		30	6.9	<0.010	0.63	<0.17	67
Benzo(a)pyrene	mg/kg	0.01	NG	NG	1		25	5.8	<0.010	0.75	0.13	58
Benzo(b)fluoranthene	mg/kg	0.01	NG	NG	0.1		18	3.5	<0.010	0.71	<0.13	69
Benzo(b/j)fluoranthene	mg/kg	0.02	NG	NG			31	6.8	<0.020	1.1	<0.19	120
Benzo(g,h,i)perylene	mg/kg	0.01	NG	NG	0.01		9.7	1.6	<0.010	0.37	0.083	56
Benzo(j)fluoranthene	mg/kg	0.01	NG	NG	0.1		13	3.4	<0.010	0.44	<0.060	50
Benzo(k)fluoranthene	mg/kg	0.01	NG	NG	0.1		13	2.8	<0.010	0.48	0.034	50
Chrysene	mg/kg	0.01	NG	NG	0.01		26	5.6	<0.010	0.68	<0.30	53
Dibenz(a,h)anthracene	mg/kg	0.01	NG	NG	1		3.6	0.62	<0.010	0.091	<0.030	25
Fluoranthene	mg/kg	0.01	5,300	3,500			85	16	<0.010	1.1	0.37	72
Fluorene	mg/kg	0.01	4,100	2,700			59	14	<0.010	0.070	1.5	5.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.01	NG	NG	0.1		9.7	1.7	<0.010	0.31	0.026	62
Naphthalene	mg/kg	0.01	25	2.2			**120**	24	<0.010	0.075	0.26	1.7
Perylene	mg/kg	0.01	NG	NG			5.8	1.1	<0.010	0.18	0.091	24
Phenanthrene	mg/kg	0.01	NG	NG			160	28	0.020	0.80	3.9	42
Pyrene	mg/kg	0.01	3,200	2,100			50	11	<0.010	0.96	0.39	58
BaP TPE	mg/kg	-	5.3	5.3			**37.3**	**8.3**	0.01	1.1	0.17	**114**

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Residential Land Use (July 6, 2013)

[3] Soil Samples are compared to NSE Tier I EQS for Residential Land Use as residential properties are located adjacent to MW-4.

BaP TPE - Benzo(a)pyrene Total Potency Equivalents

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

SHADING - Exceeds residential criteria

Table 5

Soil Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T#6-1	T#6-2	T#13-1	T#13-2	T#14-1	T#14-2	T#20-1	T#20-2	T#24-1
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1260	µg/g	NG		0.19	<0.050	<0.050	0.079	<0.050	<0.050	0.14	<0.050	0.071
Calculated Total PCB	µg/g	33		0.19	<0.050	<0.050	0.079	<0.050	<0.050	0.14	<0.050	0.071

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

PCB - Polychlorinated Biphenyls

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

Sample locations for surface soil samples collected for PCB analysis correspond to the transformer pad locations shown on Figure 3b.

Table 5

Soil Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T#24-2	T#45-1	T#45-2	T#157-1	T#157-2	T#159-1	T#159-2	T#159-2 Lab Dup	T#161-1
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1260	µg/g	NG		1.0	<0.050	<0.050	<0.050	<0.050	<0.050	0.87	0.86	0.079
Calculated Total PCB	µg/g	33		1.0	<0.050	<0.050	<0.050	<0.050	<0.050	0.87	-	0.079

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

PCB - Polychlorinated Biphenyls

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

Sample locations for surface soil samples collected for PCB analysis correspond to the transformer pad locations shown on Figure 3b.

Table 5

Soil Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T#161-2	T#164-1	T#164-2	T#166-1	T#166-2	T#168-1	T#168-2
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Aroclor 1260	µg/g	NG		0.62	0.19	0.25	0.095	0.65	<0.050	<0.050
Calculated Total PCB	µg/g	33		0.62	0.19	0.25	0.095	0.65	<0.050	<0.050

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)

"-" - Not Applicable/Not Analyzed

Lab Dup - Laboratory Duplicate

PCB - Polychlorinated Biphenyls

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

Sample locations for surface soil samples collected for PCB analysis correspond to the transformer pad locations shown on Figure 3b.

Table 6

Groundwater Analytical Results - Petroleum Hydrocarbons
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Petroleum Hydrocarbons		Benzene	Toluene	Ethylbenzene	Total Xylenes	F1	F2	F3		Modified TPH	Hydrocarbon Resemblance
						C_6 - C_{10} (less BTEX)	$>C_{10}$-C_{16}	$>C_{16}$-C_{21}	$>C_{21}$-$<C_{32}$		
Atlantic RBCA Tier I RBSLs - Commercial, Non-Potable, Coarse Grained [1]		20	20	20	20	NG	NG	NG	NG	20	Gasoline
										20	Diesel/No. 2 Fuel Oil
										20	No. 6 Oil/Lube Oil
Atlantic RBCA Tier I RBSLs - Residential, Non-Potable, Coarse Grained [2]		2.6	20	20	20	NG	NG	NG	NG	20	Gasoline
										20	Diesel/No. 2 Fuel Oil
										20	No. 6 Oil/Lube Oil
Atlantic RBCA Tier 1 ESLs - Protection of Plants and Invertebrates [3]		350	200	110	120	11	3.1	NG		NG	-
Atlantic RBCA Tier 1 ESLs - Protection of Marine Aquatic Life - 50 m to Surface Water [4]		17	15	11	10	NG	NG	NG	NG	22	Gas
										6	Diesel/#2
										22	#6 Oil/Lube
Sample ID	**Sample Date**										
MW-1	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-2	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-3	12/15/2017	<0.0010	<0.0010	<0.0010	0.011	0.064	1.0	0.19	<0.10	1.3	One product in fuel oil range. Unidentified compound(s) in fuel oil range.
MW-4 [5]	12/15/2017	<0.0010	<0.0010	<0.0010	0.0032	<0.010	0.060	<0.050	<0.10	<0.10	
MW-5	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-6 [5]	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	0.017	<0.050	<0.050	<0.10	<0.10	
MW-7	12/15/2017	0.0075	0.0095	0.0043	0.024	0.084	2.7	0.70	0.19	3.7	One product in fuel oil range. Unidentified compound(s) in fuel oil range.
MW-8	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.052	0.084	<0.10	0.14	One product in fuel oil range.
MW-9	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.23	0.28	0.16	0.67	One product in fuel oil range. Unidentified compound(s) in fuel oil range.
MW-10	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.11	0.18	0.13	0.43	One product in fuel / lube range.
MW-11	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	
MW-12	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	0.081	0.27	0.27	0.62	One product in fuel / lube range.
BH-5	12/15/2017	<0.0010	<0.0010	<0.0010	<0.0020	<0.010	<0.050	<0.050	<0.10	<0.10	

Notes:

[1] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Groundwater - Commercial Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)

[2] Atlantic Risk-Based Corrective Action (RBCA) Tier I Risk-Based Screening Levels (RBSLs) for Groundwater - Residential Land Use, Non-Potable Groundwater Use, Coarse-Grained Soil Type (July 2012, revised January 2015)

[3] Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Ecological Screening Levels (ESLs) for Plant and Invertebrate Direct Contact with Shallow Groundwater - Commercial Land Use, Coarse-Grained Soil Type (July 2012, revised January 2015) - only applicable to groundwater present within 3 metres of ground surface

[4] Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Groundwater Ecological Screening Levels (ESLs) for Protection of Marine Aquatic Life - Distance to Surface Water of 50 metres (MW-10 is closest monitoring well) (July 2012, revised January 2015)

[5] Groundwater Samples are compared to Atlantic RBCA Tier I RBSLs for Residential Land Use as the residential properties are located adjacent to MW-4 and MW-6.

Results for all parameters are reports in milligrams per liter (mg/L)

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial criteria

SHADING - Exceeds residential criteria

Table 7

Groundwater Analytical Results - Metals
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	NSE PSS - Discharge to Surface Water - >10 m from Marine Surface Water Body [3]	Sample ID	MW-4	MW-4 Lab Dup	MW-7	MW-9	MW-10	MW-12
					Sample Date	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017
Aluminum	µg/L	NG	NG	NG		<5.0	<5.0	370	28	45	<50
Antimony	µg/L	NG	NG	5,000		2.2	2.2	1.6	<1.0	<1.0	<10
Arsenic	µg/L	NG	NG	125		1.8	1.8	3.7	<1.0	<1.0	<10
Barium	µg/L	NG	NG	5,000		100	110	10	43	15	61
Beryllium	µg/L	NG	NG	1,000		<1.0	<1.0	<1.0	<1.0	<1.0	<10
Bismuth	µg/L	NG	NG	NG		<2.0	<2.0	<2.0	<2.0	<2.0	<20
Boron	µg/L	NG	NG	12,000		<50	<50	180	160	200	1100
Cadmium	µg/L	NG	NG	1.2		0.21	0.22	0.026	<0.010	0.33	<0.10
Calcium	µg/L	NG	NG	NG		140000	140000	2700	82000	180000	110000
Chromium	µg/L	NG	NG	NG		<1.0	<1.0	3.7	<1.0	1.2	<10
Cobalt	µg/L	NG	NG	NG		1.4	1.4	0.91	1.8	3.4	<4.0
Copper	µg/L	NG	NG	20		<2.0	<2.0	<2.0	<2.0	2.3	<20
Iron	µg/L	NG	NG	NG		<50	<50	1800	4800	3800	<500
Lead	µg/L	NG	NG	20		<0.50	<0.50	1.6	<0.50	<0.50	<5.0
Magnesium	µg/L	NG	NG	NG		27000	27000	230	28000	19000	190000
Manganese	µg/L	NG	NG	NG		210	200	780	4000	1300	720
Mercury	µg/L	NG	NG	0.16		<0.013	NA	<0.013	<0.013	<0.013	<0.013
Molybdenum	µg/L	NG	NG	NG		17	19	17	<2.0	4.0	65
Nickel	µg/L	NG	NG	83		2.1	<2.0	3.0	3.4	13	40
Phosphorus	µg/L	NG	NG	NG		<100	<100	360	<100	<100	<1000
Potassium	µg/L	NG	NG	NG		11000	11000	2500	11000	9800	83000
Selenium	µg/L	NG	NG	20		<1.0	<1.0	1.1	<1.0	<1.0	<10
Silver	µg/L	NG	NG	15		<0.10	<0.10	<0.10	<0.10	<0.10	<1.0
Sodium	µg/L	NG	NG	NG		1000000	1000000	260000	81000	23000	1900000
Strontium	µg/L	NG	NG	NG		460	450	9.9	260	240	1100
Thallium	µg/L	NG	NG	213		<0.10	<0.10	<0.10	<0.10	<0.10	<1.0
Tin	µg/L	NG	NG	NG		2.9	3.1	10	<2.0	2.1	<20
Titanium	µg/L	NG	NG	NG		<2.0	<2.0	29	<2.0	<2.0	<20
Uranium	µg/L	NG	NG	1,000		2.4	2.4	0.88	0.30	0.33	1.9
Vanadium	µg/L	NG	NG	500		130	130	31	<2.0	3.6	1600
Zinc	µg/L	NG	NG	100		<5.0	<5.0	5.1	13	130	<50

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Commercial Land Use (July 6, 2013)

[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Residential Land Use (July 6, 2013)

[3] Nova Scotia Environment (NSE) Pathway Specific Standards (PSS) for Groundwater - Groundwater Discharging to Surface Water, >10 metres from Surface Water Body, Discharge to Marine Water (April 2014)

Lab Dup - Laboratory Duplicate

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial/residential criteria

SHADING - Exceeds NSE PSS

Table 8

Groundwater Analytical Results - Polyaromatic Hydrocarbons (PAHs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PAHs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	NSE Tier 1 EQS - Non-Potable, Coarse, Residential [2]	NSE PSS - Discharge to Surface Water - >10 m from Marine Surface Water Body [3]	Sample ID	MW-4 [4]	MW-4 Lab Dup [4]	MW-7	MW-9	MW-10	MW-12
					Sample Date	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017	12/15/2017
1-Methylnaphthalene	µg/L	38,000	6,200	10		3.4	3.5	260	14	0.54	0.80
2-Methylnaphthalene	µg/L	38,000	6,200	20		0.93	0.99	17	1.5	0.58	0.81
Acenaphthene	µg/L	NG	NG	60		1.5	1.6	150	9.6	0.25	3.5
Acenaphthylene	µg/L	750	36	60		2.0	2.1	240	24	<0.050	1.0
Anthracene	µg/L	NG	NG	NG		6.0	6.7	590	33	0.19	26
Benzo(a)anthracene	µg/L	NG	NG	NG		4.3	4.4	150	23	0.068	49
Benzo(a)pyrene	µg/L	NG	NG	0.1		2.4	2.3	59	11	0.047	40
Benzo(b)fluoranthene	µg/L	NG	NG	NG		1.6	1.7	40	7.7	0.041	27
Benzo(b/j)fluoranthene	µg/L	NG	NG	NG		2.8	NA	70	13	0.058	47
Benzo(g,h,i)perylene	µg/L	NG	NG	NG		0.81	0.79	20	3.5	0.029	17
Benzo(j)fluoranthene	µg/L	NG	NG	NG		1.2	1.2	29	5.3	0.018	20
Benzo(k)fluoranthene	µg/L	NG	NG	NG		1.2	1.1	29	5.3	0.013	20
Chrysene	µg/L	NG	NG	1		3.8	4.0	140	21	0.12	47
Dibenz(a,h)anthracene	µg/L	NG	NG	NG		0.41	0.36	8.5	1.7	0.010	7.7
Fluoranthene	µg/L	NG	NG	110		11	11	630	49	0.14	74
Fluorene	µg/L	NG	NG	120		5.8	6.1	490	34	0.38	5.2
Indeno(1,2,3-cd)pyrene	µg/L	NG	NG	NG		0.94	0.90	22	3.9	<0.020	19
Naphthalene	µg/L	7,000	600	14		4.8	5.5	450	8.0	<0.20	0.82
Perylene	µg/L	NG	NG	NG		0.45	0.46	12	2.4	0.022	9.3
Phenanthrene	µg/L	NG	NG	46		13	14	1300	72	1.3	38
Pyrene	µg/L	NG	NG	0.2		7.6	8.0	410	36	0.17	56

Notes:

[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Commercial Land Use (July 6, 2013)

[2] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Groundwater - Non-Potable Groundwater, Coarse-Grained Soil, Residential Land Use (July 6, 2013)

[3] Nova Scotia Environment (NSE) Pathway Specific Standards (PSS) for Groundwater - Groundwater Discharging to Surface Water, >10 metres from Surface Water Body, Discharge to Marine Water (April 2014)

[4] Groundwater Samples are compared to NSE Tier I EQS for Groundwater - Non-Potable Coarse-Grained Soil, Residential Land Use as residential properties are located adjacent to MW-4.

Lab Dup - Laboratory Duplicate

NA - Not Analyzed

NG - No Guideline

BOLD/UNDERLINE - Exceeds commercial/residential criteria

SHADING - Exceeds NSE PSS

Table 9a

Paint Analytical Results - Metal Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	PS-6	PS-7	PS-9	PS-10	PS-11	PS-13	PS-14	PS-15	PS-16
			Sample Date	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017
			Colour	Old Grey	New Grey	Yellow	Blue	Green	Green	Blue	Orange	Black
			Substrate	Paint - Steel H Beam-Stairs	Paint - Steel H Beam Supports	Paint - Steel Hand Rail	Paint - Steel Blower	Paint - Steel Reserve Tank	Paint - Steel Pedestal Valve	Paint - Steel Pedestal Valve	Paint - Steel Pedestal Valve	Paint - CW Pipe
			Location	Basement	Basement	Basement	Basement	Basement	Unit 10	Unit 10	Unit 10	Basement
Lead	mg/kg	1,000		**<u>1800</u>**	**<u>4300</u>**	520	**<u>1800</u>**	**<u>1400</u>**	**<u>4200</u>**	**<u>2200</u>**	**<u>5600</u>**	670
Lead Leachate	mg/L	5		0.58	3.6	0.16	NA	0.3	NA	NA	NA	NA
Zinc	mg/kg	1,500		**<u>6700</u>**	630	**<u>8300</u>**	**<u>7300</u>**	**<u>2000</u>**	620	1100	850	240
Zinc Leachate	mg/L	500		38	5	55	NA	51	NA	NA	NA	NA

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9a

Paint Analytical Results - Metal Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	PS-16 Lab Dup	PS-16 Lab Dup	PS-18	PS-20	Eastwall (Steel)	Northwall (Steel)	Southwall (Steel)	Westwall (Steel)
			Sample Date	12/13/2017	12/13/2017	12/13/2017	12/13/2017	1/15/2018	1/15/2018	1/15/2018	1/15/2018
			Colour	Black	Black	Red	Beige	Beige	Beige	Beige	Beige
			Substrate	Paint - CW Pipe	Paint - CW Pipe	Paint - Steel Pipe-sprinkler system	Paint - Structural Steel	Paint - Structural Steel	Paint - Structural Steel	Paint - Structural Steel	Paint - Structural Steel
			Location	Basement	Basement	Basement Unit 10	Pumphouse	Pumphouse	Pumphouse	Pumphouse	Pumphouse
Lead	mg/kg	1,000		440	510	<5.0	160	**<u>1900</u>**	86	760	**<u>31000</u>**
Lead Leachate	mg/L	5		NA	NA	NA	0.015	NA	NA	NA	NA
Zinc	mg/kg	1,500		71	84	140	**<u>120000</u>**	**<u>170000</u>**	**<u>8800</u>**	**<u>17000</u>**	900
Zinc Leachate	mg/L	500		NA	NA	NA	**<u>620</u>**	NA	NA	NA	NA

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9b

Paint Analytical Results - Porous Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	PS-1	PS-2	PS-3	PS-4	PS-5	PS-8	PS-12	PS-17	PS-19	OES Base
			Sample Date	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	1/12/2018
			Colour	Green	Beige	Beige	Grey	White	Black	Orange	Grey	Grey	Grey
			Substrate	Paint - Wood Cabinet	Paint - Wood wall	Paint - Concrete Wall	Paint - Concrete Floor	Paint - Concrete Wall	Paint - Concrete Wall	Paint - Concrete Floor	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack
			Location	Machine Shop	Machine Shop	RT3 Basement	RT3 Basement	RT3 Basement	Basement	Unit 10	Old Stack Outside	New Stack Outside Base	New Stack Outside Base
Lead	mg/kg	1,000		**1700**	**2900**	350	**1800**	810	400	510	18	**12000**	**20000**
Lead Leachate	mg/L	5		1.1	2.6	NA	0.37	0.19	NA	NA	NA	**7.6**	2.2
Zinc	mg/kg	1,500		190	310	420	760	870	**2900**	840	1200	440	250
Zinc Leachate	mg/L	500		2.3	3.7	NA	7.8	3.7	NA	NA	NA	3	17

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
BOLD/UNDERLINE - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9b

Paint Analytical Results - Porous Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	**Units**	**Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)**	**Sample ID**	**OES 50'**	**OES 100'**	**OES 150'**	**OES 210'**	**OES Base #1 At Door Ground Level**	**OES Base #1 At Door Ground Level Lab Dup**	**OES Base #2 Opp. Door Ground Level**	**OES 125' Core Samples New Stacks 225'-125'**	**OES 210' New Stack 225'-225' Level**
			Sample Date	1/12/2018	1/12/2018	1/12/2018	1/12/2018 2/7/2018	2/7/2018	2/7/2018	2/7/2018	2/7/2018	2/7/2018
			Colour	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
			Substrate	Paint - Concrete Stack	Paint - Concrete Stack (New Stack)	Paint - Concrete Stack	Paint - Concrete Stack	Concrete Core	Concrete Core	Concrete Core	Concrete Core	Concrete Core
			Location	New Stack Outside 15m Level	New Stack Outside 30.5m Level	New Stack Outside 46m Level	New Stack Outside 64m Level	New Stack Outside Base	New Stack Outside Base	New Stack Outside Base #2	New Stack Outside 38m Level	New Stack Outside 64m Level
Lead	mg/kg	1,000		**20000**	**24000**	**32000**	300	NA	NA	NA	NA	NA
Lead Leachate	mg/L	5		NA	NA	NA	0.089	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc	mg/kg	1,500		640	830	640	**2900**	NA	NA	NA	NA	NA
Zinc Leachate	mg/L	500		NA	NA	NA	37	<0.050	<0.050	<0.050	<0.05	<0.050

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
BOLD/UNDERLINE - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 9b

Paint Analytical Results - Porous Surfaces
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

Metals	Units	Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)	Sample ID	10 Stack Base	10 Stack 50'	10 Stack 100'	10 Stack 150'	10 Stack 210'	Eastwall (Block)	Northwall (Block)	Southwall (Block)	Westwall (Block)
			Sample Date	1/12/2018	1/12/2018	1/12/2018	1/12/2018	1/12/2018	1/15/2018 2/7/2018	1/15/2018 2/7/2018	1/15/2018 2/7/2018	1/15/2018 2/7/2018
			Colour	Grey	Grey	Grey	Grey	Grey	Beige	Beige	Beige	Beige
			Substrate	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Stack	Paint - Concrete Wall	Paint - Concrete Wall	Paint - Concrete Wall	Paint - Concrete Wall
			Location	Old Stack Outside Base	Old Stack Outside 15m Level	Old Stack Outside 30.5m Level	Old Stack Outside 46m Level	Old Stack Outside 64m Level	Pumphouse	Pumphouse	Pumphouse	Pumphouse
Lead	mg/kg	1,000		42	<41	39	88	35	220	**<u>3900</u>**	460	33
Lead Leachate	mg/L	5		NA	NA	NA	NA	NA	0.022	0.84	0.15	**<u>5.1</u>**
Zinc	mg/kg	1,500		**<u>5700</u>**	660	<340	<550	<250	**<u>6600</u>**	190	330	140
Zinc Leachate	mg/L	500		NA	NA	NA	NA	NA	41	9.6	15	12

Notes:
Lab Dup - Laboratory Duplicate
[1] Nova Scotia Guidelines for Disposal of Contaminated Solids in Landfills (NSE, 2005)
<u>BOLD/UNDERLINE</u> - Exceeds NS Guidelines for Disposal of Contaminated Solids in Landfills
NA - Not Analyzed

Table 10

Concrete Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	NSE Tier 1 EQS - Non-Potable, Coarse, Commercial [1]	Sample ID	T #6	T #6 Lab Dup	T #13	T #14	T #20	T #24	T #157	T #159	T #161	T #164	T #166	T #168
			Sample Date	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Aroclor 1016	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1221	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1232	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1248	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1242	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1254	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aroclor 1260	µg/g	NG		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Calculated Total PCB	µg/g	33		<0.50	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Notes:
[1] Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for Soil at a Non-Potable Site - Coarse Soil Type, Commercial Land Use (July 6, 2013)
"-" - Not Applicable/Not Analyzed
Lab Dup - Laboratory Duplicate
PCB - Polychlorinated Biphenyls
NG - No Guideline
BOLD/UNDERLINE - Exceeds criteria

Table 11

PILC Analytical Results - Polychlorinated Biphenyls (PCBs)
Updated Phase II Environmental Site Assessment
Charlottetown Thermal Generation Station
50 Cumberland Street, Charlottetown, PEI

PCBs	Units	PCB Regulations SOR/2008 273 [1]	Sample ID	4160 (OLD END) Oil	4160 (OLD END) Lab Dup Oil	4160 (OLD END) Paper
			Sample Date	12/18/2017	12/18/2017	12/18/2017
Aroclor 1016	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1221	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1232	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1248	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1242	µg/g	NG		<0.050	<0.050	<0.050
Aroclor 1254	µg/g	NG		7.0	6.3	2.8
Aroclor 1260	µg/g	NG		<0.050	<0.050	<0.050
Calculated Total PCB	µg/g	2		**<u>7.0</u>**	-	**<u>2.8</u>**

Notes:

[1] Part 2 of the PCB regulations (SOR/2008 273) of the Canadian Environmental Protection Act, 2008 and amended in 2015
"-" - Not Applicable/Not Analyzed
Lab Dup - Laboratory Duplicate
PCB - Polychlorinated Biphenyls
NG - No Guideline
<u>BOLD /UNDERLINE</u> - Exceeds criteria

Appendix A
Site Photographs

Photo 1 Hydroexcavating at MW-2, looking south.

Photo 2 RL Dennis using ground penetrating radar to mark out utilities in the ground prior to hydroexcavating MW-4, looking southeast.

Site Photographs

Photo 3 CME 55 track mounted drill rig setting up on MW-12, looking west.

Photo 4 Geotechnical assessment of soil in split spoon from MW-12.

Site Photographs

Photo 5 Paint sample PS-4 and sampling area. Concrete floor in CT3 BOP area basement.

Photo 6 Paint sample PS-5 and sampling area. Concrete wall in CT3 BOP area basement.

Site Photographs

Photo 7 Spoil pile area (hydroexcavated material) located near MW-2, looking east.

Site Photographs

Appendix B
Borehole Logs

REFERENCE No.: 11149943-07 ENCLOSURE No.:

BOREHOLE No.: MW-1

ELEVATION: 2.23 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

DESCRIBED BY: MCG CHECKED BY: LW

DATE (START): 11 December 2017 DATE (FINISH): 11 December 2017

LEGEND

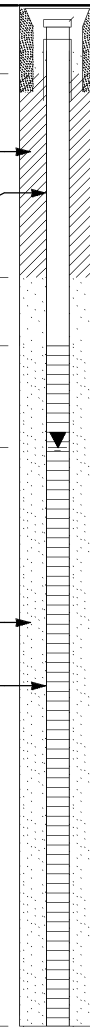
- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Metres)	Elevation (m) BGS	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)
0.00	2.23	GROUND SURFACE						
0.15	2.08	Asphalt						
		Reddish Brown, compact, Clayey Silt and Sand	1	-		0	Grab	-
			2	-		0	Grab	-
			3	100		0	4/4/4/6	8
3.12	-0.89		4	70	*	0	3/5/50 5"	ref
4.5	-2.27	Reddish Brown Sandstone	5	-		-	Augered	-

END OF BOREHOLE 4.5m

* Sample Sent For Analysis

REMARKS



WELL LOG 11149943-FR.GPJ INSPEC_SOL.GDT 27/2/18

REFERENCE No.: 11149943-07 ENCLOSURE No.:

BOREHOLE No.: **MW-2**

ELEVATION: 2.81 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

DESCRIBED BY: MCG CHECKED BY: LW

DATE (START): 13 December 2017 DATE (FINISH): 13 December 2017

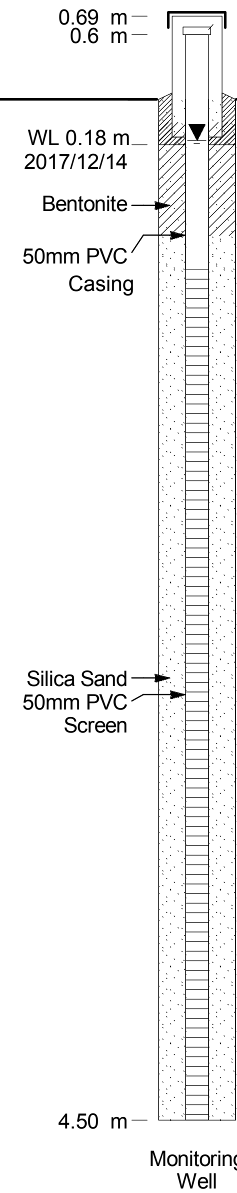
LEGEND

- ☒ SSE - SPLIT SPOON
- ▨ STE - SHELBY TUBE
- ▮ RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Metres)	Elevation (m) BGS	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)
	2.81	GROUND SURFACE						
0.0		Greyish Brown, loose Sand with asphalt debris, fill Wet at 1.5m						
			1	-		0	Grab	-
			2	-		0	Grab	-
2.10	0.71	Reddish Brown, loose, Clayey, Silt and Sand						
			3	70		10	1/1/1/0	2
3.30	-0.49	Reddish Brown, loose, Silty, Sandy, Clay	4	70		15	0/1/2/1	3
			5	50		25	1/2/2/5	4
			6	30		20	5/4/5/6	9
			7	40	*	100	4/3/3/5	6
5.5	-2.69	END OF BOREHOLE 5.5m * Sample Sent For Analysis						

Depth scale: Feet 1–19; Metres 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5

REMARKS



REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: MW-3

ELEVATION: 2.37 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

DESCRIBED BY: MCG CHECKED BY: LW

DATE (START): 13 December 2017 DATE (FINISH): 13 December 2017

LEGEND

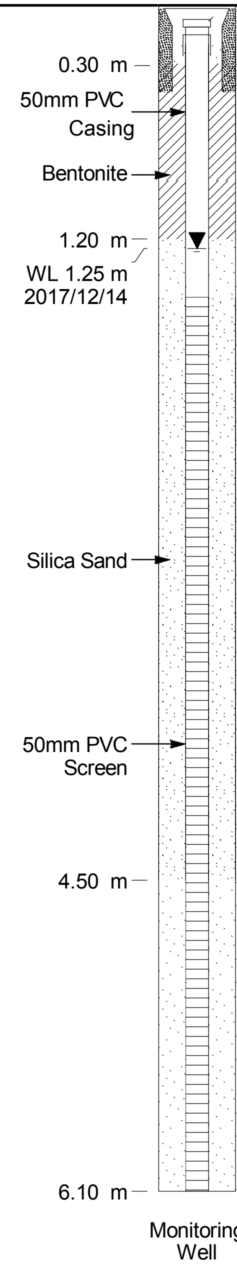
SSE - SPLIT SPOON
STE - SHELBY TUBE
RCE - ROCK CORE
- WATER LEVEL
O.V.C. - ORGANIC VAPOR CONC.
CHEM - CHEMICAL ANALYSIS

Depth (Metres)	Elevation (m) BGS	Description of Soil and Bedrock
	2.37	GROUND SURFACE
0.15	2.22	Sand and Gravel fill
		Compact Reddish Brown, Clayey Silt and Sand, some Blackish Red with tar odours from 1.5 to 2.7m
5.35	-2.98	Reddish Brown Sandstone
6.10	-3.73	END OF BOREHOLE 6.1m

Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)
1	-		0	Grab	-
2	-		0	Grab	-
3	70	*	10	4/6/8/8	14
4	70		55	7/29/10/7	39
5	70		5	12/10/15/24	25
6	40		310	15/22/23/18	45
7	70	*	430	7/5/5/24	10
8	20		310	13/50 4"	ref
9	-		-	Augered	-

* Sample Sent For Analysis

REMARKS



REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: **MW-4**

ELEVATION: 1.87 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

DESCRIBED BY: MCG   CHECKED BY: LW

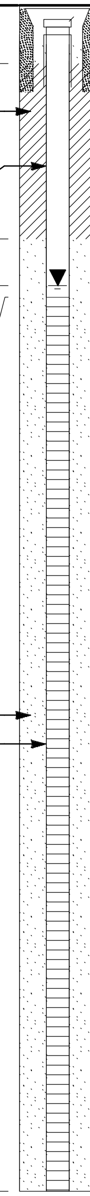
DATE (START): 12 December 2017   DATE (FINISH): 12 December 2017

LEGEND

- ☒ SSE - SPLIT SPOON
- ▨ STE - SHELBY TUBE
- ◨ RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Metres)	Elevation (m) BGS	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)	REMARKS
	1.87	GROUND SURFACE							
0.15	1.72	Asphalt							
		Reddish Brown Sand with some Silt							0.30 m; Bentonite
0.90	0.97	Compact Reddish Brown, Clayey Silt and Sand	1	-		0	Grab	-	50mm PVC casing; 1.20 m; WL 1.44 m 2017/12/14; 1.50 m
			2	70		0	3/8/8/4	16	
			3	70		20	5/3/3/10	6	
3.70	-1.83	Reddish Brown Sandstone	4	45	*	40	11/18/50 1"	ref	Silica Sand; 50mm PVC Screen
			5	-		-	Augered	-	
6.10	-4.23	END OF BOREHOLE 6.1m							6.10 m

* Sample Sent For Analysis



Monitoring Well

REFERENCE No.: 11149943-07 ENCLOSURE No.:

GHD

BOREHOLE No.: **MW-5**
ELEVATION: 2.59 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric
PROJECT: Updated Phase II ESA
LOCATION: 50 Cumberland Street, Charlottetown, PEI
DESCRIBED BY: MCG CHECKED BY: LW
DATE (START): 12 December 2017 DATE (FINISH): 12 December 2017

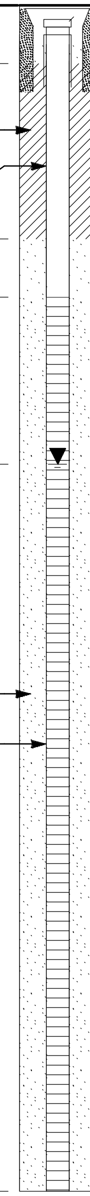
LEGEND

- ☒ SSE - SPLIT SPOON
- ▨ STE - SHELBY TUBE
- ◨ RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)
		2.59	GROUND SURFACE						
	0.15	2.44	Sand and Gravel fill						
1			Reddish Brown, compact, Clayey Silt and Sand, some layers of ash from 0.6-2.1m	1	60		10	11/13/19/11	31
3	1.0			2	80		5	11/8/5/5	13
5				3	60		10	1/1/1/5	2
7	2.0			4	30		-	5/5/6/12	11
9				5	75		0	5/7/8/11	15
11	3.0			6	60	*	15	4/5/5/5	10
13	4.0	-1.41	Reddish Brown Sandstone	7	50		0	6/6/50 3"	ref
17	5.0			8	-		-	Augered	-
20	6.0 6.10	-3.51	END OF BOREHOLE 6.1m						

* Sample Sent For Analysis

REMARKS



REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: **MW-6**

ELEVATION: 2.50 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

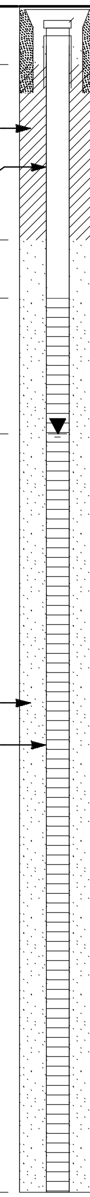
DESCRIBED BY: MCG CHECKED BY: LW

DATE (START): 12 December 2017 DATE (FINISH): 12 December 2017

LEGEND

- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)	REMARKS
		2.50	GROUND SURFACE							
0	0.00		Reddish Brown, compact, Clayey Silt and Sand. Grass at surface							0.30 m
										Bentonite
										50mm PVC casing
4				1	-		0	Grab	-	1.20 m
										1.50 m
6				2	-		0	Grab	-	
										WL 2.20 m 2017/12/14
8				3	75		10	11/11/7/5	18	
10				4	70	*	15	5/3/2/3	5	
12	3.70	-1.21	Reddish Brown Sandstone	5	80		5	11/18/50 1"	ref	Silica Sand
										50mm PVC Screen
16.5				6	-		-	Augered	-	
20	6.10	-3.61	END OF BOREHOLE 6.1m							6.10 m
			* Sample Sent For Analysis							Monitoring Well



REFERENCE No.: 11149943-07 ENCLOSURE No.:

GHD

BOREHOLE No.: MW-7
ELEVATION: 2.44 m

BOREHOLE REPORT

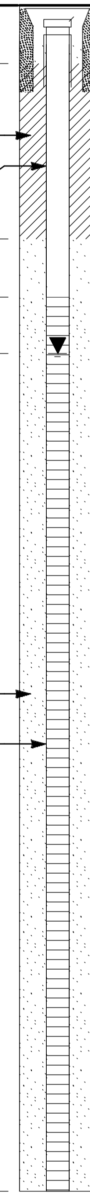
Page: 1 of 1

CLIENT: Maritime Electric
PROJECT: Updated Phase II ESA
LOCATION: 50 Cumberland Street, Charlottetown, PEI
DESCRIBED BY: MCG CHECKED BY: LW
DATE (START): 13 December 2017 DATE (FINISH): 13 December 2017

LEGEND

- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)	REMARKS
		2.44		GROUND SURFACE								
1				Reddish Brown, compact, Clayey Silt and Sand. Grass at surface		1	80		0	0/2/4/4	6	0.30 m
3	0.45	1.99		Ash		2	40	*	5	5/4/2/3	6	Bentonite; 50mm PVC casing; 1.20 m
5						3	70		0	3/5/2/3	7	1.50 m
7	1.80	0.64		Reddish Brown, compact, Clayey Silt and Sand with weathered Sandstone cobbles		4	70		35	2/2/2/15	4	WL 1.79 m 2017/12/14
9						5	80	*	590	5/7/7/5	14	
11						6	70		35	2/3/5/10	8	Silica Sand
13						7	80	*	5	6/7/3/7	10	50mm PVC Screen
15						8	0		-	3/2/2/5	4	
17						9	0		-	1/3/4/14	7	
19						10	10		-	3/6/4/3	10	
20	6.10	-3.66		END OF BOREHOLE 6.1m								6.10 m
				* Sample Sent For Analysis								Monitoring Well



REFERENCE No.: 11149943-07 ENCLOSURE No.:

	BOREHOLE No.: MW-8 ELEVATION: 2.75 m	**BOREHOLE REPORT** Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

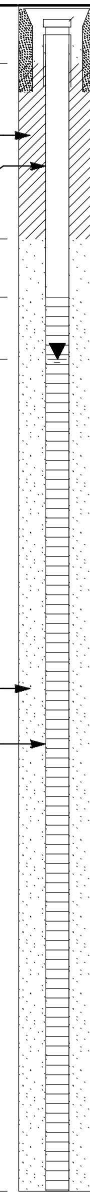
DESCRIBED BY: MCG CHECKED BY: LW

DATE (START): 13 December 2017 DATE (FINISH): 13 December 2017

LEGEND

- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Other Tests	Organic Vapor	Blows per 6 in. / 15 cm	Penetraion Index	REMARKS
Feet	Metres	2.75		GROUND SURFACE			%		ppm		N	
				Reddish Brown to blackish brown, compact, Clayey Silt and Sand								
1						1	70		0	1/3/11/11	14	0.30 m
2												Bentonite
3	1.0					2	50		0	2/2/1/2	3	50mm PVC casing
4	1.20	1.55		Grey, Clayey Silt								1.20 m
5						3	60		10	0/0/0/0	0	1.50 m
6												WL 1.82 m 2017/12/14
7	2.0					4	60		15	0/0/0/0	0	
8												
9						5	80		5	1/0/1/0	1	
10	3.0											
11						6	70		10	0/1/3/5	4	
	3.50	-0.76		Reddish Brown, compact, Clayey Silt and Sand with some weathered rock								Silica Sand
12												50mm PVC Screen
13	4.0					7	60	*	100	3/4/7/10	11	
14												
15						8	50		80	4/5/7/10	12	
16	5.0											
17						9	50	*	150	2/4/4/12	8	
18												
19						10	40		55	4/4/5/4	9	
20	6.0 / 6.10	-3.36		END OF BOREHOLE 6.1m								6.10 m
21												Monitoring Well
22				* Sample Sent For Analysis								



WELL LOG 11149943-FR.GPJ INSPEC_SOL.GDT 27/2/18

REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: MW-9

ELEVATION: 4.55 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

DESCRIBED BY: MCG

CHECKED BY: LW

DATE (START): 13 December 2017

DATE (FINISH): 13 December 2017

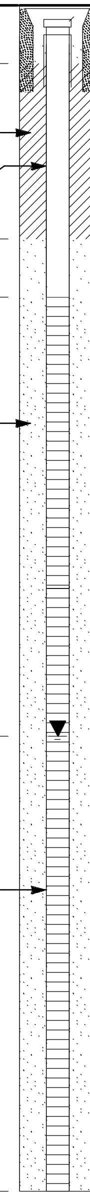
LEGEND

- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Metres)	Elevation (m) BGS	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)
0	4.55	GROUND SURFACE						
0.15	4.40	Asphalt						
		Reddish Brown, compact, Clayey Silt and Sand	1	90		0	2/3/2/2	5
			2	70	*	0	1/0/3/11	3
			3	70		50	3/3/13/11	16
			4	50		15	9/13/11/50 5"	ref
				-		-	Augered	-
3.12	1.43	Reddish Brown Sandstone	5	60	*	240	5/16/9/5	25
			6	90		10	5/4/9/9	13
			7	70		50	4/3/8/12	11
			8	50	*	130	10/20/50 5"	ref
			9	-		-	Augered	-
6.10	-1.56	END OF BOREHOLE 6.1m						

* Sample Sent For Analysis

REMARKS



WELL LOG 11149943-FR.GPJ INSPEC_SOL.GDT 27/2/18

REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: MW-10
ELEVATION: 2.83 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT:	Maritime Electric
PROJECT:	Updated Phase II ESA
LOCATION:	50 Cumberland Street, Charlottetown, PEI
DESCRIBED BY:	MCG
CHECKED BY:	LW
DATE (START):	13 December 2017
DATE (FINISH):	13 December 2017

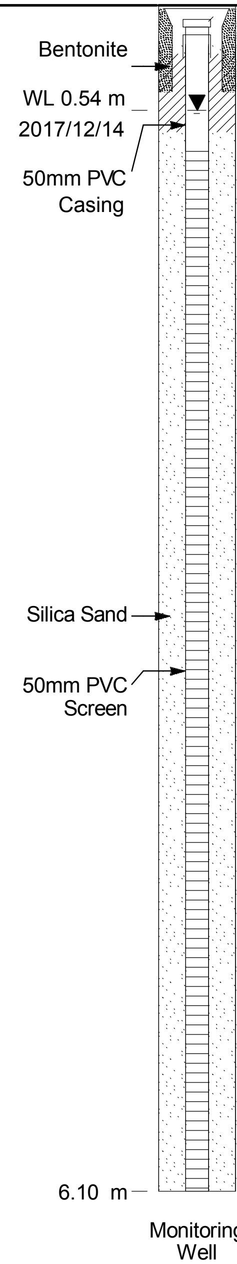
LEGEND

- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Metres)	Elevation (m) BGS	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery (%)	Other Tests	Organic Vapor (ppm)	Blows per 6 in. / 15 cm	Penetraion Index (N)
	2.83	GROUND SURFACE						
0		Reddish Brown, loose, Clayey Silt and Sand Blackish Brown layer from 0.6-1.2m	1	90	*	0	1/1/1/1	2
			2	80	*	0	1/2/3/5	5
1.20	1.63	Reddish Grey, loose, Clayey Silt and Sand	3	70		15	1/2/2/0	4
			4	80		15	2/0/1/1	1
			5	40		5	0/0/1/0	1
3.0	-0.17	Grey Brown, loose, depositional, Silty, Clayey Sand, with some sea shells	6	60		0	0/0/0/0	0
			7	80		15	0/1/0/0	1
			8	40	*	20	0/0/0/1	0
			9	50		5	1/1/1/2	2
			10	30		0	1/0/2/1	2
6.10	-3.27	END OF BOREHOLE 6.1m						

* Sample Sent For Analysis

REMARKS



REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: **MW-11**

ELEVATION: 3.78 m

BOREHOLE REPORT

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

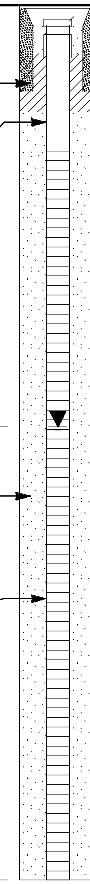
DESCRIBED BY: MCG　　CHECKED BY: LW

DATE (START): 13 December 2017　　DATE (FINISH): 13 December 2017

LEGEND

- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Other Tests	Organic Vapor	Blows per 6 in. / 15 cm	Penetraion Index	REMARKS
		3.78		GROUND SURFACE			%		ppm		N	
1				Reddish Brown, loose, Clayey Silt and Sand with bits of ash and broken glass		1	70	*	0	1/1/3/2	4	Bentonite
2	0.60	3.18		Reddish Brown, loose, Clayey Silt and Sand								50mm PVC Casing
3	1.0					2	40		0	1/1/4/3	5	
5						3	70		15	3/2/0/3	2	
7	2.0					4	60	*	130	7/5/5/5	10	WL 2.17 m 2017/12/14
8	2.40	1.38		Grey Brown, loose, depositional, Silty, Clayey Sand, with some sea shells								Silica Sand
9						5	70		60	2/2/1/2	3	
10	3.0											50mm PVC Screen
11						6	60		0	0/0/0/0	0	
13	4.0					7	70		0	0/1/0/1	1	
15						8	0		5	0/0/0/0	0	4.50 m
16	5.0											Monitoring Well
17						9	20		0	0/1/1/3	2	
18	5.50	-1.72		END OF BOREHOLE 5.5m								
19–22	6.0			* Sample Sent For Anlysis								



REFERENCE No.: 11149943-07 ENCLOSURE No.:

BOREHOLE No.: MW-12
ELEVATION: 1.88 m

BOREHOLE REPORT

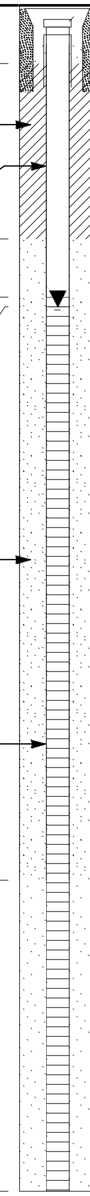
Page: 1 of 1

CLIENT: Maritime Electric
PROJECT: Updated Phase II ESA
LOCATION: 50 Cumberland Street, Charlottetown, PEI
DESCRIBED BY: MCG CHECKED BY: LW
DATE (START): 12 December 2017 DATE (FINISH): 12 December 2017

LEGEND

- ☒ SSE - SPLIT SPOON
- ▨ STE - SHELBY TUBE
- ◫ RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Other Tests	Organic Vapor	Blows per 6 in. / 15 cm	Penetraion Index	REMARKS
Feet	Metres	1.88		GROUND SURFACE			%		ppm		N	
				Reddish Brown, loose, Silty Sand and Gravel fill								
1	0.30	1.58		Black ash	☒	1	70		0	6/9/4/4	13	0.30 m
2					☒							Bentonite
3	1.0				☒	2	0		0	4/5/3/4	8	50mm PVC Casing
4					☒							1.20 m
5	1.50	0.38		Reddish Brown, loose to compact, Clayey Silt and Sand with some cobbles	☒	3	60	*	10	2/2/5/6	7	1.50 m WL 1.55 m 2017/12/14
6	2.0				☒							
7					☒	4	55		0	4/3/2/3	5	
8					☒							
9					☒	5	100		0	2/3/3/4	6	Silica Sand
10	3.0				☒							
11					☒	6	80		0	6/10/10/10	20	
12					☒							
13	4.0				☒	7	70		0	9/11/15/8	26	50mm PVC Screen
14					☒							
15					☒	8	40		0	8/7/9/10	16	4.50 m
16	5.0				☒							
17					☒	9	40	*	250	15/10/12/20	22	
18					☒							
19					☒	10	50		0	22/33/24/27	57	
20	6.0 6.10	-4.22										6.10 m
21				END OF BOREHOLE 6.1m								Monitoring Well
22				* Sample Sent For Analysis								



WELL LOG 11149943-FR.GPJ INSPEC_SOL.GDT 27/2/18

REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: **SP-1**

ELEVATION: 0.92 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

DESCRIBED BY: MCG

CHECKED BY: LW

DATE (START): 11 December 2017

DATE (FINISH): 11 December 2017

LEGEND

- ☒ SSE - SPLIT SPOON
- ▨ STE - SHELBY TUBE
- ◨ RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Other Tests	Organic Vapor	Blows per 6 in. / 15 cm	Penetraion Index	REMARKS
		0.92		GROUND SURFACE			%		ppm		N	
				Reddish Brown, compact, Clayey Silt and Sand								
						1	-		0	Grab	-	
						2	-		0	Grab	-	
					☒	3	80		0	9/8/10/13	18	
					☒	4	80	*	0	7/7/6/9	13	
					☒	5	70		0	6/5/8/9	12	
	4.0	-3.09		Reddish Brown Sandstone	☒	6	40		0	10/18/50 4"	ref	
	4.30	-3.39		END OF BOREHOLE 4.3m								
				* Sample Sent For Analysis								

WELL LOG 11149943-FR.GPJ INSPEC_SOL.GDT 27/2/18

REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: SP-2
ELEVATION: 0.91 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric
PROJECT: Updated Phase II ESA
LOCATION: 50 Cumberland Street, Charlottetown, PEI
DESCRIBED BY: MCG
CHECKED BY: LW
DATE (START): 12 December 2017
DATE (FINISH): 12 December 2017

LEGEND

- SSE - SPLIT SPOON
- STE - SHELBY TUBE
- RCE - ROCK CORE
- ▼ - WATER LEVEL
- O.V.C. - ORGANIC VAPOR CONC.
- CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Other Tests	Organic Vapor	Blows per 6 in. / 15 cm	Penetraion Index	REMARKS
Feet	Metres	0.91		GROUND SURFACE			%		ppm		N	
				Asphalt with Reddish Brown, Sand and Gravel fill								
1	0.30	0.61		Reddish Brown, compact, Clayey Silt and Sand, wet at 1.8m								
2	0.5				SSE	1	50		0	2/3/2/2	5	
3	1.0											
4					SSE	2	70		5	2/5/3/5	8	
5	1.5											
6					SSE	3	85		5	5/8/8/9	16	
7	2.0											
8	2.5				SSE	4	65	*	560	7/6/8/11	14	
9												
10	3.0				SSE	5	80		160	4/5/6/6	11	
11												
12	3.5				SSE	6	90	*	1300	7/8/10/6	18	
13	4.0											
14					SSE	7	70		15	8/15/11/12	26	
15	4.5											
16	4.90 / 5.0	-3.99		Reddish Brown Sandstone	SSE	8	30		10	20/43/50 5"	ref	
17	5.20	-4.29										
18	5.5			END OF BOREHOLE 5.2m								
19				* Sample Sent For Analysis								

WELL LOG 11149943-FR.GPJ INSPEC_SOL.GDT 27/2/18

REFERENCE No.: 11149943-07

ENCLOSURE No.:

BOREHOLE No.: **SP-3**

ELEVATION: 1.07 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Maritime Electric

PROJECT: Updated Phase II ESA

LOCATION: 50 Cumberland Street, Charlottetown, PEI

DESCRIBED BY: MCG CHECKED BY: LW

DATE (START): 12 December 2017 DATE (FINISH): 12 December 2017

LEGEND

☒ SSE - SPLIT SPOON
▨ STE - SHELBY TUBE
◨ RCE - ROCK CORE
▼ - WATER LEVEL
O.V.C. - ORGANIC VAPOR CONC.
CHEM - CHEMICAL ANALYSIS

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery	Other Tests	Organic Vapor	Blows per 6 in. / 15 cm	Penetraion Index	REMARKS
Feet	Metres	1.07		GROUND SURFACE			%		ppm		N	
				Reddish Brown, Sand and Gravel fill								
1	0.30	0.77		Reddish Brown, compact, Clayey Silt and Sand	☒	1	60		0	23/11/7/11	18	
3					☒	2	60		0	11/5/5/6	10	
5					☒	3	70		10	4/3/4/7	7	
7					☒	4	50		0	6/8/13/12	21	
9					☒	5	90	*	200	8/7/8/7	15	
11					☒	6	70		15	1/1/2/3	3	
13	4.0	-2.93		Reddish Brown Sandstone	☒	7	45		25	8/7/50 5"	ref	
14	4.30	-3.23		END OF BOREHOLE 4.3m								
				* Sample Sent For Analysis								

WELL LOG 11149943-FR.GPJ INSPEC_SOL.GDT 27/2/18

Appendix C
Laboratory Certificates

Your P.O. #: 73509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B64248, B64247

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2018/01/11
Report #: R4934738
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7S8580
Received: 2017/12/19, 10:01

Sample Matrix: Paint
Samples Received: 20

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction	9	2018/01/09	2018/01/09	ATL SOP 00058	EPA 6020A R1 m
Metals Leach TCLP/CGSB extraction	1	2018/01/09	2018/01/10	ATL SOP 00058	EPA 6020A R1 m
Metals Paint Acid Extr. ICPMS	20	2017/12/22	2017/12/22	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH	10	N/A	2018/01/09	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight	10	N/A	2018/01/09	ATL SOP 00035	EPA 1311 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your P.O. #: 73509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B64248, B64247

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2018/01/11
Report #: R4934738
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7S8580
Received: 2017/12/19, 10:01

Encryption Key

Sara Mason
Sara Mason
Project Manager Assistant
11 Jan 2018 15:04:35

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S8580
Report Date: 2018/01/11

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

RESULTS OF ANALYSES OF PAINT

Maxxam ID		FUM875	FUM876	FUM878	FUM879	FUM880	FUM881	FUM883	
Sampling Date		2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	
COC Number		B64248	B64248	B64248	B64248	B64248	B64248	B64248	
	UNITS	PS-1	PS-2	PS-4	PS-5	PS-6	PS-7	PS-9	QC Batch
Inorganics									
Sample Weight (as received)	g	4.0	5.1	22	30	50	10	15	5343501
Initial pH	N/A	5.0	5.0	5.0	5.3	4.9	4.9	5.0	5343502
Final pH	N/A	5.5	5.6	5.3	6.4	5.1	5.0	5.2	5343502
QC Batch = Quality Control Batch									

Maxxam ID		FUM891	FUM899	FUM900	
Sampling Date		2017/12/13	2017/12/13	2017/12/13	
COC Number		B64247	B64247	B64247	
	UNITS	PS-11	PS-19	PS-20	QC Batch
Inorganics					
Sample Weight (as received)	g	4.2	9.4	18	5343501
Initial pH	N/A	5.0	5.0	5.0	5343502
Final pH	N/A	5.4	5.6	6.7	5343502
QC Batch = Quality Control Batch					

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S8580
Report Date: 2018/01/11

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ELEMENTS BY ICP/MS (PAINT)

Maxxam ID		FUM875	FUM876	FUM878	FUM879	FUM880	FUM881	FUM883		
Sampling Date		2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13		
COC Number		B64248	B64248	B64248	B64248	B64248	B64248	B64248		
	UNITS	**PS-1**	**PS-2**	**PS-4**	**PS-5**	**PS-6**	**PS-7**	**PS-9**	**RDL**	**QC Batch**
Metals										
Leachable Lead (Pb)	ug/L	1100	2600	370	190	580	3600	160	5.0	5344855
Leachable Zinc (Zn)	ug/L	2300	3700	7800	3700	38000	5000	55000	50	5344855

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUM891	FUM899		FUM900		
Sampling Date		2017/12/13	2017/12/13		2017/12/13		
COC Number		B64247	B64247		B64247		
	UNITS	**PS-11**	**PS-19**	**RDL**	**PS-20**	**RDL**	**QC Batch**
Metals							
Leachable Lead (Pb)	ug/L	300	7600	5.0	15	5.0	5344855
Leachable Zinc (Zn)	ug/L	51000	3000	50	620000	500	5344855

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S8580
Report Date: 2018/01/11

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FUM875	FUM876	FUM877	FUM878	FUM879	FUM880	FUM881		
Sampling Date		2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13		
COC Number		B64248	B64248	B64248	B64248	B64248	B64248	B64248		
	UNITS	**PS-1**	**PS-2**	**PS-3**	**PS-4**	**PS-5**	**PS-6**	**PS-7**	**RDL**	**QC Batch**
Metals										
Acid Extractable Lead (Pb)	mg/kg	1700	2900	350	1800	810	1800	4300	5.0	5328766
Acid Extractable Zinc (Zn)	mg/kg	190	310	420	760	870	6700	630	50	5328766

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUM882	FUM883	FUM884	FUM891	FUM892	FUM893	FUM894		
Sampling Date		2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13		
COC Number		B64248	B64248	B64248	B64247	B64247	B64247	B64247		
	UNITS	**PS-8**	**PS-9**	**PS-10**	**PS-11**	**PS-12**	**PS-13**	**PS-14**	**RDL**	**QC Batch**
Metals										
Acid Extractable Lead (Pb)	mg/kg	400	520	1800	1400	510	4200	2200	5.0	5328766
Acid Extractable Zinc (Zn)	mg/kg	2900	8300	7300	2000	840	620	1100	50	5328766

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUM895	FUM896	FUM896	FUM896	FUM897	FUM898	FUM899		
Sampling Date		2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13		
COC Number		B64247	B64247	B64247	B64247	B64247	B64247	B64247		
	UNITS	**PS-15**	**PS-16**	**PS-16 Lab-Dup**	**PS-16 Lab-Dup 2**	**PS-17**	**PS-18**	**PS-19**	**RDL**	**QC Batch**
Metals										
Acid Extractable Lead (Pb)	mg/kg	5600	670	440 (1)	510	18	<5.0	12000	5.0	5328766
Acid Extractable Zinc (Zn)	mg/kg	850	240	71 (1)	84 (2)	1200	140	440	50	5328766

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Poor RPD due to sample inhomogeneity. Results confirmed by repeat digestion and analysis.
(2) Poor RPD due to sample inhomogeneity.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S8580
Report Date: 2018/01/11

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FUM900		
Sampling Date		2017/12/13		
COC Number		B64247		
	UNITS	**PS-20**	**RDL**	**QC Batch**
Metals				
Acid Extractable Lead (Pb)	mg/kg	160	5.0	5328766
Acid Extractable Zinc (Zn)	mg/kg	120000	50	5328766

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S8580
Report Date: 2018/01/11

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.7°C

Revised Report: Added Leachate + Lead and Zinc to the below listed samples as per request from Mario. HWS Jan 5/18
FUM875
FUM876
FUM878
FUM879
FUM880
FUM881
FUM883
FUM891
FUM899
FUM900

Sample FUM875 [PS-1] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM876 [PS-2] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM878 [PS-4] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM879 [PS-5] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM880 [PS-6] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM881 [PS-7] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM883 [PS-9] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM891 [PS-11] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM899 [PS-19] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FUM900 [PS-20] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S8580
Report Date: 2018/01/11

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5328766	Acid Extractable Lead (Pb)	2017/12/22	NC (1)	75 - 125	99	75 - 125	<5.0	mg/kg	41 (2,3)	35
5328766	Acid Extractable Zinc (Zn)	2017/12/22	NC (1)	75 - 125	101	75 - 125	<50	mg/kg	108 (2,3)	35
5343501	Sample Weight (as received)	2018/01/09					NA	g		
5344855	Leachable Lead (Pb)	2018/01/09	NC (4)	75 - 125	97	N/A	<5.0	ug/L		
5344855	Leachable Zinc (Zn)	2018/01/09	NC (4)	75 - 125	96	N/A	<50	ug/L		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

(1) Matrix Spike Parent ID [FUM896-01]

(2) Poor RPD due to sample inhomogeneity. Results confirmed by repeat digestion and analysis.

(3) Duplicate Parent ID [FUM896-01]

(4) Matrix Spike Parent ID [FUM876-01]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S8580
Report Date: 2018/01/11

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Eric Dearman, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your P.O. #: 73509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64246

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2018/01/03
Report #: R4927680
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S8628
Received: 2017/12/19, 10:01

Sample Matrix: ROCK
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PCBs in Solid by GC/ECD (1)	11	2017/12/28	2018/01/02	ATL SOP 00105	EPA 8082A m
PCB Aroclor sum (solid)	11	N/A	2018/01/02	N/A	Auto Calc.

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Samples were analyzed for PCB using an accredited standard procedure modified for a non-standard matrix. Best laboratory practice and all routine QC procedures were employed. The accreditation does not extend to the matrix analyzed.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your P.O. #: 73509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64246

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2018/01/03
Report #: R4927680
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S8628
Received: 2017/12/19, 10:01

Encryption Key

Sara Mason
Project Manager Assistant
03 Jan 2018 17:18:23

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S8628
Report Date: 2018/01/03

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

POLYCHLORINATED BIPHENYLS BY GC-ECD (ROCK)

Maxxam ID		FUN038			FUN038			FUN039	FUN040	FUN041		
Sampling Date		2017/12/14			2017/12/14			2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64246			B 64246			B 64246	B 64246	B 64246		
	UNITS	T #6	RDL	QC Batch	T #6 Lab-Dup	RDL	QC Batch	T #13	T #14	T #20	RDL	QC Batch
PCBs												
Aroclor 1016	mg/kg	<0.50	0.50	5334037	<0.50	0.50	5334037	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1221	mg/kg	<0.50	0.50	5334037	<0.50	0.50	5334037	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1232	mg/kg	<0.50	0.50	5334037	<0.50	0.50	5334037	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1248	mg/kg	<0.50	0.50	5334037	<0.50	0.50	5334037	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1242	mg/kg	<0.50	0.50	5334037	<0.50	0.50	5334037	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1254	mg/kg	<0.50	0.50	5334037	<0.50	0.50	5334037	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1260	mg/kg	<0.50	0.50	5334037	<0.50	0.50	5334037	<0.50	<0.50	<0.50	0.50	5334037
Calculated Total PCB	mg/kg	<0.50	0.50	5325772				<0.50	<0.50	<0.50	0.50	5325772
Surrogate Recovery (%)												
Decachlorobiphenyl	%	84		5334037	100		5334037	74	96	100		5334037

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		FUN042	FUN043	FUN044	FUN045	FUN046	FUN047	FUN048		
Sampling Date		2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64246	B 64246	B 64246	B 64246	B 64246	B 64246	B 64246		
	UNITS	T #24	T #157	T #159	T #161	T #164	T #166	T #168	RDL	QC Batch
PCBs										
Aroclor 1016	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1221	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1232	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1248	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1242	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1254	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5334037
Aroclor 1260	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5334037
Calculated Total PCB	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5325772
Surrogate Recovery (%)										
Decachlorobiphenyl	%	83	99	106	106	106	103	107		5334037

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S8628
Report Date: 2018/01/03

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.7°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S8628
Report Date: 2018/01/03

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5334037	Decachlorobiphenyl	2018/01/02	107 (1)	30 - 130	102	30 - 130	101	%		
5334037	Aroclor 1016	2018/01/02					<0.50	mg/kg	NC (2)	50
5334037	Aroclor 1221	2018/01/02					<0.50	mg/kg	NC (2)	50
5334037	Aroclor 1232	2018/01/02					<0.50	mg/kg	NC (2)	50
5334037	Aroclor 1242	2018/01/02					<0.50	mg/kg	NC (2)	50
5334037	Aroclor 1248	2018/01/02					<0.50	mg/kg	NC (2)	50
5334037	Aroclor 1254	2018/01/02	43 (1)	30 - 130	105	30 - 130	<0.50	mg/kg	NC (2)	50
5334037	Aroclor 1260	2018/01/02					<0.50	mg/kg	NC (2)	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [FUN038-01]

(2) Duplicate Parent ID [FUN038-01]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Phil Deveau, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Analytics

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64246 Page 1 of 2

This column for lab use only:
Client Code:
Maxxam Job #: B7S 8628

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			9	11	9	

Integrity: YES / NO (NO circled) — Integrity / Checklist by: BM
Labelled by: — Location / Bin #:

INVOICE INFORMATION:
Company Name: GHD Ltd
Contact Name: Troy Small
Address: 466 Hodgson Rd
Fredericton, NB Postal Code E3C 2G5
Email: troy.small@ghd.com
Ph: (506) 458-1248 Fax: (506) 462-7464

REPORT INFORMATION (if differs from invoice):
Company Name:
Contact Name:
Address:
Postal Code
Email:
Ph: Fax:

PO #: 73509971
Project # / Phase #: 11149947-07
Project Name / Site Location: Maritime Electric
Quote:
Site #:
Task Order #:
Sampled by: M. Gaines / M. Theriault

TURNAROUND TIME
Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

Analysis columns: Field Filtered & Preserved; Lab Filtration Required; RCAP-30 (Choose Total or Diss Metals); RCAP-MS (Choose Total or Diss Metals); Metals Water: Total Digest (Default Method) for well water, surface water; Dissolved for ground water; Mercury; Metals Soil: Metals & Mercury Default Available Digest Method; Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4); Mercury Low level by Cold Vapour AA; Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural; Hot Water soluble Boron (required for CCME Agricultural); Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32); Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32; NB Potable Water BTEX, VPH, Low level T.E.H.; TPH Fractionation; PAH's; PAH's with Acridine, Quinoline; PCB's

#	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	PCB's
1	T#6	Concrete	2017/12/14	1 bag	N	N	✓
2	T#13	Concrete	2017/12/14	1 bag	N	N	✓
3	T#14	Concrete	2017/12/14	1 bag	N	N	✓
4	T#20	Concrete	2017/12/14	1 bag	N	N	✓
5	T#24	Concrete	2017/12/14	1 bag	N	N	✓
6	T#157	Concrete	2017/12/14	1 bag	N	N	✓
7	T#159	Concrete	2017/12/14	1 bag	N	N	✓
8	T#161	Concrete	2017/12/14	1 bag	N	N	✓
9	T#164	Concrete	2017/12/14	1 bag	N	N	✓
10	T#166	Concrete	2017/12/14	1 bag	N	N	✓

2017 DEC 19 10:0

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec 18/17	14:00	shipped from FREDTON — D Albert		

White: Maxxam Yellow: Mail Pink: Client ATL FCD 00149 / Revision 8 11/08

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64245 Page 2 of 2

This column for lab use only:	
Client Code	
Maxxam Job #	B7S8628

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			9	11	9	

Integrity: YES NO (NO circled)
Integrity / Checklist by: BM
Labelled by:
Location / Bin #:

INVOICE INFORMATION:
Company Name: GHD Ltd
Contact Name: Troy Small
Address: 466 Hodgson Rd
Fredericton, NB Postal Code E3C 2G5
Email: troy.small@ghd.com
Ph: (506) 458-1248 Fax: (506) 462-7646

REPORT INFORMATION (if differs from invoice):
Company Name:
Contact Name:
Address:
Postal Code
Email:
Ph: Fax:

PO #: 73509971
Project # / Phase #: 11149943-07
Project Name / Site Location: Maritime Electric
Quote:
Site #:
Task Order #:
Sampled by: M. Gaines / M. Theriault

TURNAROUND TIME
Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline	PCB's				
1	T# 168	concrete	2017/12/14	1 bag	N	N																	✓				
2																											
3																											
4																											
5																											
6																											
7																											
8																											
9																											
10																											

2017 DEC 19 10:01

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 18/17	14:00	D Albert		

Shipped from FREDTON

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 8 11/08

Your P.O. #: 73509971
Your Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64244, B 64243, B 64242

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2017/12/29
Report #: R4924406
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S9013
Received: 2017/12/19, 19:02

Sample Matrix: Soil
Samples Received: 24

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Moisture	24	N/A	2017/12/21	ATL SOP 00001	OMOE Handbook 1983 m
PCBs in soil by GC/ECD (1)	2	2017/12/21	2017/12/22	ATL SOP 00106	EPA 8082A 2007 m
PCBs in soil by GC/ECD (1)	22	2017/12/28	2017/12/29	ATL SOP 00106	EPA 8082A 2007 m
PCB Aroclor sum (soil)	2	N/A	2017/12/22	N/A	Auto Calc.
PCB Aroclor sum (soil)	22	N/A	2017/12/29	N/A	Auto Calc.

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Soils are reported on a dry weight basis unless otherwise specified.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your P.O. #: 73509971
Your Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64244, B 64243, B 64242

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2017/12/29
Report #: R4924406
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S9013
Received: 2017/12/19, 19:02

Encryption Key

Sam Sherker
Bedford Client Svc
29 Dec 2017 17:02:39

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9013
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FUO972	FUO973	FUO974	FUO975	FUO976	FUO977	FUO978		
Sampling Date		2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64244	B 64244	B 64244	B 64244	B 64244	B 64244	B 64244		
	UNITS	**T#6-1**	**T#6-2**	**T#13-1**	**T#13-2**	**T#14-1**	**T#14-2**	**T#20-1**	**RDL**	**QC Batch**
Inorganics										
Moisture	%	16	17	18	21	19	16	15	1.0	5326776

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUO979	FUO980	FUO981	FUP020	FUP020	FUP021		
Sampling Date		2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64244	B 64244	B 64244	B 64243	B 64243	B 64243		
	UNITS	**T#20-2**	**T#24-1**	**T#24-2**	**T#45-1**	**T#45-1 Lab-Dup**	**T#45-2**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	18	15	19	6.6	6.0	12	1.0	5326776

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		FUP022	FUP023	FUP024	FUP025	FUP026	FUP027	FUP028		
Sampling Date		2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64243	B 64243	B 64243	B 64243	B 64243	B 64243	B 64243		
	UNITS	**T#157-1**	**T#157-2**	**T#159-1**	**T#159-2**	**T#161-1**	**T#161-2**	**T#164-1**	**RDL**	**QC Batch**
Inorganics										
Moisture	%	12	16	9.6	18	18	20	19	1.0	5326620

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUP029	FUP030	FUP031		FUP032	FUP033		
Sampling Date		2017/12/14	2017/12/14	2017/12/14		2017/12/14	2017/12/14		
COC Number		B 64243	B 64242	B 64242		B 64242	B 64242		
	UNITS	**T#164-2**	**T#166-1**	**T#166-2**	**QC Batch**	**T#168-1**	**T#168-2**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	18	9.8	15	5326620	12	10	1.0	5326776

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9013
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		FUO972	FUO973		FUO974	FUO975	FUO976	FUO977		
Sampling Date		2017/12/14	2017/12/14		2017/12/14	2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64244	B 64244		B 64244	B 64244	B 64244	B 64244		
	UNITS	**T#6-1**	**T#6-2**	**QC Batch**	**T#13-1**	**T#13-2**	**T#14-1**	**T#14-2**	**RDL**	**QC Batch**
PCBs										
Aroclor 1016	ug/g	<0.050	<0.050	5327135	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1221	ug/g	<0.050	<0.050	5327135	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1232	ug/g	<0.050	<0.050	5327135	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1248	ug/g	<0.050	<0.050	5327135	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1242	ug/g	<0.050	<0.050	5327135	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1254	ug/g	<0.050	<0.050	5327135	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1260	ug/g	0.19	<0.050	5327135	<0.050	0.079	<0.050	<0.050	0.050	5333022
Calculated Total PCB	ug/g	0.19	<0.050	5326645	<0.050	0.079	<0.050	<0.050	0.050	5326645
Surrogate Recovery (%)										
Decachlorobiphenyl	%	88	87	5327135	71	74	83	85		5333022

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUO978	FUO979	FUO980	FUO981	FUP020	FUP021	FUP022		
Sampling Date		2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64244	B 64244	B 64244	B 64244	B 64243	B 64243	B 64243		
	UNITS	**T#20-1**	**T#20-2**	**T#24-1**	**T#24-2**	**T#45-1**	**T#45-2**	**T#157-1**	**RDL**	**QC Batch**
PCBs										
Aroclor 1016	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1221	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1232	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1248	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1242	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1254	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1260	ug/g	0.14	<0.050	0.071	1.0	<0.050	<0.050	<0.050	0.050	5333022
Calculated Total PCB	ug/g	0.14	<0.050	0.071	1.0	<0.050	<0.050	<0.050	0.050	5326645
Surrogate Recovery (%)										
Decachlorobiphenyl	%	83	85 (1)	86 (1)	94	87	87	91		5333022

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) PCB samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9013
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		FUP023	FUP024	FUP025			FUP025		
Sampling Date		2017/12/14	2017/12/14	2017/12/14			2017/12/14		
COC Number		B 64243	B 64243	B 64243			B 64243		
	UNITS	**T#157-2**	**T#159-1**	**T#159-2**	**RDL**	**QC Batch**	**T#159-2 Lab-Dup**	**RDL**	**QC Batch**
PCBs									
Aroclor 1016	ug/g	<0.050	<0.050	<0.050	0.050	5333022	<0.050	0.050	5333022
Aroclor 1221	ug/g	<0.050	<0.050	<0.050	0.050	5333022	<0.050	0.050	5333022
Aroclor 1232	ug/g	<0.050	<0.050	<0.050	0.050	5333022	<0.050	0.050	5333022
Aroclor 1248	ug/g	<0.050	<0.050	<0.050	0.050	5333022	<0.050	0.050	5333022
Aroclor 1242	ug/g	<0.050	<0.050	<0.050	0.050	5333022	<0.050	0.050	5333022
Aroclor 1254	ug/g	<0.050	<0.050	<0.050	0.050	5333022	<0.050	0.050	5333022
Aroclor 1260	ug/g	<0.050	<0.050	0.87	0.050	5333022	0.86	0.050	5333022
Calculated Total PCB	ug/g	<0.050	<0.050	0.87	0.050	5326645			
Surrogate Recovery (%)									
Decachlorobiphenyl	%	92	63 (1)	84		5333022	82		5333022

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) PCB surrogate not within acceptance limits. Sample past recommended hold time for repeat analysis.

Maxxam ID		FUP026	FUP027	FUP028	FUP029	FUP030	FUP031		
Sampling Date		2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14	2017/12/14		
COC Number		B 64243	B 64243	B 64243	B 64243	B 64242	B 64242		
	UNITS	**T#161-1**	**T#161-2**	**T#164-1**	**T#164-2**	**T#166-1**	**T#166-2**	**RDL**	**QC Batch**
PCBs									
Aroclor 1016	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1221	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1232	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1248	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1242	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1254	ug/g	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	5333022
Aroclor 1260	ug/g	0.079	0.62	0.19	0.25	0.095	0.65	0.050	5333022
Calculated Total PCB	ug/g	0.079	0.62	0.19	0.25	0.095	0.65	0.050	5326645
Surrogate Recovery (%)									
Decachlorobiphenyl	%	81	77	78	72	66 (1)	72		5333022

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) PCB surrogate not within acceptance limits. Sample past recommended hold time for repeat analysis.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9013
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		FUP032	FUP033		
Sampling Date		2017/12/14	2017/12/14		
COC Number		B 64242	B 64242		
	UNITS	**T#168-1**	**T#168-2**	**RDL**	**QC Batch**
PCBs					
Aroclor 1016	ug/g	<0.050	<0.050	0.050	5333573
Aroclor 1221	ug/g	<0.050	<0.050	0.050	5333573
Aroclor 1232	ug/g	<0.050	<0.050	0.050	5333573
Aroclor 1248	ug/g	<0.050	<0.050	0.050	5333573
Aroclor 1242	ug/g	<0.050	<0.050	0.050	5333573
Aroclor 1254	ug/g	<0.050	<0.050	0.050	5333573
Aroclor 1260	ug/g	<0.050	<0.050	0.050	5333573
Calculated Total PCB	ug/g	<0.050	<0.050	0.050	5326645
Surrogate Recovery (%)					
Decachlorobiphenyl	%	86	88		5333573

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9013
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.7°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9013
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5327135	Decachlorobiphenyl	2017/12/22	95	30 - 130	86	30 - 130	92	%		
5333022	Decachlorobiphenyl	2017/12/29	73 (3)	30 - 130	92	30 - 130	99	%		
5333573	Decachlorobiphenyl	2017/12/29	92	30 - 130	91	30 - 130	91	%		
5326620	Moisture	2017/12/21							9.6 (1)	25
5326776	Moisture	2017/12/21							9.5 (2)	25
5327135	Aroclor 1016	2017/12/22					<0.050	ug/g	NC (1)	50
5327135	Aroclor 1221	2017/12/22					<0.050	ug/g	NC (1)	50
5327135	Aroclor 1232	2017/12/22					<0.050	ug/g	NC (1)	50
5327135	Aroclor 1242	2017/12/22					<0.050	ug/g	NC (1)	50
5327135	Aroclor 1248	2017/12/22					<0.050	ug/g	NC (1)	50
5327135	Aroclor 1254	2017/12/22	90	30 - 130	86	30 - 130	<0.050	ug/g	NC (1)	50
5327135	Aroclor 1260	2017/12/22					<0.050	ug/g	NC (1)	50
5333022	Aroclor 1016	2017/12/29					<0.050	ug/g	NC (4)	50
5333022	Aroclor 1221	2017/12/29					<0.050	ug/g	NC (4)	50
5333022	Aroclor 1232	2017/12/29					<0.050	ug/g	NC (4)	50
5333022	Aroclor 1242	2017/12/29					<0.050	ug/g	NC (4)	50
5333022	Aroclor 1248	2017/12/29					<0.050	ug/g	NC (4)	50
5333022	Aroclor 1254	2017/12/29	NC (3)	30 - 130	96	30 - 130	<0.050	ug/g	NC (4)	50
5333022	Aroclor 1260	2017/12/29					<0.050	ug/g	1.6 (4)	50
5333573	Aroclor 1016	2017/12/29					<0.050	ug/g	NC (1)	50
5333573	Aroclor 1221	2017/12/29					<0.050	ug/g	NC (1)	50
5333573	Aroclor 1232	2017/12/29					<0.050	ug/g	NC (1)	50
5333573	Aroclor 1242	2017/12/29					<0.050	ug/g	NC (1)	50
5333573	Aroclor 1248	2017/12/29					<0.050	ug/g	NC (1)	50
5333573	Aroclor 1254	2017/12/29	94	30 - 130	94	30 - 130	<0.050	ug/g	NC (1)	50

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9013
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5333573	Aroclor 1260	2017/12/29					<0.050	ug/g	NC (1)	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Duplicate Parent ID [FUP020-01]

(3) Matrix Spike Parent ID [FUP025-01]

(4) Duplicate Parent ID [FUP025-01]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9013
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149947-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

RoseMarie MacDonald

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64244 Page 1 of 3

This column for lab use only:	INVOICE INFORMATION:	REPORT INFORMATION (if differs from invoice):		TURNAROUND TIME
Client Code	Company Name: GHD Ltd	Company Name:	PO # 73509971	Standard ☑
	Contact Name: Trey Small	Contact Name:	Project # / Phase # 11149947-07	10 day ☐
Maxxam Job # B7S9013	Address: 466 Hodgson Rd	Address:	Project Name / Site Location Maritime Electric	If RUSH Specify Date:
	Fredericton, NB Postal Code E3C 2G5	Postal Code	Quote	
	Email: trey.small@ghd.com	Email:	Site #	Pre-schedule rush work
	Ph: (506) 458-1248 Fax: (506) 462-7646	Ph: Fax:	Task Order #	Charge for # Jars used but not submitted
			Sampled by M. Gaines / M. Theriault	

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			9	11	9	

Integrity: YES / NO (NO circled) — Integrity / Checklist by: CW

Labelled by: CW — Location / Bin #

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

Analysis columns: Field Filtered & Preserved; Lab Filtration Required; RCAP-30 (Choose Total or Diss Metals); RCAP-MS (Choose Total or Diss Metals); Metals Water: Total Digest (Default Method) for well water, surface water; Dissolved for ground water; Mercury; Metals Soil: Metals & Mercury Default Available Digest Method; Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4); Mercury Low level by Cold Vapour AA; Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural; Hot Water soluble Boron (required for CCME Agricultural); Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32); Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32; NB Potable Water BTEX, VPH, Low level T.E.H.; TPH Fractionation; PAH's; PAH's with Acridine, Quinoline; PCB's

#	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	PCB's
1	T#6-1	Soil	2017/12/14	1 bag	N	N	✓
2	T#6-2	Soil	2017/12/14	1 bag	N	N	✓
3	T#17-1	Soil	2017/12/14	1 bag	N	N	✓
4	T#17-2	Soil	2017/12/14	1 bag	N	N	✓
5	T#14-1	Soil	2017/12/14	1 bag	N	N	✓
6	T#14-2	Soil	2017/12/14	1 bag	N	N	✓
7	T#20-1	Soil	2017/12/14	1 bag	N	N	✓
8	T#20-2	Soil	2017/12/14	1 bag	N	N	✓
9	T#24-1	Soil	2017/12/14	1 bag	N	N	✓
10	T#24-2	Soil	2017/12/14	1 bag	N	N	✓

2017 DEC 19 10:02

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 18/17	14:00	D Albert — shipped from: FREDTON		

White: Maxxam Yellow: Mail Pink: Client ATL FCD 00149 / Revision 8 11/08

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64243

Page 2 of 3

This column for lab use only:

Client Code:

Maxxam Job #: B7S9013

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			9	11	9	

Integrity: YES / NO (NO circled) — Integrity / Checklist by: CW

Labelled by: CW — Location / Bin #:

INVOICE INFORMATION:

Company Name: GHD Ltd
Contact Name: Troy Small
Address: 466 Hodgson Rd
Fredericton, NB Postal Code E3C 2G5
Email: troy.small@ghd.com
Ph: (506) 458-1248 Fax: (506) 462-7646

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name:
Address:
Postal Code:
Email:
Ph: Fax:

PO #: 73509971
Project # / Phase #: 11149943-07
Project Name / Site Location: Maritime Electric
Quote:
Site #:
Task Order #:
Sampled by: M. Gaines / M. Theriault

TURNAROUND TIME

Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

Metals Water: Total Digest (Default Method) for well water, surface water; Dissolved for ground water; Mercury
Metals Soil: Metals & Mercury Default Available Digest Method; Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4); Mercury Low level by Cold Vapour AA; Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural; Hot Water soluble Boron (required for CCME Agricultural)
Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32); Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32; NB Potable Water BTEX, VPH, Low level T.E.H.; TPH Fractionation; PAH's; PAH's with Acridine, Quinoline

#	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 (Choose Total or Diss Metals)	RCAP-MS (Choose Total or Diss Metals)	PCB's
1	T#45-1	Soil	2017/12/14	1 bag	N	N			✓
2	T#45-2	Soil	2017/12/14	1 bag	N	N			✓
3	T#157-1	Soil	2017/12/14	1 bag	N	N			✓
4	T#157-2	Soil	2017/12/14	1 bag	N	N			✓
5	T#159-1	Soil	2017/12/14	1 bag	N	N			✓
6	T#159-2	Soil	2017/12/14	1 bag	N	N			✓
7	T#161-1	Soil	2017/12/14	1 bag	N	N			✓
8	T#161-2	Soil	2017/12/14	1 bag	N	N			✓
9	T#164-1	Soil	2017/12/14	1 bag	N	N			✓
10	T#164-2	Soil	2017/12/14	1 bag	N	N			✓

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 18/17	14:00	D Albert		

2017 DEC 19 10:02

Shipped from FREDTON

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 8 11/08

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64242

Page 3 of 3

This column for lab use only:

Client Code:

Maxxam Job #: B7S9013

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			9	11	9	

Integrity: YES NO (NO circled)

Integrity / Checklist by: CW

Labelled by: CW

Location / Bin #:

INVOICE INFORMATION:

Company Name: GHD Ltd

Contact Name: Troy Small

Address: 466 Hodgson Rd

Fredericton, NB Postal Code E3C 2G5

Email: troy.small@ghd.com

Ph: (506) 458-1248 Fax (506) 462-7646

REPORT INFORMATION (if differs from invoice):

Company Name:

Contact Name:

Address:

Postal Code

Email:

Ph: Fax:

PO #: 73509971

Project # / Phase #: 11149943-07

Project Name / Site Location: Maritime Electric

Quote:

Site #:

Task Order #:

Sampled by: M. Gaines / M. Theriault

TURNAROUND TIME

Standard ☑

10 day ☐

If RUSH Specify Date:

Pre-schedule rush work

Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 (Choose Total or Diss Metals)	RCAP-MS (Choose Total or Diss Metals)	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons BTEX, C6-C32	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Soil Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	PAH's with Acridine, Quinoline	PCB's					
1	T# 166-1	Soil	2017/12/14	1 bag	N	N																	✓					
2	T# 166-2	Soil	2017/12/14	1 bag	N	N																	✓					
3	T# 168-1	Soil	2017/12/14	1 bag	N	N																	✓					
4	T# 168-2	Soil	2017/12/14	1 bag	N	N																	✓					
5																												
6																												
7																												
8																												
9																												
10																												

2017DEC19 10:02

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 18/17	14:00	D. Albert		

Shipped from FREDTON

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 8 11/08

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 73509971
Your Project #: 11149943
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64236

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2017/12/28
Report #: R4923672
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S9108
Received: 2017/12/20, 09:32

Sample Matrix: Soil
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Solids Acid Extr. ICPMS	8	2017/12/27	2017/12/27	ATL SOP 00058	EPA 6020A R1 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Sam Sherker
Bedford Client Svc
29 Dec 2017 16:54:23

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 1

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9108
Report Date: 2017/12/28

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		FUP487	FUP488	FUP489	FUP490	FUP490	FUP491		
Sampling Date		2017/12/11	2017/12/11	2017/12/11	2017/12/11	2017/12/11	2017/12/11		
COC Number		B 64236	B 64236	B 64236	B 64236	B 64236	B 64236		
	UNITS	**SS-1**	**SS-2**	**SS-3**	**SS-4**	**SS-4 Lab-Dup**	**SS-5**	**RDL**	**QC Batch**
Metals									
Acid Extractable Aluminum (Al)	mg/kg	9900	7600	8600	8800	9100	7200	10	5331377
Acid Extractable Antimony (Sb)	mg/kg	<2.0	<2.0	2.7	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Arsenic (As)	mg/kg	4.3	3.1	4.3	5.0	5.2	3.5	2.0	5331377
Acid Extractable Barium (Ba)	mg/kg	45	21	29	48	53	27	5.0	5331377
Acid Extractable Beryllium (Be)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	<50	<50	<50	50	5331377
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.30	5331377
Acid Extractable Chromium (Cr)	mg/kg	19	14	16	17	18	27	2.0	5331377
Acid Extractable Cobalt (Co)	mg/kg	7.9	5.7	6.6	6.6	6.9	8.0	1.0	5331377
Acid Extractable Copper (Cu)	mg/kg	11	9.3	13	16	17	27	2.0	5331377
Acid Extractable Iron (Fe)	mg/kg	21000	18000	19000	20000	20000	24000	50	5331377
Acid Extractable Lead (Pb)	mg/kg	16	11	31	64	69	18	0.50	5331377
Acid Extractable Lithium (Li)	mg/kg	22	20	21	22	23	13	2.0	5331377
Acid Extractable Manganese (Mn)	mg/kg	560	370	480	440	430	530	2.0	5331377
Acid Extractable Mercury (Hg)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	0.10	5331377
Acid Extractable Molybdenum (Mo)	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Nickel (Ni)	mg/kg	17	14	18	21	21	29	2.0	5331377
Acid Extractable Rubidium (Rb)	mg/kg	9.7	6.7	8.5	8.8	8.9	4.0	2.0	5331377
Acid Extractable Selenium (Se)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	5331377
Acid Extractable Silver (Ag)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	5331377
Acid Extractable Strontium (Sr)	mg/kg	13	<5.0	7.0	7.9	8.3	20	5.0	5331377
Acid Extractable Thallium (Tl)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	5331377
Acid Extractable Tin (Sn)	mg/kg	<2.0	<2.0	<2.0	2.6	5.8	<2.0	2.0	5331377
Acid Extractable Uranium (U)	mg/kg	1.0	0.57	0.54	0.55	0.57	0.73	0.10	5331377
Acid Extractable Vanadium (V)	mg/kg	25	24	50	59	62	73	2.0	5331377
Acid Extractable Zinc (Zn)	mg/kg	64	38	64	100	100	650	5.0	5331377

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9108
Report Date: 2017/12/28

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		FUP492	FUP493	FUP494		
Sampling Date		2017/12/11	2017/12/11	2017/12/11		
COC Number		B 64236	B 64236	B 64236		
	UNITS	SS-6	SS-7	SS-8	RDL	QC Batch
Metals						
Acid Extractable Aluminum (Al)	mg/kg	9600	6000	11000	10	5331377
Acid Extractable Antimony (Sb)	mg/kg	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Arsenic (As)	mg/kg	3.6	3.5	3.5	2.0	5331377
Acid Extractable Barium (Ba)	mg/kg	30	27	26	5.0	5331377
Acid Extractable Beryllium (Be)	mg/kg	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Boron (B)	mg/kg	<50	<50	<50	50	5331377
Acid Extractable Cadmium (Cd)	mg/kg	<0.30	<0.30	<0.30	0.30	5331377
Acid Extractable Chromium (Cr)	mg/kg	20	13	19	2.0	5331377
Acid Extractable Cobalt (Co)	mg/kg	7.3	5.1	7.4	1.0	5331377
Acid Extractable Copper (Cu)	mg/kg	12	8.9	13	2.0	5331377
Acid Extractable Iron (Fe)	mg/kg	21000	15000	21000	50	5331377
Acid Extractable Lead (Pb)	mg/kg	25	16	14	0.50	5331377
Acid Extractable Lithium (Li)	mg/kg	22	15	22	2.0	5331377
Acid Extractable Manganese (Mn)	mg/kg	480	340	400	2.0	5331377
Acid Extractable Mercury (Hg)	mg/kg	<0.10	<0.10	<0.10	0.10	5331377
Acid Extractable Molybdenum (Mo)	mg/kg	<2.0	<2.0	<2.0	2.0	5331377
Acid Extractable Nickel (Ni)	mg/kg	17	13	20	2.0	5331377
Acid Extractable Rubidium (Rb)	mg/kg	10	5.9	11	2.0	5331377
Acid Extractable Selenium (Se)	mg/kg	<1.0	<1.0	<1.0	1.0	5331377
Acid Extractable Silver (Ag)	mg/kg	<0.50	<0.50	<0.50	0.50	5331377
Acid Extractable Strontium (Sr)	mg/kg	6.4	6.3	6.2	5.0	5331377
Acid Extractable Thallium (Tl)	mg/kg	<0.10	<0.10	<0.10	0.10	5331377
Acid Extractable Tin (Sn)	mg/kg	<2.0	6.4	<2.0	2.0	5331377
Acid Extractable Uranium (U)	mg/kg	0.57	0.72	0.90	0.10	5331377
Acid Extractable Vanadium (V)	mg/kg	25	20	52	2.0	5331377
Acid Extractable Zinc (Zn)	mg/kg	78	47	56	5.0	5331377

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.0°C
Package 2	4.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9108
Report Date: 2017/12/28

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5331377	Acid Extractable Aluminum (Al)	2017/12/27					<10	mg/kg	3.5 (2)	35
5331377	Acid Extractable Antimony (Sb)	2017/12/27	102 (1)	75 - 125	105	75 - 125	<2.0	mg/kg	NC (2)	35
5331377	Acid Extractable Arsenic (As)	2017/12/27	96 (1)	75 - 125	98	75 - 125	<2.0	mg/kg	5.0 (2)	35
5331377	Acid Extractable Barium (Ba)	2017/12/27	108 (1)	75 - 125	96	75 - 125	<5.0	mg/kg	10 (2)	35
5331377	Acid Extractable Beryllium (Be)	2017/12/27	101 (1)	75 - 125	99	75 - 125	<2.0	mg/kg	NC (2)	35
5331377	Acid Extractable Bismuth (Bi)	2017/12/27	97 (1)	75 - 125	95	75 - 125	<2.0	mg/kg	NC (2)	35
5331377	Acid Extractable Boron (B)	2017/12/27	93 (1)	75 - 125	98	75 - 125	<50	mg/kg	NC (2)	35
5331377	Acid Extractable Cadmium (Cd)	2017/12/27	101 (1)	75 - 125	99	75 - 125	<0.30	mg/kg	NC (2)	35
5331377	Acid Extractable Chromium (Cr)	2017/12/27	100 (1)	75 - 125	97	75 - 125	<2.0	mg/kg	3.8 (2)	35
5331377	Acid Extractable Cobalt (Co)	2017/12/27	98 (1)	75 - 125	96	75 - 125	<1.0	mg/kg	5.2 (2)	35
5331377	Acid Extractable Copper (Cu)	2017/12/27	96 (1)	75 - 125	95	75 - 125	<2.0	mg/kg	3.6 (2)	35
5331377	Acid Extractable Iron (Fe)	2017/12/27					<50	mg/kg	3.5 (2)	35
5331377	Acid Extractable Lead (Pb)	2017/12/27	NC (1)	75 - 125	98	75 - 125	<0.50	mg/kg	6.7 (2)	35
5331377	Acid Extractable Lithium (Li)	2017/12/27	104 (1)	75 - 125	99	75 - 125	<2.0	mg/kg	4.4 (2)	35
5331377	Acid Extractable Manganese (Mn)	2017/12/27	NC (1)	75 - 125	98	75 - 125	<2.0	mg/kg	2.7 (2)	35
5331377	Acid Extractable Mercury (Hg)	2017/12/27	96 (1)	75 - 125	104	75 - 125	<0.10	mg/kg	13 (2)	35
5331377	Acid Extractable Molybdenum (Mo)	2017/12/27	98 (1)	75 - 125	92	75 - 125	<2.0	mg/kg	NC (2)	35
5331377	Acid Extractable Nickel (Ni)	2017/12/27	103 (1)	75 - 125	97	75 - 125	<2.0	mg/kg	2.0 (2)	35
5331377	Acid Extractable Rubidium (Rb)	2017/12/27	97 (1)	75 - 125	100	75 - 125	<2.0	mg/kg	1.7 (2)	35
5331377	Acid Extractable Selenium (Se)	2017/12/27	94 (1)	75 - 125	93	75 - 125	<1.0	mg/kg	NC (2)	35
5331377	Acid Extractable Silver (Ag)	2017/12/27	102 (1)	75 - 125	99	75 - 125	<0.50	mg/kg	NC (2)	35
5331377	Acid Extractable Strontium (Sr)	2017/12/27	105 (1)	75 - 125	100	75 - 125	<5.0	mg/kg	5.2 (2)	35
5331377	Acid Extractable Thallium (Tl)	2017/12/27	99 (1)	75 - 125	99	75 - 125	<0.10	mg/kg	NC (2)	35
5331377	Acid Extractable Tin (Sn)	2017/12/27	106 (1)	75 - 125	94	75 - 125	<2.0	mg/kg	NC (2)	35
5331377	Acid Extractable Uranium (U)	2017/12/27	103 (1)	75 - 125	99	75 - 125	<0.10	mg/kg	2.8 (2)	35
5331377	Acid Extractable Vanadium (V)	2017/12/27	NC (1)	75 - 125	98	75 - 125	<2.0	mg/kg	5.7 (2)	35

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9108
Report Date: 2017/12/28

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5331377	Acid Extractable Zinc (Zn)	2017/12/27	NC (1)	75 - 125	105	75 - 125	<5.0	mg/kg	2.9 (2)	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [FUP490-01]

(2) Duplicate Parent ID [FUP490-01]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9108
Report Date: 2017/12/28

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Kevin G. MacDonald

Kevin MacDonald, Inorganics Supervisor

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64236

Page 1 of 1

This column for lab use only:
Client Code
Maxxam Job # B7S9108

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			1	0	2	
			6	3	4	

Integrity: YES NO (YES circled)
Integrity / Checklist by: BM
Labelled by
Location / Bin #

INVOICE INFORMATION:
Company Name: GHD Ltd
Contact Name: Troy Small
Address: 466 Hodgson Rd
Fredericton, NB Postal Code E3C 2G5
Email: Troy.Small@ghd.com
Ph: (506) 458-1248 Fax: (506) 462-7646

REPORT INFORMATION (if differs from invoice):
Company Name:
Contact Name:
Address:
Postal Code
Email:
Ph:
Fax:

PO # 73509971
Project # / Phase # 11149943-07
Project Name / Site Location: Maritime Electric
Quote
Site #
Task Order #
Sampled by: M. Gaines / M. Theriault

TURNAROUND TIME
Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

Analysis columns: Field Filtered & Preserved; Lab Filtration Required; RCAP-30 (Choose Total or Diss Metals); RCAP-MS (Choose Total or Diss Metals); Metals Water: Total Digest (Default Method) for well water, surface water; Dissolved for ground water; Mercury; Metals Soil: Metals & Mercury Default Available Digest Method; Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4); Mercury Low level by Cold Vapour AA; Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural; Hot Water soluble Boron (required for CCME Agricultural); Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32); Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32; NB Potable Water BTEX, VPH, Low level T.E.H.; TPH Fractionation; PAH's; PAH's with Acridine, Quinoline

#	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	Metals & Mercury Default Available Digest Method
1	SS-1	Soil		1 bag	N	N	✓
2	SS-2	Soil		1 bag	N	N	✓
3	SS-3	Soil		1 bag	N	N	✓
4	SS-4	Soil		1 bag	N	N	✓
5	SS-5	Soil		1 bag	N	N	✓
6	SS-6	Soil		1 bag	N	N	✓
7	SS-7	Soil		1 bag	N	N	✓
8	SS-8	Soil		1 bag	N	N	✓
9							
10							

28 DEC 20 9:32

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 19/17	10:00	D Albert		

Shipped from FREDTON

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 8 11/08

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 730509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64241, B 64238, B 64239

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2017/12/29
Report #: R4924572
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S9172
Received: 2017/12/20, 09:32

Sample Matrix: Soil
Samples Received: 27

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Benzo(b/j)fluoranthene Sum (soil)	4	N/A	2017/12/27	N/A	Auto Calc.
Benzo(b/j)fluoranthene Sum (soil)	2	N/A	2017/12/29	N/A	Auto Calc.
TEH in Soil (PIRI) (1)	14	2017/12/22	2017/12/22	ATL SOP 00111	Atl. RBCA v3.1 m
TEH in Soil (PIRI) (1)	3	2017/12/22	2017/12/27	ATL SOP 00111	Atl. RBCA v3.1 m
TEH in Soil (PIRI) (1)	4	2017/12/22	2017/12/28	ATL SOP 00111	Atl. RBCA v3.1 m
Metals Solids Acid Extr. ICPMS	2	2017/12/27	2017/12/27	ATL SOP 00058	EPA 6020A R1 m
Metals Solids Acid Extr. ICPMS	4	2017/12/27	2017/12/28	ATL SOP 00058	EPA 6020A R1 m
Moisture	23	N/A	2017/12/22	ATL SOP 00001	OMOE Handbook 1983 m
PAH Compounds by GCMS (SIM) (1)	3	2017/12/22	2017/12/23	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	1	2017/12/22	2017/12/24	ATL SOP 00102	EPA 8270D 2007 m
PAH Compounds by GCMS (SIM) (1)	2	2017/12/22	2017/12/29	ATL SOP 00102	EPA 8270D 2007 m
ModTPH (T1) Calc. for Soil	7	N/A	2017/12/27	N/A	Atl. RBCA v3.1 m
ModTPH (T1) Calc. for Soil	10	N/A	2017/12/28	N/A	Atl. RBCA v3.1 m
ModTPH (T1) Calc. for Soil	4	N/A	2017/12/29	N/A	Atl. RBCA v3.1 m
VPH in Soil (PIRI) - Field Preserved (2)	1	N/A	2017/12/21	ATL SOP 00119	Atl. RBCA v3.1 m
VPH in Soil (PIRI) - Field Preserved (2)	7	N/A	2017/12/22	ATL SOP 00119	Atl. RBCA v3.1 m
VPH in Soil (PIRI) - Field Preserved (2)	11	N/A	2017/12/27	ATL SOP 00119	Atl. RBCA v3.1 m
VPH in Soil (PIRI) - Field Preserved (2)	2	N/A	2017/12/28	ATL SOP 00119	Atl. RBCA v3.1 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 730509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64241, B 64238, B 64239

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2017/12/29
Report #: R4924572
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S9172
Received: 2017/12/20, 09:32

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Soils are reported on a dry weight basis unless otherwise specified.
(2) No lab extraction date is given for C6-C10/BTEX and VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.

Encryption Key Sam Sherker
Bedford Client Svc
29 Dec 2017 17:03:49

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FUP752	FUP753	FUP754	FUP755	FUP756	FUP757		
Sampling Date		2017/12/11	2017/12/12	2017/12/12	2017/12/12	2017/12/11	2017/12/13		
COC Number		B 64241	B 64241	B 64241	B 64241	B 64241	B 64241		
	UNITS	**SP-1 (2.4-3.0)**	**SP-2 (2.1-2.7)**	**SP-2 (3.3-4.0)**	**SP-3 (2.4-3.0)**	**MW-1 (2.7-3.3)**	**MW-2 (4.9-5.5)**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	15	13	14	14	15	16	1.0	5326891

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUP758	FUP759	FUP760	FUP761	FUP799		
Sampling Date		2017/12/13	2017/12/12	2017/12/12	2017/12/12	2017/12/12		
COC Number		B 64241	B 64241	B 64241	B 64241	B 64238		
	UNITS	**MW-3 (2.1-2.7)**	**MW-3 (4.6-5.2)**	**MW-4 (3.3-4.0)**	**MW-5 (3.0-3.7)**	**MW-6 (2.7-3.3)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	21	17	14	14	13	1.0	5326891

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUP800	FUP801	FUP802	FUP803	FUP804		
Sampling Date		2017/12/13	2017/12/13	2017/12/13	2017/12/13	2017/12/13		
COC Number		B 64238	B 64238	B 64238	B 64238	B 64238		
	UNITS	**MW-7 (2.4-3.0)**	**MW-7 (3.7-4.3)**	**MW-8 (3.7-4.3)**	**MW-8 (4.9-5.5)**	**MW-9 (0.6-1.2)**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	15	16	15	16	19	1.0	5326891

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

RESULTS OF ANALYSES OF SOIL

Maxxam ID		FUP805	FUP806		FUP807	FUP808	FUP846		
Sampling Date		2017/12/13	2017/12/13		2017/12/13	2017/12/13	2017/12/13		
COC Number		B 64238	B 64238		B 64238	B 64238	B 64239		
	UNITS	**MW-9 (3.0-3.7)**	**MW-9 (4.9-5.5)**	**QC Batch**	**MW-10 (0.6-1.2)**	**MW-10 (4.3-4.9)**	**MW-11 (1.8-2.4)**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	14	17	5326891	25	37	20	1.0	5327149

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FUP847	FUP848	FUP848		
Sampling Date		2017/12/12	2017/12/12	2017/12/12		
COC Number		B 64239	B 64239	B 64239		
	UNITS	**MW-12 (1.2-1.8)**	**MW-12 (4.9-5.5)**	**MW-12 (4.9-5.5) Lab-Dup**	**RDL**	**QC Batch**
Inorganics						
Moisture	%	35	13	13	1.0	5327149

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		FUP804	FUP847		FUP849	FUP850		
Sampling Date		2017/12/13	2017/12/12		2017/12/13	2017/12/13		
COC Number		B 64238	B 64239		B 64239	B 64239		
	UNITS	MW-9 (0.6-1.2)	MW-12 (1.2-1.8)	QC Batch	MW-7 (0.6-1.2)	MW-10 (0-0.6)	RDL	QC Batch
Metals								
Acid Extractable Aluminum (Al)	mg/kg	8000	13000	5331377	4600	9300	10	5331387
Acid Extractable Antimony (Sb)	mg/kg	<2.0	<2.0	5331377	2.7	<2.0	2.0	5331387
Acid Extractable Arsenic (As)	mg/kg	18	19	5331377	41	5.2	2.0	5331387
Acid Extractable Barium (Ba)	mg/kg	110	120	5331377	110	32	5.0	5331387
Acid Extractable Beryllium (Be)	mg/kg	<2.0	<2.0	5331377	<2.0	<2.0	2.0	5331387
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	5331377	<2.0	<2.0	2.0	5331387
Acid Extractable Boron (B)	mg/kg	<50	<50	5331377	<50	<50	50	5331387
Acid Extractable Cadmium (Cd)	mg/kg	0.38	0.36	5331377	<0.30	<0.30	0.30	5331387
Acid Extractable Chromium (Cr)	mg/kg	18	26	5331377	12	18	2.0	5331387
Acid Extractable Cobalt (Co)	mg/kg	7.2	10	5331377	4.7	7.5	1.0	5331387
Acid Extractable Copper (Cu)	mg/kg	35	77	5331377	25	14	2.0	5331387
Acid Extractable Iron (Fe)	mg/kg	25000	35000	5331377	33000	21000	50	5331387
Acid Extractable Lead (Pb)	mg/kg	130	62	5331377	87	36	0.50	5331387
Acid Extractable Lithium (Li)	mg/kg	20	21	5331377	10	24	2.0	5331387
Acid Extractable Manganese (Mn)	mg/kg	450	480	5331377	220	450	2.0	5331387
Acid Extractable Mercury (Hg)	mg/kg	0.29	0.27	5331377	<0.10	<0.10	0.10	5331387
Acid Extractable Molybdenum (Mo)	mg/kg	3.6	5.3	5331377	5.7	<2.0	2.0	5331387
Acid Extractable Nickel (Ni)	mg/kg	26	180	5331377	19	18	2.0	5331387
Acid Extractable Rubidium (Rb)	mg/kg	7.1	5.1	5331377	5.2	9.3	2.0	5331387
Acid Extractable Selenium (Se)	mg/kg	<1.0	<1.0	5331377	2.3	<1.0	1.0	5331387
Acid Extractable Silver (Ag)	mg/kg	<0.50	<0.50	5331377	<0.50	<0.50	0.50	5331387
Acid Extractable Strontium (Sr)	mg/kg	24	64	5331377	33	7.5	5.0	5331387
Acid Extractable Thallium (Tl)	mg/kg	0.19	0.13	5331377	0.40	<0.10	0.10	5331387
Acid Extractable Tin (Sn)	mg/kg	4.3	4.5	5331377	4.3	<2.0	2.0	5331387
Acid Extractable Uranium (U)	mg/kg	0.58	0.81	5331377	0.36	0.71	0.10	5331387
Acid Extractable Vanadium (V)	mg/kg	83	990	5331377	75	34	2.0	5331387
Acid Extractable Zinc (Zn)	mg/kg	200	280	5331377	94	61	5.0	5331387

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		FUP851	FUP852		
Sampling Date		2017/12/13	2017/12/15		
COC Number		B 64239	B 64239		
	UNITS	**MW-11 (0-0.6)**	**SPOIL PILE**	**RDL**	**QC Batch**
Metals					
Acid Extractable Aluminum (Al)	mg/kg	9900	3500	10	5331387
Acid Extractable Antimony (Sb)	mg/kg	3.0	<2.0	2.0	5331387
Acid Extractable Arsenic (As)	mg/kg	31	3.8	2.0	5331387
Acid Extractable Barium (Ba)	mg/kg	320	12	5.0	5331387
Acid Extractable Beryllium (Be)	mg/kg	<2.0	<2.0	2.0	5331387
Acid Extractable Bismuth (Bi)	mg/kg	<2.0	<2.0	2.0	5331387
Acid Extractable Boron (B)	mg/kg	<50	<50	50	5331387
Acid Extractable Cadmium (Cd)	mg/kg	1.1	<0.30	0.30	5331387
Acid Extractable Chromium (Cr)	mg/kg	28	9.0	2.0	5331387
Acid Extractable Cobalt (Co)	mg/kg	9.5	3.2	1.0	5331387
Acid Extractable Copper (Cu)	mg/kg	76	6.3	2.0	5331387
Acid Extractable Iron (Fe)	mg/kg	38000	10000	50	5331387
Acid Extractable Lead (Pb)	mg/kg	670	9.2	0.50	5331387
Acid Extractable Lithium (Li)	mg/kg	21	10	2.0	5331387
Acid Extractable Manganese (Mn)	mg/kg	700	190	2.0	5331387
Acid Extractable Mercury (Hg)	mg/kg	0.67	<0.10	0.10	5331387
Acid Extractable Molybdenum (Mo)	mg/kg	4.3	<2.0	2.0	5331387
Acid Extractable Nickel (Ni)	mg/kg	25	24	2.0	5331387
Acid Extractable Rubidium (Rb)	mg/kg	9.8	2.7	2.0	5331387
Acid Extractable Selenium (Se)	mg/kg	<1.0	<1.0	1.0	5331387
Acid Extractable Silver (Ag)	mg/kg	0.62	<0.50	0.50	5331387
Acid Extractable Strontium (Sr)	mg/kg	37	<5.0	5.0	5331387
Acid Extractable Thallium (Tl)	mg/kg	0.31	<0.10	0.10	5331387
Acid Extractable Tin (Sn)	mg/kg	24	<2.0	2.0	5331387
Acid Extractable Uranium (U)	mg/kg	0.71	0.26	0.10	5331387
Acid Extractable Vanadium (V)	mg/kg	35	77	2.0	5331387
Acid Extractable Zinc (Zn)	mg/kg	450	25	5.0	5331387

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		FUP758		FUP760	FUP800	FUP804		
Sampling Date		2017/12/13		2017/12/12	2017/12/13	2017/12/13		
COC Number		B 64241		B 64241	B 64238	B 64238		
	UNITS	**MW-3 (2.1-2.7)**	**RDL**	**MW-4 (3.3-4.0)**	**MW-7 (2.4-3.0)**	**MW-9 (0.6-1.2)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons								
1-Methylnaphthalene	mg/kg	46	0.010	9.2	<0.010	0.083	0.010	5328886
2-Methylnaphthalene	mg/kg	36	0.010	2.9	<0.010	0.11	0.010	5328886
Acenaphthene	mg/kg	12	0.010	2.6	<0.010	0.083	0.010	5328886
Acenaphthylene	mg/kg	4.1	0.010	3.0	<0.010	0.018	0.010	5328886
Anthracene	mg/kg	61	0.010	9.1	<0.010	0.23	0.010	5328886
Benzo(a)anthracene	mg/kg	30	0.010	6.9	<0.010	0.63	0.010	5328886
Benzo(a)pyrene	mg/kg	25	0.010	5.8	<0.010	0.75	0.010	5328886
Benzo(b)fluoranthene	mg/kg	18	0.010	3.5	<0.010	0.71	0.010	5328886
Benzo(b/j)fluoranthene	mg/kg	31	0.020	6.8	<0.020	1.1	0.020	5327035
Benzo(g,h,i)perylene	mg/kg	9.7	0.010	1.6	<0.010	0.37	0.010	5328886
Benzo(j)fluoranthene	mg/kg	13	0.010	3.4	<0.010	0.44	0.010	5328886
Benzo(k)fluoranthene	mg/kg	13	0.010	2.8	<0.010	0.48	0.010	5328886
Chrysene	mg/kg	26	0.010	5.6	<0.010	0.68	0.010	5328886
Dibenz(a,h)anthracene	mg/kg	3.6	0.010	0.62	<0.010	0.091	0.010	5328886
Fluoranthene	mg/kg	85 (1)	0.20	16	<0.010	1.1	0.010	5328886
Fluorene	mg/kg	59 (1)	0.20	14	<0.010	0.070	0.010	5328886
Indeno(1,2,3-cd)pyrene	mg/kg	9.7	0.010	1.7	<0.010	0.31	0.010	5328886
Naphthalene	mg/kg	120 (1)	0.20	24	<0.010	0.075	0.010	5328886
Perylene	mg/kg	5.8	0.010	1.1	<0.010	0.18	0.010	5328886
Phenanthrene	mg/kg	160 (1)	0.20	28	0.020	0.80	0.010	5328886
Pyrene	mg/kg	50	0.010	11	<0.010	0.96	0.010	5328886
Surrogate Recovery (%)								
D10-Anthracene	%	64		78	87	81		5328886
D14-Terphenyl (FS)	%	66		77	67	82		5328886
D8-Acenaphthylene	%	98		98	101	99		5328886

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to sample dilution.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		FUP807		FUP847		
Sampling Date		2017/12/13		2017/12/12		
COC Number		B 64238		B 64239		
	UNITS	**MW-10 (0.6-1.2)**	**RDL**	**MW-12 (1.2-1.8)**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons						
1-Methylnaphthalene	mg/kg	1.7	0.010	0.65	0.010	5328886
2-Methylnaphthalene	mg/kg	2.0	0.010	1.0	0.010	5328886
Acenaphthene	mg/kg	0.77	0.010	5.1	0.010	5328886
Acenaphthylene	mg/kg	0.099	0.010	0.36	0.010	5328886
Anthracene	mg/kg	0.32	0.010	16	0.010	5328886
Benzo(a)anthracene	mg/kg	<0.17 (1)	0.17	67	0.010	5328886
Benzo(a)pyrene	mg/kg	0.13	0.010	58 (2)	0.050	5328886
Benzo(b)fluoranthene	mg/kg	<0.13 (1)	0.13	69	0.010	5328886
Benzo(b/j)fluoranthene	mg/kg	<0.19	0.19	120	0.020	5327035
Benzo(g,h,i)perylene	mg/kg	0.083	0.010	56	0.010	5328886
Benzo(j)fluoranthene	mg/kg	<0.060 (1)	0.060	50	0.010	5328886
Benzo(k)fluoranthene	mg/kg	0.034	0.010	50	0.010	5328886
Chrysene	mg/kg	<0.30 (1)	0.30	53	0.010	5328886
Dibenz(a,h)anthracene	mg/kg	<0.030 (1)	0.030	25	0.010	5328886
Fluoranthene	mg/kg	0.37	0.010	72	0.010	5328886
Fluorene	mg/kg	1.5	0.010	5.5	0.010	5328886
Indeno(1,2,3-cd)pyrene	mg/kg	0.026	0.010	62	0.010	5328886
Naphthalene	mg/kg	0.26	0.010	1.7	0.010	5328886
Perylene	mg/kg	0.091	0.010	24	0.010	5328886
Phenanthrene	mg/kg	3.9	0.010	42	0.010	5328886
Pyrene	mg/kg	0.39	0.010	58	0.010	5328886
Surrogate Recovery (%)						
D10-Anthracene	%	84		78		5328886
D14-Terphenyl (FS)	%	82		86		5328886
D8-Acenaphthylene	%	104		98		5328886

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to matrix / co-extractive interference.
(2) Elevated PAH RDL(s) due to sample dilution.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		FUP752	FUP753	FUP754	FUP755	FUP756		
Sampling Date		2017/12/11	2017/12/12	2017/12/12	2017/12/12	2017/12/11		
COC Number		B 64241	B 64241	B 64241	B 64241	B 64241		
	UNITS	**SP-1 (2.4-3.0)**	**SP-2 (2.1-2.7)**	**SP-2 (3.3-4.0)**	**SP-3 (2.4-3.0)**	**MW-1 (2.7-3.3)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	5327089
Toluene	mg/kg	<0.025	<0.025	<0.025	0.13	<0.025	0.025	5327089
Ethylbenzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	5327089
Total Xylenes	mg/kg	<0.050	<0.050	<0.050	0.14	<0.050	0.050	5327089
C6 - C10 (less BTEX)	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	5327089
>C10-C16 Hydrocarbons	mg/kg	<10	<10	<10	<10	<10	10	5329126
>C16-C21 Hydrocarbons	mg/kg	<10	<10	<10	<10	<10	10	5329126
>C21-<C32 Hydrocarbons	mg/kg	<15	<15	<15	<15	<15	15	5329126
Modified TPH (Tier1)	mg/kg	<15	<15	<15	<15	<15	15	5326583
Reached Baseline at C32	mg/kg	NA	NA	NA	NA	NA	N/A	5329126
Hydrocarbon Resemblance	mg/kg	NA	NA	NA	NA	NA	N/A	5329126
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	109	81	97	105	96		5329126
n-Dotriacontane - Extractable	%	125	93	111	121	109		5329126
Isobutylbenzene - Volatile	%	109	102 (1)	106	108	107 (1)		5327089

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		FUP756			FUP757	FUP758	FUP759		
Sampling Date		2017/12/11			2017/12/13	2017/12/13	2017/12/12		
COC Number		B 64241			B 64241	B 64241	B 64241		
	UNITS	**MW-1 (2.7-3.3) Lab-Dup**	**RDL**	**QC Batch**	**MW-2 (4.9-5.5)**	**MW-3 (2.1-2.7)**	**MW-3 (4.6-5.2)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/kg				<0.025	0.11	<0.025	0.025	5327089
Toluene	mg/kg				<0.025	0.24	<0.025	0.025	5327089
Ethylbenzene	mg/kg				<0.025	<0.025	<0.025	0.025	5327089
Total Xylenes	mg/kg				<0.050	0.25	<0.050	0.050	5327089
C6 - C10 (less BTEX)	mg/kg				<2.5	<2.5	<2.5	2.5	5327089
>C10-C16 Hydrocarbons	mg/kg	<10	10	5329126	<10	750	<10	10	5329126
>C16-C21 Hydrocarbons	mg/kg	<10	10	5329126	<10	930	<10	10	5329126
>C21-<C32 Hydrocarbons	mg/kg	<15	15	5329126	<15	1000	<15	15	5329126
Modified TPH (Tier1)	mg/kg				<15	2700	<15	15	5326583
Reached Baseline at C32	mg/kg				NA	Yes	NA	N/A	5329126
Hydrocarbon Resemblance	mg/kg				NA	COMMENT (1)	NA	N/A	5329126
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	93		5329126	98	90	97		5329126
n-Dotriacontane - Extractable	%	108		5329126	115	105	116		5329126
Isobutylbenzene - Volatile	%				113 (2)	113	111 (2)		5327089

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
(2) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		FUP760	FUP761	FUP799	FUP800	FUP801		
Sampling Date		2017/12/12	2017/12/12	2017/12/12	2017/12/13	2017/12/13		
COC Number		B 64241	B 64241	B 64238	B 64238	B 64238		
	UNITS	**MW-4 (3.3-4.0)**	**MW-5 (3.0-3.7)**	**MW-6 (2.7-3.3)**	**MW-7 (2.4-3.0)**	**MW-7 (3.7-4.3)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.025	0.039	<0.025	0.078	<0.025	0.025	5328911
Toluene	mg/kg	<0.025	0.14	<0.025	0.20	0.070	0.025	5328911
Ethylbenzene	mg/kg	<0.025	<0.025	<0.025	<0.025	<0.025	0.025	5328911
Total Xylenes	mg/kg	<0.050	0.15	<0.050	0.10	<0.050	0.050	5328911
C6 - C10 (less BTEX)	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	2.5	5328911
>C10-C16 Hydrocarbons	mg/kg	180	<10	<10	<10	<10	10	5329126
>C16-C21 Hydrocarbons	mg/kg	240	<10	<10	<10	<10	10	5329126
>C21-<C32 Hydrocarbons	mg/kg	310	<15	<15	<15	<15	15	5329126
Modified TPH (Tier1)	mg/kg	720	<15	<15	<15	<15	15	5326583
Reached Baseline at C32	mg/kg	Yes	NA	NA	NA	NA	N/A	5329126
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	NA	NA	NA	NA	N/A	5329126
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	102	108	102	105	102		5329126
n-Dotriacontane - Extractable	%	107	128	120	126	122		5329126
Isobutylbenzene - Volatile	%	102	101 (2)	109	107 (2)	148 (3)		5328911

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

(1) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.

(2) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

(3) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility. VPH surrogate not within acceptance limits. Analysis was repeated with similar results.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		FUP802		FUP803		FUP805	FUP806		
Sampling Date		2017/12/13		2017/12/13		2017/12/13	2017/12/13		
COC Number		B 64238		B 64238		B 64238	B 64238		
	UNITS	**MW-8 (3.7-4.3)**	**QC Batch**	**MW-8 (4.9-5.5)**	**QC Batch**	**MW-9 (3.0-3.7)**	**MW-9 (4.9-5.5)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/kg	<0.025	5328911	<0.025	5328911	0.27	<0.025	0.025	5328911
Toluene	mg/kg	<0.025	5328911	<0.025	5328911	0.89	<0.025	0.025	5328911
Ethylbenzene	mg/kg	<0.025	5328911	<0.025	5328911	0.066	<0.025	0.025	5328911
Total Xylenes	mg/kg	<0.050	5328911	<0.050	5328911	0.92	<0.050	0.050	5328911
C6 - C10 (less BTEX)	mg/kg	<2.5	5328911	<2.5	5328911	7.0	<2.5	2.5	5328911
>C10-C16 Hydrocarbons	mg/kg	<10	5329126	<10	5328729	31	14	10	5329126
>C16-C21 Hydrocarbons	mg/kg	<10	5329126	<10	5328729	59	46	10	5329126
>C21-<C32 Hydrocarbons	mg/kg	<15	5329126	<15	5328729	220	74	15	5329126
Modified TPH (Tier1)	mg/kg	<15	5326583	<15	5326583	320	130	15	5326583
Reached Baseline at C32	mg/kg	NA	5329126	NA	5328729	Yes	Yes	N/A	5329126
Hydrocarbon Resemblance	mg/kg	NA	5329126	NA	5328729	COMMENT (1)	COMMENT (2)	N/A	5329126
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	100	5329126	94	5328729	109	109		5329126
n-Dotriacontane - Extractable	%	124	5329126	95	5328729	109	123		5329126
Isobutylbenzene - Volatile	%	109	5328911	110	5328911	99 (3)	139 (4)		5328911

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) One product in fuel oil range. Lube oil fraction.
(2) One product in fuel / lube range. Unidentified compound(s) in fuel / lube range.
(3) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.
(4) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility. VPH surrogate not within acceptance limits. Analysis was repeated with similar results.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (SOIL)

Maxxam ID		FUP807	FUP808	FUP846		FUP848		
Sampling Date		2017/12/13	2017/12/13	2017/12/13		2017/12/12		
COC Number		B 64238	B 64238	B 64239		B 64239		
	UNITS	**MW-10 (0.6-1.2)**	**MW-10 (4.3-4.9)**	**MW-11 (1.8-2.4)**	**QC Batch**	**MW-12 (4.9-5.5)**	**RDL**	**QC Batch**
Petroleum Hydrocarbons								
Benzene	mg/kg	<0.025	<0.025	<0.025	5328911	<0.025	0.025	5328911
Toluene	mg/kg	0.070	<0.025	0.071	5328911	<0.025	0.025	5328911
Ethylbenzene	mg/kg	0.29	<0.025	<0.025	5328911	<0.025	0.025	5328911
Total Xylenes	mg/kg	1.7	<0.050	<0.050	5328911	<0.050	0.050	5328911
C6 - C10 (less BTEX)	mg/kg	65	<2.5	<2.5	5328911	<2.5	2.5	5328911
>C10-C16 Hydrocarbons	mg/kg	800	<10	<10	5329126	<10	10	5328729
>C16-C21 Hydrocarbons	mg/kg	1300	<10	13	5329126	<10	10	5328729
>C21-<C32 Hydrocarbons	mg/kg	1500	36	38	5329126	<15	15	5328729
Modified TPH (Tier1)	mg/kg	3600	36	51	5326583	<15	15	5326583
Reached Baseline at C32	mg/kg	No	Yes	Yes	5329126	NA	N/A	5328729
Hydrocarbon Resemblance	mg/kg	COMMENT (1)	COMMENT (2)	COMMENT (2)	5329126	NA	N/A	5328729
Surrogate Recovery (%)								
Isobutylbenzene - Extractable	%	94	107	103	5329126	92		5328729
n-Dotriacontane - Extractable	%	116	114	98	5329126	85		5328729
Isobutylbenzene - Volatile	%	46 (3)	108 (4)	101 (4)	5328911	108 (4)		5328911

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Weathered fuel oil fraction. Lube oil fraction.
(2) Possible lube oil fraction.
(3) VPH surrogate not within acceptance limits. Analysis was repeated with similar results. VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.
(4) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.0°C
Package 2	4.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9172
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5327089	Isobutylbenzene - Volatile	2017/12/21	93 (2)	60 - 130	97	60 - 130	98	%		
5328729	Isobutylbenzene - Extractable	2017/12/22	92	30 - 130	97	30 - 130	91	%		
5328729	n-Dotriacontane - Extractable	2017/12/22	113	30 - 130	96	30 - 130	89	%		
5328886	D10-Anthracene	2017/12/23	91	50 - 130	81	50 - 130	90	%		
5328886	D14-Terphenyl (FS)	2017/12/23	88	50 - 130	79	50 - 130	87	%		
5328886	D8-Acenaphthylene	2017/12/23	95	50 - 130	100	50 - 130	101	%		
5328911	Isobutylbenzene - Volatile	2017/12/22	100	60 - 130	95	60 - 130	96	%		
5329126	Isobutylbenzene - Extractable	2017/12/22	99 (4)	30 - 130	105	30 - 130	102	%		
5329126	n-Dotriacontane - Extractable	2017/12/22	113 (4)	30 - 130	121	30 - 130	115	%		
5326891	Moisture	2017/12/22							3.2 (1)	25
5327089	Benzene	2017/12/21	83	60 - 130	93	60 - 140	<0.025	mg/kg	NC (1)	50
5327089	C6 - C10 (less BTEX)	2017/12/21					<2.5	mg/kg	NC (1)	50
5327089	Ethylbenzene	2017/12/21	90	60 - 130	93	60 - 140	<0.025	mg/kg	NC (1)	50
5327089	Toluene	2017/12/21	83	60 - 130	93	60 - 140	<0.025	mg/kg	NC (1)	50
5327089	Total Xylenes	2017/12/21	87	60 - 130	93	60 - 140	<0.050	mg/kg	NC (1)	50
5327149	Moisture	2017/12/22							1.6 (3)	25
5328729	>C10-C16 Hydrocarbons	2017/12/23	88	30 - 130	94	30 - 130	<10	mg/kg	NC (1)	50
5328729	>C16-C21 Hydrocarbons	2017/12/23	90	30 - 130	94	30 - 130	<10	mg/kg	NC (1)	50
5328729	>C21-<C32 Hydrocarbons	2017/12/23	NC	30 - 130	87	30 - 130	<15	mg/kg	0.42 (1)	50
5328886	1-Methylnaphthalene	2017/12/23	77	30 - 130	74	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	2-Methylnaphthalene	2017/12/23	83	30 - 130	80	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Acenaphthene	2017/12/23	88	30 - 130	84	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Acenaphthylene	2017/12/23	85	30 - 130	83	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Anthracene	2017/12/23	94	30 - 130	84	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Benzo(a)anthracene	2017/12/23	113	30 - 130	78	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Benzo(a)pyrene	2017/12/23	109	30 - 130	92	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Benzo(b)fluoranthene	2017/12/23	114	30 - 130	113	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Benzo(g,h,i)perylene	2017/12/23	86	30 - 130	70	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Benzo(j)fluoranthene	2017/12/23	122	30 - 130	122	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Benzo(k)fluoranthene	2017/12/23	116	30 - 130	113	30 - 130	<0.010	mg/kg	NC (1)	50

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9172
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5328886	Chrysene	2017/12/23	110	30 - 130	89	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Dibenz(a,h)anthracene	2017/12/23	80	30 - 130	62	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Fluoranthene	2017/12/23	95	30 - 130	82	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Fluorene	2017/12/23	89	30 - 130	90	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Indeno(1,2,3-cd)pyrene	2017/12/23	80	30 - 130	62	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Naphthalene	2017/12/23	79	30 - 130	75	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Perylene	2017/12/23	111	30 - 130	92	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Phenanthrene	2017/12/23	94	30 - 130	85	30 - 130	<0.010	mg/kg	NC (1)	50
5328886	Pyrene	2017/12/23	92	30 - 130	83	30 - 130	<0.010	mg/kg	NC (1)	50
5328911	Benzene	2017/12/27	108	60 - 130	96	60 - 140	<0.025	mg/kg	NC (1)	50
5328911	C6 - C10 (less BTEX)	2017/12/27					<2.5	mg/kg	NC (1)	50
5328911	Ethylbenzene	2017/12/27	107	60 - 130	98	60 - 140	<0.025	mg/kg	NC (1)	50
5328911	Toluene	2017/12/27	105	60 - 130	98	60 - 140	<0.025	mg/kg	NC (1)	50
5328911	Total Xylenes	2017/12/27	107	60 - 130	94	60 - 140	<0.050	mg/kg	NC (1)	50
5329126	>C10-C16 Hydrocarbons	2017/12/22	98 (4)	30 - 130	107	30 - 130	<10	mg/kg	NC (5)	50
5329126	>C16-C21 Hydrocarbons	2017/12/22	87 (4)	30 - 130	94	30 - 130	<10	mg/kg	NC (5)	50
5329126	>C21-<C32 Hydrocarbons	2017/12/22	107 (4)	30 - 130	120	30 - 130	<15	mg/kg	NC (5)	50
5331377	Acid Extractable Aluminum (Al)	2017/12/27					<10	mg/kg	3.5 (1)	35
5331377	Acid Extractable Antimony (Sb)	2017/12/27	102	75 - 125	105	75 - 125	<2.0	mg/kg	NC (1)	35
5331377	Acid Extractable Arsenic (As)	2017/12/27	96	75 - 125	98	75 - 125	<2.0	mg/kg	5.0 (1)	35
5331377	Acid Extractable Barium (Ba)	2017/12/27	108	75 - 125	96	75 - 125	<5.0	mg/kg	10 (1)	35
5331377	Acid Extractable Beryllium (Be)	2017/12/27	101	75 - 125	99	75 - 125	<2.0	mg/kg	NC (1)	35
5331377	Acid Extractable Bismuth (Bi)	2017/12/27	97	75 - 125	95	75 - 125	<2.0	mg/kg	NC (1)	35
5331377	Acid Extractable Boron (B)	2017/12/27	93	75 - 125	98	75 - 125	<50	mg/kg	NC (1)	35
5331377	Acid Extractable Cadmium (Cd)	2017/12/27	101	75 - 125	99	75 - 125	<0.30	mg/kg	NC (1)	35
5331377	Acid Extractable Chromium (Cr)	2017/12/27	100	75 - 125	97	75 - 125	<2.0	mg/kg	3.8 (1)	35
5331377	Acid Extractable Cobalt (Co)	2017/12/27	98	75 - 125	96	75 - 125	<1.0	mg/kg	5.2 (1)	35
5331377	Acid Extractable Copper (Cu)	2017/12/27	96	75 - 125	95	75 - 125	<2.0	mg/kg	3.6 (1)	35
5331377	Acid Extractable Iron (Fe)	2017/12/27					<50	mg/kg	3.5 (1)	35
5331377	Acid Extractable Lead (Pb)	2017/12/27	NC	75 - 125	98	75 - 125	<0.50	mg/kg	6.7 (1)	35

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9172
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5331377	Acid Extractable Lithium (Li)	2017/12/27	104	75 - 125	99	75 - 125	<2.0	mg/kg	4.4 (1)	35
5331377	Acid Extractable Manganese (Mn)	2017/12/27	NC	75 - 125	98	75 - 125	<2.0	mg/kg	2.7 (1)	35
5331377	Acid Extractable Mercury (Hg)	2017/12/27	96	75 - 125	104	75 - 125	<0.10	mg/kg	13 (1)	35
5331377	Acid Extractable Molybdenum (Mo)	2017/12/27	98	75 - 125	92	75 - 125	<2.0	mg/kg	NC (1)	35
5331377	Acid Extractable Nickel (Ni)	2017/12/27	103	75 - 125	97	75 - 125	<2.0	mg/kg	2.0 (1)	35
5331377	Acid Extractable Rubidium (Rb)	2017/12/27	97	75 - 125	100	75 - 125	<2.0	mg/kg	1.7 (1)	35
5331377	Acid Extractable Selenium (Se)	2017/12/27	94	75 - 125	93	75 - 125	<1.0	mg/kg	NC (1)	35
5331377	Acid Extractable Silver (Ag)	2017/12/27	102	75 - 125	99	75 - 125	<0.50	mg/kg	NC (1)	35
5331377	Acid Extractable Strontium (Sr)	2017/12/27	105	75 - 125	100	75 - 125	<5.0	mg/kg	5.2 (1)	35
5331377	Acid Extractable Thallium (Tl)	2017/12/27	99	75 - 125	99	75 - 125	<0.10	mg/kg	NC (1)	35
5331377	Acid Extractable Tin (Sn)	2017/12/27	106	75 - 125	94	75 - 125	<2.0	mg/kg	NC (1)	35
5331377	Acid Extractable Uranium (U)	2017/12/27	103	75 - 125	99	75 - 125	<0.10	mg/kg	2.8 (1)	35
5331377	Acid Extractable Vanadium (V)	2017/12/27	NC	75 - 125	98	75 - 125	<2.0	mg/kg	5.7 (1)	35
5331377	Acid Extractable Zinc (Zn)	2017/12/27	NC	75 - 125	105	75 - 125	<5.0	mg/kg	2.9 (1)	35
5331387	Acid Extractable Aluminum (Al)	2017/12/28					<10	mg/kg	3.7 (1)	35
5331387	Acid Extractable Antimony (Sb)	2017/12/28	100	75 - 125	108	75 - 125	<2.0	mg/kg	NC (1)	35
5331387	Acid Extractable Arsenic (As)	2017/12/28	98	75 - 125	96	75 - 125	<2.0	mg/kg	4.2 (1)	35
5331387	Acid Extractable Barium (Ba)	2017/12/28	NC	75 - 125	98	75 - 125	<5.0	mg/kg	3.9 (1)	35
5331387	Acid Extractable Beryllium (Be)	2017/12/28	104	75 - 125	98	75 - 125	<2.0	mg/kg	NC (1)	35
5331387	Acid Extractable Bismuth (Bi)	2017/12/28	100	75 - 125	96	75 - 125	<2.0	mg/kg	NC (1)	35
5331387	Acid Extractable Boron (B)	2017/12/28	99	75 - 125	96	75 - 125	<50	mg/kg	NC (1)	35
5331387	Acid Extractable Cadmium (Cd)	2017/12/28	101	75 - 125	98	75 - 125	<0.30	mg/kg	NC (1)	35
5331387	Acid Extractable Chromium (Cr)	2017/12/28	98	75 - 125	96	75 - 125	<2.0	mg/kg	1.7 (1)	35
5331387	Acid Extractable Cobalt (Co)	2017/12/28	99	75 - 125	97	75 - 125	<1.0	mg/kg	3.9 (1)	35
5331387	Acid Extractable Copper (Cu)	2017/12/28	92	75 - 125	94	75 - 125	<2.0	mg/kg	7.2 (1)	35
5331387	Acid Extractable Iron (Fe)	2017/12/28					<50	mg/kg	1.1 (1)	35
5331387	Acid Extractable Lead (Pb)	2017/12/28	102	75 - 125	99	75 - 125	<0.50	mg/kg	4.1 (1)	35
5331387	Acid Extractable Lithium (Li)	2017/12/28	103	75 - 125	100	75 - 125	<2.0	mg/kg	3.9 (1)	35
5331387	Acid Extractable Manganese (Mn)	2017/12/28	NC	75 - 125	99	75 - 125	<2.0	mg/kg	1.2 (1)	35
5331387	Acid Extractable Mercury (Hg)	2017/12/28	96	75 - 125	100	75 - 125	<0.10	mg/kg	NC (1)	35

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9172
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 730509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5331387	Acid Extractable Molybdenum (Mo)	2017/12/28	97	75 - 125	91	75 - 125	<2.0	mg/kg	NC (1)	35
5331387	Acid Extractable Nickel (Ni)	2017/12/28	100	75 - 125	97	75 - 125	<2.0	mg/kg	2.4 (1)	35
5331387	Acid Extractable Rubidium (Rb)	2017/12/28	98	75 - 125	95	75 - 125	<2.0	mg/kg	5.4 (1)	35
5331387	Acid Extractable Selenium (Se)	2017/12/28	94	75 - 125	93	75 - 125	<1.0	mg/kg	NC (1)	35
5331387	Acid Extractable Silver (Ag)	2017/12/28	100	75 - 125	98	75 - 125	<0.50	mg/kg	NC (1)	35
5331387	Acid Extractable Strontium (Sr)	2017/12/28	108	75 - 125	103	75 - 125	<5.0	mg/kg	5.2 (1)	35
5331387	Acid Extractable Thallium (Tl)	2017/12/28	102	75 - 125	101	75 - 125	<0.10	mg/kg	NC (1)	35
5331387	Acid Extractable Tin (Sn)	2017/12/28	99	75 - 125	103	75 - 125	<2.0	mg/kg	NC (1)	35
5331387	Acid Extractable Uranium (U)	2017/12/28	106	75 - 125	99	75 - 125	<0.10	mg/kg	3.6 (1)	35
5331387	Acid Extractable Vanadium (V)	2017/12/28	103	75 - 125	97	75 - 125	<2.0	mg/kg	4.5 (1)	35
5331387	Acid Extractable Zinc (Zn)	2017/12/28	99	75 - 125	104	75 - 125	<5.0	mg/kg	3.6 (1)	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) VPH samples were extracted using a flat-bed shaker instead of the accelerated mechanical shaker due to matrix incompatibility.

(3) Duplicate Parent ID [FUP848-01]

(4) Matrix Spike Parent ID [FUP756-01]

(5) Duplicate Parent ID [FUP756-01]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Kevin MacDonald, Inorganics Supervisor

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64241 Page 1 of 3

This column for lab use only:	INVOICE INFORMATION:	REPORT INFORMATION (if differs from invoice):		TURNAROUND TIME
Client Code	Company Name: GHD Ltd	Company Name:	PO # 73050997	Standard ☑
	Contact Name: Troy Small	Contact Name:	Project # / Phase # 11149943-07	10 day ☐
Maxxam Job # B7S9172	Address: 466 Hodgson Rd	Address: Same	Project Name / Site Location Maritime Electric	If RUSH Specify Date:
	Fredericton, NB Postal Code E3C 2G5	Postal Code	Quote	
	Email: troy.small@ghd.com	Email:	Site #	Pre-schedule rush work
	Ph: (506) 458-1248 Fax: (506) 462-7646	Ph: Fax:	Task Order #	Charge for # Jars used but not submitted
			Sampled by M. Gaines / M. Theriault	

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			1	0	2	
			6	3	4	

Integrity: YES / NO (NO circled) — Integrity / Checklist by: CW

Labelled by: CW — Location / Bin #

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 (Choose Total or Diss Metals)	RCAP-MS (Choose Total or Diss Metals)	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron required for CCME Agricultural	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	PAH's with Acridine, Quinoline
1	SP-1 (2.4-3.0m)	Soil	2017/12/11	3	N	N											✓					
2	SP-2 (2.1-2.7m)	Soil	2017/12/12	3	N	N											✓					
3	SP-2 (3.3-4.0m)	Soil	2017/12/12	3	N	N											✓					
4	SP-3 (2.4-3.0m)	Soil	2017/12/12	3	N	N											✓					
5	MW-1 (2.7-3.3m)	Soil	2017/12/11	3	N	N											✓					
6	MW-2 (4.9-5.5m)	Soil	2017/12/11	3	N	N											✓					
7	MW-3 (2.1-2.7m)	Soil	2017/12/13	3	N	N											✓				✓	
8	MW-3 (4.6-5.2m)	Soil	2017/12/12	3	N	N											✓					
9	MW-4 (3.3-4.0m)	Soil	2017/12/12	3	N	N											✓				✓	
10	MW-5 (3.0-3.7m)	Soil	2017/12/12	3	N	N											✓					

2017 DEC 20 9:32

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 19/17	10:00	D. Albert		

Shipped from FREDTON

White: Maxxam Yellow : Mail Pink: Client ATL FCD 00149 / Revision 8 11/08

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64238

Page 2 of 3

This column for lab use only:

Client Code

Maxxam Job # B7S9172

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			1	0	2	
			6	3	4	

Integrity YES / NO

Integrity / Checklist by AW

Labelled by AW

Location / Bin #

INVOICE INFORMATION:

Company Name: GHD Ltd

Contact Name: Troy Small

Address: 466 Hodgson Rd Fredericton, NB Postal Code E3C 2G5

Email: Troy.Small@ghd.com

Ph (506) 458-1248 Fax: (506) 462-7646

REPORT INFORMATION (if differs from invoice):

Company Name: Same

Contact Name:

Address: Postal Code

Email:

Ph: Fax:

PO # 73509971

Project # / Phase # 11149943-07

Project Name / Site Location Maritime Electric

Quote

Site #

Task Order #

Sampled by McGuire / M. Theriault

TURNAROUND TIME

Standard ☑

10 day ☐

If RUSH Specify Date:

Pre-schedule rush work

Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

Analysis columns: Field Filtered & Preserved; Lab Filtration Required; RCAP-30 (Choose Total or Diss Metals); RCAP-MS (Choose Total or Diss Metals); Metals Water: Total Digest (Default Method) for well water, surface water; Dissolved for ground water; Mercury; Metals Soil: Metals & Mercury Default Available Digest Method; Metals Total Digest - for Ocean sediments (HNO3/HF/HClO4); Mercury Low level by Cold Vapour AA; Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural; Hot Water soluble Boron (required for CCME Agricultural); Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32); Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32; NB Potable Water BTEX, VPH, Low level T.E.H.; TPH Fractionation; PAH's; PAH's with Acridine, Quinoline

#	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	Metals & Mercury	RBCA Hydrocarbons	PAH's
1	MW-6 (2.7-3.3m)	Soil	2017/12/12	3	N	N		✓	
2	MW-7 (2.4-3.0m)	Soil	2017/12/13	3	N	N		✓	✓
3	MW-7 (3.7-4.3m)	Soil	2017/12/13	3	N	N		✓	
4	MW-8 (3.7-4.3m)	Soil	2017/12/13	3	N	N		✓	
5	MW-8 (4.9-5.5m)	Soil	2017/12/13	3	N	N		✓	
6	MW-9 (0.6-1.2m)	Soil	2017/12/13	1	N	N	✓		✓
7	MW-9 (3.0-3.7m)	Soil	2017/12/13	3	N	N		✓	
8	MW-9 (4.9-5.5m)	Soil	2017/12/13	3	N	N		✓	
9	MW-10 (0.6-1.2m)	Soil	2017/12/13	3	N	N		✓	✓
10	MW-10 (4.3-4.9m)	Soil	2017/12/13	3	N	N		✓	

2017 DEC 20 9:32

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 19/17	10:00	D Albert		

Shipped from FREDTON

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 8 11/08

Maxxam Analytics

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64239 Page 3 of 3

This column for lab use only:
Client Code
Maxxam Job # B7S9172

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			1	0	2	
			6	3	4	

Integrity: YES NO — Integrity / Checklist by: CW
Labelled by: AW — Location / Bin #

INVOICE INFORMATION:
Company Name: GHD Ltd
Contact Name: Troy Small
Address: Fredericton, NB 466 Hodgson Rd Postal Code E3C 2G5
Email: troy.Small@ghd.com
Ph: (506) 458-1248 Fax: (506) 462-7646

REPORT INFORMATION (if differs from invoice):
Company Name:
Contact Name:
Address: Same
Postal Code
Email:
Ph: Fax:

PO # 73509971
Project # / Phase # 11149943-07
Project Name / Site Location: Maritime Electric
Quote
Site #
Task Order #
Sampled by: M. Gaines / M. Theriault

TURNAROUND TIME
Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 (Choose Total or Diss Metals)	RCAP-MS (Choose Total or Diss Metals)	Metals Water: Total Digest (Default Method) for well water, surface water	Dissolved for ground water	Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Mercury Low level by Cold Vapour AA	Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	NB Potable Water BTEX, VPH, Low level T.E.H.	TPH Fractionation	PAH's	PAH's with Acridine, Quinoline					
1	MW-11 (1.8-2.4m)	Soil	2017/12/13	3	N	N											✓										
2	MW-12 (1.2-1.8m)	Soil	2017/12/12	1	N	N						✓									✓						
3	MW-12 (4.9-5.5m)	Soil	2017/12/12	3	N	N											✓										
4	MW-7 (0.6-1.2m)	Soil	2017/12/13	1	N	N						✓															
5	MW-10 (0-0.6m)	Soil	2017/12/13	1	N	N						✓															
6	MW-11 (0-0.6m)	Soil	2017/12/13	1	N	N						✓															
7	Spoil pile	Soil	2017/12/15	2	N	N						✓															
8																							2017 DEC 20 9:32				
9																											
10																											

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 19/17	10:00	D Albert		

Shipped from FREDERICTON

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 8 11/08

Your P.O. #: 73509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64240, B 64237

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2017/12/29
Report #: R4924729
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S9022
Received: 2017/12/20, 09:36

Sample Matrix: Water
Samples Received: 13

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Benzo(b/j)fluoranthene Sum (water)	5	N/A	2017/12/29	N/A	Auto Calc.
TEH in Water (PIRI)	12	2017/12/21	2017/12/22	ATL SOP 00113	Atl. RBCA v3.1 m
TEH in Water (PIRI)	1	2017/12/27	2017/12/27	ATL SOP 00113	Atl. RBCA v3.1 m
Mercury - Total (CVAA,LL)	5	2017/12/27	2017/12/28	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Diss. MS (as rec'd)	4	N/A	2017/12/22	ATL SOP 00058	EPA 6020A R1 m
Metals Water Diss. MS (as rec'd)	1	N/A	2017/12/27	ATL SOP 00058	EPA 6020A R1 m
PAH in Water by GC/MS (SIM)	1	2017/12/22	2017/12/28	ATL SOP 00103	EPA 8270D 2007 m
PAH in Water by GC/MS (SIM)	4	2017/12/22	2017/12/29	ATL SOP 00103	EPA 8270D 2007 m
VPH in Water (PIRI)	12	N/A	2017/12/21	ATL SOP 00118	Atl. RBCA v3.1 m
VPH in Water (PIRI)	1	N/A	2017/12/22	ATL SOP 00118	Atl. RBCA v3.1 m
ModTPH (T1) Calc. for Water	3	N/A	2017/12/27	N/A	Atl. RBCA v3 m
ModTPH (T1) Calc. for Water	10	N/A	2017/12/28	N/A	Atl. RBCA v3 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your P.O. #: 73509971
Your Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64240, B 64237

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2017/12/29
Report #: R4924729
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7S9022
Received: 2017/12/20, 09:36

Encryption Key

Sam Sherker
Bedford Client Svc
29 Dec 2017 17:04:28

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		FUP096	FUP099	FUP101	FUP102	FUP104		
Sampling Date		2017/12/15	2017/12/15	2017/12/15	2017/12/15	2017/12/15		
COC Number		B 64240	B 64240	B 64240	B 64240	B 64237		
	UNITS	**MW-4**	**MW-7**	**MW-9**	**MW-10**	**MW-12**	**RDL**	**QC Batch**
Metals								
Total Mercury (Hg)	ug/L	<0.013	<0.013	<0.013	<0.013	<0.013	0.013	5331502

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		FUP096	FUP096	FUP099	FUP101	FUP102		FUP104		
Sampling Date		2017/12/15	2017/12/15	2017/12/15	2017/12/15	2017/12/15		2017/12/15		
COC Number		B 64240	B 64240	B 64240	B 64240	B 64240		B 64237		
	UNITS	**MW-4**	**MW-4 Lab-Dup**	**MW-7**	**MW-9**	**MW-10**	**RDL**	**MW-12**	**RDL**	**QC Batch**
Metals										
Dissolved Aluminum (Al)	ug/L	<5.0	<5.0	370	28	45	5.0	<50	50	5328748
Dissolved Antimony (Sb)	ug/L	2.2	2.2	1.6	<1.0	<1.0	1.0	<10	10	5328748
Dissolved Arsenic (As)	ug/L	1.8	1.8	3.7	<1.0	<1.0	1.0	<10	10	5328748
Dissolved Barium (Ba)	ug/L	100	110	10	43	15	1.0	61	10	5328748
Dissolved Beryllium (Be)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<10	10	5328748
Dissolved Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	<20	20	5328748
Dissolved Boron (B)	ug/L	<50	<50	180	160	200	50	1100	500	5328748
Dissolved Cadmium (Cd)	ug/L	0.21	0.22	0.026	<0.010	0.33	0.010	<0.10	0.10	5328748
Dissolved Calcium (Ca)	ug/L	140000	140000	2700	82000	180000	100	110000	1000	5328748
Dissolved Chromium (Cr)	ug/L	<1.0	<1.0	3.7	<1.0	1.2	1.0	<10	10	5328748
Dissolved Cobalt (Co)	ug/L	1.4	1.4	0.91	1.8	3.4	0.40	<4.0	4.0	5328748
Dissolved Copper (Cu)	ug/L	<2.0	<2.0	<2.0	<2.0	2.3	2.0	<20	20	5328748
Dissolved Iron (Fe)	ug/L	<50	<50	1800	4800	3800	50	<500	500	5328748
Dissolved Lead (Pb)	ug/L	<0.50	<0.50	1.6	<0.50	<0.50	0.50	<5.0	5.0	5328748
Dissolved Magnesium (Mg)	ug/L	27000	27000	230	28000	19000	100	190000	1000	5328748
Dissolved Manganese (Mn)	ug/L	210	200	780	4000	1300	2.0	720	20	5328748
Dissolved Molybdenum (Mo)	ug/L	17	19	17	<2.0	4.0	2.0	65	20	5328748
Dissolved Nickel (Ni)	ug/L	2.1	<2.0	3.0	3.4	13	2.0	40	20	5328748
Dissolved Phosphorus (P)	ug/L	<100	<100	360	<100	<100	100	<1000	1000	5328748
Dissolved Potassium (K)	ug/L	11000	11000	2500	11000	9800	100	83000	1000	5328748
Dissolved Selenium (Se)	ug/L	<1.0	<1.0	1.1	<1.0	<1.0	1.0	<10	10	5328748
Dissolved Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	<1.0	1.0	5328748
Dissolved Sodium (Na)	ug/L	1000000	1000000	260000	81000	23000	100	1900000	1000	5328748
Dissolved Strontium (Sr)	ug/L	460	450	9.9	260	240	2.0	1100	20	5328748
Dissolved Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	<1.0	1.0	5328748
Dissolved Tin (Sn)	ug/L	2.9	3.1	10	<2.0	2.1	2.0	<20	20	5328748
Dissolved Titanium (Ti)	ug/L	<2.0	<2.0	29	<2.0	<2.0	2.0	<20	20	5328748
Dissolved Uranium (U)	ug/L	2.4	2.4	0.88	0.30	0.33	0.10	1.9	1.0	5328748
Dissolved Vanadium (V)	ug/L	130	130	31	<2.0	3.6	2.0	1600	20	5328748
Dissolved Zinc (Zn)	ug/L	<5.0	<5.0	5.1	13	130	5.0	<50	50	5328748

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		FUP096			FUP096			FUP099		FUP101		
Sampling Date		2017/12/15			2017/12/15			2017/12/15		2017/12/15		
COC Number		B 64240			B 64240			B 64240		B 64240		
	UNITS	**MW-4**	**RDL**	**QC Batch**	**MW-4 Lab-Dup**	**RDL**	**QC Batch**	**MW-7**	**RDL**	**MW-9**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons												
1-Methylnaphthalene	ug/L	3.4	0.050	5329303	3.5	0.050	5329303	260	5.0	14	0.050	5329303
2-Methylnaphthalene	ug/L	0.93	0.050	5329303	0.99	0.050	5329303	17	5.0	1.5	0.050	5329303
Acenaphthene	ug/L	1.5	0.010	5329303	1.6	0.010	5329303	150	1.0	9.6	0.010	5329303
Acenaphthylene	ug/L	2.0	0.010	5329303	2.1	0.010	5329303	240	1.0	24	0.010	5329303
Anthracene	ug/L	6.0	0.010	5329303	6.7	0.010	5329303	590	1.0	33	0.010	5329303
Benzo(a)anthracene	ug/L	4.3	0.010	5329303	4.4	0.010	5329303	150	1.0	23	0.010	5329303
Benzo(a)pyrene	ug/L	2.4	0.010	5329303	2.3	0.010	5329303	59	1.0	11	0.010	5329303
Benzo(b)fluoranthene	ug/L	1.6	0.010	5329303	1.7	0.010	5329303	40	1.0	7.7	0.010	5329303
Benzo(b/j)fluoranthene	ug/L	2.8	0.020	5326755				70	2.0	13	0.020	5326755
Benzo(g,h,i)perylene	ug/L	0.81	0.010	5329303	0.79	0.010	5329303	20	1.0	3.5	0.010	5329303
Benzo(j)fluoranthene	ug/L	1.2	0.010	5329303	1.2	0.010	5329303	29	1.0	5.3	0.010	5329303
Benzo(k)fluoranthene	ug/L	1.2	0.010	5329303	1.1	0.010	5329303	29	1.0	5.3	0.010	5329303
Chrysene	ug/L	3.8	0.010	5329303	4.0	0.010	5329303	140	1.0	21	0.010	5329303
Dibenz(a,h)anthracene	ug/L	0.41	0.010	5329303	0.36	0.010	5329303	8.5	1.0	1.7	0.010	5329303
Fluoranthene	ug/L	11	0.010	5329303	11	0.010	5329303	630	1.0	49 (1)	0.10	5329303
Fluorene	ug/L	5.8	0.010	5329303	6.1	0.010	5329303	490	1.0	34	0.010	5329303
Indeno(1,2,3-cd)pyrene	ug/L	0.94	0.010	5329303	0.90	0.010	5329303	22	1.0	3.9	0.010	5329303
Naphthalene	ug/L	4.8	0.20	5329303	5.5	0.20	5329303	450	20	8.0	0.20	5329303
Perylene	ug/L	0.45	0.010	5329303	0.46	0.010	5329303	12	1.0	2.4	0.010	5329303
Phenanthrene	ug/L	13	0.010	5329303	14	0.010	5329303	1300	1.0	72 (1)	0.10	5329303
Pyrene	ug/L	7.6	0.010	5329303	8.0	0.010	5329303	410	1.0	36	0.010	5329303
Surrogate Recovery (%)												
D10-Anthracene	%	62		5329303	78		5329303	527 (2)		97		5329303
D14-Terphenyl	%	63 (3)		5329303	67 (3)		5329303	631 (4)		78		5329303
D8-Acenaphthylene	%	78		5329303	76		5329303	183 (2)		100		5329303

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Elevated PAH RDL(s) due to sample dilution.
(2) PAH surrogate(s) not within acceptance limits due to sample dilution / product interference.
(3) PAH sample contained sediment.
(4) Elevated PAH RDL(s) due to sample dilution. PAH surrogate(s) not within acceptance limits due to sample dilution / product interference. PAH sample contained sediment.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		FUP102		FUP104		
Sampling Date		2017/12/15		2017/12/15		
COC Number		B 64240		B 64237		
	UNITS	**MW-10**	**RDL**	**MW-12**	**RDL**	**QC Batch**
Polyaromatic Hydrocarbons						
1-Methylnaphthalene	ug/L	0.54	0.050	0.80	0.050	5329303
2-Methylnaphthalene	ug/L	0.58	0.050	0.81	0.050	5329303
Acenaphthene	ug/L	0.25	0.010	3.5	0.010	5329303
Acenaphthylene	ug/L	<0.050 (1)	0.050	1.0	0.010	5329303
Anthracene	ug/L	0.19	0.010	26	0.010	5329303
Benzo(a)anthracene	ug/L	0.068	0.010	49 (2)	0.10	5329303
Benzo(a)pyrene	ug/L	0.047	0.010	40 (2)	0.10	5329303
Benzo(b)fluoranthene	ug/L	0.041	0.010	27	0.010	5329303
Benzo(b/j)fluoranthene	ug/L	0.058	0.020	47	0.020	5326755
Benzo(g,h,i)perylene	ug/L	0.029	0.010	17	0.010	5329303
Benzo(j)fluoranthene	ug/L	0.018	0.010	20	0.010	5329303
Benzo(k)fluoranthene	ug/L	0.013	0.010	20	0.010	5329303
Chrysene	ug/L	0.12	0.010	47 (2)	0.10	5329303
Dibenz(a,h)anthracene	ug/L	0.010	0.010	7.7	0.010	5329303
Fluoranthene	ug/L	0.14	0.010	74 (2)	0.10	5329303
Fluorene	ug/L	0.38	0.010	5.2	0.010	5329303
Indeno(1,2,3-cd)pyrene	ug/L	<0.020 (1)	0.020	19	0.010	5329303
Naphthalene	ug/L	<0.20	0.20	0.82	0.20	5329303
Perylene	ug/L	0.022	0.010	9.3	0.010	5329303
Phenanthrene	ug/L	1.3	0.010	38 (2)	0.10	5329303
Pyrene	ug/L	0.17	0.010	56 (2)	0.10	5329303
Surrogate Recovery (%)						
D10-Anthracene	%	62		95		5329303
D14-Terphenyl	%	64		81 (3)		5329303
D8-Acenaphthylene	%	77		92		5329303

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Elevated PAH RDL(s) due to matrix / co-extractive interference.
(2) Elevated PAH RDL(s) due to sample dilution.
(3) PAH sample contained sediment.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		FUP093		FUP094		FUP095		FUP096		
Sampling Date		2017/12/15		2017/12/15		2017/12/15		2017/12/15		
COC Number		B 64240		B 64240		B 64240		B 64240		
	UNITS	**MW-1**	**QC Batch**	**MW-2**	**QC Batch**	**MW-3**	**QC Batch**	**MW-4**	**RDL**	**QC Batch**
Petroleum Hydrocarbons										
Benzene	mg/L	<0.0010	5326832	<0.0010	5326832	<0.0010	5326832	<0.0010	0.0010	5326832
Toluene	mg/L	<0.0010	5326832	<0.0010	5326832	<0.0010	5326832	<0.0010	0.0010	5326832
Ethylbenzene	mg/L	<0.0010	5326832	<0.0010	5326832	<0.0010	5326832	<0.0010	0.0010	5326832
Total Xylenes	mg/L	<0.0020	5326832	<0.0020	5326832	0.011	5326832	0.0032	0.0020	5326832
C6 - C10 (less BTEX)	mg/L	<0.010	5326832	<0.010	5326832	0.064	5326832	<0.010	0.010	5326832
>C10-C16 Hydrocarbons	mg/L	<0.050	5327007	<0.050	5327015	1.0	5331399	0.060	0.050	5327015
>C16-C21 Hydrocarbons	mg/L	<0.050	5327007	<0.050	5327015	0.19	5331399	<0.050	0.050	5327015
>C21-<C32 Hydrocarbons	mg/L	<0.10	5327007	<0.10	5327015	<0.10	5331399	<0.10	0.10	5327015
Modified TPH (Tier1)	mg/L	<0.10	5326561	<0.10	5326561	1.3	5326561	<0.10	0.10	5326561
Reached Baseline at C32	mg/L	NA	5327007	NA	5327015	Yes	5331399	NA	N/A	5327015
Hydrocarbon Resemblance	mg/L	NA	5327007	NA	5327015	COMMENT (1)	5331399	NA	N/A	5327015
Surrogate Recovery (%)										
Isobutylbenzene - Extractable	%	70	5327007	86	5327015	98	5331399	88		5327015
n-Dotriacontane - Extractable	%	108	5327007	91	5327015	121	5331399	94		5327015
Isobutylbenzene - Volatile	%	101	5326832	95	5326832	107	5326832	104		5326832

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) One product in fuel oil range. Unidentified compound(s) in fuel oil range.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		FUP097	FUP098	FUP099		FUP100	FUP101		
Sampling Date		2017/12/15	2017/12/15	2017/12/15		2017/12/15	2017/12/15		
COC Number		B 64240	B 64240	B 64240		B 64240	B 64240		
	UNITS	**MW-5**	**MW-6**	**MW-7**	**QC Batch**	**MW-8**	**MW-9**	**RDL**	**QC Batch**
Petroleum Hydrocarbons									
Benzene	mg/L	<0.0010	<0.0010	0.0075	5326832	<0.0010	<0.0010	0.0010	5326832
Toluene	mg/L	<0.0010	<0.0010	0.0095	5326832	<0.0010	<0.0010	0.0010	5326832
Ethylbenzene	mg/L	<0.0010	<0.0010	0.0043	5326832	<0.0010	<0.0010	0.0010	5326832
Total Xylenes	mg/L	<0.0020	<0.0020	0.024	5326832	<0.0020	<0.0020	0.0020	5326832
C6 - C10 (less BTEX)	mg/L	<0.010	0.017 (1)	0.084	5326832	<0.010	<0.010	0.010	5326832
>C10-C16 Hydrocarbons	mg/L	<0.050	<0.050	2.7	5327007	0.052	0.23	0.050	5327007
>C16-C21 Hydrocarbons	mg/L	<0.050	<0.050	0.70	5327007	0.084	0.28	0.050	5327007
>C21-<C32 Hydrocarbons	mg/L	<0.10	<0.10	0.19	5327007	<0.10	0.16	0.10	5327007
Modified TPH (Tier1)	mg/L	<0.10	<0.10	3.7	5326561	0.14	0.67	0.10	5326756
Reached Baseline at C32	mg/L	NA	NA	Yes	5327007	Yes	Yes	N/A	5327007
Hydrocarbon Resemblance	mg/L	NA	NA	COMMENT (2)	5327007	COMMENT (3)	COMMENT (2)	N/A	5327007
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	90	89	102	5327007	102	93		5327007
n-Dotriacontane - Extractable	%	110	116	113 (4)	5327007	117	110		5327007
Isobutylbenzene - Volatile	%	100	101	105	5326832	92	101		5326832

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Interference from Volatile Organic Compounds (VOCs) in the gasoline range.
(2) One product in fuel oil range. Unidentified compound(s) in fuel oil range.
(3) One product in fuel oil range.
(4) TEH sample contained sediment.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

ATLANTIC RBCA HYDROCARBONS (WATER)

Maxxam ID		FUP102		FUP103		FUP104	FUP105		
Sampling Date		2017/12/15		2017/12/15		2017/12/15	2017/12/15		
COC Number		B 64240		B 64237		B 64237	B 64237		
	UNITS	MW-10	QC Batch	MW-11	QC Batch	MW-12	BH-5	RDL	QC Batch
Petroleum Hydrocarbons									
Benzene	mg/L	<0.0010	5326832	<0.0010	5326832	<0.0010	<0.0010	0.0010	5326832
Toluene	mg/L	<0.0010	5326832	<0.0010	5326832	<0.0010	<0.0010	0.0010	5326832
Ethylbenzene	mg/L	<0.0010	5326832	<0.0010	5326832	<0.0010	<0.0010	0.0010	5326832
Total Xylenes	mg/L	<0.0020	5326832	<0.0020	5326832	<0.0020	<0.0020	0.0020	5326832
C6 - C10 (less BTEX)	mg/L	<0.010	5326832	<0.010	5326832	<0.010	<0.010	0.010	5326832
>C10-C16 Hydrocarbons	mg/L	0.11	5327007	<0.050	5327015	0.081	<0.050	0.050	5327007
>C16-C21 Hydrocarbons	mg/L	0.18	5327007	<0.050	5327015	0.27	<0.050	0.050	5327007
>C21-<C32 Hydrocarbons	mg/L	0.13	5327007	<0.10	5327015	0.27	<0.10	0.10	5327007
Modified TPH (Tier1)	mg/L	0.43	5326756	<0.10	5326756	0.62	<0.10	0.10	5326756
Reached Baseline at C32	mg/L	Yes	5327007	NA	5327015	Yes	NA	N/A	5327007
Hydrocarbon Resemblance	mg/L	COMMENT (1)	5327007	NA	5327015	COMMENT (1)	NA	N/A	5327007
Surrogate Recovery (%)									
Isobutylbenzene - Extractable	%	102	5327007	79	5327015	94	103		5327007
n-Dotriacontane - Extractable	%	117	5327007	87	5327015	121 (2)	118		5327007
Isobutylbenzene - Volatile	%	90	5326832	92	5326832	96	86		5326832

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) One product in fuel / lube range.
(2) TEH sample contained sediment.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.7°C
Package 2	2.3°C
Package 3	2.3°C

Sample FUP104 [MW-12] : Elevated reporting limits for trace metals due to sample matrix.

Results relate only to the items tested.

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7S9022
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5326832	Isobutylbenzene - Volatile	2017/12/21	76	70 - 130	105	70 - 130	101	%		
5327007	Isobutylbenzene - Extractable	2017/12/27	104	30 - 130	80	30 - 130	87	%		
5327007	n-Dotriacontane - Extractable	2017/12/27	117	30 - 130	115	30 - 130	114	%		
5327015	Isobutylbenzene - Extractable	2017/12/22	101	30 - 130	93	30 - 130	81	%		
5327015	n-Dotriacontane - Extractable	2017/12/22	108	30 - 130	99	30 - 130	88	%		
5329303	D10-Anthracene	2017/12/28	100 (4)	50 - 130	88	50 - 130	106	%		
5329303	D14-Terphenyl	2017/12/28	63 (5,4)	50 - 130	90	50 - 130	102	%		
5329303	D8-Acenaphthylene	2017/12/28	89 (4)	50 - 130	100	50 - 130	102	%		
5331399	Isobutylbenzene - Extractable	2017/12/27	92	30 - 130	91	30 - 130	94	%		
5331399	n-Dotriacontane - Extractable	2017/12/27	118	30 - 130	114	30 - 130	113	%		
5326832	Benzene	2017/12/21	110	70 - 130	123	70 - 130	<0.0010	mg/L	NC (1)	40
5326832	C6 - C10 (less BTEX)	2017/12/21					<0.010	mg/L	NC (1)	40
5326832	Ethylbenzene	2017/12/21	110	70 - 130	121	70 - 130	<0.0010	mg/L	NC (1)	40
5326832	Toluene	2017/12/21	112	70 - 130	122	70 - 130	<0.0010	mg/L	NC (1)	40
5326832	Total Xylenes	2017/12/21	111	70 - 130	122	70 - 130	<0.0020	mg/L	NC (1)	40
5327007	>C10-C16 Hydrocarbons	2017/12/28	96	70 - 130	96	70 - 130	<0.050	mg/L	NC (1)	40
5327007	>C16-C21 Hydrocarbons	2017/12/28	96	70 - 130	96	70 - 130	<0.050	mg/L	NC (1)	40
5327007	>C21-<C32 Hydrocarbons	2017/12/28	86	70 - 130	89	70 - 130	<0.10	mg/L	NC (1)	40
5327015	>C10-C16 Hydrocarbons	2017/12/27	96	70 - 130	90	70 - 130	<0.050	mg/L	NC (1)	40
5327015	>C16-C21 Hydrocarbons	2017/12/27	101	70 - 130	91	70 - 130	<0.050	mg/L	NC (1)	40
5327015	>C21-<C32 Hydrocarbons	2017/12/27	100	70 - 130	93	70 - 130	<0.10	mg/L	NC (1)	40
5328748	Dissolved Aluminum (Al)	2017/12/22	107 (2)	80 - 120	101	80 - 120	<5.0	ug/L	NC (3)	20
5328748	Dissolved Antimony (Sb)	2017/12/22	90 (2)	80 - 120	90	80 - 120	<1.0	ug/L	0.75 (3)	20
5328748	Dissolved Arsenic (As)	2017/12/22	100 (2)	80 - 120	98	80 - 120	<1.0	ug/L	4.4 (3)	20
5328748	Dissolved Barium (Ba)	2017/12/22	NC (2)	80 - 120	97	80 - 120	<1.0	ug/L	1.2 (3)	20
5328748	Dissolved Beryllium (Be)	2017/12/22	98 (2)	80 - 120	100	80 - 120	<1.0	ug/L	NC (3)	20
5328748	Dissolved Bismuth (Bi)	2017/12/22	94 (2)	80 - 120	102	80 - 120	<2.0	ug/L	NC (3)	20
5328748	Dissolved Boron (B)	2017/12/22	96 (2)	80 - 120	100	80 - 120	<50	ug/L	NC (3)	20
5328748	Dissolved Cadmium (Cd)	2017/12/22	101 (2)	80 - 120	102	80 - 120	<0.010	ug/L	7.5 (3)	20
5328748	Dissolved Calcium (Ca)	2017/12/22	NC (2)	80 - 120	101	80 - 120	<100	ug/L	0.39 (3)	20

Maxxam Job #: B7S9022
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5328748	Dissolved Chromium (Cr)	2017/12/22	101 (2)	80 - 120	99	80 - 120	<1.0	ug/L	NC (3)	20
5328748	Dissolved Cobalt (Co)	2017/12/22	98 (2)	80 - 120	100	80 - 120	<0.40	ug/L	3.1 (3)	20
5328748	Dissolved Copper (Cu)	2017/12/22	91 (2)	80 - 120	98	80 - 120	<2.0	ug/L	NC (3)	20
5328748	Dissolved Iron (Fe)	2017/12/22	103 (2)	80 - 120	103	80 - 120	<50	ug/L	NC (3)	20
5328748	Dissolved Lead (Pb)	2017/12/22	94 (2)	80 - 120	97	80 - 120	<0.50	ug/L	NC (3)	20
5328748	Dissolved Magnesium (Mg)	2017/12/22	NC (2)	80 - 120	103	80 - 120	<100	ug/L	1.1 (3)	20
5328748	Dissolved Manganese (Mn)	2017/12/22	NC (2)	80 - 120	99	80 - 120	<2.0	ug/L	1.1 (3)	20
5328748	Dissolved Molybdenum (Mo)	2017/12/22	109 (2)	80 - 120	101	80 - 120	<2.0	ug/L	8.1 (3)	20
5328748	Dissolved Nickel (Ni)	2017/12/22	94 (2)	80 - 120	100	80 - 120	<2.0	ug/L	4.8 (3)	20
5328748	Dissolved Phosphorus (P)	2017/12/22	106 (2)	80 - 120	104	80 - 120	<100	ug/L	NC (3)	20
5328748	Dissolved Potassium (K)	2017/12/22	NC (2)	80 - 120	103	80 - 120	<100	ug/L	0.77 (3)	20
5328748	Dissolved Selenium (Se)	2017/12/22	100 (2)	80 - 120	102	80 - 120	<1.0	ug/L	NC (3)	20
5328748	Dissolved Silver (Ag)	2017/12/22	95 (2)	80 - 120	98	80 - 120	<0.10	ug/L	NC (3)	20
5328748	Dissolved Sodium (Na)	2017/12/22	NC (2)	80 - 120	100	80 - 120	<100	ug/L	0.010 (3)	20
5328748	Dissolved Strontium (Sr)	2017/12/22	NC (2)	80 - 120	99	80 - 120	<2.0	ug/L	1.5 (3)	20
5328748	Dissolved Thallium (Tl)	2017/12/22	97 (2)	80 - 120	101	80 - 120	<0.10	ug/L	NC (3)	20
5328748	Dissolved Tin (Sn)	2017/12/22	107 (2)	80 - 120	103	80 - 120	<2.0	ug/L	4.7 (3)	20
5328748	Dissolved Titanium (Ti)	2017/12/22	109 (2)	80 - 120	104	80 - 120	<2.0	ug/L	NC (3)	20
5328748	Dissolved Uranium (U)	2017/12/22	103 (2)	80 - 120	102	80 - 120	<0.10	ug/L	0.86 (3)	20
5328748	Dissolved Vanadium (V)	2017/12/22	NC (2)	80 - 120	101	80 - 120	<2.0	ug/L	0.22 (3)	20
5328748	Dissolved Zinc (Zn)	2017/12/22	93 (2)	80 - 120	102	80 - 120	<5.0	ug/L	NC (3)	20
5329303	1-Methylnaphthalene	2017/12/29	NC (4)	30 - 130	78	30 - 130	<0.050	ug/L	5.0 (6)	40
5329303	2-Methylnaphthalene	2017/12/29	NC (4)	30 - 130	82	30 - 130	<0.050	ug/L	6.4 (6)	40
5329303	Acenaphthene	2017/12/29	NC (4)	30 - 130	89	30 - 130	<0.010	ug/L	4.1 (6)	40
5329303	Acenaphthylene	2017/12/29	NC (4)	30 - 130	83	30 - 130	<0.010	ug/L	5.6 (6)	40
5329303	Anthracene	2017/12/29	NC (4)	30 - 130	88	30 - 130	<0.010	ug/L	10 (6)	40
5329303	Benzo(a)anthracene	2017/12/29	NC (4)	30 - 130	94	30 - 130	<0.010	ug/L	3.7 (6)	40
5329303	Benzo(a)pyrene	2017/12/29	NC (4)	30 - 130	77	30 - 130	<0.010	ug/L	4.0 (6)	40
5329303	Benzo(b)fluoranthene	2017/12/29	NC (4)	30 - 130	83	30 - 130	<0.010	ug/L	4.5 (6)	40
5329303	Benzo(g,h,i)perylene	2017/12/29	NC (4)	30 - 130	82	30 - 130	<0.010	ug/L	1.9 (6)	40

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9022
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5329303	Benzo(j)fluoranthene	2017/12/29	NC (4)	30 - 130	83	30 - 130	<0.010	ug/L	1.5 (6)	40
5329303	Benzo(k)fluoranthene	2017/12/29	NC (4)	30 - 130	74	30 - 130	<0.010	ug/L	3.8 (6)	40
5329303	Chrysene	2017/12/29	NC (4)	30 - 130	92	30 - 130	<0.010	ug/L	4.2 (6)	40
5329303	Dibenz(a,h)anthracene	2017/12/29	NC (4)	30 - 130	77	30 - 130	<0.010	ug/L	12 (6)	40
5329303	Fluoranthene	2017/12/29	NC (4)	30 - 130	94	30 - 130	<0.010	ug/L	5.3 (6)	40
5329303	Fluorene	2017/12/29	NC (4)	30 - 130	86	30 - 130	<0.010	ug/L	4.7 (6)	40
5329303	Indeno(1,2,3-cd)pyrene	2017/12/29	NC (4)	30 - 130	79	30 - 130	<0.010	ug/L	4.0 (6)	40
5329303	Naphthalene	2017/12/29	NC (4)	30 - 130	80	30 - 130	<0.20	ug/L	12 (6)	40
5329303	Perylene	2017/12/29	NC (4)	30 - 130	80	30 - 130	<0.010	ug/L	2.2 (6)	40
5329303	Phenanthrene	2017/12/29	NC (4)	30 - 130	91	30 - 130	<0.010	ug/L	5.3 (6)	40
5329303	Pyrene	2017/12/29	NC (4)	30 - 130	91	30 - 130	<0.010	ug/L	6.2 (6)	40
5331399	>C10-C16 Hydrocarbons	2017/12/27	94	70 - 130	98	70 - 130	<0.050	mg/L	NC (1)	40
5331399	>C16-C21 Hydrocarbons	2017/12/27	90	70 - 130	91	70 - 130	<0.050	mg/L	NC (1)	40
5331399	>C21-<C32 Hydrocarbons	2017/12/27	103	70 - 130	111	70 - 130	<0.10	mg/L	NC (1)	40

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9022
Report Date: 2017/12/29

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
5331502	Total Mercury (Hg)	2017/12/28	103	80 - 120	102	80 - 120	<0.013	ug/L	NC (1)	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [FUP096-03]

(3) Duplicate Parent ID [FUP096-03]

(4) Matrix Spike Parent ID [FUP099-05]

(5) PAH sample contained sediment.

(6) Duplicate Parent ID [FUP096-05]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7S9022
Report Date: 2017/12/29

GHD Limited
Client Project #: 11149943-07
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Kevin G. MacDonald

Kevin MacDonald, Inorganics Supervisor

RoseMarie MacDonald

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Analytics

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64240

This column for lab use only:

Client Code:

Maxxam Job #: B7S9022

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			4	2	2	
			2	2	3	
			2	2	3	

Integrity: YES / NO (NO circled)

Integrity / Checklist by: CW

Labelled by: CW

Location / Bin #:

INVOICE INFORMATION:

Company Name: GHD Ltd

Contact Name: Troy Small

Address: Fredericton, NB

466 Hodgson Rd Postal Code: E3C 2G5

Email: troy.Small@ghd.com

Ph: (506) 458-1248 Fax: (506) 462-7646

REPORT INFORMATION (if differs from invoice):

Company Name:

Contact Name:

Address: Same

Postal Code:

Email:

Ph: Fax:

PO #: 73509971

Project # / Phase #: 11149943-07

Project Name / Site Location: Maritime Electric

Quote:

Site #:

Task Order #:

Sampled by: M. Gaines / M. Theriault

TURNAROUND TIME

Standard ☑

10 day ☐

If RUSH Specify Date:

Pre-schedule rush work

Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

#	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 (Choose Total or Diss Metals)	RCAP-MS (Choose Total or Diss Metals)	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons BTEX, C6-C32	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline
1	MW-1	GW	2017/12/15	5	N	N											✓					
2	MW-2	GW	2017/12/15	5	N	N											✓					
3	MW-3	GW	2017/12/15	5	N	N											✓					
4	MW-4	GW	2017/12/15	9	N	N				✓	✓						✓				✓	
5	MW-5	GW	2017/12/15	5	N	N											✓					
6	MW-6	GW	2017/12/15	5	N	N											✓					
7	MW-7	GW	2017/12/15	9	N	N				✓	✓						✓				✓	
8	MW-8	GW	2017/12/15	5	N	N											✓					
9	MW-9	GW	2017/12/15	9	N	N				✓	✓						✓				✓	
10	MW-10	GW	2017/12/15	9	N	N				✓	✓						✓				✓	

2017 DEC 20 9:35

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 19/17	10:00	JHibbert		

Shipped from FREDTON

White: Maxxam Yellow: Mail Pink: Client

ATL FCD 00149 / Revision 8 11/08

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64237 Page 2 of 2

This column for lab use only:

Client Code

Maxxam Job # B7S9022

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			4	2	2	
			2	2	3	
			2	2	3	

Integrity YES NO (NO circled) — Integrity / Checklist by: CW

Labelled by: CW — Location / Bin #

INVOICE INFORMATION:

Company Name: GHD Ltd
Contact Name: Troy Small
Address: 466 Hodgson Rd Fredericton, NB Postal Code E3C 2G5
Email: troy-small@ghd.com
Ph: (506) 458-1248 Fax: (506) 462-7646

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name:
Address: Same
Postal Code
Email:
Ph: Fax:

PO # 7356 9971
Project # / Phase # 11149947-07
Project Name / Site Location Maritime Electric
Quote
Site #
Task Order #
Sampled by M. Gaines / M. Theriault

TURNAROUND TIME

Standard ☑
10 day ☐
If RUSH Specify Date:
Pre-schedule rush work
Charge for # Jars used but not submitted

Guideline Requirements / Detection Limits / Special Instructions

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

#	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	Hydrocarbons: PAH's with Acridine, Quinoline					
1	MW-11	GW	2017/12/15	5	N	N											✓										
2	MW-12	GW	2017/12/15	9	N	N				✓	✓						✓				✓						
3	BH-5	GW	2017/12/15	5	N	N											✓										
4																											
5																											
6																											
7																											
8																											
9																											
10																											

2017 DEC 20 9:35

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec. 19/17	10:00	[signature]		Shipped from FREDTON

White: Maxxam Yellow: Mail Pink: Client ATL FCD 00149 / Revision 8 11/08

Your P.O. #: 73509971
Your Project #: 11149943
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64249

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2018/01/19
Report #: R4942855
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7T0227
Received: 2017/12/21, 09:08

Sample Matrix: Solid
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PCBs in Solid by GC/ECD (1)	1	2017/12/28	2018/01/02	ATL SOP 00105	EPA 8082A m
PCBs in Solid by GC/ECD (1)	1	2017/12/28	2018/01/17	ATL SOP 00105	EPA 8082A m
PCB Aroclor sum (solid)	1	N/A	2018/01/02	N/A	Auto Calc.
PCB Aroclor sum (solid)	1	N/A	2018/01/17	N/A	Auto Calc.
Sample weight	3	2018/01/17	2018/01/17		

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Samples were analyzed for PCB using an accredited standard procedure modified for a non-standard matrix. Best laboratory practice and all routine QC procedures were employed. The accreditation does not extend to the matrix analyzed.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your P.O. #: 73509971
Your Project #: 11149943
Site Location: MARITIME ELECTRIC
Your C.O.C. #: B 64249

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2018/01/19
Report #: R4942855
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7T0227
Received: 2017/12/21, 09:08

Encryption Key

Sara Mason
Project Manager Assistant
19 Jan 2018 15:09:29

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7T0227
Report Date: 2018/01/19

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

RESULTS OF ANALYSES OF SOLID

Maxxam ID		FXQ701	FXQ702	FXQ703		
Sampling Date		2017/12/18	2017/12/18	2017/12/18		
COC Number		B 64249	B 64249	B 64249		
	UNITS	**4160 (OLD END)-Whole Cable Weight**	**4160 (OLD END)-Weight of Steel**	**4160 (OLD END)-Weight of Copper**	**RDL**	**QC Batch**
Inorganics						
Weight	g	351	155	157	0.10	5356737
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOLID)

Maxxam ID		FUU760			FUU760			FXQ700		
Sampling Date		2017/12/18			2017/12/18			2017/12/18		
COC Number		B 64249			B 64249			B 64249		
	UNITS	4160 (OLD END)	RDL	QC Batch	4160 (OLD END) Lab-Dup	RDL	QC Batch	4160 (OLD END)-Paper	RDL	QC Batch
PCBs										
Aroclor 1016	mg/kg	<0.50	0.50	5334035	<0.50	0.50	5334035	<0.50	0.50	5356753
Aroclor 1221	mg/kg	<0.50	0.50	5334035	<0.50	0.50	5334035	<0.50	0.50	5356753
Aroclor 1232	mg/kg	<0.50	0.50	5334035	<0.50	0.50	5334035	<0.50	0.50	5356753
Aroclor 1248	mg/kg	<0.50	0.50	5334035	<0.50	0.50	5334035	<0.50	0.50	5356753
Aroclor 1242	mg/kg	<0.50	0.50	5334035	<0.50	0.50	5334035	<0.50	0.50	5356753
Aroclor 1254	mg/kg	7.0 (1)	0.50	5334035	6.3 (1)	0.50	5334035	2.8	0.50	5356753
Aroclor 1260	mg/kg	<0.50	0.50	5334035	<0.50	0.50	5334035	<0.50	0.50	5356753
Calculated Total PCB	mg/kg	7.0	0.50	5328721				2.8	0.50	5356620
Surrogate Recovery (%)										
Decachlorobiphenyl	%	57		5334035	56		5334035	57		5356753

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) PCB result calculated assuming PCB contribution from oil portion of sample only.

Maxxam ID		FXQ700		
Sampling Date		2017/12/18		
COC Number		B 64249		
	UNITS	4160 (OLD END)-Paper Lab-Dup	RDL	QC Batch
PCBs				
Aroclor 1016	mg/kg	<0.50	0.50	5356753
Aroclor 1221	mg/kg	<0.50	0.50	5356753
Aroclor 1232	mg/kg	<0.50	0.50	5356753
Aroclor 1248	mg/kg	<0.50	0.50	5356753
Aroclor 1242	mg/kg	<0.50	0.50	5356753
Aroclor 1254	mg/kg	2.5	0.50	5356753
Aroclor 1260	mg/kg	<0.50	0.50	5356753
Surrogate Recovery (%)				
Decachlorobiphenyl	%	56		5356753

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7T0227
Report Date: 2018/01/19

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	14.0°C

Revised report - Additional weight analysis added as per request from Troy. HWS Jan 19/18

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7T0227
Report Date: 2018/01/19

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149943
Site Location: MARITIME ELECTRIC
Your P.O. #: 73509971
Sampler Initials: MG

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5334035	Decachlorobiphenyl	2018/01/02	55 (1)	30 - 130	93	30 - 130	102	%		
5356753	Decachlorobiphenyl	2018/01/02	55 (4)	30 - 130	93	30 - 130	102	%		
5334035	Aroclor 1016	2018/01/02					<0.50	mg/kg	NC (2)	50
5334035	Aroclor 1221	2018/01/02					<0.50	mg/kg	NC (2)	50
5334035	Aroclor 1232	2018/01/02					<0.50	mg/kg	NC (2)	50
5334035	Aroclor 1242	2018/01/02					<0.50	mg/kg	NC (2)	50
5334035	Aroclor 1248	2018/01/02					<0.50	mg/kg	NC (2)	50
5334035	Aroclor 1254	2018/01/02					<0.50	mg/kg	11 (3,2)	50
5334035	Aroclor 1260	2018/01/02	127 (1)	30 - 130	97	30 - 130	<0.50	mg/kg	NC (2)	50
5356753	Aroclor 1016	2018/01/17					<0.50	mg/kg	NC (5)	50
5356753	Aroclor 1221	2018/01/17					<0.50	mg/kg	NC (5)	50
5356753	Aroclor 1232	2018/01/17					<0.50	mg/kg	NC (5)	50
5356753	Aroclor 1242	2018/01/17					<0.50	mg/kg	NC (5)	50
5356753	Aroclor 1248	2018/01/17					<0.50	mg/kg	NC (5)	50
5356753	Aroclor 1254	2018/01/17					<0.50	mg/kg	13 (5)	50
5356753	Aroclor 1260	2018/01/17	50 (4)	30 - 130	97	30 - 130	<0.50	mg/kg	NC (5)	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Matrix Spike Parent ID [FUU760-01]

(2) Duplicate Parent ID [FUU760-01]

(3) PCB result calculated assuming PCB contribution from oil portion of sample only.

(4) Matrix Spike Parent ID [FXQ700-01]

(5) Duplicate Parent ID [FXQ700-01]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Alan Stewart, Organics Manager, Bedford

Eric Dearman, Scientific Specialist

Rosemarie MacDonald, Scientific Specialist (Organics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
90 Esplanade Sydney, NS B1P 1A1 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 888-535-7770
www.maxxamanalytics.com E-mail: Clientservicesbedford@maxxamanalytics.com

MAXXAM Chain of Custody Record

COC #: B 64249 Page 1 of 1

This column for lab use only:	INVOICE INFORMATION:	REPORT INFORMATION (if differs from invoice):		TURNAROUND TIME
Client Code	Company Name: GHD Ltd	Company Name:	PO # 73509971	Standard ☑
	Contact Name: Troy Small	Contact Name:	Project # / Phase # 11149943 - 07	10 day ☐
Maxxam Job # B7T0227	Address: 466 Hodgson Rd	Address: Same	Project Name / Site Location Maritime Electric	If RUSH Specify Date:
	Fredericton, NB Postal Code E3C 2G5	Postal Code	Quote	
			Site #	
	Email: troy.small@ghd.com	Email:	Task Order #	Pre-schedule rush work
	Ph: (506) 458-1248 Fax: (506) 462-7646	Ph: Fax:	Sampled by M. Gaines / M. Theriault	Charge for # Jars used but not submitted

Cooler ID	Seal Present	Seal Intact	Temp 1	Temp 2	Temp 3	Average Temp
			14	14	14	

Integrity: YES / NO (NO circled)
Integrity / Checklist by: BM
Labelled by:
Location / Bin #:

Guideline Requirements / Detection Limits / Special Instructions:
* Possible PICL Cable

*Specify Matrix: Surface/Salt/Ground/Tapwater/Sewage/Effluent/Potable/NonPotable/Tissue/Soil/Sludge/Metal/Seawater

	Field Sample Identification	Matrix*	Date/Time Sampled	# & type of bottles	Field Filtered & Preserved	Lab Filtration Required	RCAP-30 Choose Total or Diss Metals	RCAP-MS Choose Total or Diss Metals	Metals Water: Total Digest (Default Method) for well water, surface water	Metals Water: Dissolved for ground water	Metals Water: Mercury	Metals Soil: Metals & Mercury Default Available Digest Method	Metals Soil: Metals Total Digest - for Ocean sediments (HNO3/HF/HCLO4)	Metals Soil: Mercury Low level by Cold Vapour AA	Metals Soil: Selenium (low level) Req'd for CCME Residential, Parklands, Agricultural	Metals Soil: Hot Water soluble Boron (required for CCME Agricultural)	Hydrocarbons: RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons: Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	Hydrocarbons: NB Potable Water BTEX, VPH, Low level T.E.H.	Hydrocarbons: TPH Fractionation	Hydrocarbons: PAH's	PAH's with Acridine, Quinoline	PCB's
1	4160 (Cold End)	cable	2017/12/18	1 piece	N	N																	✓
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							

2017 DEC 21 9:08

RELINQUISHED BY: (Signature/Print)	Date	Time	RECEIVED BY: (Signature/Print)	Date	Time
Michael Gaines	Dec.20/17	11:00	[signature]		

White: Maxxam Yellow: Mail Pink: Client ATL FCD 00149 / Revision 8 11/08

Att: Mario Theriault

GHD

466 Hodgson Road,

Fredericton, NB

E3C-2G5

As Per Kevin Burns, Please find I length insulated Copper wire from the Charlottetown Generation Station,

50 Cumberland Street,

Charlottetown ,PE

C1A-5B9

Taken from the former Longworth St. Circuit.

Thank you

LVM/KB

Your Project #: 11149943
Your C.O.C. #: N/A

Attention: Troy Small

GHD Limited
466 Hodgson Rd
Fredericton , NB
E3C 2G5

Report Date: 2018/01/26
Report #: R4952136
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B811285
Received: 2018/01/17, 09:03

Sample Matrix: Paint
Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Paint Acid Extr. ICPMS	11	2018/01/19	2018/01/19	ATL SOP 00058	EPA 6020A R1 m
Metals Paint Acid Extr. ICPMS	7	2018/01/22	2018/01/24	ATL SOP 00058	EPA 6020A R1 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Maxxam
26 Jan 2018 09:04:01

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B811285
Report Date: 2018/01/26

GHD Limited
Client Project #: 11149943
Sampler Initials: LMD

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FXR046			FXR047	FXR048	FXR049	FXR050		
Sampling Date		2018/01/12 12:00			2018/01/12 12:00	2018/01/12 12:00	2018/01/12 12:00	2018/01/12 12:00		
COC Number		N/A			N/A	N/A	N/A	N/A		
	UNITS	OES BASE	RDL	QC Batch	OES 50'	OES 100'	OES 150'	OES 210'	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	20000	8.5	5363721	20000	24000	32000	300	5.0	5360434
Acid Extractable Zinc (Zn)	mg/kg	250	85	5363721	640	830	640	2900	50	5360434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FXR051		FXR052		FXR053		FXR054		FXR055		
Sampling Date		2018/01/12 13:00		2018/01/12 13:00		2018/01/12 13:00		2018/01/12 13:00		2018/01/12 13:00		
COC Number		N/A		N/A		N/A		N/A		N/A		
	UNITS	10 STACK BASE	RDL	10 STACK 50'	RDL	10 STACK 100'	RDL	10 STACK 150'	RDL	10 STACK 210'	RDL	QC Batch
Metals												
Acid Extractable Lead (Pb)	mg/kg	42	8.0	<41	41	39	34	88	55	35	25	5363721
Acid Extractable Zinc (Zn)	mg/kg	5700	80	660	410	<340	340	<550	550	<250	250	5363721

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FXR056	FXR057	FXR058	FXR059		
Sampling Date		2018/01/15 09:00	2018/01/15 09:00	2018/01/15 09:00	2018/01/15 09:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	EASTWALL (STEEL)	EASTWALL (BLOCK)	NORTHWALL (STEEL)	NORTHWALL (BLOCK)	RDL	QC Batch
Metals							
Acid Extractable Lead (Pb)	mg/kg	1900	220	86	3900	5.0	5360434
Acid Extractable Zinc (Zn)	mg/kg	170000	6600	8800	190	50	5360434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B811285
Report Date: 2018/01/26

GHD Limited
Client Project #: 11149943
Sampler Initials: LMD

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FXR060			FXR061	FXR062		
Sampling Date		2018/01/15 09:00			2018/01/15 09:00	2018/01/15 09:00		
COC Number		N/A			N/A	N/A		
	UNITS	SOUTHWALL (STEEL)	RDL	QC Batch	SOUTHWALL (BLOCK)	WESTWALL (STEEL)	RDL	QC Batch
Metals								
Acid Extractable Lead (Pb)	mg/kg	760	6.3	5363721	460	31000	5.0	5360434
Acid Extractable Zinc (Zn)	mg/kg	17000	63	5363721	330	900	50	5360434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FXR063		
Sampling Date		2018/01/15 09:00		
COC Number		N/A		
	UNITS	WESTWALL (BLOCK)	RDL	QC Batch
Metals				
Acid Extractable Lead (Pb)	mg/kg	33	5.0	5360434
Acid Extractable Zinc (Zn)	mg/kg	140	50	5360434

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B811285
Report Date: 2018/01/26

GHD Limited
Client Project #: 11149943
Sampler Initials: LMD

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	14.3°C

Sample FXR046 [OES BASE] : Elevated reporting limits for trace metals due to a low sample weight used in the digestion.

Sample FXR051 [10 STACK BASE] : Elevated reporting limits for trace metals due to a low sample weight used in the digestion.

Sample FXR052 [10 STACK 50'] : Elevated reporting limits for trace metals due to a low sample weight used in the digestion.

Sample FXR053 [10 STACK 100'] : Elevated reporting limits for trace metals due to a low sample weight used in the digestion.

Sample FXR054 [10 STACK 150'] : Elevated reporting limits for trace metals due to a low sample weight used in the digestion.

Sample FXR055 [10 STACK 210'] : Elevated reporting limits for trace metals due to a low sample weight used in the digestion.

Sample FXR060 [SOUTHWALL (STEEL)] : Elevated reporting limits for trace metals due to a low sample weight used in the digestion.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B811285
Report Date: 2018/01/26

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11149943
Sampler Initials: LMD

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5360434	Acid Extractable Lead (Pb)	2018/01/19	NC	75 - 125	99	75 - 125	<5.0	mg/kg	51 (1,2)	35
5360434	Acid Extractable Zinc (Zn)	2018/01/19	NC	75 - 125	102	75 - 125	<50	mg/kg		
5363721	Acid Extractable Lead (Pb)	2018/01/24	NC	75 - 125	98	75 - 125	<5.0	mg/kg	5.1 (2)	35
5363721	Acid Extractable Zinc (Zn)	2018/01/23	NC	75 - 125	103	75 - 125	<50	mg/kg		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

(1) Poor RPD due to sample inhomogeneity. Results confirmed with repeat digestion and analysis.

(2) Duplicate Parent ID

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B811285
Report Date: 2018/01/26

GHD Limited
Client Project #: 11149943
Sampler Initials: LMD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Eric Dearman, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Samples are to be analyzed for LEAD and ZINC
with extract to be held for Potential future Leachate analysis

Maxxam
A Bureau Veritas Group Company

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49-55 Elizabeth Avenue, St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
465 George Street, Unit G, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / 22

CHAIN OF CUSTODY RECORD

COC #:

Page 1 of 3

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: MARITIME ELECTRIC	Company Name:	Quotation #:	☐ Regular TAT (5 business days) Most analyses
Contact Name: ADAM MacKenzie	Contact Name:	P.O. #:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: Po Box 1328	Address:	Project #: 1114994-3	IF RUSH please specify date (Surcharges will be applied)
Charlottetown Postal Code: C1A-7N2	Postal Code:	Site Location:	DATE REQUIRED:
Phone: 800-670-1012 Fax: 902-629-3754	Phone: Fax:	Site #:	
Email: mackenzie.ad@maritimeelectric.com	Email:	Sampled By: Larry MacDonald.	

Laboratory Use Only

CUSTODY SEAL Present	CUSTODY SEAL Intact	COOLER TEMPERATURES	COOLER TEMPERATURES
		14, 16, 13	

COOLING MEDIA PRESENT Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	LAB FILTRATION REQUIRED	RCAP-MS (Total Metals) Well / Surface water	RCAP-MS (Dissolved Metals) Ground waters	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury (CIRCLE) TOTAL / DISSOLVED	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural/ Landfill)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	CCME Hydrocarbons (CWS-PHC F1/BTEX, F2-F4)	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs (Default for water/soil)	PAHs (FWAL/CCME Sediment)	PCBs	VOCs	Total Coliform/E.coli (Presence/Absence)	Total Coliform/E.Coli (Count)		HOLD- DO NOT ANALYZE	Regulatory Requirements (Specify) / COMMENTS
1	OES BASE	2018/01/12	1200		1																								
2	OES 50'	"	1200		1																								
3	OES 100'	"	1200		1																								
4	OES 150'	"	1200		1																								
5	OES 210'	"	1200		1																								
6																													2018 JAN 17 9:03
7																													
8																													
9																													
10																													

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY:(Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
			D Albert			B811285

White: Maxxam Pink: Client

Samples are to be analyzed for Lead and Zinc with the extract
To be held for potential future leachate analysis

Maxxam
A Bureau Veritas Group Company

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49-55 Elizabeth Avenue, St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
465 George Street, Unit G, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / 22

CHAIN OF CUSTODY RECORD

COC #:

Page 2 of 3

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	Maritime Electric Co Ltd	Company Name:		Quotation #:		☐ Regular TAT (5 business days) Most analyses
Contact Name:	ADAM MacKenzie	Contact Name:		P.O. #:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	PO Box 1328	Address:		Project #:	1149943	IF RUSH please specify date (Surcharges will be applied)
	Charlottetown Postal Code: C1A 7N2	Postal Code:		Site Location:		DATE REQUIRED:
Phone:	800-670-1012 Fax: 902-629-3754	Phone: Fax:		Site #:		
Email:	mackenzie.ad@maritimeelectric.com	Email:		Sampled By:	Larry MacDonald	

Laboratory Use Only

CUSTODY SEAL Present	CUSTODY SEAL Intact	COOLER TEMPERATURES	COOLER TEMPERATURES
		14, 16, 13	

COOLING MEDIA PRESENT Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

#	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	LAB FILTRATION REQUIRED	RCAP-MS [Total Metals] Well / Surface water	RCAP-MS [Dissolved Metals] Ground waters	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury (CIRCLE) TOTAL / DISSOLVED	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural/ Landfill)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	CCME Hydrocarbons (CWS-PHC F1/BTEX, F2-F4)	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs (Default for water/soil)	PAHs (FWAL/CCME Sediment)	PCBs	VOCs	Total Coliform/E.coli (Presence/Absence)	Total Coliform/E.Coli (Count)	HOLD- DO NOT ANALYZE	COMMENTS
1	10 STACK BASE	2015/06/12	1300		1																							
2	10 STACK 50'	"	"		1																							
3	10 STACK 100'	"	"		1																							
4	10 STACK 150'	"	"		1																							
5	10 STACK 200'	"	"		1																							
6																												
7																												2015 JAN 17 9:05
8																												
9																												
10																												

Regulatory Requirements (Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY:(Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
			D Albert			B811285

White: Maxxam Pink: Client

Samples are to be analyzed for LEAD and ZINC
With extract to be held for potential Leachate analysis.

Maxxam
A Bureau Veritas Group Company

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49-55 Elizabeth Avenue, St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
465 George Street, Unit G, Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / 22

CHAIN OF CUSTODY RECORD

COC #:

Page 3 of 3

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: Maritime Electric Co LTD	Company Name:	Quotation #:	☐ Regular TAT (5 business days) Most analyses
Contact Name: ADAM MacKenzie	Contact Name:	P.O. #:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: PO Box 1328	Address:	Project #: 1114993	IF RUSH please specify date (Surcharges will be applied)
Charlottetown Postal Code: C1A 7N2	Postal Code:	Site Location:	
Phone: 800-670-1012 Fax: 902629-3754	Phone: Fax:	Site #:	DATE REQUIRED:
Email: mackenzie.ad@maritimeelectric.com	Email:	Sampled By: Kevin Burns	

Laboratory Use Only

CUSTODY SEAL Present	CUSTODY SEAL Intact	COOLER TEMPERATURES	COOLER TEMPERATURES
		4, 16, 13	

COOLING MEDIA PRESENT Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	LAB FILTRATION REQUIRED	RCAP-MS (Total Metals) Well / Surface water	RCAP-MS (Dissolved Metals) Ground waters	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury (CIRCLE) TOTAL / DISSOLVED	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural/ Landfill)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	CCME Hydrocarbons (CWS-PHC F1/BTEX, F2-F4)	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs (Default for water/soil)	PAHs (PWAL /CCME Sediment)	PCBs	VOCs	Total Coliform/E.coli (Presence/Absence)	Total Coliform/E.Coli (Count)		HOLD- DO NOT ANALYZE	Regulatory Requirements (Specify) / COMMENTS
1	EASTWall (Steel)	2015/01/15	0900		1																								
2	EAST Wall (Block)	"	"		1																								
3	North Wall (Steel)	"	"		1																								2015 JAN 17 9:03
4	North Wall (Block)	"	"		1																								
5	South Wall (Steel)	"	"		1																								
6	South Wall (Block)	"	"		1																								
7	West Wall (Steel)	"	"		1																								
8	West wall (Block	"	"		1																								
9																													
10																													

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY:(Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
			DAlbert			B811285

White: Maxxam Pink: Client

Project 11149943

Paint samples taken 01/12/18

Sample taken	Old End Stack		10 Stack	River Pump House
BASE of Stack	☐		✓	☐
50 foot	☐		✓	☐
100 foot	☐		✓	☐
150 foot	☐		✓	☐
2~~0~~0 foot	☐	200	✓	☐
				☐
				☐
				☐
				☐

Project 11149943

Paint samples taken 01/12/18

Sample taken	Old End Stack	10 Stack	River Pump House
BASE of Stack	✓		
50 foot	✓		
100 foot	✓		
150 foot	✓		
200 foot	✓		

Project 11149943

Paint samples taken 01/15/18

Sample taken	Old End Stack	10 Stack	River Pump House
BASE of Stack			EAST Wall STeel
50 foot			EAST Wall Block
100 foot			NorTh wall steel
150 foot			North wall Block
200 foot			SouTh wall steel
			SouTh wall Block
			WesT wall Steel
			West wall Block

Maxxam
A Bureau Veritas Group Company

Your Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Your C.O.C. #: N/A

Attention: Adam MacKenzie

Maritime Electric
50 Cumberland Street
Charlottetown, PE
CANADA C1A 7N2

Report Date: 2018/02/21
Report #: R5003595
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831867
Received: 2018/02/09, 09:19

Sample Matrix: Paint
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction	6	2018/02/16	2018/02/16	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH	6	N/A	2018/02/16	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight	6	N/A	2018/02/16	ATL SOP 00035	EPA 1311 m

Sample Matrix: Solid
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction	4	2018/02/16	2018/02/16	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH	4	N/A	2018/02/16	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight	4	N/A	2018/02/16	ATL SOP 00035	EPA 1311 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Your Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Your C.O.C. #: N/A

Attention: Adam MacKenzie

Maritime Electric
50 Cumberland Street
Charlottetown, PE
CANADA C1A 7N2

Report Date: 2018/02/21
Report #: R5003595
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831867
Received: 2018/02/09, 09:19

Encryption Key

Sara Mason
Project Manager Assistant
21 Feb 2018 14:33:59

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Senior Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B831867
Report Date: 2018/02/21

Maritime Electric
Client Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Sampler Initials: KB

RESULTS OF ANALYSES OF PAINT

Maxxam ID		GBO961	GBO962	GBO963	GBO964	
Sampling Date		2018/02/07 14:00	2018/02/07 14:10	2018/02/07 14:15	2018/02/07 14:20	
COC Number		N/A	N/A	N/A	N/A	
	UNITS	**RIVER PUMPHOUSE NORTH**	**RIVER PUMPHOUSE SOUTH**	**RIVER PUMPHOUSE EAST**	**RIVER PUMPHOUSE WEST**	**QC Batch**
Inorganics						
Sample Weight (as received)	g	12	11	23	5.9	5400837
Initial pH	N/A	5.0	5.0	5.1	5.0	5400838
Final pH	N/A	5.4	5.2	6.7	5.5	5400838
QC Batch = Quality Control Batch						

Maxxam ID		GBO965	GBO967	
Sampling Date		2018/02/07 15:00	2018/02/07 15:30	
COC Number		N/A	N/A	
	UNITS	**NEW STACK 225' 1-BASE**	**NEW STACK 225' 3-225"**	**QC Batch**
Inorganics				
Sample Weight (as received)	g	2.6	8.2	5400837
Initial pH	N/A	5.0	5.0	5400838
Final pH	N/A	5.2	5.6	5400838
QC Batch = Quality Control Batch				

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B831867
Report Date: 2018/02/21

Maritime Electric
Client Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Sampler Initials: KB

ELEMENTS BY ICP/MS (PAINT)

Maxxam ID		GBO961	GBO962	GBO963		
Sampling Date		2018/02/07 14:00	2018/02/07 14:10	2018/02/07 14:15		
COC Number		N/A	N/A	N/A		
	UNITS	**RIVER PUMPHOUSE NORTH**	**RIVER PUMPHOUSE SOUTH**	**RIVER PUMPHOUSE EAST**	**RDL**	**QC Batch**
Metals						
Leachable Lead (Pb)	ug/L	840	150	22	5.0	5403058
Leachable Zinc (Zn)	ug/L	9600	15000	41000	50	5403058

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		GBO964	GBO965	GBO967		
Sampling Date		2018/02/07 14:20	2018/02/07 15:00	2018/02/07 15:30		
COC Number		N/A	N/A	N/A		
	UNITS	**RIVER PUMPHOUSE WEST**	**NEW STACK 225' 1-BASE**	**NEW STACK 225' 3-225"**	**RDL**	**QC Batch**
Metals						
Leachable Lead (Pb)	ug/L	5100	2200	89	5.0	5403058
Leachable Zinc (Zn)	ug/L	12000	17000	37000	50	5403058

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B831867
Report Date: 2018/02/21

Maritime Electric
Client Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Sampler Initials: KB

RESULTS OF ANALYSES OF SOLID

Maxxam ID		GBP004	GBP004	GBP005	GBP006	
Sampling Date		2018/02/07 14:40	2018/02/07 14:40	2018/02/07 14:45	2018/02/07 14:50	
COC Number		N/A	N/A	N/A	N/A	
	UNITS	**AT. DOOR GROUND LEVEL**	**AT. DOOR GROUND LEVEL Lab-Dup**	**OPP. DOOR GROUND LEVEL**	**CORE SAMPLES NEW STACK 225'--125' LEVEL**	**QC Batch**
Inorganics						
Sample Weight (as received)	g	100	100	100	100	5400837
Initial pH	N/A	5.0	5.1	5.0	5.0	5400838
Final pH	N/A	8.2	8.1	12	12	5400838

QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		GBP007	
Sampling Date		2018/02/07 14:55	
COC Number		N/A	
	UNITS	**CORE SAMPLES NEW STACK 225'--225' LEVEL**	**QC Batch**
Inorganics			
Sample Weight (as received)	g	100	5400837
Initial pH	N/A	5.1	5400838
Final pH	N/A	12	5400838

QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B831867
Report Date: 2018/02/21

Maritime Electric
Client Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Sampler Initials: KB

ELEMENTS BY ICP/MS (SOLID)

Maxxam ID		GBP004	GBP004	GBP005		
Sampling Date		2018/02/07 14:40	2018/02/07 14:40	2018/02/07 14:45		
COC Number		N/A	N/A	N/A		
	UNITS	**AT. DOOR GROUND LEVEL**	**AT. DOOR GROUND LEVEL Lab-Dup**	**OPP. DOOR GROUND LEVEL**	**RDL**	**QC Batch**
Metals						
Leachable Lead (Pb)	ug/L	<5.0	<5.0	<5.0	5.0	5403058
Leachable Zinc (Zn)	ug/L	<50	<50	<50	50	5403058

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		GBP006	GBP007		
Sampling Date		2018/02/07 14:50	2018/02/07 14:55		
COC Number		N/A	N/A		
	UNITS	**CORE SAMPLES NEW STACK 225'--125' LEVEL**	**CORE SAMPLES NEW STACK 225'--225' LEVEL**	**RDL**	**QC Batch**
Metals					
Leachable Lead (Pb)	ug/L	<5.0	<5.0	5.0	5403058
Leachable Zinc (Zn)	ug/L	<50	<50	50	5403058

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B831867
Report Date: 2018/02/21

Maritime Electric
Client Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Sampler Initials: KB

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	14.0°C

Sample GBO961 [RIVER PUMPHOUSE NORTH] : The minimum weight of 100g for the standard TCLP extraction, as per Reference Method EPA 1311 R1992, could not be achieved due to insufficient sample. Client consent has been received to proceed using the modified TCLP method. The uncertainty of the analysis may be increased, and the reported results may not be suitable for compliance purposes.

Sample GBO962 [RIVER PUMPHOUSE SOUTH] : The minimum weight of 100g for the standard TCLP extraction, as per Reference Method EPA 1311 R1992, could not be achieved due to insufficient sample. Client consent has been received to proceed using the modified TCLP method. The uncertainty of the analysis may be increased, and the reported results may not be suitable for compliance purposes.

Sample GBO963 [RIVER PUMPHOUSE EAST] : The minimum weight of 100g for the standard TCLP extraction, as per Reference Method EPA 1311 R1992, could not be achieved due to insufficient sample. Client consent has been received to proceed using the modified TCLP method. The uncertainty of the analysis may be increased, and the reported results may not be suitable for compliance purposes.

Sample GBO964 [RIVER PUMPHOUSE WEST] : The minimum weight of 100g for the standard TCLP extraction, as per Reference Method EPA 1311 R1992, could not be achieved due to insufficient sample. Client consent has been received to proceed using the modified TCLP method. The uncertainty of the analysis may be increased, and the reported results may not be suitable for compliance purposes.

Sample GBO965 [NEW STACK 225' 1-BASE] : The minimum weight of 100g for the standard TCLP extraction, as per Reference Method EPA 1311 R1992, could not be achieved due to insufficient sample. Client consent has been received to proceed using the modified TCLP method. The uncertainty of the analysis may be increased, and the reported results may not be suitable for compliance purposes.

Sample GBO967 [NEW STACK 225' 3-225"] : The minimum weight of 100g for the standard TCLP extraction, as per Reference Method EPA 1311 R1992, could not be achieved due to insufficient sample. Client consent has been received to proceed using the modified TCLP method. The uncertainty of the analysis may be increased, and the reported results may not be suitable for compliance purposes.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B831867
Report Date: 2018/02/21

QUALITY ASSURANCE REPORT

Maritime Electric
Client Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Sampler Initials: KB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**% Recovery**	**QC Limits**	**Value**	**UNITS**	**Value (%)**	**QC Limits**
5400837	Sample Weight (as received)	2018/02/16					NA	g	0.0090 (1)	N/A
5403058	Leachable Lead (Pb)	2018/02/16	94 (2)	75 - 125	96	N/A	<5.0	ug/L	NC (1)	35
5403058	Leachable Zinc (Zn)	2018/02/16	NC (2)	75 - 125	99	N/A	<50	ug/L	NC (1)	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID [GBP004-01]

(2) Matrix Spike Parent ID [GBO961-01]

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B831867
Report Date: 2018/02/21

Maritime Electric
Client Project #: 11149943
Site Location: NEW STACK, RIVER PUMPHOUSE
Sampler Initials: KB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Eric Dearman, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam
A Bureau Veritas Group Company

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49-55 Elizabeth Avenue, St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
465 George Street,Unit G,Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / 22

CHAIN OF CUSTODY RECORD

COC #:

Page 1 of 2

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	Maritime Electric Co. Ltd.	Company Name:		Quotation #:		Regular TAT (5 business days) Most analyses
Contact Name:	Adam MacKenzie	Contact Name:		P.O. #:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	PO Box 1328	Address:		Project #:	GHD 11149943	IF RUSH please specify date (Surcharges will be applied)
	Charlottetown,PE Postal Code: C1A7N2		Postal Code:	Site Location:	New Stack, River Pumphouse	DATE REQUIRED:
Phone:	800-670-1012 Fax: 902-629-3754	Phone:	Fax:	Site #:		
Email:	mackenziead@maritimeelectric.com	Email:		Sampled By:	Kevin Burns	

Laboratory Use Only

CUSTODY SEAL Present	CUSTODY SEAL Intact	COOLER TEMPERATURES	COOLER TEMPERATURES
		14,13,19	

COOLING MEDIA PRESENT Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

Regulatory Requirements (Specify)

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	LAB FILTRATION REQUIRED	RCAP-MS (Total Metals) Well / Surface water	RCAP-MS (Dissolved Metals) Ground waters	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury (CIRCLE) TOTAL / DISSOLVED	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural/ Landfill)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX ,C6-C32	CCME Hydrocarbons (CWS-PHC F1/BTEX, F2-F4)	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs (Default for water/soil)	PAHs (FWAL /CCME Sediment)	PCBs	VOCs	Total Coliform/E.coli (Presence/Absence)	Total Coliform/E.Coli (Count)		HOLD- DO NOT ANALYZE	COMMENTS
1	Paint sample(s) River Pumphouse North	02/07/2018	1400		1																								
2	Paint sample(s) River Pumphouse South	02/07/2018	1410		1																								
3	Paint sample(s) River Pumphouse East	02/07/2018	1415		1																								
4	Paint sample(s) River Pumphouse West	02/07/2018	1420		1																								
5	Paint Sample(s) New Stack 225' 1-BASE	02/07/2018	1500		1																								
6	Paint Sample(s) New Stack 225' 2-125' (A&B)	02/07/2018	1519		1																								
7	Paint Sample(s) New Stack 225' 3-225"	02/07/2018	1530		1																								2018 FEB 9 9:19
8		02/07/2018																											
9		02/07/2018																											
10																													

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY:(Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Larry MacDonald	Feb 8th 2018	10:00	D Albert			B831867
	Feb 8/18					

White: Maxxam Pink: Client

Maxxam
A Bureau Veritas Group Company

200 Bluewater Road, Suite 105, Bedford, Nova Scotia B4B 1G9 Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227
49-55 Elizabeth Avenue, St John's, NL A1A 1W9 Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227
465 George Street,Unit G,Sydney, NS B1P 1K5 Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770
www.maxxam.ca E-mail: Customerservicebedford@maxxam.ca

ATL FCD 00149 / 22

CHAIN OF CUSTODY RECORD

COC #:

Page 2 of 2

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required
Company Name:	Maritime Electric Co. Ltd.	Company Name:		Quotation #:		☐ Regular TAT (5 business days) Most analyses
Contact Name:	Adam MacKenzie	Contact Name:		P.O. #:		PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	PO Box 1328	Address:		Project #:	GHD 11149943	IF RUSH please specify date (Surcharges will be applied)
	Charlottetown,PE Postal Code: C1A7N2	Postal Code:		Site Location:	New Stack	
Phone:	800-670-1012 Fax: 902-629-3754	Phone:	Fax:	Site #:		DATE REQUIRED:
Email:	mackenziead@maritimeelectric.com	Email:		Sampled By:	Kevin Burns	

Laboratory Use Only

CUSTODY SEAL Present	CUSTODY SEAL Intact	COOLER TEMPERATURES	COOLER TEMPERATURES
		14, 13, 19	

COOLING MEDIA PRESENT Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Analysis Requested

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED &PRESERVED	LAB FILTRATION REQUIRED	RCAP-MS (Total Metals) Well / Surface water	RCAP-MS (Dissolved Metals) Ground waters	Metals (Water): Total Digest (Default Method) for well water & surface water	Metals (Water): Dissolved for ground water	Metals (Water): Mercury (CIRCLE) TOTAL / DISSOLVED	Metals (Soil): Metals & Mercury Default Acid Extractable (Available) Digest	Metals (Soil): Metals Total Digest -for Ocean sediments (HNO3/HF/HClO4)	Metals (Soil): Mercury Low level by Cold Vapour AA	Metals (Soil): Hot Water Soluble Boron (required for CCME Agricultural/ Landfill)	RBCA Hydrocarbons (BTEX, C6-C32)	Hydrocarbons Soil (Potable), NS Fuel Oil Spill Policy Low Level BTEX, C6-C32	CCME Hydrocarbons (CWS-PHC F1/BTEX, F2-F4)	NB Potable Water BTEX, VPH, Low level T.E.H	PAHs (Default for water/soil)	PAHs (FWAL /CCME Sediment)	PCBs	VOCs	Total Coliform/E.coli (Presence/Absence)	Total Coliform/E.coli (Count)		HOLD- DO NOT ANALYZE	COMMENTS
1	E Sample(s) New Stack 225'-Ground level @	02/07/2018	1440		1																								
2	ple(s) New Stack 225'-Ground level 180° fron	02/07/2018	1445		1																								
3	CORE Sample(s) New Stack 225'--125' level	02/07/2018	1450		1																								
4	CORE Sample(s) New Stack 225'--225'level	02/07/2018	1455		1																								
5		02/07/2018																											2018FEB 9 9:19
6		02/07/2018																											
7		02/07/2018																											
8		02/07/2018																											
9		02/07/2018																											
10																													

Regulatory Requirements (Specify)

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY:(Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	MAXXAM JOB #
Larry MacDonald	Feb 8th 2018	10:00	D Albert			B8 31867
	Feb 8/18					

White: Maxxam Pink: Client

Appendix D
Geotechnical Report - Fundy Engineering

☎ 877.635.1566 fundy@fundyeng.com www.fundyeng.com

Bio-Resources | Building Systems | Environmental | Geotechnical | Project Management

GEOTECHNICAL INVESTIGATION REPORT

Stack Demolition Project
Maritime Electric Generating Station
50 Cumberland Street
Charlottetown, Prince Edward Island

Prepared for:

GHD
45 Akerley Blvd.
Dartmouth, Nova Scotia
B3B 1J7

Attn: Mr. Michael Gallahue, *P.Eng.*

May, 23 2018

Project No: 12814

FUNDY Engineering

Serving Our Clients' Needs First

SAINT JOHN CHARLOTTETOWN HALIFAX

JOB FILE:	12814		
PROJECT TITLE:	Geotechnical Investigation –50 Cumberland St., Charlottetown, PE		
VERSION	**ISSUANCE DATE**	**PREPARED BY**	**REVIEWED BY**
1.0	January 10, 2018	Alex Mouland, *P.Eng., PMP*	Gordon Mouland, M.Eng., P.Eng.
1.1	May 23, 2018	Alex Mouland, *P.Eng., PMP*	Gordon Mouland, M.Eng., P.Eng.

FUNDY Engineering

Serving Our Clients' Needs First

This report was prepared for the sole use of the Client. The material and observations presented reflects Fundy Engineering & Consulting Ltd.'s opinion and best judgment based on the information available. Fundy Engineering & Consulting Ltd. accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon the material, observations, and / or opinions by any third-party or for any damages suffered by any third-party resulting from the use of this report.

PROFESSIONAL SEAL:

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF THE PROVINCE OF PRINCE EDWARD ISLAND
VALID FOR THE YEAR 2018

G. Alex Mouland
No. 1730

DATE: May 23, 2018

LICENSED PROFESSIONAL ENGINEER
PROVINCE OF PRINCE EDWARD ISLAND

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Scope of Work Completed 1
1.2 Limitations 1
2.0 BACKGROUND 1
2.1 Site Description And Location 1
3.0 SITE WORK COMPLETED 3
3.1 Borehole Investigation 3
3.2 Soils Encountered 3
3.3 Bedrock Encountered 3
3.4 Groundwater Encountered 3
4.0 DISCUSSON 4
4.1 Existing Structures 4
5.0 RECOMMENDATIONS 4
5.1 General 4
5.2 Ground Improvement Recommendations 4
5.3 Recommended Additional Analysis 5
6.0 CONCLUSIONS AND CLOSING REMARKS 5

LIST OF FIGURES

Figure 1 - Site Plan 2

LIST OF APPENDICES

APPENDIX I .... Symbols and Terms
APPENDIX II .... Borehole Logs
APPENDIX III .... Site Plan
Appendix IV .... Geotechnical Guidelines/Recommendations for Winter Construction

1.0 INTRODUCTION

Fundy Engineering & Consulting Ltd. (Fundy Engineering) was retained by GHD (the Client) to undertake a geotechnical investigation at 50 Cumberland Street in Charlottetown, Prince Edward Island.

The purpose of this geotechnical investigation was to obtain information on the soil and bedrock conditions at the site and to provide recommendations for crane pads.

This investigation consisted of four (4) boreholes adjacent to the existing exhaust stacks that are part of the Maritime Electric Power Generation Station on the property (Figure 1).

Boreholes were extended to a maximum depth of 6.1 metres below the ground surface.

1.1 *SCOPE OF WORK COMPLETED*

This following scope of work was performed by Fundy Engineering as part of this geotechnical investigation:

- Four (4) boreholes were drilled adjacent to the existing exhaust stacks.
- Representative soil samples were collected at 600mm intervals via a split spoon sampler.
- A complete geotechnical report which includes the factual findings, data collected over the course of the investigation, discussion of site findings and recommendations pertaining to the site.

1.2 *LIMITATIONS*

The observations made and facts presented in this report are based on the geotechnical investigation carried out in December 2017. While every effort has been made to determine the geotechnical concerns pertaining to the area of interest, the discovery or development of additional geotechnical concerns cannot be precluded.

Further investigation may reveal additional information that may influence the recommendations included herein. Should such information be revealed, Fundy Engineering should be notified in a timely fashion so that any required amendments to our recommendations can be made.

At the time of this report the type of crane (crawler or tower crane) was not known. Therefore recommendations for geotechnical improvements should be considered preliminary. Additional recommendations for crane pad design once the type of crane for the project is finalized and bearing capacity requirements are determined.

These results are reported confidentially to the client, who is advised to take appropriate action to rectify any areas of concern. No professional responsibility is assumed for the use or interpretation of these findings by others.

2.0 BACKGROUND

2.1 *SITE DESCRIPTION AND LOCATION*

The property is a section of power generation facility in Charlottetown, PE. The subject site is covered by grass, gravel and asphalt. There are multiple buildings on the site which house power plant operations and offices. The power station property is bounded to the southeast by

Water Street, to the southwest by Cumberland Street and to the northwest Grafton Street (Figure 1).

Figure 1 - Site Plan

3.0 SITE WORK COMPLETED

3.1 Borehole Investigation

A geotechnical borehole investigation was completed at the site to collect information pertaining to the soils and bedrock in the project area and to assess their suitability for the project's geotechnical requirements. On December 12th, 2017, four (4) boreholes were drilled to obtain such information. The truck mounted rotary drill used to complete the field work was provided by Meg Drilling Services under the supervision of Tyler Pineau of Fundy Engineering.

Split spoon samples of the overburden soils were collected at 600mm intervals to obtain an understanding of the soil depths and stratigraphy. Borehole locations were determined by the Client.

3.2 Soils Encountered

Soils encountered in this investigation can be delineated in to two distinct descriptions:

Condition 1 was observed in MW12 and MW5 and can generally be described as **Very Loose ORGANICS with some Clay** overlying **Firm to Hard Red Sandy CLAY**.

Condition 2 was observed in SP2 and SP3 and can generally be described as **Asphalt or Gravel** overlying **Firm to Very Stiff Red Sandy CLAY**.

Further details of the soils encountered in this geotechnical investigation can be found in the borehole logs that are appended to this report (Appendix II).

3.3 Bedrock Encountered

Red Sandstone BEDROCK was encountered in Boreholes MW12, SP3 and MW5 at depths of between 4.3 and 5.2 metres below the ground surface. Bedrock was not sampled. Depths were determined based on refusal blow counts of the split spoon sampler.

Bedrock was not sampled as part of this geotechnical investigation. It is assumed that the Bedrock at this site consists of a **Red Sandstone BEDROCK** based on Fundy Engineering's experience in the local area.

3.4 Groundwater Encountered

Groundwater was observed in all of the boreholes.

Observed Groundwater was identified at depths of 1.8 and 3.0 metres below the ground surface.

Note that seasonal conditions and precipitation events will have some effects on these observed elevations and hence these measurements do not represent a referenced groundwater table elevation.

4.0 DISCUSSON

4.1 EXISTING STRUCTURES

It is our understanding that Maritime Electric (the Owner) intends to demolish the existing stacks at this site. In order to accomplish this, a crane must be brought to the site to facilitate demolition. The options for a crane presented by the Client include a track mounted crawler crane or a tower crane. Based on the observation of the geotechnical investigation each option will require some ground improvements before a crane can be erected.

5.0 RECOMMENDATIONS

5.1 GENERAL

The following recommendations outline recommendations based on the above findings from observations made in the field.

5.2 GROUND IMPROVEMENT RECOMMENDATIONS

The soils adjacent to the existing stacks do not have sufficient bearing capacity to support the assumed crane loads therefore ground improvements are recommended.

Two distinct soil conditions were observed during the geotechnical investigation. Recommendations for a crane pad have been developed for each soil condition.

Condition 1 (MW12 & MW5): It is recommended that the insitu soils be excavated to a depth of 1.8 metres below the ground surface. The excavation should extend a minimum of at least 1.2 metres beyond the widest point of the crane (i.e. 1.2 metres beyond the outside of the outriggers). Once the excavation has reached the recommended depth, 300mm of compacted Select Borrow should be placed over the insitu soils. Once the initial 300mm of Select Borrow has been placed, a Tensar TriAx TX130S (or approved equivalent) Geogrid should be installed over the bottom of the excavation as per the manufacturer's recommendations. Once the Geogrid has been placed the remainder of the excavation should be backfilled with compacted Select Borrow.

Condition 2 (SP2 & SP3): It is recommended that the insitu soils be excavated to a depth of 0.5 metres below the ground surface. The excavation should extend a minimum of at least 1.2 metres beyond the widest point of the crane (i.e. 1.2 metres beyond the outside of the outriggers). Once the excavation has reached the recommended depth a Tensar TriAx TX130S (or approved equivalent) Geogrid should be installed over the bottom of the excavation as per the manufacturer's recommendations.

For preparation of a Crane pad in both Conditions 1 & 2

- It is recommended that removal of all unsuitable materials and the placement of Structural Fills be monitored continuously by a Geotechnical Engineering firm.
- The excavation should be backfilled with Structural Fill meeting the current Prince Edward Island Transportation, Infrastructure and Energy specification for Select Borrow.

- All Structural Fill placed as backfill should be compacted with lift thicknesses compatible with the soil type and the compaction equipment to 100 percent of its Standard Proctor density at optimum moisture content.

5.3 RECOMMENDED ADDITIONAL ANALYSIS

At the time of this report the type of crane which will be utilized for the project was not known. It is our understanding that the Client may select a tower crane or a crawler crane for this project. Once the crane is selected and the specifications are determined a crane pad design should be completed based on the crane’s required bearing capacities to complete the planned lifts.

6.0 CONCLUSIONS AND CLOSING REMARKS

The purpose of this geotechnical investigation was to obtain information on the soil and bedrock conditions at the site and to provide some recommendations for crane pad foundations.

We trust this is sufficient for your present needs, please feel free to contact the undersigned for any additional information or clarification that may be required. This report has been prepared by Alex Mouland, *P.Eng., PMP* and reviewed by Gordon Mouland, M.Eng., *P.Eng.*

Sincerely,
Fundy Engineering & Consulting Ltd.

Mr. Alex Mouland, *P.Eng., PMP*
Fundy Engineering &Consulting Ltd.

APPENDIX I

SYMBOLS AND TERMS

FUNDY ENGINEERING SYMBOLS AND TERMS
Borehole, Test Pit, and Monitoring Well Logs

SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

Desiccated..having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured.. having cracks, and hence a blocky structure
Varved.. ....composed of regular alternating layers of silt and clay
Stratified..composed of alternating layers of different soil types, e.g. silt and sand or silt and clay
Well Graded..having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded..............................predominantly of one grain size

Terminology used for describing soil strata based upon the proportion of individual particle sizes present:

Trace, or occasional..............................less than 10%
Some..10-20%
Adjective (e.g. silty or sandy)...................20-35%
And (e.g. silt or sand..............................35-50%

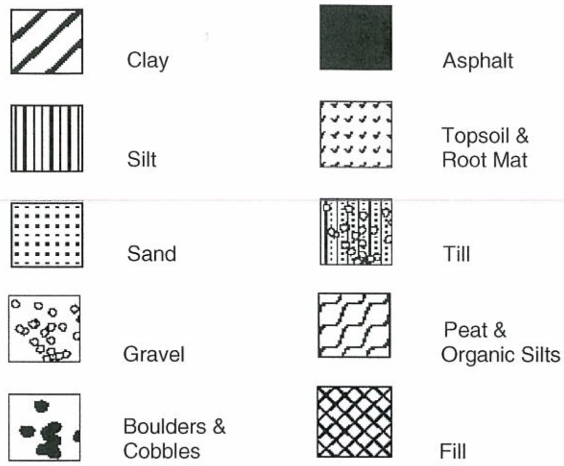
The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test 'N' - value: the number of blows of 140 pound (64kg) hammer falling 30 inches (50.8mm) O.D. split spoon sampler one foot (305mm) into the soil.

RELATIVE DENSITY	N' VALUE	RELATIVE DENSITY %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

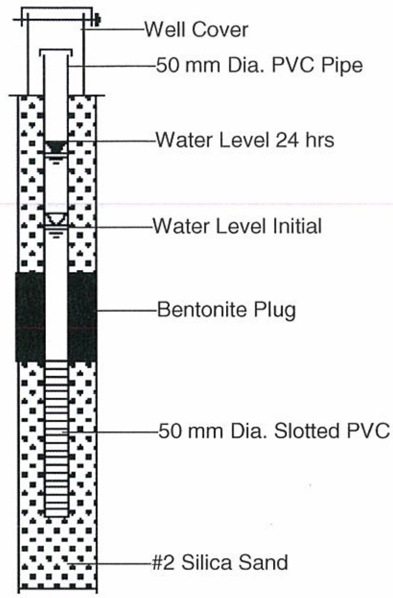
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer test, unconfined compression tests, or occasionally by standard penetration tests.

CONSISTENCY	UNDRAINED SHEAR STRENGTH		'N' VALUE
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

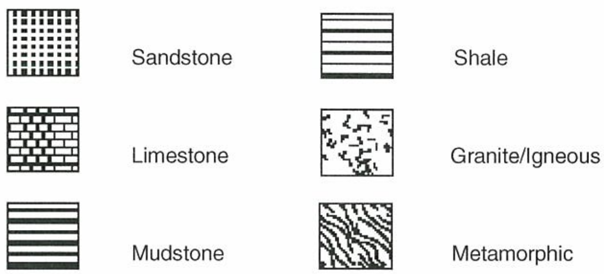
SOILS GRAPHIC LEGEND



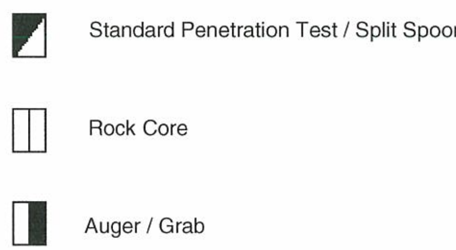
MONITORING WELL SCHEMATIC



BEDROCK GRAPHIC LEGEND



SAMPLER SYMBOLS



LABORATORY TESTS

MC Moisture Content
SG Specific Gravity
HA Hydrometer Analysis
SA Sieve Analysis

P Field Permeability
PF Permeability Falling Head
PC Permeability Constant Head
PR Proctor

CD Consolidation Drained Triaxial
CU Consolidation Undrained Triaxial
UU Unconsolidated Undrained Triaxial
DS Direct Shear

BEDROCK DESCRIPTION

The description of bedrock is based on the rock quality designation (RQD).

The classification is based on a modified core recovery percentage in which all pieces of sound core over 100mm long are expressed as a percentage of total recovery. The small pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. In most cases RQD is measured on NXL core.

RQD	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

FUNDY Engineering

APPENDIX II

BOREHOLE LOGS

FUNDY Engineering

BOREHOLE LOG No. MW-12

PROJECT: Maritime Electric Stack **PROJECT NO.:** 17-12814
CLIENT: GHD
PROJECT LOCATION: 50 Cumberland Street, Charlottetown **ELEVATION:**
DRILLING CONTRACTOR: Meg Drilling Services Ltd.
LOGGED BY: Devan Thomas **CHECKED BY:** Al Mouland
DRILLING METHOD: Standard Auger **DATE:** 12/12/2017
DEPTH TO - WATER> INITIAL: ▽ 2.74m **AFTER 24 HOURS:** ▼ **CAVING>** C

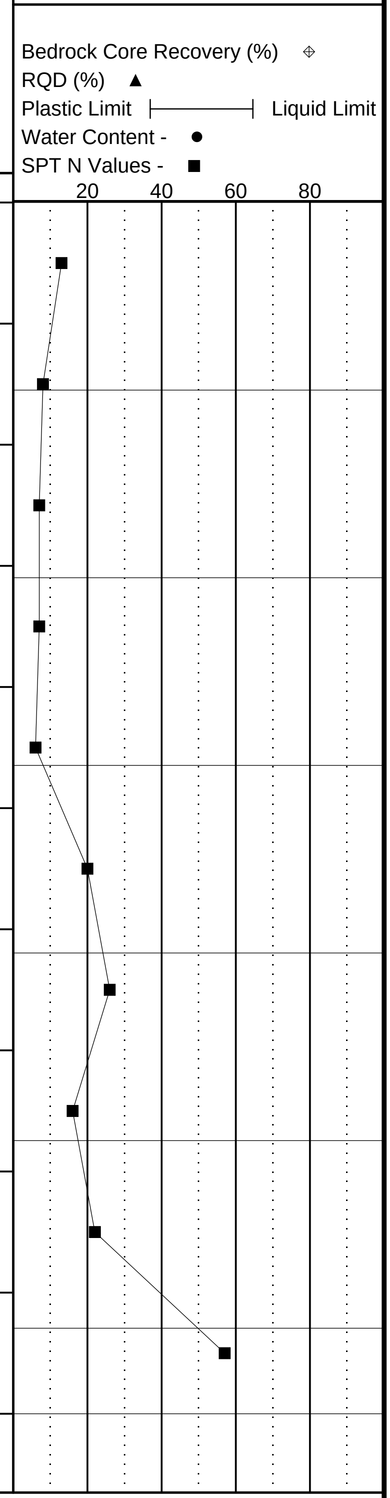
This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Depth (meters): 0, 0.62, 1.24, 1.86, 2.48, 3.1, 3.72, 4.34, 4.96, 5.58

Depth (feet): 0, 2.48, 4.96, 7.44, 9.92, 12.4, 14.88, 17.36, 19.84

Description	Sample No.	Sample Rec. (cm)	Blow Counts (N value)	RQD (%)	Undrained Shear Strength (kPa)	% < #200
Very Loose ORGANICS with some Red Sandy Clay	1-1	40.6	6-9-4-4 (13)			
	1-2		4-5-3-4 (8)			
	1-3		2-2-5-6 (7)			
Firm to Very Stiff Red Sandy CLAY with some Organics	1-4	35.6	4-5-2-3 (7)			
	1-5		2-3-3-4 (6)			
	1-6		6-10-10-10 (20)			
Very Stiff to Hard Red Sandy CLAY	1-7	61	9-11-15-8 (26)			
	1-8		8-7-9-10 (16)			
	1-9		15-10-12-20 (22)			
	1-10		22-33-24-27 (57)			
Boring terminated at 6.1 m.						

TEST RESULTS SUMMARY



FUNDY Engineering

BOREHOLE LOG No. MW-5

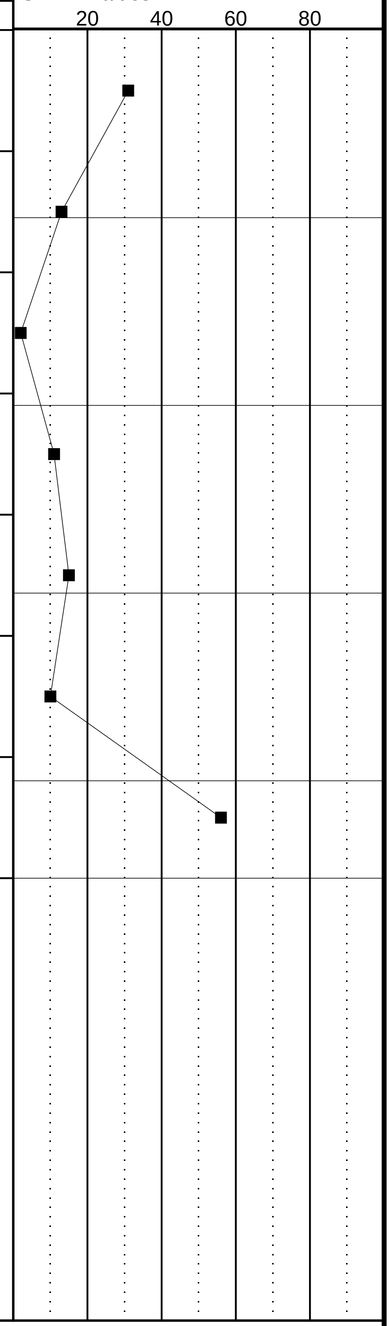
PROJECT: Maritime Electric Stack **PROJECT NO.:** 17-12814
CLIENT: GHD
PROJECT LOCATION: 50 Cumberland Street, Charlottetown **ELEVATION:**
DRILLING CONTRACTOR: Meg Drilling Services Ltd.
LOGGED BY: Devan Thomas **CHECKED BY:** Al Mouland
DRILLING METHOD: Standard Auger **DATE:** 12/12/2017
DEPTH TO - WATER> INITIAL: 3.05m **AFTER 24 HOURS:** **CAVING>**

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Depth (meters)	Depth (feet)	Description	Graphic	Sample Type	Sample No.	Sample Rec. (cm)	Blow Counts (N value)	RQD (%)	Undrained Shear Strength (kPa)	% < #200
0	0	Hard Red Sandy CLAY with some Gravel and Organics			4-1	50.8	11-12-19-11 (31)			
0.62	2.48	Stiff Black ORGANICS with some Sandy Clay			4-2	43.2	11-8-5-5 (13)			
1.24	4.96	Soft Greyish Red Sandy CLAY with some Organics			4-3	40.6	1-1-1-5 (2)			
1.86	7.44	Stiff Sandy Red CLAY with some Organics			4-4	15.2	5-5-6-12 (11)			
2.48	9.92	Stiff Red Sandy CLAY - Wet			4-5	45.7	5-7-8-11 (15)			
3.1		Stiff Red Sandy CLAY with some Organics			4-6	38.1	4-5-5-5 (10)			
3.72	12.4	Hard Red Sandy CLAY			4-7	40.6	6-6-50/3 (56)			
		Boring terminated at 4.27 m.								

TEST RESULTS SUMMARY

Bedrock Core Recovery (%)
RQD (%)
Plastic Limit — Liquid Limit
Water Content -
SPT N Values -



FUNDY Engineering

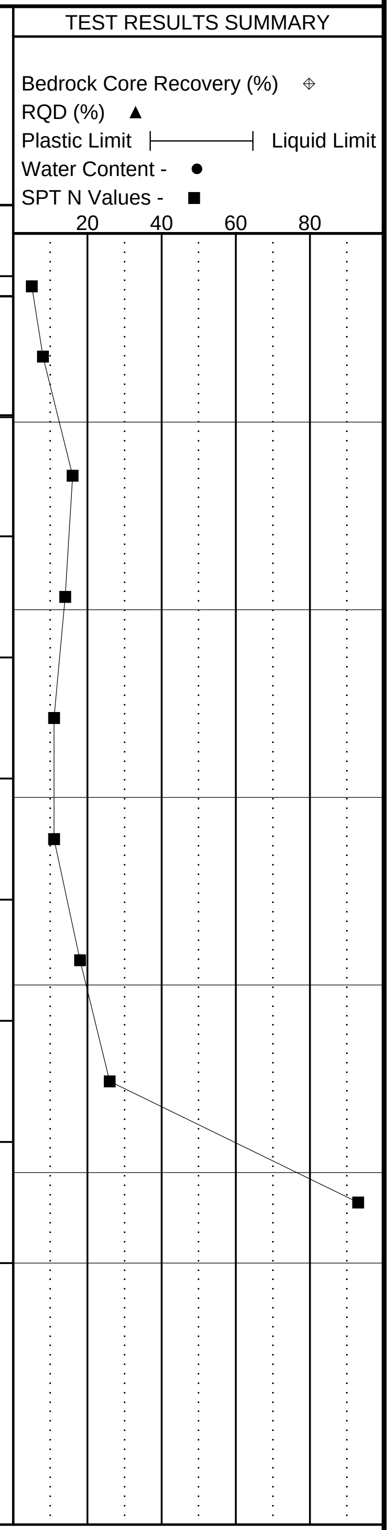
BOREHOLE LOG No. SP-2

PROJECT: Maritime Electric Stack **PROJECT NO.:** 17-12814
CLIENT: GHD
PROJECT LOCATION: 50 Cumberland Street, Charlottetown **ELEVATION:**
DRILLING CONTRACTOR: Meg Drilling Services Ltd.
LOGGED BY: Devan Thomas **CHECKED BY:** Al Mouland
DRILLING METHOD: Standard Auger **DATE:** 12/12/2017
DEPTH TO - WATER> INITIAL: 1.83m **AFTER 24 HOURS:** **CAVING>**

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Depth (meters)	Depth (feet)	Description	Graphic	Sample Type	Sample No.	Sample Rec. (cm)	Blow Counts (N value)	RQD (%)	Undrained Shear Strength (kPa)	% < #200
0	0	Augered to 8"								
		Firm to Very Stiff Red Sandy CLAY			2-1	10.2	2-3-2-2 (5)			
0.62	2.48				2-2		2-5-3-5 (8)			
1.24	4.96				2-3		5-8-8-9 (16)			
1.86					2-4		7-6-8-11 (14)			
2.48	7.44				2-5		4-5-6-6 (11)			
3.1	9.92				2-6		4-5-6-6 (11)			
3.72	12.4				2-7		7-8-10-6 (18)			
4.34					2-8		8-15-11-12 (26)			
4.96	14.88	Hard Red Sandy CLAY with Very Dense Sandstone			2-9	50.8	20-43-50/5 (93)			
		Boring terminated at 5.18 m.								

TEST RESULTS SUMMARY



FUNDY Engineering

BOREHOLE LOG No. SP-3

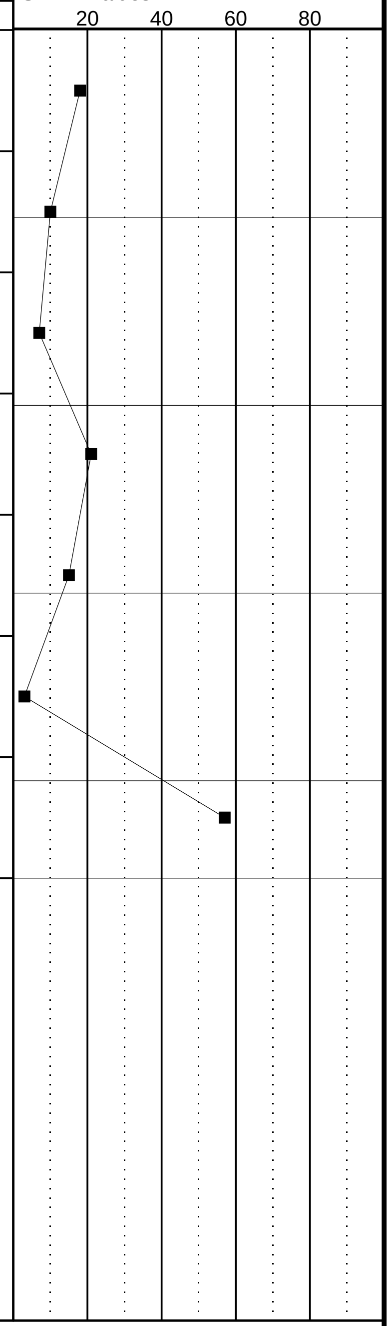
PROJECT: Maritime Electric Stack **PROJECT NO.:** 17-12814
CLIENT: GHD
PROJECT LOCATION: 50 Cumberland Street, Charlottetown **ELEVATION:**
DRILLING CONTRACTOR: Meg Drilling Services Ltd.
LOGGED BY: Devan Thomas **CHECKED BY:** Al Mouland
DRILLING METHOD: Standard Auger **DATE:** 12/12/2017
DEPTH TO - WATER> INITIAL: 2.74m **AFTER 24 HOURS:** **CAVING>** C

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Depth (meters)	Depth (feet)	Description	Graphic	Sample Type	Sample No.	Sample Rec. (cm)	Blow Counts (N value)	RQD (%)	Undrained Shear Strength (kPa)	% < #200
0	0	Compact Gravel FILL with some Sandy CLAY			3-1	38.1	23-11-7-11 (18)			
0.62	2.48	Stiff to Very Stiff Sandy Red CLAY with some Organics			3-2	30.5	11-5-5-6 (10)			
1.24	4.96				3-3		4-3-4-7 (7)			
1.86	7.44				3-4		6-8-13-12 (21)			
2.48	9.92				3-5		8-7-8-7 (15)			
3.1					3-6		1-1-2-3 (3)			
3.72	12.4				3-7		8-7-50/5 (57)			
		Boring terminated at 4.27 m.								

TEST RESULTS SUMMARY

Bedrock Core Recovery (%)
RQD (%)
Plastic Limit Liquid Limit
Water Content -
SPT N Values -



APPENDIX III

SITE PLAN

Legend

Subject Property Line

Borehole

Project Title:

Geotechnical Investigation

50 Cumberland Street, Charlottetown, PE

FUNDY Engineering

Serving Our Clients' Needs First

Drawing Title:

Borehole Location Plan

(2013 Aerial Photograph)

Job No: 17-12814

Drawn By:	Checked By:	Date:	Figure:
SL	AM	JAN 8, 2017	1

APPENDIX IV

GEOTECHNICAL GUIDELINES / RECOMMENDATIONS FOR WINTER CONSTRUCTION

Geotechnical Guidelines/Recommendations for Winter Construction

Construction during winter months exposes a construction project to freezing temperatures and other weather events, such as snow, which can have a detrimental effect on Engineered Fill and concrete construction activities. Therefore it is recommended that some extra work be undertaken to protect these construction elements during winter construction.

The following sections outline a set of guidelines for concrete and earthwork construction activities in cold weather.

Excavation

Insitu soils, such as root mat or topsoil can act as natural insulators and can protect the underlying soils from frost. Therefore excavation activities should be limited to sections which can be filled over before the end of the working day.

It is **<u>NOT</u>** recommended that Fills to be used at a later date be stockpiled on site during freezing conditions. They should be placed and compacted immediately.

Fill Type

A well-graded material with sand content of 30% or over is **<u>NOT</u>** recommended for use as Fills in freezing temperatures. Clear stone or rock fills are not as susceptible to freezing and are therefore recommended as they will remain workable for a longer period of time.

Fill Placement Methods

Fill placement should be conducted in small areas such that it can be completed in the area by the end of the working day. The area should be small enough to allow for the subsequent lift to be placed over compacted unfrozen material.

Material that contains snow and/or ice should not be allowed to be placed in a Fill. If a snow event occurs during Fill procedures the snow should be removed before any additional material can be placed. It is recommended that the surface of the Fill under the snow should be removed to ensure that all the snow and ice has been removed.

For areas that will require additional Fill but must be left for a long period of time (ex. overnight) frost protection should be provided to the placed Fill in the form of straw, insulated blankets, or some other approved measure. If frost protection is not available then any frozen material at or near the top of the lift should be removed and wasted before fill placement resumes.

Underside of slabs, footings and any other ‘final’ Fill surface should be protected from frost. If frost protection is not possible then the soil should be thawed prior to placing footings, slabs, etc. I it is suspected that the soil is frozen then some limited excavations should be undertaken to determine the temperature prior to pouring concrete or placing additional Fills. Any areas that have been determined to be frozen should be removed and replaced with new compacted materials.

All slopes and edges of Fills should be tamped or compacted to reduce frost penetration.

During compaction of Fills the soil temperature should be greater than 2^{o}C. Any Fills below this temperature will not achieve the theoretical maximum compaction density and should therefore be removed.

FUNDY Engineering

Footings

Building footings should **NEVER** be placed on frozen Fill.

If the foundation design recommends that footings be placed on insitu soils, but those soils are fine grained, it is recommended that below the footings an over-excavation of approximately 6 inches be completed to allow for a base of 25mm clear stone be placed.

Once the footings have been placed they should be protected from cold weather with insulated blankets, hay or some approved means. The frost protection should extend beyond the footings to also protect the surrounding bearing soils.

During cold weather the depth of interior footings should be dropped to 1.2 metres below ground surface for frost protection. If lowering the footings is not possible then some other approved method of protecting the interior footings is recommended.

Foundations should be backfilled with free-draining granular materials that will not hold moisture.

Inspection and Testing

The above document is intended as a set of guidelines for geotechnical winter construction in general. A strategy for winter construction will be required for each individual site. It is recommended that prior to beginning any winter earthwork construction the services of a qualified geotechnical engineering company be engaged to develop a customized plan a specific site. Testing and inspection services by a geotechnical engineering company are especially important during winter geotechnical construction activities. A plan developed with the expertise of a Geotechnical Engineer will reduce harmful procedures and mistakes and will allow construction activities to continue during cold weather without unexpected delays and costs.

Serving Our Clients' Needs First

Fundy Engineering is proud to be one of the largest employee-owned, full-service multi-disciplinary engineering-consulting companies headquartered in New Brunswick and serving Atlantic Canada and New England

Top-Quality Engineering-Consulting Solutions

Bio-Resources | Building Systems | Environmental | Geotechnical | Project Management

877.635.1566

fundy@fundyeng.com

www.fundyeng.com

FUNDY Engineering

Thank you for choosing our team for your engineering and consulting needs. We encourage you to visit our website and share your needs and concerns so that we can continue to provide you with top-quality technically sound solutions.

Serving the Atlantic Region from:

SAINT JOHN OFFICE
27 Wellington Row
PO Box 6626
Saint John, NB E2L 4S1

506.635.1566

CORNWALL OFFICE
768 Bannockburn Road, Unit #1
Cornwall, PE C0A 1H0

902.675.4885

HALIFAX OFFICE
PO Box 25083
Halifax, NS
B3M 4H4

902.492.1550

www.ghd.com

June 18 2018 Reference No. 11149943-06

Mr. Kent Nicholson
Manager, Production and Energy Control Operations
Maritime Electric Company, Limited
P.O. Box 1328
Charlottetown, PE C1A 7N2

Dear Mr. Nicholson:

Re: 2017 Decommissioning Study – Preliminary Options Analysis
Demolition of the Charlottetown Thermal Generating Station
Charlottetown, Prince Edward Island

1. Background

GHD was retained by Maritime Electric Company, Limited (MECL) to provide engineering support in the preparation of a Decommissioning Study including closure cost forecasting for the Charlottetown Thermal Generating Station (CTGS). The Decommissioning Study will provide the basis for preparation of tender documents and specifications for the future demolition of the CTGS. Cost estimates for implementation of decommissioning activities and associated engineering will be provided for MECL planning purposes and organized to facilitate an update to the overall cost estimate closer to the scheduled demolition date in 2022.

During the project kick-off meeting on October 31, 2017, MECL requested that GHD complete a Preliminary Options Analysis to explore potential cost differences between maintaining the Combustion Turbine #3 (CT3) Balance of Plant (BOP) equipment within a portion of the existing Steam Plant building (as described in MECL's Request for Proposal 2017-24) versus relocating the CT3 Balance of Plant equipment into a new on-site building and completely demolishing the Steam Plant building (including the current CT3 Balance of Plant area). GHD submitted a proposal providing an overview of the scope of work (SOW) and associated professional fees to conduct this Preliminary Options Analysis, which was approved by MECL on November 17, 2017. Figures showing the current layout of the Steam Plant building, the CT3 Balance of Plant area to be potentially retained, and the proposed location(s) of a new building previously provided by MECL are included in Attachment A for reference purposes.

The agreed upon SOW was to complete an American Association of Cost Engineering (AACE) Class 5 cost analysis for retaining the existing CT3 Balance of Plant building (partial demolition of Steam Plant building as per original SOW) versus construction of a new CT3 Balance of Plant building and total demolition of the Steam Plant building. The Class 5 cost estimate for this Preliminary Options Analysis follows the cost classification system matrix adapted from Recommended Practice No 17R 97 and 18R 97 by the Association for the Advancement of Costing Engineering (AACE) International, which typically provides an accuracy range of +100% to -50%. Based on the findings of the Preliminary Options Analysis, MECL will select a preferred option, which will be carried forward for the Decommissioning Study Report preparation and a Class 3 cost estimate (+30% to -20%).

2. Preliminary Options Analysis Overview

In discussions with MECL, it was determined that the Preliminary Options Analysis should focus on a cost comparison of specific items that will significantly affect costs associated with the two CT3 Balance of Plant options (CT3 Balance of Plant remains in Steam Plant Building or is replaced by a new separate building). As such, the Preliminary Options Analysis does not identify total costs to complete all future decommissioning/demolition work but identifies differences between each scenario and associated costs. Items that are considered to be cost neutral and required regardless of the option chosen for the CT3 Balance of Plant have not been evaluated as part of the current Preliminary Options Analysis. Specific examples of items that are considered to be cost neutral include, but are not limited to, the following:

- **Demolition –** Costs associated with the decommissioning and demolition of the majority of the Steam Plant Building as well as associated permitting and engineering costs will be similar regardless of the Option chosen. The exception would be decommissioning/demolition inefficiencies for the contractor associated with partial building demolition around the existing CT3 Balance of Plant area. Costs for demolition inefficiencies are included in the cost analysis estimate.
- **Dorman Diesels –** The existing emergency back-up diesels currently in the CT3 Balance of Plant building are nearing their life expectancy and will require replacement regardless of the option chosen. For the purposes of this study, it is assumed the new diesel generator(s) will be installed in weather enclosures exterior of either building (existing CT3 Balance of Plant or new separate building).
- **Energy Control Center (ECC) Sprinkler System –** Under either scenario the water supply for the sprinkler system servicing the ECC will need to be re-configured.
- **Life Cycle Costs –** End of life expectancy and life cycle costs for CT3 Balance of Plant electrical and mechanical control equipment to be re-used/re-located to new building is considered to be cost neutral. Examples of end of life expectancy costs that are considered cost neutral would include the Reverse Osmosis (RO) and Electrodeionization (EDI) system, compressors, switchgear, breaker panels, transformers, etc. Costs for re-locating and commissioning the electrical and mechanical control equipment from the existing building to a new building have been included in the cost analysis estimate. Life cycle costs for building services are also included in cost analysis estimate.

An overview of primary components that were reviewed and evaluated for each option are outlined below:

- **Stack Demolition –** Cost differences have been provided for potential stack demolition methodologies assuming CT3 Balance of Plant remains and will need to be operational during future demolition/decommissioning activities versus costs if CT3 Balance of Plant is re-located. Based on our preliminary review, demolition of the 225’ high stack (new stack) would utilize mast climbers if the CT3 Balance of Plant is to remain. The use of mast climbers is considered to be the safest alternative given the proximity of the stack to the CT3 Balance of Plant building and would still require significant safety controls and the establishment of strict exclusion zone protocols. With the CT3 Balance of Plant removed, a more economical option of using a crawler crane with a demolition attachment and high reach equipment is considered viable.

- **Partial Building Demolition Costs –** Costs for potential decommissioning/demolition inefficiencies for the contractor associated with partial building demolition around the existing CT3 Balance of Plant have been provided. It is assumed that if the CT3 Balance of Plant is to remain within the steam plant, the contractor's demolition productivity will be slowed considerably around the structure that is to remain. In addition, there will be additional costs associated with temporary supports and shoring that will be required to ensure the remaining structure is protected during demolition activities.
- **Mechanical/Electrical Systems –** Differences in costs for mechanical and electrical systems to be re-configured to keep the existing CT3 Balance of Plant versus mechanical/electrical requirements for a new building have been provided. These new mechanical costs include installation of a new wastewater treatment plant (WWTP) and new demineralized water storage tank(s) for the new building. GHD retained the services of MCA Consultants Inc. (MCA) from Charlottetown, PEI to review the mechanical requirements for each option and prepare a preliminary layout for a new Balance of Plant building (Attachment E). GHD also retained Strum Engineering Associates Ltd. from Dartmouth, NS to review the electrical requirements for each option (Attachment F).
- **Structural Considerations –** GHD completed a visual inspection of structural members within the Steam Plant building to determine if the connection of a new end wall, where Turbine #7 area meets with the CT3 Balance of Plant area, will require structural reinforcement (or structural member replacement) if the option is selected to retain the existing CT3 Balance of Plant area. The review noted that the majority of the existing structure is in good repair with no signs of structural distress and a new end wall installation is feasible. However, the investigation did find that signs of distress to the brick side walls and the "west" end wall of the existing WWTP area were present. Significant cracks in the side walls are present for the full height of the wall (approx. 45 feet). The cracks are continuous from top to bottom with the largest opening at the top and decreasing to hairline at the bottom. Costs to repair the existing masonry side walls and replace the WWTP west end wall have been included in the cost analysis. See below for additional risk items associated with the recent structural review of the existing building. A memorandum outlining the findings of the structural review is provided in Attachment B.
- **Life Cycle Costs –** 35 year building life cycle costs have been considered for both the proposed new building and the existing CT3 Balance of Plant area of the building. These life cycle costs include heating, mechanical and electrical systems, building maintenance and roofing. It is assumed that the built-up roofing for the existing building will have to be replaced twice over the 35 year life cycle due to its current condition. For the second replacement, we have assumed that a resurfacing could be completed at a reduced cost compared to a complete replacement. Heating costs for the existing CT3 Balance of Plant building that is to remain as well as heating costs for the new building were provided by MECL or MCA.

  It is also assumed that localized repairs of the original brick walls could be required over the 35 year life cycle given that the brick is currently 60-80 years of age. For budgeting purposes, we have assumed that on average 1% of the overall brick wall will require re-pointing/localized repairs each year.

MECL’s Weighted Cost of Capital for Valuation of Life Cycle Items

A fundamental principle of finance is that a dollar obtained or spent in the future has less value than a dollar obtained or spent today. The connection between the two is the interest rate. To express the value of the dollar obtained or spent in the future in terms of its value today (the present value), the future dollar is discounted to the present using the interest rate. In this calculation the interest rate is usually referred to as the discount rate. This principle of future worth was used in the cost analysis for valuing life cycle cost items for both of the CT3 Balance of Plant options and summarized in the following paragraphs.

For a business, the interest rate is usually its weighted average cost of capital (WACC); i.e., the cost for the business to borrow money, typically through a combination of equity and debt. In deciding whether to make an investment that will reduce operating costs, the business is comparing two future streams of expenses – the annual financing costs associated with the investment and the annual reduction in operating costs that would be achieved through the investment. To compare the two streams of expenses, they are discounted to the present using the interest rate, which for the business is its WACC.

The WACC for MECL was calculated to be 6.44%, based on 40.0% equity at 9.35% allowed return and 60.0% debt at 4.50% interest rate (provided by MECL). The 9.35% is the current allowed rate of return on average common equity, as determined by the Island Regulatory and Appeals Commission (IRAC), and is subject to review and adjustment by the Commission. The 4.50% debt interest rate is the estimated cost for long term borrowing by MECL (minimum of 30 years, longer if available so as to better match the 35 year remaining life of the CT3 generator and its Balance of Plant equipment). Details of the WACC calculated for each life cycle item are provided in Attachment C.

- **New Construction Cost –** A building footprint/layout design for the new building was generated by MCA using computer aided design software based on MECL requirements and subsequent review modifications. The list of equipment and operational requirements provided by MECL are included in Attachment D. The proposed building layout as proposed by MCA and reviewed by MECL is included in the MCA back-up information of Attachment E. A cost for the proposed new building has been provided by MECL based on the agreed upon footprint/layout drawing. Costing includes building shell and foundations only. Costing for electrical/mechanical requirements and equipment relocation for the new building has been included in the “Mechanical/Electrical Systems” line item above.

  New construction that would be required for the existing CT3 Balance of Plant would include the construction of a new end wall at the proposed cut-off location for the CT3 Balance of Plant. Due to the structural deficiencies (cracks and deflection in brick walls) identified above with the WWTP walls, a new steel frame end wall and masonry repairs would also be required for that section of the CT3 Balance of Plant.

- **Fire Protection/Building Code Updates –** Costs for building updates/improvements required to the existing CT3 Balance of Plant area of the building to meet current National Fire and Building Codes (based on recommendations from the local fire marshal) have been provided (Attachment G). These costs are limited to enclosing electrical systems and exits as per instructions from MECL fire protection specialist (Mr. Byron Webber). Costs for new fire protection systems (or re-configuration of existing system) for the new building have also been provided.

2.1 Assumptions

An overview of the primary assumptions used to develop cost estimates for the preliminary options analysis are outlined below:

- GHD has assumed that the existing wastewater treatment unit as well as the water treatment unit (RO/EDI unit) will stay as-is and will require operation during future demolition activities if existing CT3 Balance of Plant equipment remains in the Steam Plant building.
- GHD has assumed that, for the new building option, the existing RO/EDI water treatment unit will be relocated to the new building (cost for relocating, reconnecting and commissioning have been included in the cost analysis).
- GHD has assumed that a new wastewater treatment system would be required with the new building option (cost for new system has been included in the cost analysis).
- GHD has assumed Boiler 6 will be moth-balled if the existing CT3 Balance of Plant building is retained (least expensive option).
- GHD has assumed that instrument air equipment will be re-located for new building option (cost for relocating, reconnecting and commissioning have been included in the cost analysis).
- GHD has assumed that electrical control equipment will be re-used for new building option to the extent possible (cost for relocating, reconnecting and commissioning have been included in the cost analysis).
- GHD has assumed that CT3 station services transformer can be re-used and re-located for the new building option (cost for relocating, reconnecting and commissioning have been included in the cost analysis).

2.2 Risk Items

During preparation of the cost analysis for each option there were several assumptions or unidentified items that could incur significant costs if they are required based on regulatory obligations (or other agreements) and have therefore been identified as potential risk items. These following items were discussed with MECL during project specific meetings and, as directed by MECL, have also been identified in the cost analysis. An overview of the primary risk items identified specific to the CT3 Balance of Plant options analysis review are outlined below:

- There is a possibility given the age of the original roof system above the CT3 Balance of Plant area that asbestos containing material (ACM) could be found in the original roofing asphalt. If this is the case, this ACM would need to be abated as part of the re-roofing work. This would add significant cost to the re-roofing work. If the CT3 Balance of Plant equipment is to be re-located and it is found that the existing roofing asphalt contains ACM, then the roofing can be cut-off in sections and disposed of as ACM debris at an approved landfill. Cutting the roof in sections for disposal is much cheaper than having to conduct in-place abatement.

- Costs for the existing CT3 Balance of Plant building currently assume a code review is not required. The estimate specifically precludes the requirement for meeting current National Building Code snow and wind load requirements and post-disaster seismic design requirements. The local building inspector would have final say on whether a full code review is required but based on our recent structural review of the CT3 Balance of Plant, there is a high likelihood that a full code review will be required. This would likely have a significant impact on the costs to keep the existing CT3 Balance of Plant building.
- Costs for existing CT3 Balance of Plant building do not include improvements to existing fire suppression sprinkler system as per instructions from MECL's fire protection specialist.
- Electrical costs for new building assume some cables associated with the CT3 Balance of Plant are suitable for re-use (e.g., transformer, switchgear and MCC).
- Costs for existing CT3 Balance of Plant building assume Boiler 6 will be moth-balled and will stay in-place for 35 years. Costs for manual dismantlement of Boiler 6 are not included in Preliminary Options Analysis.

3. Preliminary Options Analysis Cost Estimate Differential

A summary of the anticipated costs for specific items associated with each CT3 Balance of Plant option (retain existing building or build a new building) and the cost differential between the two options is presented in Table 1 (following text). Based on the specific items outlined in the previous sections, it is anticipated that the costs to keep the existing CT3 Balance of Plant building would be approximately $621,000 higher over the life cycle of the CT3 unit versus construction of a new building. This anticipated cost differential excludes potential risk allowance items.

As previously indicated, this cost estimate is a comparison of specific items that are expected to significantly affect costs associated with the two CT3 Balance of Plant options and is not intended to identify total costs to complete all future decommissioning/demolition work. In addition, the cost estimate provided for specific items associated with each option have an accuracy level range of +100% to -50%. A breakdown of the cost items indicating units, unit rates and assumptions utilized in calculating the Class 5 cost estimates have been provided in Attachments B to G.

4. Closure

We trust that this memorandum meets with your present requirements. If there are any questions please do not hesitate to contact the undersigned at any time.

Sincerely,

GHD

Troy Small, M.Sc. CE
Principal

Michael Gallahue, P.Eng.
Associate

TS/ad/4

List of Attachments

Attachment A – Figures
Attachment B – GHD Structural Review Memorandum
Attachment C – GHD Supplied Costing Information and WACC
Attachment D – MECL Supplied Costing Information
Attachment E – MCA Supplied Costing Information (Mechanical) and New Building Layout
Attachment F – Strum Supplied Costing Information (Electrical)
Attachment G – Fire Protection Requirements and Costing (Byron Webber, Project Advisor)

PRELIMINARY OPTIONS ANALYSIS
2017 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Options	Estimated Costs (Class 5 Estimate)	Quantitative Assessment	Cost Differential		Comments
				Keep CT3 Balance of Plant	New CT3 Balance of Plant	
Options Analysis Items						
Maintenance & Capital Improvements Required Over a 35 Year Life Cycle Period						
Heating Costs	Keep CT3 Balance of Plant - Heating costs for remaining section of plant is estimated at $95,000/year	$ 1,553,000	Extra $1,283,000 in costs over the 35-years life cycle to keep the CT3 Balance of Plant	$1,807,000	---	Annual heating costs provided by MECL. Costs adjusted for 2% annual inflation over a 35 year period as well as MECL 6.44% Weighted Average Cost of Capital (WACC). Cost difference would be $4,164,781 excluding WACC.
	New CT3 Balance of Plant - Heating costs for new building is estimated at $16,500/year	$ 270,000				
Roofing Costs	Keep CT3 Balance of Plant - Built-up roofing will need to be replaced twice during 35 year life cycle except for the maintenance shop which is a metal roof and will only require replacement once	$ 304,000	Extra $304,000 in costs over the 35-years life cycle to keep the CT3 Balance of Plant			Costing assumes a full roof replacement in Year 1 and a re-surfacing or coating in Year 20 (except for the Maintenance Shop) to extend the life of the roof for another 15 years. Design costs also included. Potential asbestos abatement <u>not</u> included. Year 1 roofing costs are $262,000. Year 20 roofing costs are $42,000. WACC included in year 2040 roof re-surfacing cost calculation ($112,000 is $42,035 in 2040). Costs provided by GHD (see Attachment C).
	New CT3 Balance of Plant - Metal roofing for new building has an expected useful life of over 35 years and will not require replacement during 35 year life cycle	$ -				
Wall Costs	Keep CT3 Balance of Plant - Maintenance of Brick Walls during 35 year life cycle	$ 75,000	Extra $75,000 in costs over the 35-years life cycle to keep the CT3 Balance of Plant			Assumes on average 1% of brick wall/year will require maintenance/re-pointing and/or localized replacement. WACC included in re-surfacing cost calculation ($161,000 in 2017 is $75,135 over 35 years). Costs provided by GHD (see Attachment C).
	New CT3 Balance of Plant - Metal siding for new building has an expected useful life of over 35 years and will not require replacement during 35 year life cycle	$ -				
Structural Analysis and Code Review	Keep CT3 Balance of Plant - Analysis of snow and wind loading as well as post disaster seismic design requirements to meet current National Building Code	$ 145,000	Extra $145,000 in costs to determine structural improvements required to meet current National Building Codes			Includes analysis of all existing structural connections and members to verify strengths and structural capacity and comparison to current loading and seismic requirements. Also includes costing for anticipated design and engineering for structural reinforcements to bring the existing structure up to current code.
	New CT3 Balance of Plant - Not required as new building designed to National Building Code	$ -				

PRELIMINARY OPTIONS ANALYSIS
2017 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

Item	Options	Estimated Costs (Class 5 Estimate)	Quantitative Assessment	Cost Differential		Comments
				Keep CT3 Balance of Plant	New CT3 Balance of Plant	
Demolition Costs						
Building Demolition	Keep CT3 Balance of Plant - Demolition schedule and cost will be increased due to demolition contractor having to carefully remove structures surrounding the CT3 Balance of Plant to ensure no structural damage occurs to the structures that are to remain	$ 120,000	Extra $25,000 in cost to keep the CT3 Balance of Plant structure	$470,000	---	Assumes an extra 2.5 weeks of demolition time and extra costs for temporary controls, shoring and supports.
	New CT3 Balance of Plant - If a new building is built the existing CT3 Balance of Plant will need to be demolished	$ 95,000				Demolition costs include a $25,000 credit for salvage value of structural and carbon steel.
Stack Demolition	Keep CT3 Balance of Plant - Due to proximity of CT3 BOP to the 225' high Stack the only option for demolition will be mechanical dismantling using a mast climber and platform, which will be slower, require more manpower and thus be more expensive than using a crane with a mechanical demo attachment. There will also be delays/costs due to the RD-EDI Plant being part of an exclusion zone and demolition having to stop whenever staff are working in that area of the Plant. Significant safety controls will be required around the RD-EDI Plant and the stack would have to be below 35' in height before a high reach excavator could be employed.	See Comment	Anticipated Extra $445,000 in costs to demolish the 225' high stack while keeping the CT3 Balance of Plant			Costs for stack demolition are variable and will be dependent on methodology acceptable to MECL. Key considerations are safety, constructability, contractor acceptance/bonding, etc. Only the 225' high stack will be affected by whether the CT3 Balance of Plant stays or not. The 200' stack will require mechanical dismantling down to grade due to it's proximity to the existing gas turbine, residential neighborhood and ECC building that is scheduled to remain post demolition. Costs provided by GHD (see Attachment C).
	New CT3 Balance of Plant - There is possibly an opportunity to use the existing building foundations/slab as a pad for a crawler crane with a demolition attachment to demolish the stack. This would be quicker and the bottom 75' could be demolished using high reach excavator, which is considerably cheaper than a crane. This is also a significantly safer option as there would be no demolition above an active/occupied building.	See Comment				
New Construction Costs						
New Construction	Keep CT3 Balance of Plant - Construction of new end wall required, replacement of existing end wall for WWTP required and repairs required for WWTP side walls	$ 135,000	Extra $1,186,000 in cost to construct a New CT3 Balance of Plant building compared to constructing a new end wall for the existing CT3 Balance of Plant structure	See next page	See next page	Cost includes construction of new end wall with structural steel, metal siding and reinforced concrete foundations and minor structural reinforcement to existing structure. Costs assume a new wall will be required the entire length of the west wall (including waste water treatment plant wall - see GHD structural analysis information). Design costs also included.
	New CT3 Balance of Plant - Construction of a new 8,750 sq.ft building will be required	$ 1,321,000				Costs for a new 20 ft high, 8,750 sq. ft. building as provided by MECL. Costs are for building foundation and building shell. Costs for new building services are provided below.

PRELIMINARY OPTIONS ANALYSIS
2017 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

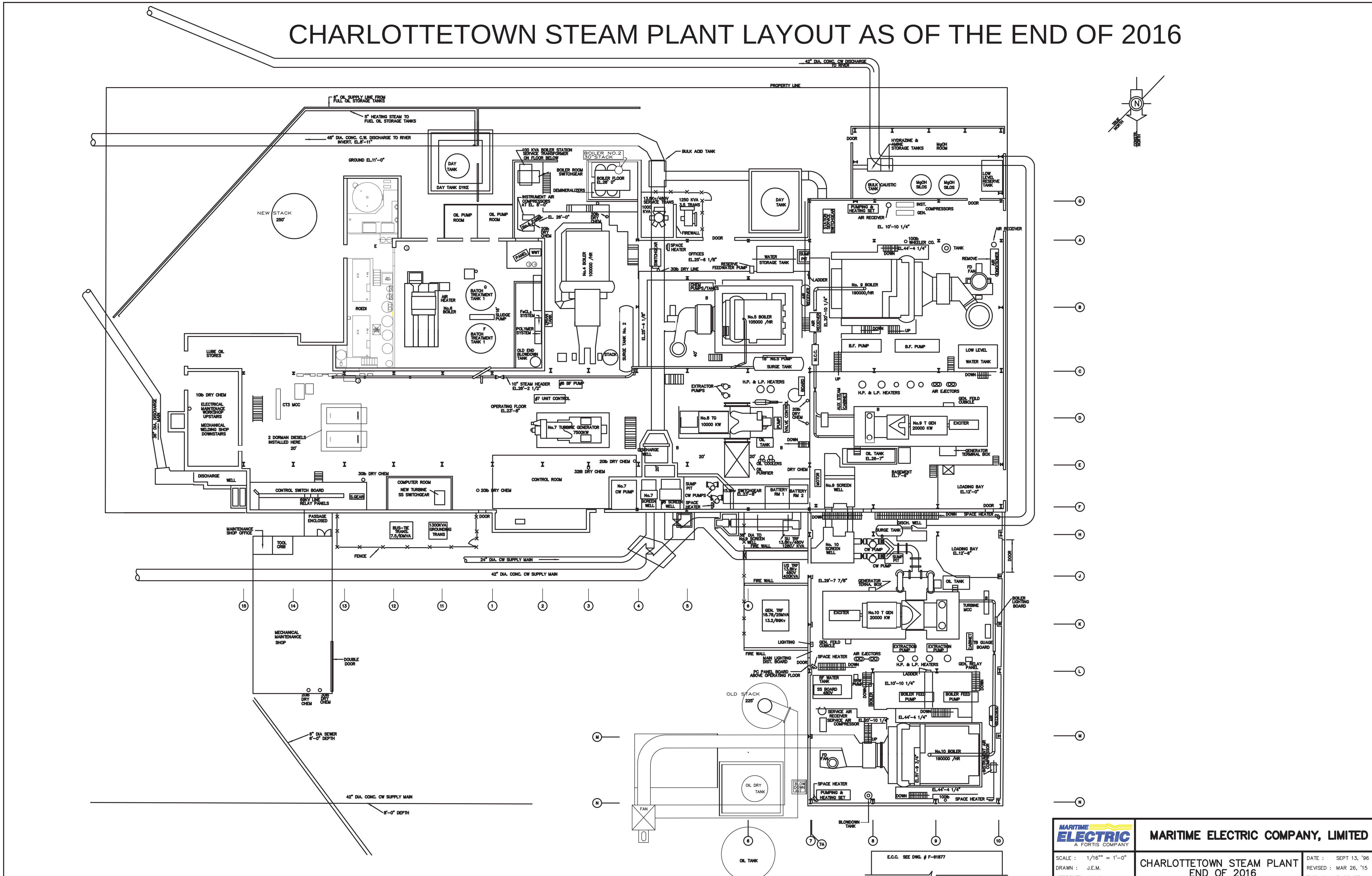
Item	Options	Estimated Costs (Class 5 Estimate)	Quantitative Assessment	Cost Differential		Comments
				Keep CT3 Balance of Plant	New CT3 Balance of Plant	
Services	Keep CT3 Balance of Plant - Reconfiguration of Services such as wastewater effluent, building services, etc. (excludes fire suppression equipment) Mechanical - Re-locate Water and Wastewater services ($105,000) - Electrical Unit Heaters ($20,000) - Life Cycle Costs ($263,000) Electrical - Upgrade Building Electrical Services ($155,000) - Electrical Life Cycle Costs ($45,500)	$ 588,500	Extra $718,500 in cost for new building equipment and re-location of existing equipment	$271,000	$1,904,500	Fire Suppression for CT3 Balance of Plant not required assuming diesels are moved outside (assumption made based on email from B. Webber Nov. 28/17). ECC fire protection to be provided from municipal waterline. Electrical costs exclude new telecommunications which are cost neutral. Fuel oil piping for new diesel generators cost neutral. Costs for Mechanical Requirements provided by MCA Consultants Inc. (see Attachment E) Costs for Electrical Requirements provided by Strum Engineering (see Attachment F) WACC included in Mechanical and Electrical Life Cycle Costs ($1,115,000 in costs if WACC not considered).
	New CT3 Balance of Plant - Supply & Installation of new equipment and relocation and re-connection of existing equipment for the new building Mechanical - New Waste Water Treatment Plant and O/W Separator ($150,000) - New Piping - RO/WWT/Instrument Air (excludes fuel oil line as cost neutral) ($120,000) - New HVAC equipment and Ventilation ($122,500) - Re-location of RO/EDI, compressors and miscellaneous equipment ($51,000) - One New Stainless Steel Demineralized Water tank ($100,000) - New potable water services including washroom/shower ($97,500) - New Sprinkler System ($44,000) - Commissioning/Fit-up ($31,000) - Mechanical Life Cycle ($193,000) Electrical - Re-location of Station Services Transformer ($25,000) - New Fire Protection Panel and Detectors ($23,000) - Electrical Equipment and Panel Relocation or new equipment ($58,000) - Install and terminate new cables ($132,000) - New building electrical services ($100,000) - Commission Equipment ($30,000) - Electrical Life Cycle Costs ($30,000)	$ 1,307,000				Costs assume new water treatment unit will be required for new building as well as new de-mineralized water storage tank. Remainder of CT3 Balance of Plant equipment (RO/EDI, compressors, etc.), electrical panels, pad mount transformer and maintenance shop equipment will be re-located to new building. No re-location of fire pump or equipment. Assumes ECC fire protection to be provided from municipal waterline. Costs for Mechanical Requirements provided by MCA Consultants Inc. (see Attachment E) Costs for Electrical Requirements provided by Strum Engineering (see Attachment F) WACC included in Mechanical and Electrical Life Cycle Costs ($801,000 in costs if WACC not considered).

PRELIMINARY OPTIONS ANALYSIS
2017 DECOMMISSIONING STUDY
CHARLOTTETOWN THERMAL GENERATING STATION
CHARLOTTETOWN, PEI

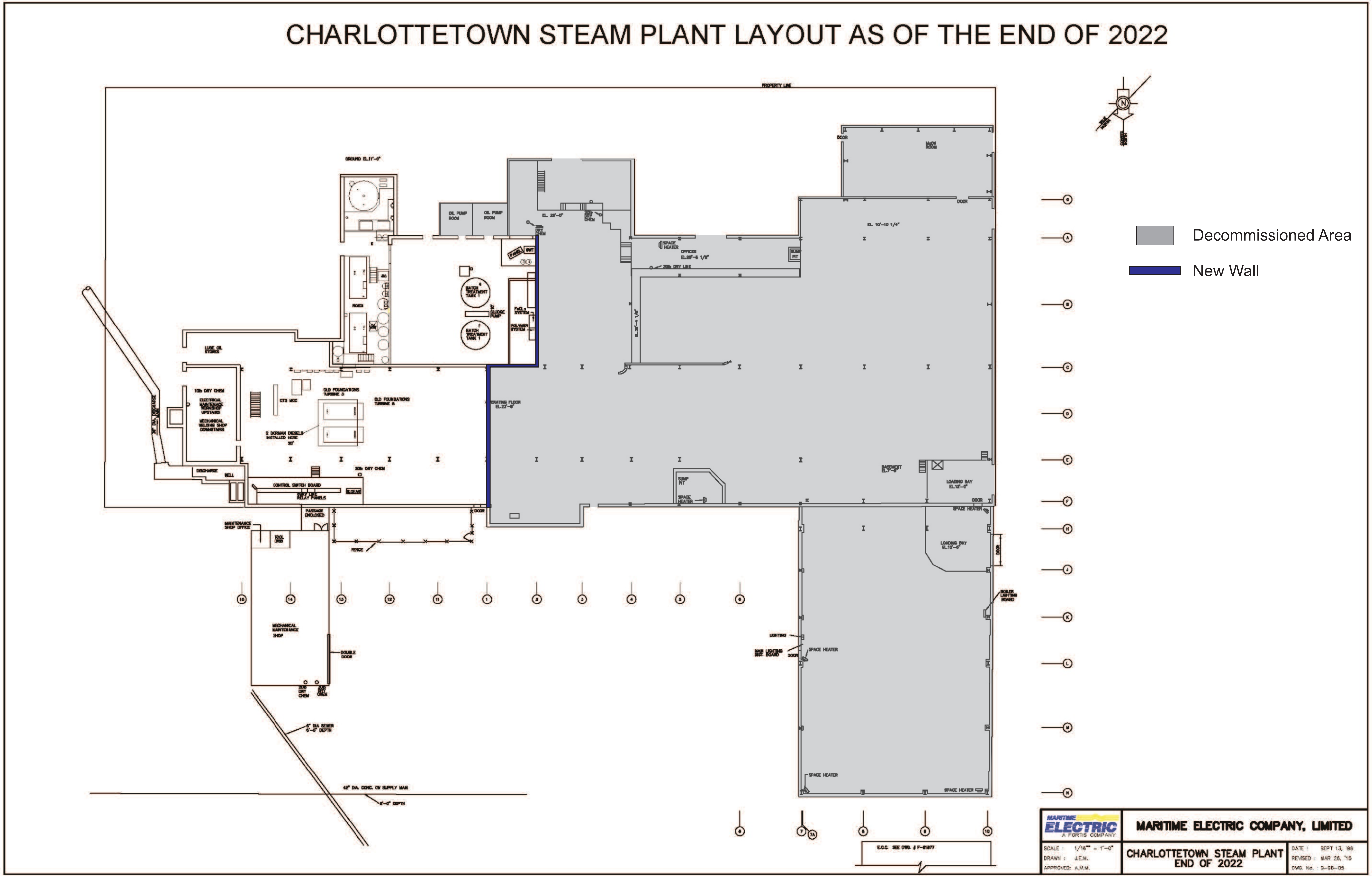
Item	Options	Estimated Costs (Class 5 Estimate)	Quantitative Assessment	Cost Differential		Comments
				Keep CT3 Balance of Plant	New CT3 Balance of Plant	
Fire Code Upgrades	Keep CT3 Balance of Plant - Construction of fire separations for select equipment including stairwell exits	$ 271,000	Extra $271,000 in costs for fire separations including stair wells, control panels, etc.	See previous page	See previous page	Sprinkler protection upgrades not required as per B. Webber. Fire separation requirements provided by B. Webber with costing provided by GHD (see Attachment G)
	New CT3 Balance of Plant - Will be designed and constructed to current fire code. Costs included in costing above for Services in new 8750 sq.ft building.	---				ECC protection cost neutral for either scenario (B. Webber)
			Column Total	**$2,548,000**	**$1,904,500**	
			Estimated Engineering Costs	**$168,000**	**$190,450**	Anticipated Engineering Costs - 15% for keeping existing CT3 building (exclude heating costs and code review engineering) - 10% for new building
			Cost Differential	**$621,050**		Anticipated extra costs for keeping CT3 Balance of Plant

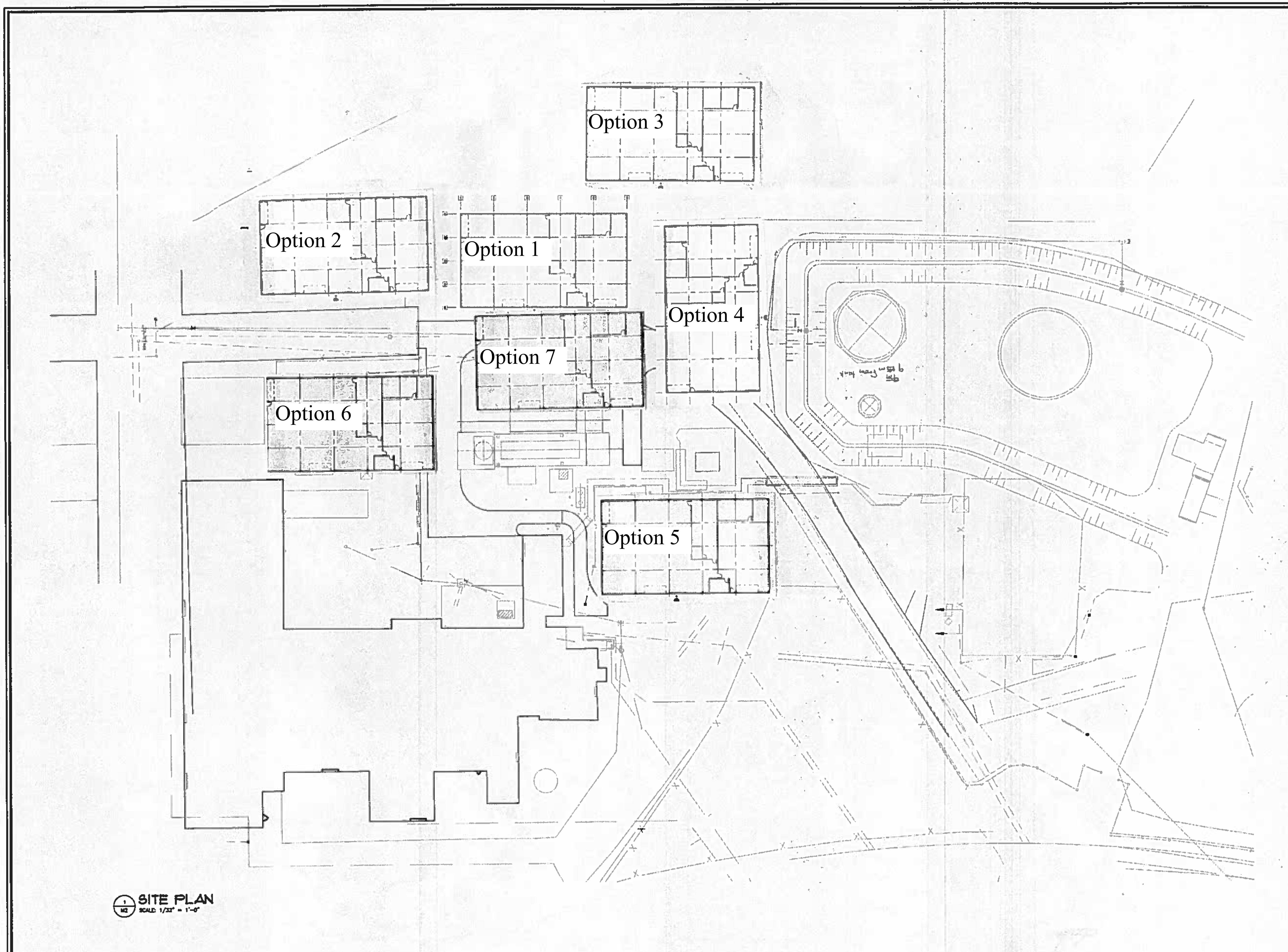
Attachment A
Figures

Current Floor Plan of Steam Plant Building with Equipment



CTGS Plant Layout End of 2022





NOTES

NO.	REVISIONS	DD/MM/YY

Stamp

Client

MECL POWER PLANT DECOMMISSIONING

MCA CONSULTANTS INC.

ENGINEERS · PROJECT MANAGEMENT

902.566.9223 | info@mcaconsultants.ca www.mcaconsultants.ca

Project

MECL POWER PLANT DECOMMISSIONING

Sheet Title

SITE PLAN

Scale: AS NOTED	Date: NOV. 24, 2017
Drn By: S.G.M.	Chk'd By: J.D.M.
Project No.: 17-232	Sheet No.: M2

Attachment B
GHD Structural Review Memorandum

Memorandum

To:	Mr. Troy Small	Ref. No.:	11149943-06
From:	Michael Gallahue, GHD	Date:	December 8, 2017
CC:			

Subject: **2017 Decommissioning Study – Preliminary Options Analysis – Structural Review Demolition of the Charlottetown Thermal Generating Station Charlottetown, PEI**

On December 5, 2017 Matthew Mitrovich, P.Eng., from our structural group visited the above site to conduct a visual assessment of the CT3 Balance of Plant structure to ascertain whether there were any signs of current or previous structural stress on the structural elements of the building. This visual assessment was required as part of our ongoing Preliminary Options Analysis to help determine whether to keep or demolish the existing CT3 Balance of Plant. Based on a recent meeting with the local Building Inspector on November 21, 2017 it was determined that a structural assessment would be required on the existing structure to help confirm whether or not the structure would be subject to a full code review based on the proposed alterations that would be required to the CT3 Balance of Plant if it were to remain post demolition. A summary of the findings from the structural review are provided below, based on email correspondence attached.

The review noted that the majority of the structure is in good repair with no signs of structural distress and the construction of a new end wall where Turbine #7 area meets with the CT3 Balance of Plant, is feasible. However, the investigation did find that signs of distress to the brick side walls and the “west” end wall of the Wastewater Treatment Plant (WWTP) area were present. Significant cracks in the side walls are present for the full height of the wall (approx. 45 feet). The cracks are continuous from top to bottom with the largest opening at the top and decreasing to hairline at the bottom. Observation of the end wall noted the top to be deflected toward the #4 Boiler Area. It is presumed that the cracks are caused by either differential settlement of the brick end wall and side walls or permanent lateral deformation of the brick end wall or a combination of both. It should be noted that the #4 Boiler Area was an addition to the original structure. This addition had the adverse effect of increasing vertical load to the original end wall and the potential benefit of preventing the end wall from tilting further. In this scenario, removing the additions up the original exterior end wall of the WWTP area poses the risk of decreasing the stability of the end wall. Also, since the building’s original construction, it has contained operational boilers that maintained an interior temperature high enough to melt snow from the roof in winter. Despite the older age of the building, it has yet to experience the full load effects from snow and drifting snow. The structure may be adequate for this loading however it is noted that altering interior temperatures may have an adverse effect and would constitute a change in loading and counter a proven past performance approach to the building not having to meet current codes. Building codes are not retroactive to existing buildings. However, when a change in use, change in loading or alterations/renovations are performed, current building codes apply. It was originally considered an option that the existing CT3

Balance of Plant building would not fall into this category so long as the original portion of the building to remain was not changed and showed no signs of damage, distress or deterioration. From the field review and the above change in loading and alterations required, it is our opinion that the building would be required to meet current codes. In meeting current codes, the building would be designated with a post-disaster importance category because it is a power plant that provides utilities to the public. At a minimum, the lateral force resisting system would require upgrading to meet ductility requirements. This will require an analysis of the existing structure, which could lead to further reinforcement requirements of other members and footings.

We trust that this memorandum meets with your present requirements. If there are any questions please do not hesitate to contact the undersigned at any time.

GHD

M. G. Gallahue

Michael Gallahue, P.Eng.

MG/ad/2

Encl.

Attachment C
GHD Supplied Costing Information and WACC

Charlottetown Thermal Generating Station
Preliminary Options Analysis - Class 5 Cost Estimate
Cost Breakdown
GHD Project No. 11149943

	Activities	Units	Unit Price	Quantity	Total	Comments
Maintenance & Capital Improvements Required Over a 35 Year Life Cycle Period						
1.0	**Roofing Costs**					
	Re-roof with Built-up roofing (20 year life)	sq.ft	$ 20.00	11250	$ 225,000.00	
	Re-roof with Metal roofing for Maintenance Shop (35+ year life)	sq.ft	$ 16.00	1840	$ 29,440.00	
	Re-surface Built-up roofing after 20 years (coat or re-surface only to extend life by 15 years)	sq.ft	$ 10.00	11250	$ 112,500.00	
	Design Fees	LS	$ 7,500.00	1	$ 7,500.00	
				Subtotal	***$ 374,440.00***	
2.0	**Wall Repairs**					
	Repairs to brick walls which are currently 60-80 years of age (assume 1% of wall per year will need repointing)	sq.ft	$ 24.00	129	$ 3,096.00	Total area of walls in CT3 BOP estimated to be 12,900 sq.ft
	Allowance for localized areas will require repairs	LS	$ 1,500.00	1	$ 1,500.00	
				Yearly Cost	***$ 4,596.00***	
				# of years	***35***	
				Subtotal	***$ 160,860.00***	
3.0	**Heating Costs**					
	Heating costs for CT3 Balance of Plant provided by MECL as $95,000/year vs $16,500/year for new building giving a difference of $78,500/year	LS	$ 78,500.00	1	$ 78,500.00	
				Yearly Cost	***$ 78,500.00***	
				# of years	***35***	
				Subtotal	***$ 2,747,500.00***	
Demolition Costs						
1.0	***Building Demolition - Keep CT3 Balance of Plant***					
	Extra Demolition time due to partial demolition	week	$ 40,000.00	2.5	$ 100,000.00	Assuming a crew of 2 laborers, a foreman, 3 excavators (1 high reach 1/2 time), skid steer loader, consumables and dust control
	Allowance for temporary supports, shoring & controls	LS	$ 20,000.00	1	$ 20,000.00	
				Subtotal	***$ 120,000.00***	
2.0	**Building Demolition - New CT3 Balance of Plant**					
	Extra demolition time due to having to demo CT3 Balance of Plant	week	$ 40,000.00	3	$ 120,000.00	Assuming a crew of 2 laborers, a foreman, 3 excavators (1 high reach 1/2 time), skid steer loader, consumables and dust control
	Credit for salvage that can be obtained if CT3 Balance of Plant is demolished	MT	$ 225.00	114	$ (25,650.00)	Salvage steel from structural steel, trusses, metal roof decking & metal siding
				Subtotal	***$ 94,350.00***	
3.0	**Stack Demolition**					
	Extra costs for demolition using mast climber platform	week	$ 70,000.00	6	$ 420,000.00	Due to proximity of CT3 Balance of Plant to Stack #2 the only option for demolition will be mechanical dismantling using a mast climber and platform, which will be slower, require more manpower and thus be more expensive than using a crane with a mechanical demo attachment. There will also be delays due to the RO-EDI Plant being part of an exclusion zone and demolition having to stop whenever staff are working in that area of the Plant. Add an extra 6 weeks to the stack demolition at $70,000/week
	Allowance for Safety Controls that would need to be employed in the exclusion zone for the duration of the demolition	LS	$ 25,000.00	1	$ 25,000.00	estimate a 12 week demolition period @ $2,000/week for controls (sub-total rounded)
				Subtotal	***$ 445,000.00***	

Charlottetown Thermal Generating Station
Preliminary Options Analysis - Class 5 Cost Estimate
Cost Breakdown
GHD Project No. 11149943

	Activities	Units	Unit Price	Quantity	Total	Comments
New Construction Costs						
1.0	**Construction of New End Wall (50' x 44' wall)**					
	Structural Steel/Girts/Bracing	sq.ft	$ 7.00	2200	$ 15,400.00	
	Metal Siding	sq.ft	$ 9.00	2200	$ 19,800.00	
	4' deep x 12" thick foundation wall	ft	$ 90.00	50	$ 4,500.00	
	24' wide x 12" thick footing	ft	$ 75.00	50	$ 3,750.00	
	Allowance for structural alterations to existing structure at location of new end wall	LS	$ 10,000.00	1	$ 10,000.00	
	Design fees	LS	$ 10,000.00	1	$ 10,000.00	
				Subtotal	***$ 63,450.00***	
2.0	**Replacement of Existing WWTP End Wall (46' x 44' wall) & Masonry Repairs to WWTP Side Walls**					
	Structural Steel/Girts/Bracing	sq.ft	$ 7.00	2024	$ 14,168.00	
	Metal Siding	sq.ft	$ 9.00	2024	$ 18,216.00	
	Repairs to existing brick side walls	sq.ft	$ 50.00	350	$ 17,500.00	Two sections @ 35' high x 5' wide
	Allowance for structural alterations to existing structure and foundations	LS	$ 10,000.00	1	$ 10,000.00	
	Design fees	LS	$ 10,000.00	1	$ 10,000.00	
				Subtotal	***$ 69,884.00***	

PRESENT VALUE COMPARISON OF CT3 BOP AREA HEATING COSTS FOR RETAINED BUILDING VS. NEW BUILDING

Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Heating Costs for Retained Building	$ 95,000	(2017 Canadian Dollars)
Annual Heating Costs for New CT3 BOP Building	$ 16,500	(2017 Canadian Dollars)
Inflation Rate on Electric Heating Costs	2.0%	

Cash Flow Projections:

Expense Projections	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Expenses													
Annual Heating Costs for Retained Steam Plant Building				$ 100,815	$ 102,831	$ 104,888	$ 106,985	$ 109,125	$ 111,308	$ 113,534	$ 115,804	$ 118,121	$ 120,483
Discounted Cash Flows @ MECL's WACC of 6.44%				$ 83,601	$ 80,113	$ 76,772	$ 73,569	$ 70,500	$ 67,559	$ 64,741	$ 62,041	$ 59,453	$ 56,973
Annual Heating Costs for New CT3 BOP Building				$ 17,510	$ 17,860	$ 18,217	$ 18,582	$ 18,953	$ 19,332	$ 19,719	$ 20,113	$ 20,516	$ 20,926
Discounted Cash Flows @ MECL's WACC of 6.44%				$ 14,520	$ 13,914	$ 13,334	$ 12,778	$ 12,245	$ 11,734	$ 11,245	$ 10,775	$ 10,326	$ 9,895
Difference between Options				$ 83,305	$ 84,971	$ 86,670	$ 88,404	$ 90,172	$ 91,975	$ 93,815	$ 95,691	$ 97,605	$ 99,557
Discounted Cash Flows @ MECL's WACC of 6.44%	$ -	$ -	$ -	$ 69,081	$ 66,199	$ 63,438	$ 60,791	$ 58,255	$ 55,825	$ 53,497	$ 51,265	$ 49,127	$ 47,077

PRESENT VALUE COMPARISON OF CT3 BOP AREA HEATING COSTS FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Heating Costs for Retained Building	$ 95,000	(2017 Canadian Dollars)
Annual Heating Costs for New CT3 BOP Building	$ 16,500	(2017 Canadian Dollars)
Inflation Rate on Electric Heating Costs	2.0%	

Cash Flow Projections:

Expense Projections	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**
Expenses														
Annual Heating Costs for Retained Steam Plant Building	$ 122,893	$ 125,350	$ 127,857	$ 130,415	$ 133,023	$ 135,683	$ 138,397	$ 141,165	$ 143,988	$ 146,868	$ 149,805	$ 152,802	$ 155,858	$ 158,975
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 54,596	$ 52,319	$ 50,136	$ 48,045	$ 46,041	$ 44,120	$ 42,280	$ 40,516	$ 38,826	$ 37,207	$ 35,655	$ 34,167	$ 32,742	$ 31,376
Annual Heating Costs for New CT3 BOP Building	$ 21,345	$ 21,771	$ 22,207	$ 22,651	$ 23,104	$ 23,566	$ 24,037	$ 24,518	$ 25,008	$ 25,509	$ 26,019	$ 26,539	$ 27,070	$ 27,611
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 9,483	$ 9,087	$ 8,708	$ 8,345	$ 7,997	$ 7,663	$ 7,343	$ 7,037	$ 6,744	$ 6,462	$ 6,193	$ 5,934	$ 5,687	$ 5,450
Difference between Options	$ 101,548	$ 103,579	$ 105,651	$ 107,764	$ 109,919	$ 112,117	$ 114,360	$ 116,647	$ 118,980	$ 121,359	$ 123,787	$ 126,262	$ 128,788	$ 131,363
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 45,114	$ 43,232	$ 41,429	$ 39,700	$ 38,044	$ 36,457	$ 34,937	$ 33,479	$ 32,083	$ 30,744	$ 29,462	$ 28,233	$ 27,055	$ 25,927

PRESENT VALUE COMPARISON OF CT3 BOP AREA HEATING COSTS FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Heating Costs for Retained Building	$ 95,000	(2017 Canadian Dollars)
Annual Heating Costs for New CT3 BOP Building	$ 16,500	(2017 Canadian Dollars)
Inflation Rate on Electric Heating Costs	2.0%	

Cash Flow Projections:

Expense Projections	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**	**Sum**
Expenses												
Annual Heating Costs for Retained Steam Plant Building	$ 162,154	$ 165,397	$ 168,705	$ 172,079	$ 175,521	$ 179,031	$ 182,612	$ 186,264	$ 189,990	$ 193,789	$ 197,665	$ 5,040,181
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 30,067	$ 28,813	$ 27,611	$ 26,460	$ 25,356	$ 24,298	$ 23,285	$ 22,313	$ 21,383	$ 20,491	$ 19,636	$ 1,553,061
Annual Heating Costs for New CT3 BOP Building	$ 28,164	$ 28,727	$ 29,301	$ 29,887	$ 30,485	$ 31,095	$ 31,717	$ 32,351	$ 32,998	$ 33,658	$ 34,331	$ 875,400
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 5,222	$ 5,004	$ 4,796	$ 4,596	$ 4,404	$ 4,220	$ 4,044	$ 3,875	$ 3,714	$ 3,559	$ 3,410	$ 269,742
Difference between Options	$ 133,991	$ 136,670	$ 139,404	$ 142,192	$ 145,036	$ 147,936	$ 150,895	$ 153,913	$ 156,991	$ 160,131	$ 163,334	$ 4,164,781
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 24,845	$ 23,809	$ 22,816	$ 21,864	$ 20,952	$ 20,078	$ 19,240	$ 18,438	$ 17,669	$ 16,932	$ 16,225	$ 1,283,319

Present Value in 2017 Dollars of Heating Savings of New CT3 BOP Building over Old Building **$ 1,283,319**

PRESENT VALUE COMPARISON OF CT3 BOP AREA ROOFING COSTS FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Roofing re-surfacing	$ 112,000	(2017 Canadian Dollars)
Assumed Inflation Rate	2.0%	

Cash Flow Projections:

Expense Projections	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Expenses														
Roof Re-surfacing Costs projected to occur in 2040				$ 118,855	$ 121,232	$ 123,657	$ 126,130	$ 128,653	$ 131,226	$ 133,850	$ 136,527	$ 139,258	$ 142,043	$ 144,884
Discounted Cash Flows @ MECL's WACC of 6.44%	$ -	$ -	$ -	$ 98,561	$ 94,449	$ 90,510	$ 86,734	$ 83,116	$ 79,649	$ 76,327	$ 73,143	$ 70,092	$ 67,168	$ 64,366

PRESENT VALUE COMPARISON OF CT3 BOP AREA ROOFING COSTS FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Roofing re-surfacing	$ 112,000	(2017 Canadian Dollars)
Assumed Inflation Rate	2.0%	

Cash Flow Projections:

Expense Projections	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**
Expenses														
Roof Re-surfacing Costs projected to occur in 2040	$ 147,782	$ 150,737	$ 153,752	$ 156,827	$ 159,964	$ 163,163	$ 166,426	$ 169,755	$ 173,150	$ 176,613				
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 61,681	$ 59,108	$ 56,643	$ 54,280	$ 52,016	$ 49,846	$ 47,767	$ 45,774	$ 43,865	$ 42,035				

PRESENT VALUE COMPARISON OF CT3 BOP AREA ROOFING COSTS FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Roofing re-surfacing	$ 112,000	(2017 Canadian Dollars)
Assumed Inflation Rate	2.0%	

Cash Flow Projections:

Expense Projections	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**
Expenses										
Roof Re-surfacing Costs projected to occur in 2040										
Discounted Cash Flows @ MECL's WACC of 6.44%										

Present Value in 2017 Dollars of re-coating in 2040 **$ 42,035**

PRESENT VALUE COMPARISON OF CT3 BOP AREA BRICK MAINTENANCE COSTS FOR RETAINED BUILDING VS. NEW BUILDING

Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Brick Re-pointing for Existing Building	$ 4,596	(2017 Canadian Dollars)
Assumed Inflation Rate	2.0%	

Cash Flow Projections:

Expense Projections	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Expenses														
Annual Brick Maintenance Costs for Retained Steam Plant				$ 4,877	$ 4,975	$ 5,074	$ 5,176	$ 5,279	$ 5,385	$ 5,493	$ 5,602	$ 5,715	$ 5,829	$ 5,945
Discounted Cash Flows @ MECL's WACC of 6.44%	$ -	$ -	$ -	$ 4,045	$ 3,876	$ 3,714	$ 3,559	$ 3,411	$ 3,268	$ 3,132	$ 3,001	$ 2,876	$ 2,756	$ 2,641

PRESENT VALUE COMPARISON OF CT3 BOP AREA BRICK MAINTENANCE COSTS FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Brick Re-pointing for Existing Building	$ 4,596	(2017 Canadian Dollars)
Assumed Inflation Rate	2.0%	

Cash Flow Projections:

Expense Projections	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
Expenses															
Annual Brick Maintenance Costs for Retained Steam Plant	$ 6,064	$ 6,186	$ 6,309	$ 6,436	$ 6,564	$ 6,696	$ 6,829	$ 6,966	$ 7,105	$ 7,247	$ 7,392	$ 7,540	$ 7,691	$ 7,845	$ 8,002
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 2,531	$ 2,426	$ 2,324	$ 2,227	$ 2,134	$ 2,045	$ 1,960	$ 1,878	$ 1,800	$ 1,725	$ 1,653	$ 1,584	$ 1,518	$ 1,455	$ 1,394

PRESENT VALUE COMPARISON OF CT3 BOP AREA BRICK MAINTENANCE COSTS FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Brick Re-pointing for Existing Building	$ 4,596	(2017 Canadian Dollars)
Assumed Inflation Rate	2.0%	

Cash Flow Projections:

Expense Projections	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**
Expenses									
Annual Brick Maintenance Costs for Retained Steam Plant	$ 8,162	$ 8,325	$ 8,492	$ 8,661	$ 8,835	$ 9,011	$ 9,191	$ 9,375	$ 9,563
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 1,336	$ 1,280	$ 1,227	$ 1,176	$ 1,126	$ 1,079	$ 1,034	$ 991	$ 950

Present Value in 2017 Dollars of Brick Repair of Old Building **$ 75,135**

PRESENT VALUE COMPARISON OF CT3 BOP AREA LIFE CYCLE COSTS
FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Mechanical for Retained Building	$ 16,100	(2017 Canadian Dollars)
Annual Mechanical Costs for New CT3 BOP Building	$ 11,812	(2017 Canadian Dollars)
Electrical Replacement costs for Retained Building in 2045	$ 150,000	(2017 Canadian Dollars)
Electrical Replacement Costs for New CT3 BOP Building in 2045	$ 100,000	(2017 Canadian Dollars)
Inflation Rate on Electric Heating Costs	2.0%	

Cash Flow Projections:

Expense Projections	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Expenses												
Annual Mechanical Costs for Retained Steam Plant Building				$ 17,085	$ 17,427	$ 17,776	$ 18,131	$ 18,494	$ 18,864	$ 19,241	$ 19,626	$ 20,018
Discounted Cash Flows @ MECL's WACC of 6.44%				$ 14,168	$ 13,577	$ 13,011	$ 12,468	$ 11,948	$ 11,450	$ 10,972	$ 10,514	$ 10,076
Annual Mechanical Costs for New CT3 BOP Building				$ 12,535	$ 12,786	$ 13,041	$ 13,302	$ 13,568	$ 13,840	$ 14,116	$ 14,399	$ 14,687
Discounted Cash Flows @ MECL's WACC of 6.44%				$ 10,395	$ 9,961	$ 9,546	$ 9,147	$ 8,766	$ 8,400	$ 8,050	$ 7,714	$ 7,392
Difference between Options				$ 4,550	$ 4,641	$ 4,734	$ 4,829	$ 4,926	$ 5,024	$ 5,125	$ 5,227	$ 5,332
Discounted Cash Flows @ MECL's WACC of 6.44%	$ -	$ -	$ -	$ 3,773	$ 3,616	$ 3,465	$ 3,321	$ 3,182	$ 3,049	$ 2,922	$ 2,800	$ 2,684

Expense Projections	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Expenses												
Electrical Replacement Costs for Retained Steam Plant Building in 2045				$ 159,181	$ 162,365	$ 165,612	$ 168,924	$ 172,303	$ 175,749	$ 179,264	$ 182,849	$ 186,506
Discounted Cash Flows @ MECL's WACC of 6.44%				$ 132,001	$ 126,495	$ 121,218	$ 116,162	$ 111,316	$ 106,673	$ 102,223	$ 97,959	$ 93,873
Electrical Replacement Costs for New CT3 BOP Building in 2045				$ 106,121	$ 108,243	$ 110,408	$ 112,616	$ 114,869	$ 117,166	$ 119,509	$ 121,899	$ 124,337
Discounted Cash Flows @ MECL's WACC of 6.44%				$ 88,001	$ 84,330	$ 80,812	$ 77,441	$ 74,211	$ 71,115	$ 68,149	$ 65,306	$ 62,582
Difference between Options				$ 53,060	$ 54,122	$ 55,204	$ 56,308	$ 57,434	$ 58,583	$ 59,755	$ 60,950	$ 62,169
Discounted Cash Flows @ MECL's WACC of 6.44%	$ -	$ -	$ -	$ 44,000	$ 42,165	$ 40,406	$ 38,721	$ 37,105	$ 35,558	$ 34,074	$ 32,653	$ 31,291

PRESENT VALUE COMPARISON OF CT3 BOP AREA LIFE CYCLE COSTS
FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Mechanical for Retained Building	$ 16,100	(2017 Canadian Dollars)
Annual Mechanical Costs for New CT3 BOP Building	$ 11,812	(2017 Canadian Dollars)
Electrical Replacement costs for Retained Building in 2045	$ 150,000	(2017 Canadian Dollars)
Electrical Replacement Costs for New CT3 BOP Building in 2045	$ 100,000	(2017 Canadian Dollars)
Inflation Rate on Electric Heating Costs	2.0%	

Cash Flow Projections:

Expense Projections	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Expenses													
Annual Mechanical Costs for Retained Steam Plant Building	$ 20,419	$ 20,827	$ 21,244	$ 21,668	$ 22,102	$ 22,544	$ 22,995	$ 23,455	$ 23,924	$ 24,402	$ 24,890	$ 25,388	$ 25,896
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 9,655	$ 9,253	$ 8,867	$ 8,497	$ 8,142	$ 7,803	$ 7,477	$ 7,165	$ 6,866	$ 6,580	$ 6,306	$ 6,043	$ 5,790
Annual Mechanical Costs for New CT3 BOP Building	$ 14,980	$ 15,280	$ 15,586	$ 15,897	$ 16,215	$ 16,540	$ 16,870	$ 17,208	$ 17,552	$ 17,903	$ 18,261	$ 18,626	$ 18,999
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 7,084	$ 6,788	$ 6,505	$ 6,234	$ 5,974	$ 5,725	$ 5,486	$ 5,257	$ 5,038	$ 4,828	$ 4,626	$ 4,433	$ 4,248
Difference between Options	$ 5,438	$ 5,547	$ 5,658	$ 5,771	$ 5,887	$ 6,004	$ 6,124	$ 6,247	$ 6,372	$ 6,499	$ 6,629	$ 6,762	$ 6,897
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 2,572	$ 2,464	$ 2,362	$ 2,263	$ 2,169	$ 2,078	$ 1,991	$ 1,908	$ 1,829	$ 1,752	$ 1,679	$ 1,609	$ 1,542

Expense Projections	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Expenses													
Electrical Replacement Costs for Retained Steam Plant Building in 2045	$ 190,236	$ 194,041	$ 197,922	$ 201,880	$ 205,918	$ 210,036	$ 214,237	$ 218,522	$ 222,892	$ 227,350	$ 231,897	$ 236,535	$ 241,266
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 89,957	$ 86,205	$ 82,609	$ 79,163	$ 75,861	$ 72,696	$ 69,664	$ 66,758	$ 63,973	$ 61,305	$ 58,747	$ 56,297	$ 53,948
Electrical Replacement Costs for New CT3 BOP Building in 2045	$ 126,824	$ 129,361	$ 131,948	$ 134,587	$ 137,279	$ 140,024	$ 142,825	$ 145,681	$ 148,595	$ 151,567	$ 154,598	$ 157,690	$ 160,844
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 59,971	$ 57,470	$ 55,072	$ 52,775	$ 50,574	$ 48,464	$ 46,442	$ 44,505	$ 42,649	$ 40,870	$ 39,165	$ 37,531	$ 35,966
Difference between Options	$ 63,412	$ 64,680	$ 65,974	$ 67,293	$ 68,639	$ 70,012	$ 71,412	$ 72,841	$ 74,297	$ 75,783	$ 77,299	$ 78,845	$ 80,422
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 29,986	$ 28,735	$ 27,536	$ 26,388	$ 25,287	$ 24,232	$ 23,221	$ 22,253	$ 21,324	$ 20,435	$ 19,582	$ 18,766	$ 17,983

PRESENT VALUE COMPARISON OF CT3 BOP AREA LIFE CYCLE COSTS
FOR RETAINED BUILDING VS. NEW BUILDING
Revision: 12/12/2017

Assumptions:

Life Cycle Cost Analysis Time Range	35	years
Discount Rate (WACC)	6.44%	Maritime Electric's Weighted Average Cost of Capital (WACC)
Debt Ratio	60%	
Interest Rate on Debt	4.50%	
Equity Ratio	40%	
Allowed Rate of Return on Equity	9.35%	
Costs:		
Annual Mechanical for Retained Building	$ 16,100	(2017 Canadian Dollars)
Annual Mechanical Costs for New CT3 BOP Building	$ 11,812	(2017 Canadian Dollars)
Electrical Replacement costs for Retained Building in 2045	$ 150,000	(2017 Canadian Dollars)
Electrical Replacement Costs for New CT3 BOP Building in 2045	$ 100,000	(2017 Canadian Dollars)
Inflation Rate on Electric Heating Costs	2.0%	

Cash Flow Projections:

Expense Projections	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**	**Sum**
Expenses														
Annual Mechanical Costs for Retained Steam Plant Building	$ 26,414	$ 26,942	$ 27,481	$ 28,030	$ 28,591	$ 29,163	$ 29,746	$ 30,341	$ 30,948	$ 31,567	$ 32,198	$ 32,842	$ 33,499	$ 854,178
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 5,549	$ 5,317	$ 5,096	$ 4,883	$ 4,679	$ 4,484	$ 4,297	$ 4,118	$ 3,946	$ 3,782	$ 3,624	$ 3,473	$ 3,328	$ 263,203
Annual Mechanical Costs for New CT3 BOP Building	$ 19,379	$ 19,766	$ 20,162	$ 20,565	$ 20,976	$ 21,396	$ 21,824	$ 22,260	$ 22,705	$ 23,160	$ 23,623	$ 24,095	$ 24,577	$ 626,680
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 4,071	$ 3,901	$ 3,738	$ 3,583	$ 3,433	$ 3,290	$ 3,153	$ 3,021	$ 2,895	$ 2,774	$ 2,659	$ 2,548	$ 2,441	$ 193,103
Difference between Options	$ 7,035	$ 7,176	$ 7,319	$ 7,466	$ 7,615	$ 7,767	$ 7,922	$ 8,081	$ 8,243	$ 8,407	$ 8,576	$ 8,747	$ 8,922	$ 227,498
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 1,478	$ 1,416	$ 1,357	$ 1,301	$ 1,246	$ 1,194	$ 1,144	$ 1,097	$ 1,051	$ 1,007	$ 965	$ 925	$ 886	$ 70,100

Present Value in 2017 Dollars of Mechanical Life Cycle Savings of New CT3 BOP Building over Old Building **$ 70,100**

Expense Projections	**2042**	**2043**	**2044**	**2045**
Expenses				
Electrical Replacement Costs for Retained Steam Plant Building in 2045	$ 246,091	$ 251,013	$ 256,033	$ 261,154
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 51,698	$ 49,542	$ 47,475	$ 45,495
Electrical Replacement Costs for New CT3 BOP Building in 2045	$ 164,061	$ 167,342	$ 170,689	$ 174,102
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 34,465	$ 33,028	$ 31,650	$ 30,330
Difference between Options	$ 82,030	$ 83,671	$ 85,344	$ 87,051
Discounted Cash Flows @ MECL's WACC of 6.44%	$ 17,233	$ 16,514	$ 15,825	$ 15,165

Present Value in 2017 Dollars of Electrical Replacement costs in 2045 of New CT3 BOP Building over Old Building **$ 15,165**

Total Combined Difference in Mechanical and Electrical Life Cycle Costs **$ 85,265**

Structural Upgrade Design Services Estimate

Email from Matthew Mitrovich (GHD) to Michael Gallahue (GHD) on December 13, 2017 [cc'd: Tim Morrison (GHD)], Subject: Structural Upgrade Design Services Estimate

The structural upgrade pricing was calculated by compiling a drawing list and extrapolating a cost per sheet. The drawings include an architectural set that would identify the life safety items, among other things, such as the fire rated stairwells and enclosures around equipment. This value was then factored by 2 as past experience where retrofits have been designed typically end up being twice the design/coordination effort as compared to new construction. Other considerations would include another site visit to measure the as-built conditions in detail. A GHD inspector (from Montreal) should also be present to perform testing on rivets and inspect welds. GHD would be reanalyzing the building and verifying member and connection strengths. Situations like this (analysis of existing structures) can be complete after analysis reveals members have adequate resistance or can reveal the need for more design, namely reinforcing of members and/or connections. On new buildings, GHD typically delegates the connection design to fabricators but in this case, it may need to be completed by GHD. An option would be to subcontract that portion of the work as it is a tedious task GHD does not typically perform for every connection present in the building.

Approximate drawing list:

- (10 arch x $3,000) + (2 arch x $1,500) = $33,000
- (12 struc x $4,000) + (4 struc x $2,000) = $56,000
- Total **-** $89,000 x 2 for additional retrofit/coordination effort
- Total **-** $178,000 + site work for 2 people for a few days + connections subcontract (potentially)

Email from Michael Gallahue (GHD) to Troy Small (GHD) on December 14, 2017, Subject: Structural Upgrade Design Services Estimate

The estimate for structural upgrade design services totals $178,000. It is noted that this estimate includes drawings for the fire rated enclosures and stairwells, etc. The fire rated enclosures and stairwells were not originally included in the pricing completed with Byron Webber (MECL). Therefore, this estimate should be decreased by $33,000, which should be included in the fire upgrades costing. Structural upgrade design estimated at $145,000.

Attachment D
MECL Supplied Costing Information

CT3 Balance of Plant Requirements for New Building from MECL

Email from Adam MacKenzie (MECL) to Troy Small (GHD) on November 2, 2017 [cc'd: Kent Nicholson (MECL), Joe Steele (MECL) and Kevin Burns (MECL)], Subject: CT3 BOP Equipment

Following the review of the CT3 Balance of the Plant (BOP) Equipment, MECL compiled a detailed list of equipment (**Item #1** following correspondence chain) along with significant items to be relocated, including approximate sizes, suggested clearances and notes pertaining to the final configuration (**Item #2** following correspondence chain). These lists were compiled to assist GHD/MCA in determining the size of the proposed building for CT3 BOP equipment for cost comparison purposes.

MECL indicated that the following considerations should also be made:

- The building should be expandable to accommodate the addition of another combustion turbine on the same site.
- The building does not require lunchrooms, locker rooms, washrooms, etc. as it has been determined that the ECC building has adequate excess space to accommodate these areas.
- The building should not contain offices, with the exception of the 10 x 10 foot office indicated within the mechanical maintenance room.
- Black-start generators should be installed on the exterior of the building, in weather/sound enclosures.
- The unit station service transformer should be an outdoor pad-mount.
- Electrical and battery rooms should be separate.

Email from Troy Small (GHD) to Kent Nicholson (MECL) on November 24, 2017 [cc'd: Adam MacKenzie (MECL), Doug Matheson (MCA), Michael Gallahue (GHD)], Subject: Preliminary Building Layout – CT3 Balance of Plant Equipment

As per previous discussions between GHD and MECL, the preliminary layout for the proposed CT3 BOP Building is intended to provide an idea of the building sizing requirements for costing purposes as part of the Class 5 options analysis. GHD will refine the actual building layout during the Class B cost estimate evaluation if this is the preferred option. However, if MECL has any modification requirements to the preliminary layout, they should be communicated directly to Doug Matheson (MCA). It is recommended that MECL meet at MCA's office to incorporate any required modifications directly into CAD.

Email from Kent Nicholson (MECL) to Joe Steele (MECL), Adam MacKenzie (MECL), Kevin Burns (MECL) on November 24, 2017 [cc'd: Angus Orford (MECL)], Subject: Preliminary Building Layout – CT3 Balance of Plant Equipment

Kent Nicholson requested that Joe Steele and Adam MacKenzie review the Preliminary Building Layout for the CT3 BOP Equipment individually and then collectively to ensure it includes all Equipment and the Operating & Maintenance Clearances that had been compiled for GHD/MCA. The main focus should be on ensuring that the building is the correct size and that all that is needed for costing is included. Kent also requested that Kevin provide comments in terms of the needs for “Mechanical Maintenance” if MECL bases this group at this location in the future. Less focus should be put on the location of the building, as this can be assessed if a new building is the most cost effective option. It was also noted that MECL desires a higher quality building than the pre-fabricated steel Butler-type building that MCA seems to indicate on their drawings, and that MCA should be made aware of this up-front as it may increase the costing.

Email from Adam MacKenzie (MECL) to Troy Small (GHD) on November 28, 2017 [cc’d: Kent Nicholson (MECL) and Joe Steele (MECL)], Subject: Preliminary Building Layout – CT3 Balance of Plant Equipment

Following the review of the layout drawing for the proposed new CT3 BOP Building, the subsequent list of items was compiled for future discussion with MCA:

- Reconsideration has been made to the addition of locker/washrooms, and MECL would like for these areas to be added. The locker room would need to accommodate 4-6 people, with 6 lockers, a small bench and adequate space for 1-2 people to change.
- Following a discussion between MECL and a General Contractor, the electrical room should be relocated to the 2nd level within the same footprint, and locker/washrooms should be installed below the electrical room. In the event that space remains, another office should be added.
- A 2nd level mezzanine above the spare parts and tool crib should be installed for additional storage for spare parts. Access, in the form of stairs, should be shared with access to the electrical room.
- Air compressor equipment could likely be condensed or stacked. Stairs to the electrical room or additional storage could potentially be installed in this area.
- The ASCO panel should be located adjacent to the Siemen’s switchgear as they currently share a bus.
- To accommodate space for mechanical equipment for the building, consideration has been made for an electric boiler, feeding in-floor heat with possible unit heaters at overhead doors as MECL’s electricity rates are quite reasonable (open to other suggestions). Use house backflow preventer, water meter, etc. (allocate space, not necessary to have another room).
- If a sprinkler is required in the building, the associated equipment should be included in the mechanical space mentioned above.
- Is a 2nd roll-up door required in the water treatment area, or can service be provided from one door?
- Indicate a future 3rd RO train in the water treatment room.
- Details are missing for the WWT space. If this design is not complete, allocate space for pumps, oil/water separator, control panel, etc.
- Indicate black-start diesel generator exterior of the building, including one 600 kW unit with fuel tank in base and weather enclosure.

Email from Adam MacKenzie (MECL) to Troy Small (GHD) on December 14, 2017 [cc'd: Kent Nicholson (MECL)], Subject: New Building Estimate

Adam met with a local contractor and developed a budgetary quote for the new CT3 BOP Building. Began with a recent quote completed for an 8,000 ft^2 building that was also 20 ft clear. The quote was modified to include mezzanine, higher end finishes on half of the building (which Kent and Adam then changed to include higher end finishes on the entire building), etc. The pricing seems reasonable. One item to note is that the contractor increased his mark-up from 15% to 20% to cover miscellaneous items which had been left out. Other budget items were added, such as landscaping, paving, miscellaneous concrete and architectural fees. A 15% contingency was then added to the subtotal. The total budget was $1,320,775 (**Item #3** following correspondence chain). MECL is satisfied with this budget. Note that there are no funds within this budget for mechanical or electrical equipment, installation or engineering fees.

Potential Requirements for New CT3 Balance of Plant Equipment Building

If Rotable Engine is Swapped-Out 2 week Outage

Reverse Osmosis/Electrodeionization (RO/EDI) Equipment

All of the RO/EDI room equipment needs to be relocated (or replaced) but we could potentially have a smaller Demineralized Water Storage Tank (1/2 size). The room does need to be larger for RO maintenance.

- 2 x 90USGPM GE Osmonics Reverse Osmosis/Electrodeionization Trains
- 2 x 125 USGPM GE Betz Model S48-VN-A Water Softener Trains
- 1 x Water Softener Control Unit 120VAC, 15Amp, 1 Phase
- 1 x 500 US Gallon Softener Brine Storage Tank
- 2 x Brine Injection Pumps (Prominent Gamma/L Version 1005, 0 to 7 GPD)
- 1 x 66 US Gallon Caustic Storage Tank
- 2 x Caustic Injection Pumps (Prominent Gamma/L Version 1601, 0 to 4 GPD)
- 1 x 66 US Gallon Bisulphite Storage Tank
- 2 x Bisulphite Injection Pumps (Prominent Gamma/L Version 1601, 0 to 4 GPD)
- 1 x 300 US Gallon EDI Brine Storage Tank
- 1 x 18,500 US Gallon Stainless Steel Demineralized Water Storage Tank
- 2 x 90 USGPM @ 58feet TH, Demineralized Water Transfer Pumps
- Salt Pallet Storage Area (bags of Salt Pellets)
- Clean-In-Place Tank
- 135 USGPM Goulds Clean-In-Place Circulation Pump
- Eye Wash Station and Hot Water Tank
- Collection System for Water Softener/RO/EDI/Equipment Washing/Floor Drain waste streams

Instrument Air Equipment (currently located in RO/EDI Room)

The following Instrument Air equipment needs to be relocated (or replaced).

- 2 x 94 cfm(FAD) @125psig Sullair Model ES-825H-AC Screw-type Instrument Air Compressors
- 2 x Sullair Model S-MPH-125N Instrument Air Pre Filters
- 2 x Sullair Model SM-88 Desiccant-type Air Dryers
- 2 x Sullair Model S-MPF-125N Instrument Air After Filters
- 2 x 80 US Gallon Manchester Tank Model V80TF Air Receiver tanks

Waste Water Treatment Plant

Oil Water Separator for processing of oily water pumped from an underground wastewater tank which is fed by gravity from drains on the enclosure sump for the LM6000 engine (CT3).

Equipment for Treatment of:

- Water Softener Regenerations

- RO waste streams
- EDI waste streams
- LM6000 (CT3) enclosure sump drains
- Equipment Washing
- CT3 BOP Building floor drain(s) waste streams

Black Start Generator(s)

- NEW 1 x 1,000 kVA Diesel generator (currently we have 2 generators but perhaps could be reduced to one) could be located outdoors in a 80dBA enclosure like the existing Energy Control Center (ECC) generator.
- Generator Breaker Protection, Synchronization Panel, and Generator Breaker Panels, DP600-02, Interlocks and Tie Connection to Main 600V System (Our Contact from Kohler, who installed panel originally, figured we should be able to relocate these panels).

Alternatively, if the cost premium was not too high the two diesels could be located indoors for improved ease of maintenance. However, exhaust system including silencer and air intake/ducting will be required.

The existing Black Start Dorman Diesels are fed from a 969 Liter carbon steel double-walled Diesel Day Tank with vacuum gauge alarm/pump trip.

Electrical Room

Electrical vault for the following equipment:

- 600V Distribution Switchgear DP600-01, Siemens, 2000Amp, 3 Phase, 3 Wire Main Bus with Draw-out Circuit Breakers and Protection Relays
- 600V Balance of Plant Motor Control Center BOP-MCC-01, 1200Amp Bus, 600V, 3 Phase, 3 Wire
- General Distribution Transformer T-02, 45kVA, 3 Phase, 600V-120/208V, Dry Type, Floor Mounted
- Balance of Plant General Distribution Panel DP-01, 120/208V, 3 Phase, 4 Wire, 225Amp, Surface Mount
- Lighting Transformer T-03, 30kVA, 3 Phase, 600V-347/600V Dry Type, Floor Mounted
- Lighting Distribution Panel LP-01, 225Amp, 3 Phase, 4 Wire, 347/600V
- Fuel Oil Heater Control Panel LFO-HCP-01 for 138kW Field Installed Oil Heater Unit
- Balance of Plant Fuel Oil PLC Cabinet PLC-BOP-01 (See Drawings 16562EI-106 and 16562EI-107)

Same general floor area only 1½ times the size as per National Building Code.

Battery Room

125VDC Charger Unit and Battery Bank for Switchgear, Supplied by Siemens

Parts Storage for CT3

We would like a storage area for spare parts the same size as the area that the Dorman Diesels take up, if not larger.

Work Shop

We would like a workshop to be 1/3 the size of the current Machine Shop. (possible area to work on LM6000 gas turbine if necessary)

If the new CT3 BOP building were built attached to the existing Machine Shop (1976 vintage) then the workshop could be incorporated into the Machine Shop.

Offices

Office space for manuals and computers for 4 people (one office with 4 workstations).

Unit Station Service Transformer

1500kVA, 13800V-347/600V, Outdoor Pad Mount Transformer complete with Fire Barrier and Oil Retention Sump will need to remain post-Steam Plant Decommissioning

Additional Potential Items to Consider

- Make building expandable for possible CT4 BOP Equipment and show 'Future' Expansion locations on Layout Drawings
- Probably demolish welding shop with Steam Plant, do we need to replace it?
- Probably demolish locker room with Steam Plant, do we need to replace it?
- Do the staff need a lunchroom, as that will also be demolished.
- Could probably modify ECC to house offices for Combustion Turbine staff, but probably tougher to fit locker room, lunch room, welding shop into the ECC building.

Item #2

System	Name of Equipment	Size of Equipment	Suggested Clearance	Size of Existing Room	Notes
RO/EDI	RO/EDI Train (1 of 2)	6ft-9" x 16ft x 12ft high skid	5ft	75ft x 20ft	Fork Truck or Hoist access for removal of heavy equipment
	Water Softeners	12ft x 6ft	3ft on front and side		
	Chemical Area	10ft x 6ft	access from centre		Footprint indicated includes access space in middle
	Salt Storage	11ft x 6ft (plus 4-6 pallets)	3ft on one side		4ft x 4ft pallets
	Water Heater / Eyewash	4ft-6" x 6ft	3ft on front and side		
	18,500 US Gallon SS Demin Water Storage Tank	25ft-6" High x 11ft6" Diam.	3ft on front and side		Could likely shrink the size
Air Compressors	Air Compressors (1 of 2)	5ft x 3ft	3 ft on front and back		Suggest these could fit in a box - 14ft x 8ft x 8ft (high)
	Receiver (1 of 2)	23" Dia.	1 ft between tanks, 3ft access on one side		
	Dryer (1 of 2)	4ft x 2ft (both)	3ft on one side		
Electrical Equipment Room	Wall Mounted Equipment	33ft long	6 ft clearance in front	15ft x 22ft + additional 20ft of wall space	
	ASCO Panel	3ft x 4ft-6"	6 ft clearance on 3 sides		
	Siemens LV Switchgear	4ft x 6 ft	6 ft clearance on 3 sides		
	Battery Cabinet	5ft x 3ft	?		Batteries should be in separate Battery Room as per current regulations
	BOP 600V MCC	20" x 13.5ft	6ft clearance on front and 4ft clearance on back (along long dimension)		
Blackstart Diesels	Dorman Diesel footprint with Fuel Tank		4ft	24ft x 18ft	Likely will go with New Diesel located outdoors in Sound/Weather Enclosure
Spare Parts	Spare Parts Room	15ft x 26ft	-	15ft x 26ft	Wishlist includes about 50% more storage space, so 25ftx25ft
Machine Shop	Large Lathe	5ft x 16ft	4-5ft in front, 2-3ft remaining sides	60ft x 30ft	Would likely only keep one of these lathes, suggest keeping the smaller one as it is used more frequently
	Small Lathe	9ft-4" x 3ft-6"	4-5ft in front, 2-3ft remaining sides		
	Drill Press	7ft x 5ft	3ft on 3 sides		
	Ban Saw	7ft x 3ft	10-12ft in front, 2 ft remaining sides		Left a lot of room in front to allow cutting of lengths of steel
	Milling Machine	6ft x 9ft	4ft on 3 sides		
	Work Bench	10ft x 2ft each (quantity of 7)	4ft in front		Presently have 7 work benches, could likely reduce to 4 as there will be 4 employees
	Laydown Area	30ft x 20ft	-		Unsure what size this would need to be, guessed at 30ft x 20ft, should have an overhead door nearby, guess 16ft x 12ft door
	Tool Crib	10ft x 10ft	-		
	Office	10ft x 10ft	-		

Waste Water Treament Plant GHD/MCA to determine requirements for Downsized WWT Plant

Item #3

New CT3 BOP Building Budget

	Maclean Construction breakdown				MECL Adjustment		
	Unit	**Cost**	**Allowance**	**SubTotal**	**MECL Adjustment**	**Total**	**Notes**
General Conditions	-	-	$ 46,750.00	$ 46,750.00	-	$ 46,750.00	
Concrete	-	-	$ 85,635.92	$ 85,635.92	-	$ 85,635.92	
Concrete Form Rentals	-	-	$ 7,500.00	$ 7,500.00	-	$ 7,500.00	
Metals	-	-	$ 2,857.00	$ 2,857.00	-	$ 2,857.00	
Finishes	-	-	$ 7,716.98	$ 7,716.98	-	$ 7,716.98	
Exterior finish allowance	3,900	14	$ -	$ 54,600.00	$ 109,200.00	$ 109,200.00	MacLean Const. allowed increased exterior costs for 2 sides, double for all 4 sides
Building Cost	-	-	$ 520,780.00	$ 520,780.00	-	$ 520,780.00	
Windows	10	1,000	$ -	$ 10,000.00	$ 20,000.00	$ 20,000.00	Double # of windows from 10 to 20
Seamfilling	-	-	$ 7,200.00	$ 7,200.00	-	$ 7,200.00	
Acoustic Ceilings	500	4	$ -	$ 2,000.00	-	$ 2,000.00	
Floor Coating	8,750	5.7	$ 49,625.00	$ 49,875.00	-	$ 49,875.00	
Specialities (Lockers)	-	-	$ 1,600.00	$ 1,600.00	-	$ 1,600.00	
Earthwork	-	-	$ 50,000.00	$ 50,000.00	-	$ 50,000.00	
Financial	-	-	$ 10,826.38	$ 10,826.38	-	$ 10,826.38	
Subtotal				**$ 857,341.28**	**-**	**$ 857,341.28**	
Markup	$ 857,341.28	0.2	$ -	$ 171,468.26	-	$ 171,468.26	
Landscaping	-				$ 20,000.00	$ 20,000.00	Based on 85 trees at a price of $175/tree and $5,000 misc shrubs, etc.
Paving	-				$ 40,000.00	$ 40,000.00	Based on paving 10ft along 125ft side and 40ft along 70ft side@ $10/ft2
Misc. Concrete Add-ons	-				$ 5,000.00	$ 5,000.00	Floor drains, housekeeping pads, sumps, etc.
Subtotal	**-**				**-**	**$ 1,093,809.54**	
Architectural Fees	-				$ 54,690.48	$ 54,690.48	5% because mech/elec all figured out and very little inside the building
Subtotal	**-**				**-**	**$ 1,148,500.01**	
Contingency	-				$ 172,275.00	$ 172,275.00	Contingency is 15%
Total						**$ 1,320,775.01**	

*Confirmed number with Dept. of Transportation and Infrastructure Renewal - $9.50/ft2 12 months ago

** AAPEI guidelines say 4-5% for a warehouse with less than 10% office space (closest comparison)

Heating Requirements for Existing CT3 Balance of Plant versus New Building from MECL

Email from Adam MacKenzie (MECL) to Troy Small (GHD) on December 7, 2017 [cc'd: Kent Nicholson (MECL)], Subject: Life Cycle Comparison – Electric Heating for Portions of Steam Plant

Adam estimated that the existing building will cost MECL $95,000 per year to heat. He noted that the annual heating costs for the new building should be adjusted down to approximately $16,500 (assuming a rate of 0.135 $/kWh) per year based on MECL's actual cost of electricity. Refer to the following for items for details and brief descriptions:

- *Boiler Info* (**Item #4** following correspondence chain): Information based on the boilers used to get boiler efficiency.
- *Existing Oil Consumption* (**Item #5** following correspondence chain): Breakdown of the actual historical bunker volumes to determine how much of MECL's consumption is used to heat the building. Assumptions:
    - 25% of steam is used to heat the bunker tank
    - Actual energy requirements will reduce by 40% when only electric heat is used based on more efficient delivery of heat.
- *Heating Degree Days* (**Item #6** following correspondence chain): List of the Heating Degree Days (HDDs)
- *Station Service* (**Item #7** following correspondence chain): List of all of the station service usage since 2010. Assumptions:
    - Only used months between March and November as heaters have only been used during these months.
    - Corrected for any months that had generation as MECL assumes the numbers would be inaccurate during generation.
    - Corrected for period that Boiler 2 was heating (assuming that electric heaters were off while Boiler 2 was on).
    - Adjusted HDDs by 25% as heaters have only run in shoulder season and plant is able to obtain adequate heat during the day to not require heating during the night during shoulder season. HDDs were based on 18°C, although this is based on residential need to keep house at 20°C, plant only requires to be kept between 15°C and 20°C. Therefore, HDD should have been based on a lower value.
- *Station Service Analysis* (**Item #8** following correspondence chain): Average of the years between 2010 and 2013, which is used as the base consumption. Heater consumption is assumed to be the amount used between 2015 and 2017 above this base consumption. Did not use the 2014 data as heaters weren't installed in the spring (were installed in the fall). Did not use the 2016 data as it appears to be too low and there was an issue with station service 2 meter during this period.

- *Steam Plant Zone* (**Item #9** following correspondence chain): Estimated consumption for the building broken down by zone based on volumes and exposures.
- *Compared to New Bldg* (**Item #10** following correspondence chain): Comparison between MECL's estimates and MCA's projection for the building, correcting for the decreased volume.

The estimate appears to be quite accurate, despite the large assumptions. After the volume is adjusted, the estimate indicates that it would cost 2.3 times more to heat the old building versus the new building. With an R5 roof and leakage through the old building, this seems relatively low.

Item #4

Maritime Electric - New burner Start up Report

Date 3/29/2006

Burner Serial #	AP114061	Boiler Make	Volcano
Burner Model #	F18-0-150-E110-EPD160-F9H.2	Boiler Model	5M
		Serial #	W1013
Burner Rating	#2 OIL 150 GPH 140K BTU/GAL	Capacity	16000 lbs/hr
	#6 OIL 140 GPH 150K BTU/GAL		

Combustion Data For #2 Oil

Boiler Load	Steam Flow	Oil Pressure	Atm Air/Stm	O2	CO2	CO	Stack Temp	Efficiency
%	Lbs/Hr	PSI	PSI	%	%	%	Deg F	%
30	4500	16	15	6.1	10	6	475	82.4
40	6300	19	18	5.7	10.7	90	496	82.4
50	7500	22	20	4.2	12.5	29	529	83.1
60	9600	26	24	3.8	12.3	15	576	81.8
70	11000	31	28	3.8	11.8	15	616	80.3
80	12500	34	31	3	12.6	15	644	80.3
90	14600	38	35	3.3	12.2	17	673	79.2
100	16500	40	35	2.5	12.9	23	690	79.5

Combustion Data For #6 Oil

Boiler Load	Steam Flow	Oil Pressure	Atm Air/Stm	O2	CO2	CO	Stack Temp	Efficiency
%	Lbs/Hr	PSI	PSI	%	%	%	Deg F	%
30	4500	15	12	5.6	11.4	17	480	83.5
40	6000	17	13.5	na	10.9	9	524	81.8
50	7600	21	16.5	4.4	12.3	9	560	82.3
60	9500	25	19	2.9	13.5	12	588	82.9
70	10800	29	22	3.3	13.3	15	623	81.3
80	12400	33	26	3.8	12.8	15	664	79.7
90	14000	39	29	3.6	13	17	694	79.2
100	16000	43	34	3.3	13.3	39	723	78

#2 Oil Supply Pressure	105 PSI
#6 Oil Supply Pressure	100PSI
#6 Oil Supply Temperature	230-240 F Low Fire - 210-220 F High Fire
Operating Drum Pressure	115-120 PSI

Item #5

Boiler # 2 Operation

Month	Fuel: Bunker C Loading %	Efficiency	Total bbls	Vented Steam bbls	Bunker Heating bbls	Plant Heating bbls
November	40%	82%	1,082	108	243	730
December	45%	82%	1,217	-	304	913
January	60%	83%	1,623	-	406	1,217
February	60%	83%	1,623	-	406	1,217
March	45%	82%	1,217	-	304	913
April	40%	82%	1,082	-	270	811
May	35%	83%	947	95	213	639
Average/Total	46.4%	82.3%	8,791	203	2,147	6,441

Current Operation - Equivalent heating requirements of new system

Annual Consumption	6,441	bbls
Heating value	6,472,433	BTU/bbl
MMBTU's purchased	41,690	MMBTU
MMBTU's used	34,313	MMBTU

Notes: Building heating for November, December, March, April and May Only

No Labour For this Period

No Bunker Heating for this period, may effect length of time required to start generation

Electric heat

Electricity	8.5	kWh = 1 litre furnace oil
Efficiency	100%	
kWh's needed	10,056,291	kWh
Cost per kWh	8.382	cents/kWh
Cost of electricity	$ 842,918	
Labour	$ -	
Cost	$ 842,918	This is the estimated cost to heat the plant from November to May. Note that this is as heated now,
Reduction due adjusted temperatures	45%	
Cost	$ 463,605	

Description: Celsius-based heating degree days for a base temperature of 18C
Source: www.charlottetown.weatherstats.ca/charts/hdd-monthly.html
Station: Charlottetown, P. E. I., PE, CA (63.13W,46.29N)
Station ID: CYYG

Month starting	HDD	Month starting	HDD	Month starting	HDD	Month starting	HDD
1/1/2010	686	1/1/2012	714	1/1/2014	769	1/1/2016	712
2/1/2010	608	2/1/2012	700	2/1/2014	717	2/1/2016	627
3/1/2010	556	3/1/2012	572	3/1/2014	759	3/1/2016	654
4/1/2010	367	4/1/2012	380	4/1/2014	454	4/1/2016	475
5/1/2010	263	5/1/2012	225	5/1/2014	309	5/1/2016	260
6/1/2010	110	6/1/2012	120	6/1/2014	121	6/1/2016	122
7/1/2010	13	7/1/2012	12	7/1/2014	1	7/1/2016	30
8/1/2010	22	8/1/2012	5	8/1/2014	29	8/1/2016	24
9/1/2010	108	9/1/2012	77	9/1/2014	119	9/1/2016	102
10/1/2010	287	10/1/2012	244	10/1/2014	229	10/1/2016	256
11/1/2010	429	11/1/2012	452	11/1/2014	461	11/1/2016	402
12/1/2010	515	12/1/2012	592	12/1/2014	582	12/1/2016	664
1/1/2011	743	1/1/2013	804	1/1/2015	828	1/1/2017	711
2/1/2011	696	2/1/2013	675	2/1/2015	857	2/1/2017	657
3/1/2011	620	3/1/2013	597	3/1/2015	743	3/1/2017	690
4/1/2011	421	4/1/2013	442	4/1/2015	537	4/1/2017	416
5/1/2011	261	5/1/2013	239	5/1/2015	234	5/1/2017	265
6/1/2011	150	6/1/2013	101	6/1/2015	164	6/1/2017	94
7/1/2011	22	7/1/2013	18	7/1/2015	28	7/1/2017	27
8/1/2011	14	8/1/2013	19	8/1/2015	3	8/1/2017	30
9/1/2011	90	9/1/2013	107	9/1/2015	73	9/1/2017	92
10/1/2011	250	10/1/2013	302	10/1/2015	316	10/1/2017	204
11/1/2011	398	11/1/2013	475	11/1/2015	421	11/1/2017	455
12/1/2011	569	12/1/2013	743	12/1/2015	545		

Item #7

Station Service	January	February	March	April	May	June	July	August	September	October	November	December	Total	Total	Total without Dec/Jan/Feb	Total Corrected for Generation		
						2010												
2	66,240	59,400	62,040	60,240	48,000	34,320	30,300	33,600	34,440	49,920	72,780	106,920	658,200	1,821,280	1,161,830	1,161,830		
3	13,030	12,240	13,170	12,380	13,950	14,670	15,660	14,810	22,900	15,640	22,270	24,820	195,540	3,964	2,155		Average Consumption	1,124,553
9	48,500	42,100	51,500	41,100	0	0	0	0	0	0	23,700	92,900	299,800					
10	52,600	51,300	57,100	62,100	95,100	72,800	70,700	78,300	66,300	71,600	45,000	89,400	812,300					
ECC	11,200	12,320	13,920	11,840	12,240	10,240	11,920	11,920	11,760	11,680	13,280	12,240	144,560					
Generation	0	1,800	0	0	0	0	0	0	0	0	129,000	1,047,000	1,177,800					
Degree Days	686	608	556	367	263	110	13	22	108	287	429	515	3,964					
						2011												
2	67,800	80,880	61,200	60,660	54,300	35,160	33,240	30,960	28,080	36,180	67,080	83,340	638,880	1,929,890	1,134,150	1,130,140		
3	28,470	25,220	26,670	26,000	33,480	26,370	23,860	22,540	25,230	22,950	25,810	16,830	303,430	4,234	2,226			
9	22,000	70,100	22,500	25,000	23,300	21,400	21,400	24,700	21,700	20,800	38,400	127,200	438,500					
10	47,600	87,000	32,000	34,100	41,100	53,400	40,100	52,500	44,100	61,500	37,500	139,300	670,200					
ECC	12,080	7,440	8,160	8,560	9,440	9,200	11,360	11,680	10,240	11,520	11,280	10,160	121,120					
Generation	53,000	1,032,000	0	0	0	0	0	0	0	0	141,800	1,616,600	2,843,400					
Degree Days	743	696	620	421	261	150	22	14	90	250	398	569	4,234					
						2012												
2	51,600	67,620	66,840	55,680	54,180	56,640	45,540	25,080	21,240	28,320	55,500	75,540	603,780	2,593,220	1,998,690	1,155,740		
3	13,680	13,990	26,080	23,490	10,880	10,250	19,030	10,320	11,930	13,710	22,180	14,100	189,640	4,093	2,087			
9	50,100	70,000	28,300	30,900	54,000	78,500	372,200	47,200	42,600	41,100	30,100	68,400	913,400					
10	51,100	48,700	38,000	34,200	35,600	116,000	390,800	53,900	61,500	68,300	57,000	69,700	1,024,800					
ECC	9,200	8,800	10,800	9,920	11,680	11,920	14,880	14,000	9,360	11,520	12,480	13,840	138,400					
Generation	0	313,600	0	0	0	1,329,000	12,695,000	0	0	0	0	66,000	14,403,600					
Degree Days	714	700	572	380	225	120	12	5	77	244	452	592	4,093					
						2013												
2	61,320	58,200	56,940	49,740	36,480	27,240	30,120	27,300	24,600	24,840	49,320	110,160	556,260	1,788,750	1,050,500	1,050,500		
3	21,570	14,530	20,020	28,300	23,590	16,170	14,080	11,190	12,370	17,170	20,450	20,170	219,610	4,522	2,300			
9	39,000	48,100	40,300	28,300	36,400	33,300	23,300	20,300	21,400	21,400	23,200	141,000	476,000					
10	132,800	49,800	54,900	40,800	51,700	43,200	58,600	54,700	61,100	68,200	43,400	41,600	700,800					
ECC	12,000	10,880	13,920	12,880	14,800	13,440	16,560	18,320	14,960	12,960	12,800	10,400	163,920					
Generation	1,194,300	0	0	0	0	0	0	0	0	0	0	944,600	2,138,900					
Degree Days	804	675	597	442	239	101	18	19	107	302	475	743	4,522					
						2014												
2	90,900	76,560	51,900	49,500	32,580	23,940	23,700	20,760	26,340	46,860	85,320	132,060	660,420	2,114,040	1,184,450	1,184,450	2014 is an odd year as the heaters were used in Fall but not Spring	
3	11,790	12,690	11,250	10,560	11,400	14,710	16,580	10,310	12,520	13,270	11,750	13,290	150,120	4,550	2,482			
9	161,400	50,400	45,900	30,100	20,000	19,600	20,400	43,800	53,000	60,400	67,200	138,500	710,700					
10	104,200	40,500	36,600	47,200	61,000	67,900	61,500	46,700	48,200	49,900	66,600	97,300	727,600					
ECC	13,520	12,000	12,160	11,200	13,120	12,960	17,520	14,240	14,640	13,440	0	0	134,800					
Generation	3,109,900	49,100	0	0	0	0	0	0	0	0	0	1,496,600	4,655,600					
Degree Days	769	717	759	454	309	121	1	29	119	229	461	582	4,550				Additional heating Consumption	
						2015												
2	81,360	138,660	65,460	129,300	103,920	28,560	0	0	14,820	84,660	131,580	71,340	849,660	2,910,620	1,913,090	1,913,090		
3	10,340	15,470	9,480	9,010	9,720	23,760	23,650	21,160	12,330	11,410	12,370	12,260	170,960	4,749	2,519		788,538	
9	79,000	274,000	89,400	83,800	74,900	35,700	20,800	21,800	18,800	63,200	72,300	53,300	887,000					
10	71,100	158,600	64,400	150,500	153,000	68,400	40,800	40,000	40,200	100,900	83,000	32,100	1,003,000					
ECC	0	0	0	0	0	0	0	0	0	0	0	0	0					
Generation	0	4,005,300	0	0	0	0	0	0	0	0	0	0	4,005,300					
Degree Days	828	857	743	537	234	164	28	3	73	316	421	545	4,749					
% BLR On	100%	100%	100%	42%	8%	0%	0%	0%	0%	0%	56%	100%						
Corrected HDD	0	0	0	310	215	164	0	0	73	316	186	0	1,265	948.7301				
						2016												
2	66,600	119,400	17,820	0	0	0	0	0	0	0	0	43,020	246,840	2,100,560	1,473,400	1,473,400		
3	11,270	17,180	45,120	57,020	70,330	49,690	22,960	23,580	25,250	50,190	52,240	15,290	440,120	4,328	2325			
9	49,300	124,700	44,900	48,200	75,000	33,400	29,000	32,500	35,700	52,000	48,700	35,300	608,700					
10	22,800	79,200	37,700	85,900	133,100	54,400	38,000	42,700	42,800	124,800	100,400	43,100	804,900					
ECC	0	0	0	0	0	0	0	0	0	0	0	0	0					
Generation	0	1,460,100	85,200	0	0	0	0	0	0	0	0	0	1,545,300					
Degree Days	712	627	654	475	260	122	30	24	102	256	402	664	4,328					
% BLR On	100%	100%	100%	72%	8%	2%	0%	0%	0%	0%	54%	100%						
Corrected HDD	0	0	0	134	239	120	0	0	102	256	185	0	1,036	777.1666				
						2017												
2	52,320	107,520	70,500	79,680	120,960	38,760	18,780	22,020	19,380	58,740	85,980	0	674,640	2,291,480	1,701,520	1,701,520		
3	9,920	13,290	12,970	9,530	11,390	12,460	10,360	12,130	11,330	12,560	11,090	0	127,030	4,305	2273			
9	26,700	128,700	57,000	68,200	95,400	56,200	36,300	49,500	52,100	94,400	94,700	0	759,200					
10	42,300	72,500	59,300	55,100	112,400	71,300	20,300	17,200	22,700	42,700	78,100	0	593,900					
ECC	0	0	0	0	0	0	0	0	0	0	0	0	0					
Generation	0	1,512,300	429,600	0	0	0	0	0	0	0	0	0	1,941,900					
Degree Days	711	657	690	416	265	94	27	30	92	204	455	0	4305					
% BLR On	100%	100%	100%	68%	5%	3%	0%	0%	0%	0%	40%	100%						
Corrected HDD	0	0	0	133	252	91	0	0	92	204	273	0	1,045	783.7875				

		Additional Consumption	Additional Consumption Adjusted for HDD's	
Average consumption 2010-2013	2,033,285	-		
Average consumption (Mar-Nov) 2010-2013	1,124,553	-		
KWH's excluding BLR2 Consumption	899,642			
Average HDD's 2010-2016	4,349			
2014 is Odd year because heaters were working for fall but not for spring so do not use figures from 2014				
2015 consumption	2,910,620	-		
2015 Consumption (Mar-Nov)	1,913,090	1,013,448	4,645,211	
2016 Consumption	2,100,560	-		
2016 Consumption (Mar-Nov)	1,473,400	573,758	3,210,415	
2017 Consumption (Dec assumed)	2,291,480	-		
2017 Consumption (Mar-Nov)	1,701,520	801,878	4,448,940	
Average HDD's				
2016 appears to be an outlier, something wrong with KWH for 2016				
Average between 2015 & 2017			4,547,075	
Cost of Electricity				8.382
Cost to Heat Entire Building			381135.8615	

Item #9

$ 463,605.07 Estimated Total Cost to Heat Steam Plant with Electric Heat

Zone	Approx. Footprint of Zone (ft2)	Approx. Elevation of Roof Above Grade (ft)	Average	Volume (ft3)	Outdoor Wall Ratio	Multiplier	Estimated Annual Cost to Heat	
#10 Boiler / #10 Turbine Zone	8,220	55.5 (exluding 18 ft Penthouse)	58.2	478,404	5	0.916667	**$ 133,343.50**	
#9 Boiler / #9 Turbine Zone	8,920	55.5 (exluding 18 ft Penthouse)	58.2	519,144	3	0.75	**$ 118,389.92**	
MgOH Zone	1,630	Varies 30 - 32	31	50,530	4	0.833333	**$ 12,803.65**	
#5 Boiler Zone	3,145	44.5	44.5	139,953	1	0.583333	**$ 24,823.50**	
#8 Turbine Zone	3,520	38	38	133,760	1	0.583333	**$ 23,725.13**	
#4 Boiler Zone	3,305	53	53	175,165	1	0.583333	**$ 31,069.18**	
#7 Turbine Zone	3,455	Varies 28 - 44	36	124,380	1	0.583333	**$ 22,061.39**	
Waste Water Treatment Plant Zone	2,630	Varies 28 - 44	36	94,680	1	0.583333	**$ 16,793.48**	
RO-EDI Water Treatment Plant Zone	1,880	Varies 28 - 44	36	67,680	4	0.833333	**$ 17,149.23**	
CT3 Balance of Plant Equipment Zone	5,940	Varies 28 - 44	36	213,840	3	0.75	**$ 48,765.85**	$ 97,388.80
Welding Shop	800	Varies 28 - 44	36	28,800	3	0.75	**$ 6,567.79**	
Mechanical Maintenance Shop	1,840	Varies 14-15	14.5	26,680	6	1	**$ 8,112.44**	
	45,285		58.2	2,053,016	6	8.75	**$ 463,605.07**	

$ 381,135.86 Estimated Total Cost to Heat Steam Plant with Electric Heat

Zone	Approx. Footprint of Zone (ft2)	Approx. Elevation of Roof Above Grade (ft)	Average	Volume (ft3)	Outdoor Wall Ratio	Multiplier	Estimated Annual Cost to Heat	
#10 Boiler / #10 Turbine Zone	8,220	55.5 (exluding 18 ft Penthouse)	58.2	478,404	5	0.916667	**$ 109,623.46**	
#9 Boiler / #9 Turbine Zone	8,920	55.5 (exluding 18 ft Penthouse)	58.2	519,144	3	0.75	**$ 97,329.92**	
MgOH Zone	1,630	Varies 30 - 32	31	50,530	4	0.833333	**$ 10,526.05**	
#5 Boiler Zone	3,145	44.5	44.5	139,953	1	0.583333	**$ 20,407.73**	
#8 Turbine Zone	3,520	38	38	133,760	1	0.583333	**$ 19,504.75**	
#4 Boiler Zone	3,305	53	53	175,165	1	0.583333	**$ 25,542.38**	
#7 Turbine Zone	3,455	Varies 28 - 44	36	124,380	1	0.583333	**$ 18,136.96**	
Waste Water Treatment Plant Zone	2,630	Varies 28 - 44	36	94,680	1	0.583333	**$ 13,806.14**	
RO-EDI Water Treatment Plant Zone	1,880	Varies 28 - 44	36	67,680	4	0.833333	**$ 14,098.61**	
CT3 Balance of Plant Equipment Zone	5,940	Varies 28 - 44	36	213,840	3	0.75	**$ 40,091.05**	$ 80,064.62
Welding Shop	800	Varies 28 - 44	36	28,800	3	0.75	**$ 5,399.47**	
Mechanical Maintenance Shop	1,840	Varies 14-15	14.5	26,680	6	1	**$ 6,669.34**	
	45,285		58.2	2,053,016	6	8.75	**$ 381,135.86**	

Item #10

MCA Estimate for new building	$	26,000.00
Assumed $/KWH	$	0.13
Actual $/KWH	$	0.08
Corrected Annual Heating Costs	$	16,227.25
Volume of New Building (ft3)		175,000
Volume of Old Building (ft3)		431,680
Annual Costs corrected for volume	$	40,028.46
Old Building Heating Costs (Oil based Calculation)	$	97,388.80
Ratio to New Building		2.4
Old Building Heating Costs (Station Service based Calculation)	$	80,064.62
Ratio to New Building		2.0

The estimated costs to heat the existing building is only 2.4 times the projected costs to heat the new building when corrected for volume. Therefore assume the higher estimation for heating old building of $97,388.8

Estimated yearly costs to heat old building	**$**	**97,388.80**

Attachment E
MCA Supplied Costing Information (Mechanical) and New Building Layout

MCA CONSULTANTS
ENGINEERS - PROJECT MANAGEMENT

CLASS 5 OPTIONS ANALYSIS

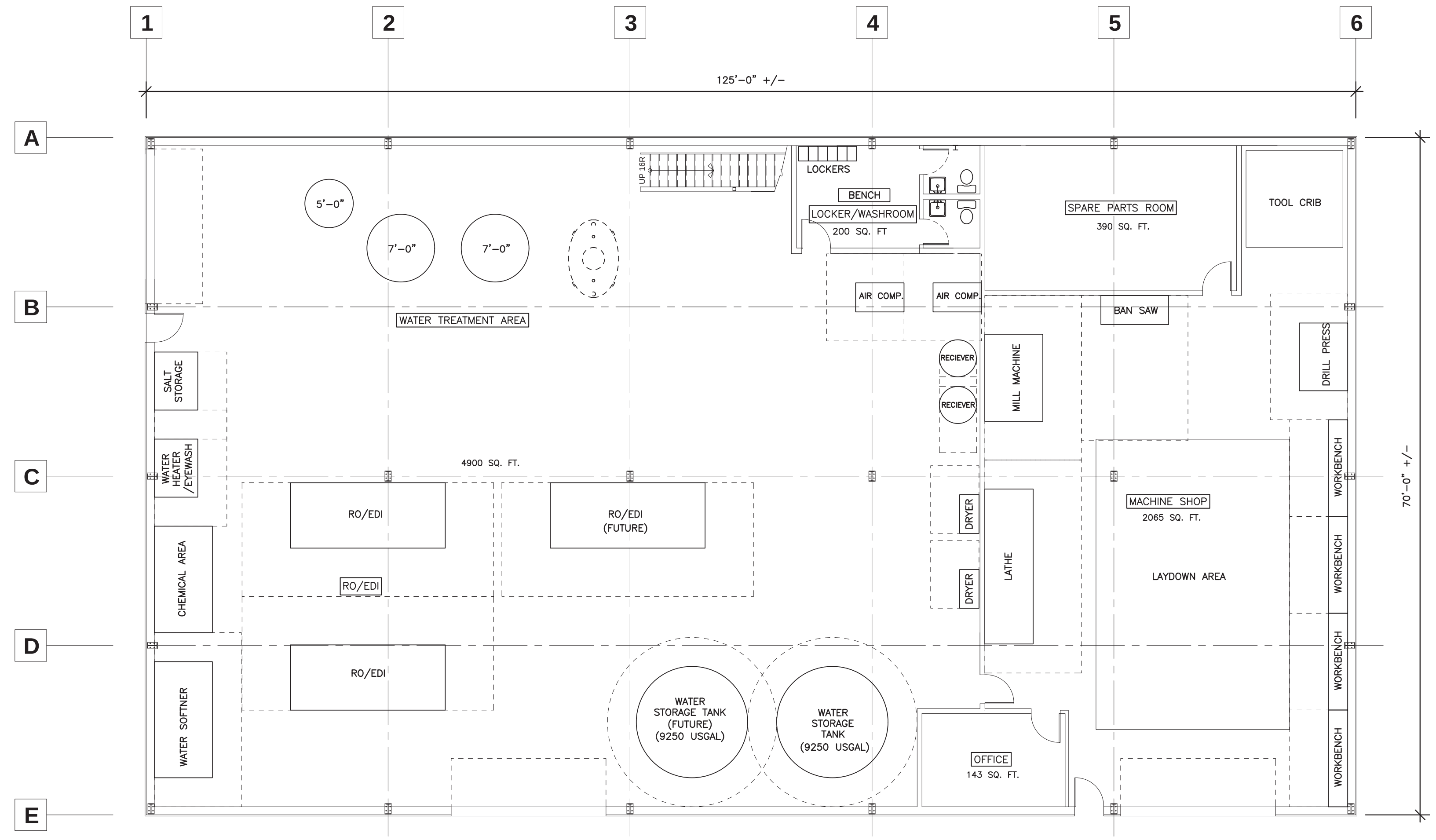
PROJECT	PROJECT NO.
MECL Decommissioning	17-232
DESCRIPTION	**DATE**
Class 5 Options Analysis	2/5/2018

CLASS 5 OPTIONS ANALYSIS											
CT3 BOP TO REMAIN IN EXISTING BUILDING					NEW BUILDING					COMPARISON	NOTE
Description	Unit	Quantity	Unit Price	Amount	Description	Unit	Quantity	Unit Price	Amount	Difference	
PART 1 CT3 BOP Equipment											
Existing RO-EDI	hrs.	0	$ 80.00	$ -	Relocate RO-EDI System (4 people, 4 weeks)	hrs.	640	$ 80.00	$ 51,200.00	$ 51,200.00	
RO-EDI Tank (Ex.)	qty.	1	$ -	$ -	RO-EDI Tanks (New) - Stainless	qty.	1	$ 100,000.00	$ 100,000.00	$ 100,000.00	1/2/8
Commissioning (Ex.)	hrs.	0	$ 100.00	$ -	Commissioning (2 people, 2 weeks)	hrs.	160	$ 100.00	$ 16,000.00	$ 16,000.00	3
RO Water Piping	ft.	0	$ -	$ -	RO Water Piping	ft.	500	$ 80.00	$ 40,000.00	$ 40,000.00	2/3
Existing Waste from CT3	ft.	0	$ -	$ -	New Waste Line from CT3	ft.	500	$ 40.00	$ 20,000.00	$ 20,000.00	2/3
Existing WWT to Remain	lot	1	$ -	$ -	New WWT System	lot	1	$ 100,000.00	$ 100,000.00	$ 100,000.00	2/7
Oil Water Separator (Ex.)	lot	1	$ -	$ -	New Oil Water Separator	lot	1	$ 10,000.00	$ 10,000.00	$ 10,000.00	2/7
Sand Filter	lot	1	$ -	$ -	New Sand Filter	lot	1	$ 40,000.00	$ 40,000.00	$ 40,000.00	2/7
WWT Piping	ft.	0	$ -	$ -	WWT Piping	ft.	500	$ 40.00	$ 20,000.00	$ 20,000.00	2/3/7
WWT Discharge Piping	lot	1	$ 30,000.00	$ 30,000.00	WWT Discharge Piping	lot	1	$ 20,000.00	$ 20,000.00	$ (10,000.00)	2/3
Compressed Air (Ex.)	lot	1	$ -	$ -	Comressed Air (Ex.)	lot	1	$ -	$ -	$ -	
Black Start Diesels (New)	qty.	2	$ -	$ -	Black Start Diesels (New)	qty.	2	$ -	$ -	$ -	
Instrument Air Piping	ft.	0	$ -	$ -	Instrument Air Piping	ft.	500	$ 40.00	$ 20,000.00	$ 20,000.00	2/3
Fuel Oil Piping	ft.	250	$ 40.00	$ 10,000.00	Fuel Oil Piping	ft.	250	$ 40.00	$ 10,000.00	$ -	2/3
Maintenance Fit-Up (Air/Water)	lot	0	$ -	$ -	Maintenance Fit-Up (Air/Water)	lot	1	$ 15,000.00	$ 15,000.00	$ 15,000.00	2/3
									TOTAL	$ 422,200.00	
PART 2 EEC BUILDING SERVICES											
Water Service	lot	1	$ -	$ -	Water Service	lot	1	$ -	$ -	$ -	
Fire Service	lot	1	$ -	$ -	Fire Service	lot	1	$ -	$ -	$ -	
									TOTAL	$ -	
PART 3 HVAC											
Existing to Remain	lot	1	$ -	$ -	HVAC Equipment	sq. ft.	8750	$ 10.00	$ 87,500.00	$ 87,500.00	2/3
Electric Unit Heaters	kW	100	$ 200.00	$ 20,000.00	Electric Unit Heaters	kW	100	$ 200.00	$ 20,000.00	$ -	2/8
Task Ventilation (Ex.)	lot	1	$ -	$ -	Task Ventilation	lot	1	$ 15,000.00	$ 15,000.00	$ 15,000.00	2/8
									TOTAL	$ 102,500.00	
PART 4 PLUMBING											
New Dom. Water Service	ft.	1	$ -	$ -	New Dom. Water Service	ft.	1	$ -	$ -	$ -	
New Sanitary Service	ft.	1	$ -	$ -	New Sanitary Service	ft.	1	$ -	$ -	$ -	
Reconfigure Services In Building	lot	1	$ 75,000.00	$ 75,000.00	New Building Water/Sanitary	sq. ft.	8750	$ 10.00	$ 87,500.00	$ 12,500.00	2/3
Existing Washrooms/Locker	lot	1	$ -	$ -	New Washrooms/Locker	lot	1	$ 10,000.00	$ 10,000.00	$ 10,000.00	2/8
									TOTAL	$ 22,500.00	
PART 5 FIRE PROTECTION											
Relocate/New Fire Pump	lot	1	$ -	$ -	Relocate/New Fire Pump	lot	1	$ -	$ -	$ -	
Fire Entrance	lot	1	$ -	$ -	Fire Entrance	lot	1	$ -	$ -	$ -	
Sprinkler Update	sq. ft.	14000	$ -	$ -	New Sprinkler System	sq. ft.	8750	$ 5.00	$ 43,750.00	$ 43,750.00	2/3
									TOTAL	$ 43,750.00	
PART 6 LIFE CYCLE COSTS											
HVAC Annual Energy Cost	sq. ft.	14000	$ -	$ -	HVAC Annual Energy Cost	sq. ft.	8750	$ -	$ -	$ -	5
HVAC Equipment Annual	sq. ft.	14000	$ 0.75	$ 10,500.00	HVAC Equipment Annual	sq. ft.	8750	$ 0.75	$ 6,562.50	$ (3,937.50)	6a
Plumbing Equipment Annual	sq. ft.	14000	$ 0.40	$ 5,600.00	Plumbing Equipment Annual	sq. ft.	8750	$ 0.40	$ 3,500.00	$ (2,100.00)	6b
Fire Protection (Redundant Sys.)	sq. ft.	14000	$ -	$ -	Fire Protection Annual	sq. ft.	8750	$ 0.20	$ 1,750.00	$ 1,750.00	6c
									TOTAL ($/yr)	$ (4,287.50)	

Lifetime (Years)	35
Relative Cost of New Building	$ 440,888

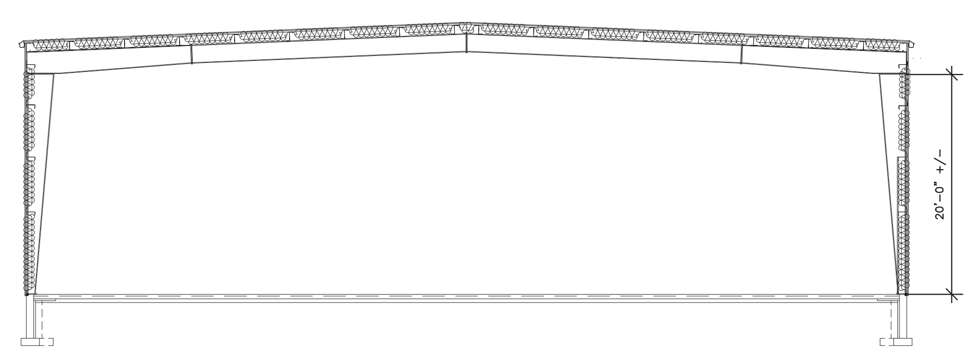
NOTES

1. RO-EDI Tanks could be provided as plastic tanks for $50,000 each (budget pricing from supplier). To be reviewed with MECL.
2. Unless otherwise noted, cost estimates are for supply and install.
3. Cost estimates based on mechanical cost estimating handbooks (RSMeans and Historical Data)
4. The scope of this analysis is to identify differential costs. These estimates may not be representative of real project costs for each option.
5. Preliminary heating load calculations provided to MECL and MECL to prepare annual heating cost estimates.
6. Life cycle costs are based on estimated present value cost of systems per sq. ft., divided by estimated life span of equipment/system.
    a. HVAC @ $15/sq. ft. with 20 year lifetime = $0.75/sq. ft. annual.
    b. Plumbing @ $10/sq. ft. with 25 year lifetime = $0.40/sq. ft. annual.
    c. Fire Protection @ $5/sq. ft. with 25 year lifetime = $0.20/sq. ft. annual.
7. New WWT System may not be necessary. MCA/MECL must confirm with city whether RO-EDI waste and Water Softener Backwash meets acceptable levels to be discharged to city sanitary.
8. Budget pricing obtained from supplier or product literature.



1 / M1 MECHANICAL LAYOUT PLAN - GROUND FLOOR

SCALE: 1/8" = 1'-0"



2 / M1 SECTION PLAN

SCALE: 1/8" = 1'-0"

PRELIMINARY
FOR REVIEW ONLY
Date FEB. 5, 2018

NOTES

NO.	REVISIONS	DD/MM/YY
0	ISSUED FOR CLASS 5 OPTIONS ANALYSIS	05/02/18

All measurements must be checked on site by the contractor prior to construction or fabrication.

This drawing is the property of MCA Consultants Inc. and shall not be used on other projects or extensions to this project except by agreement in writing from MCA Consultants Inc.

This drawing is not to be used for construction unless stamped and signed by the Engineer.

Stamp

Client

MECL POWER PLANT DECOMMISSIONING

MCA CONSULTANTS INC.
ENGINEERS · PROJECT MANAGEMENT
902.566.9223 | info@mcaconsultants.ca www.mcaconsultants.ca

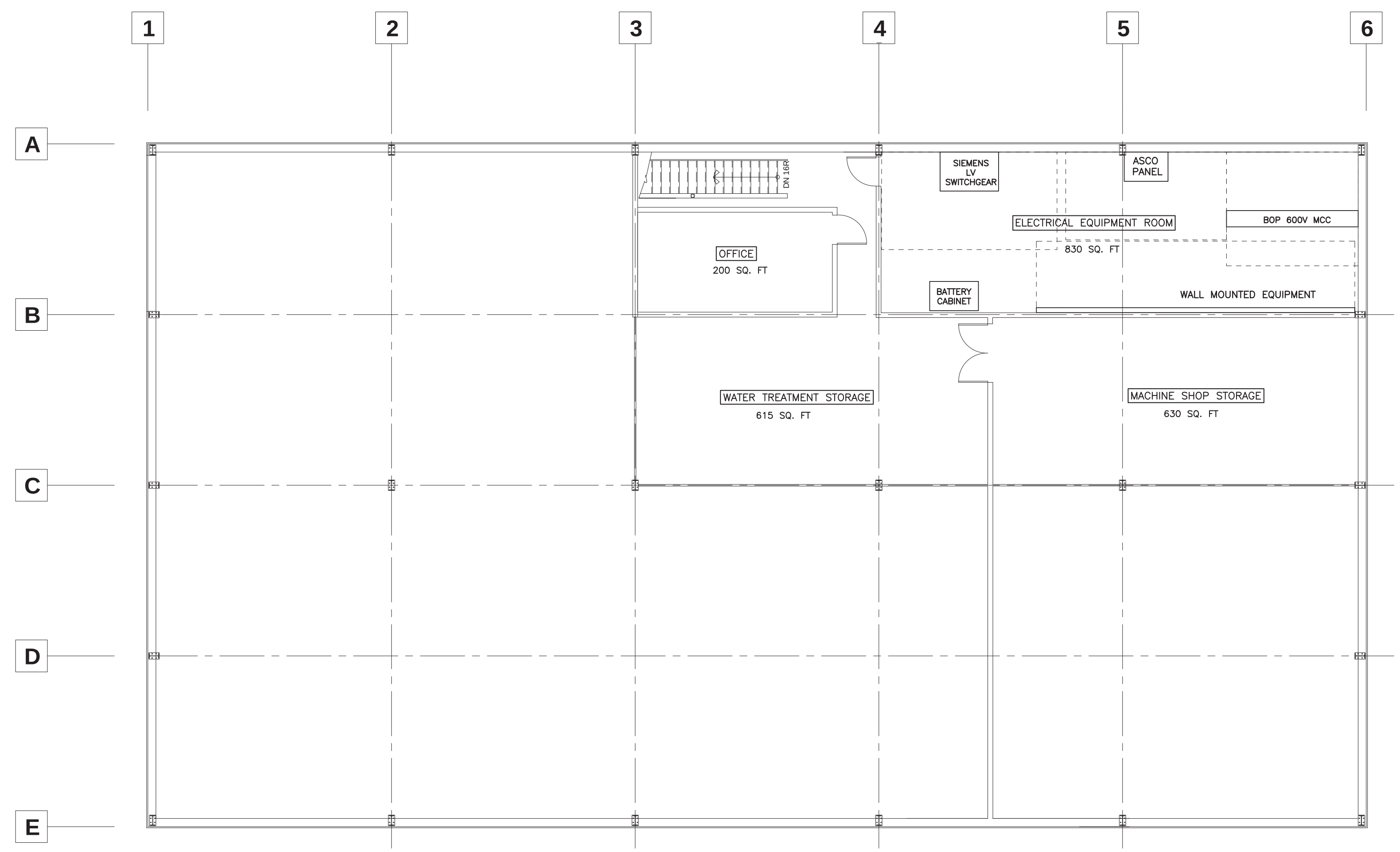
Project

MECL POWER PLANT DECOMMISSIONING

Sheet Title

MECHANICAL LAYOUT PLAN, & SECTION - GROUND FLOOR

Scale	Date
AS NOTED	FEB. 5, 2018
Drn By S.G.M.	Chk'd By J.D.M.
Project No. 17-232	Sheet No. M1



1
M1
MEZZANINE PLAN
SCALE: 1/8" = 1'-0"

PRELIMINARY
FOR REVIEW ONLY
Date FEB. 5, 2018

NOTES

NO.	REVISIONS	DD/MM/YY
0	ISSUED FOR CLASS 5 OPTIONS ANALYSIS	05/02/18

All measurements must be checked on site by the contractor prior to construction or fabrication.

This drawing is the property of MCA Consultants Inc. and shall not be used on other projects or extensions to this project except by agreement in writing from MCA Consultants Inc.

This drawing is not to be used for construction unless stamped and signed by the Engineer.

Stamp

Client

MECL POWER PLANT DECOMMISSIONING

MCA CONSULTANTS INC.
ENGINEERS - PROJECT MANAGEMENT
902.566.9223
info@mcaconsultants.ca
www.mcaconsultants.ca

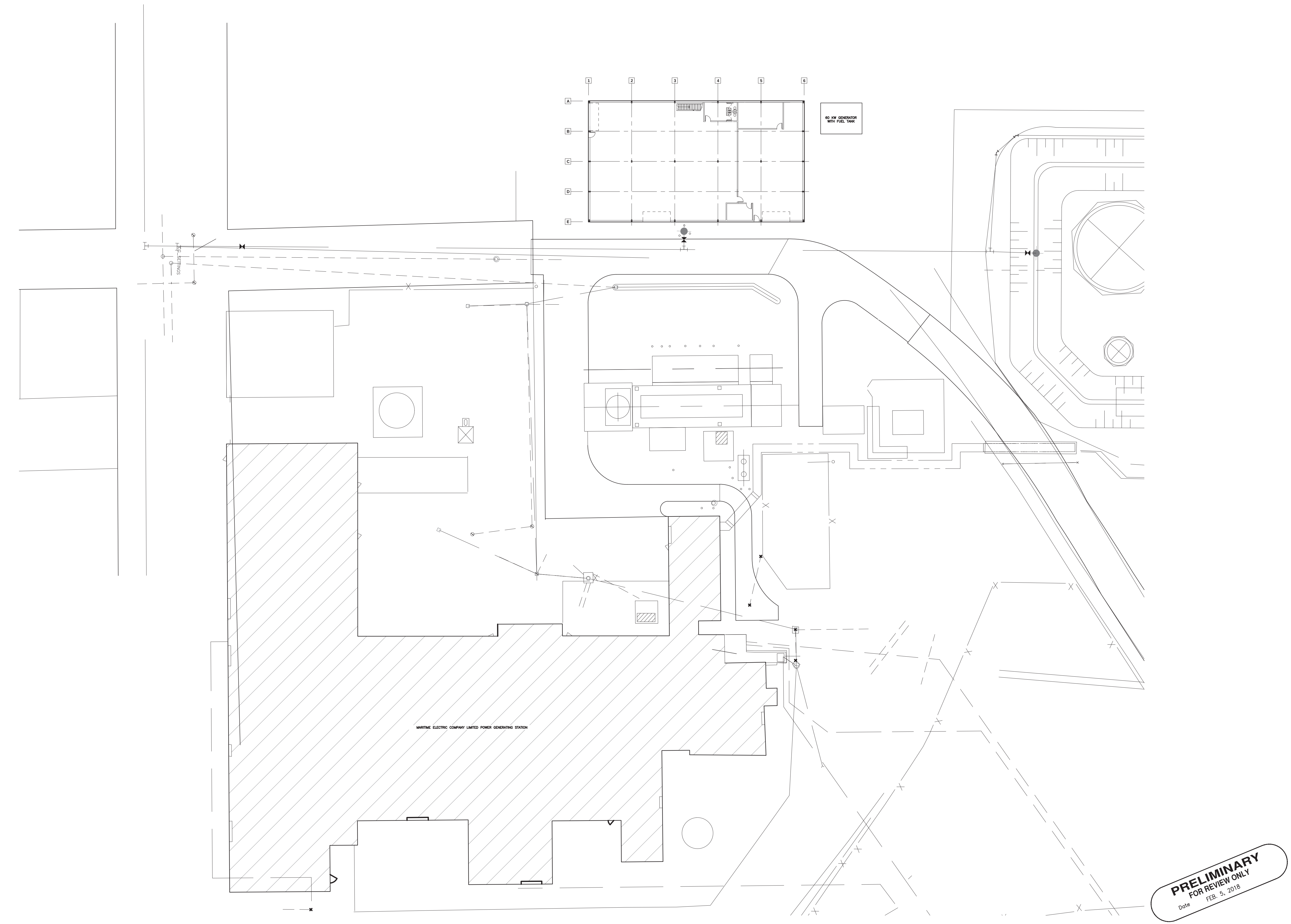
Project

MECL POWER PLANT DECOMMISSIONING

Sheet Title

MEZZANINE PLAN

Scale	Date
AS NOTED	FEB. 5, 2018
Drn By	Chk'd By
S.G.M.	J.D.M.
Project No.	Sheet No.
17-232	M2



1
M3
SITE PLAN
SCALE: 1:300

NOTES

NO.	REVISIONS	DD/MM/YY
0	ISSUED FOR CLASS 5 OPTIONS ANALYSIS	05/02/18

All measurements must be checked on site by the contractor prior to construction or fabrication.

This drawing is the property of MCA Consultants Inc. and shall not be used on other projects or extensions to this project except by agreement in writing from MCA Consultants Inc.

This drawing is not to be used for construction unless stamped and signed by the Engineer.

Stamp

Client

MECL POWER PLANT DECOMMISSIONING

MCA CONSULTANTS INC
ENGINEERS - PROJECT MANAGEMENT
902.566.9223
info@mcaconsultants.ca
www.mcaconsultants.ca

Project

MECL POWER PLANT DECOMMISSIONING

Sheet Title

SITE PLAN

Scale	Date
AS NOTED	FEB. 5, 2018
Drn By S.G.M.	Chk'd By J.D.M.
Project No. 17-232	Sheet No. M3

Attachment F

Strum Supplied Costing Information (Electrical)

MECL CHARLOTTETOWN
STEAM PLANT DECOMMISSIONING
OPTIONS COST ANALYSIS - ELECTRICAL

EQUIPMENT AND INSTALLATION COST

	CT3 BOP TO REMAIN IN EXISTING BUILDING					CT3 BOP TO MOVE TO NEW BUILDING					
CT3 BOP ELECTRICAL EQUIPMENT	TASK	UNIT	UNIT PRICE	QUANTITY	AMOUNT	TASK	UNIT	UNIT PRICE	QUANTITY	AMOUNT	DIFFERENCE
Siemens, 2000A, 3P, 3W, Switchgear	No change required	lot				Move Equipment, re-terminate existing conductors	lot	$6,000	1	$6,000	$6,000
2x900kVA Diesel Generators	Replace Generators with 1x1000kVA generator	lot	$400,000	1	$400,000	Replace Generators with 1x1000kVA generator	lot	$400,000	1	$400,000	$0
Generator Breaker, Synchronization Panel, and Generator Breakers	No change required	lot				Move Equipment, re-terminate existing conductors	lot	$6,000	1	$6,000	$6,000
600V, CT3, BOP MCC, 600V, 1200A, 3P, 3W	No change required	lot				Move Equipment, re-terminate new/existing conductors	lot	$12,000	1	$12,000	$12,000
45kVA, 3P, 600V/120-208V, Dry Type, General Dist. Transformer	No change required	lot				Disconnect and Move Equipment	lot	$2,000	1	$2,000	$2,000
Balance of Plant General Distribution Panel, 225A, 120/208V, 3P, 4W	No change required	lot				Install new general distribution panel	lot	$5,000	1	$5,000	$5,000
30kVA, 3P, 600V/347-600V, Dry Type, Lighting Dist. Transformer	No change required	lot				Disconnect and Move Equipment	lot	$2,000	1	$2,000	$2,000
347/600V, 3P, 4W, 225A, Lighting Distribution panel	No change required	lot				Install new lighting distribution panel	lot	$5,000	1	$5,000	$5,000
Fuel Oil Heater Control Panel	No change required	lot				Disconnect and Move Equipment	lot	$2,000	1	$2,000	$2,000
Balance of Plant Fuel Oil PLC Cabinet	No change required	lot				Disconnect and Move Equipment	lot	$2,000	1	$2,000	$2,000
BOP DC Supply (Charger and Batteries)	No change required	lot				Disconnect and Move Equipment	lot	$4,000	1	$4,000	$4,000
RO VEDA Drive #1, 50HP, 600V	No change required	lot				Disconnect and Move Equipment	lot	$3,000	1	$3,000	$3,000
RO VEDA Drive #1, 50HP, 600V	No change required	lot				Disconnect and Move Equipment	lot	$3,000	1	$3,000	$3,000
RO Rectifier #1, 400VDC, 27A	No change required	lot				Disconnect and Move Equipment	lot	$3,000	1	$3,000	$3,000
RO Rectifier #2, 400VDC, 27A	No change required	lot				Disconnect and Move Equipment	lot	$3,000	1	$3,000	$3,000
1500kVA, 13.8kV/347-600V, Outdoor Pad Mount Transformer	No change required	lot				Move Equipment, re-terminate existing conductors	lot	$25,000	1	$25,000	$25,000
Fire Protection System	No change required	lot				New fire control panel and associated detectors	lot	$23,000	1	$23,000	$23,000
Telecom	New Telecom System	lot	$13,000	1	$13,000	New Telecom System	lot	$13,000	1	$13,000	$0
Replace RO Power and Instrumentation cables	No new cables required	lot				Install and terminate new cables	lot	$19,000	1	$19,000	$19,000
Replace WWT Power and Instrumentation cables	No new cables required	lot				Install and terminate new cables	lot	$28,000	1	$28,000	$28,000
Replace Fuel System Instrumentation cables	No new cables required	lot				Install and terminate new cables	lot	$38,000	1	$38,000	$38,000
Replace BOP 347/600V Power Feeders (Panel LP-01)	No new cables required	lot				Install and terminate new cables	lot	$10,000	1	$10,000	$10,000
Replace BOP 120/208V Power Feeders (Panel DP-01)	No new cables required	lot				Install and terminate new cables	lot	$19,000	1	$19,000	$19,000
Replace BOP 125VDC Power Feeders	No new cables required	lot				Install and terminate new cables	lot	$10,000	1	$10,000	$10,000
Replace short cables associated with the BOP MCC	No new cables required	lot				Install and terminate new cables	lot	$8,000	1	$8,000	$8,000
Station Service for BOP Building Services	Building electrical service to be replaced and brought up to present electrical code. Building area is 14000 sq. ft.	lot	$150,000	1	$150,000	Install new building electrical services. Building area is 8750 sq. ft.	lot	$100,000	1	$100,000	-$50,000
Testing/Commissioning	Minimal testing/commissioning required	lot	$5,000	1	$5,000	Test/commissioning of relocated equipment	lot	$30,000	1	$30,000	$25,000
										DIFFERENCE	$213,000

CT3 BOP LIFE CYCLE COST ANALYSIS (35 Years)

	CT3 BOP TO REMAIN IN EXISTING BUILDING					CT3 BOP TO MOVE TO NEW BUILDING					
CT3 BOP ELECTRICAL EQUIPMENT	LIFE CYCLE INFORMATION	UNIT PRICE	EQUIPMENT AGE	LIFE CYCLE	LIFE CYCLE COST	LIFE CYCLE INFORMATION	UNIT PRICE	EQUIPMENT AGE	LIFE CYCLE	LIFE CYCLE COST	DIFFERENCE
Siemens, 2000A, 3P, 3W, Switchgear	25 Year Life Cycle, Present Value	$40,000	10	25	$40,000	25 Year Life Cycle, Present Value	$40,000	10	25	$40,000	$0
2x900kVA Diesel Generators	35 Year Life Cycle, Present Value	$400,000	0	35	$0	35 Year Life Cycle, Present Value	$400,000	0	35	$0	$0
Generator Breaker, Synchronization Panel, and Generator Breakers	25 Year Life Cycle, Present Value	$30,000	10	25	$30,000	25 Year Life Cycle, Present Value	$30,000	10	25	$30,000	$0
600V, CT3, BOP MCC, 600V, 1200A, 3P, 3W	25 Year Life Cycle, Present Value	$30,000	10	25	$30,000	25 Year Life Cycle, Present Value	$30,000	10	25	$30,000	$0
45kVA, 3P, 600V/120-208V, Dry Type, General Dist. Transformer	25 Year Life Cycle, Present Value	$7,500	10	25	$7,500	25 Year Life Cycle, Present Value	$7,500	10	25	$7,500	$0
Balance of Plant General Distribution Panel, 225A, 120/208V, 3P, 4W	25 Year Life Cycle, Present Value	$5,000	10	25	$5,000	25 Year Life Cycle, Present Value	$5,000	0	25	$5,000	$0
30kVA, 3P, 600V/347-600V, Dry Type, Lighting Dist. Transformer	25 Year Life Cycle, Present Value	$5,000	10	25	$5,000	25 Year Life Cycle, Present Value	$5,000	10	25	$5,000	$0
347/600V, 3P, 4W, 225A, Lighting Distribution panel	25 Year Life Cycle, Present Value	$5,000	10	25	$5,000	25 Year Life Cycle, Present Value	$5,000	0	25	$5,000	$0
Fuel Oil Heather Control Panel	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	$0
Balance of Plant Fuel Oil PLC Cabinet	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	$0
BOP DC Supply (Charger and Batteries)	25 Year Life Cycle, Present Value	$20,000	10	25	$20,000	25 Year Life Cycle, Present Value	$20,000	10	25	$20,000	$0
RO VFD Drive #1, 50HP, 600V	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	$0
RO VFD Drive #1, 50HP, 600V	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	$0
RO Rectifier #1, 400VDC, 27A	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	$0
RO Rectifier #2, 400VDC, 27A	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	25 Year Life Cycle, Present Value	$10,000	10	25	$10,000	$0
1500kVA, 13.8kV/347-600V, Outdoor Pad Mount Transformer	25 Year Life Cycle, Present Value	$100,000	10	25	$100,000	25 Year Life Cycle, Present Value	$100,000	10	25	$100,000	$0
Building Services	25 Year Life Cycle, Present Value	$150,000	0	25	$150,000	25 Year Life Cycle, Present Value	$100,000	0	25	$100,000	-$50,000
										DIFFERENCE	-$50,000

Relative Cost Electrical Services of New Building **$163,000**

**CT3 BOP Power Cables. It has been assumed that power cables associated with CT3 BOP Transformer, Switchgear and MCC will be re-used. If the existing cables are not long enough, new cables will be required, this is dependent on the location of CT3 BOP loads and condition of cables which will need to be tested after they are disconnected.*

Building Services Cost Calculations

Existing Building

	QTY	UNIT	LABOUR				COMMENTS	MATERIAL/EQPT/EXPENSES		TOTAL	
			UNIT MH	MH RATE	UNIT COST	AMOUNT		UNIT COST	AMOUNT	UNIT COST	AMOUNT
Remove existing electrical distribution equipment	1	lot	128	$90.00	$11,520.00	$11,520.00		$0.00	$0.00		$11,520.00
Install new Electrical Cables Associated with Branch Circuits	100	Circuits	4	$90.00	$360.00	$36,000.00		$75.00	$7,500.00		$43,500.00
Install new Electrical Cables Associated with Distribution Circuits	5	Circuits	8	$90.00	$720.00	$3,600.00		$250.00	$1,250.00		$4,850.00
Install Light Fixtures	50	Fixtures	1	$90.00	$90.00	$4,500.00		$75.00	$3,750.00		$8,250.00
Install Light Switch	15	Switches	0.5	$90.00	$45.00	$675.00		$5.00	$75.00		$750.00
Install Receptacles	75	Recpt.	1	$90.00	$90.00	$6,750.00		$5.00	$375.00		$7,125.00
Install Distribution Panel	3	Panel	20	$90.00	$1,800.00	$5,400.00		$3,000.00	$9,000.00		$14,400.00
Install Lighting Panel	2	Panel	8	$90.00	$720.00	$1,440.00		$3,000.00	$6,000.00		$7,440.00
Building Services Transformer	1	XFMR	8	$90.00	$720.00	$720.00		$40,000.00	$40,000.00		$40,720.00
Shop Transformer	1	XFMR	8	$90.00	$720.00	$720.00		$8,000.00	$8,000.00		$8,720.00

$147,275.00

New Building

	QTY	UNIT	LABOUR				COMMENTS	MATERIAL/EQPT/EXPENSES		TOTAL	
			UNIT MH	MH RATE	UNIT COST	AMOUNT		UNIT COST	AMOUNT	UNIT COST	AMOUNT
Install new Electrical Cables Associated with Branch Circuits	80	Circuits	4	$90.00	$360.00	$28,800.00		$75.00	$6,000.00		$34,800.00
Install new Electrical Cables Associated with Distribution Circuits	3	Circuits	8	$90.00	$720.00	$2,160.00		$250.00	$750.00		$2,910.00
Install Light Fixtures	40	Fixtures	1	$90.00	$90.00	$3,600.00		$75.00	$3,000.00		$6,600.00
Install Light Switch	10	Switches	0.5	$90.00	$45.00	$450.00		$5.00	$50.00		$500.00
Install Receptacles	50	Recpt.	1	$90.00	$90.00	$4,500.00		$5.00	$250.00		$4,750.00
Install Distribution Panel	2	Panel	20	$90.00	$1,800.00	$3,600.00		$3,000.00	$6,000.00		$9,600.00
Install Lighting Panel	1	Panel	8	$90.00	$720.00	$720.00		$3,000.00	$3,000.00		$3,720.00
Building Services Transformer	1	XFMR	8	$90.00	$720.00	$720.00		$25,000.00	$25,000.00		$25,720.00
Shop Transformer	1	XFMR	8	$90.00	$720.00	$720.00		$8,000.00	$8,000.00		$8,720.00

$97,320.00

Equipment Relocation/Replacement Cost Calculations

	Labour				Equipment				
CT3 BOP ELECTRICAL EQUIPMENT	Unit	Unit Rate	Quantity	Amount	Unit	Unit Rate	Quantity	Amount	Total
Siemens, 2000A, 3P, 3W, Switchgear	hours	$90	48	$4,320	lot	$1,000	1	$1,000	$5,320
2x900kVA Diesel Generators					lot	$400,000	1	$400,000	$400,000
Generator Breaker, Synchronization Panel, and Generator Breakers	hours	$90	48	$4,320	lot	$1,000	1	$1,000	$5,320
600V, CT3, BOP MCC, 600V, 1200A, 3P, 3W	hours	$90	112	$10,080	lot	$1,000	1	$1,000	$11,080
45kVA, 3P, 600V/120-208V, Dry Type, General Dist. Transformer	hours	$90	8	$720	lot	$1,000	1	$1,000	$1,720
Balance of Plant General Distribution Panel, 225A, 120/208V, 3P, 4W	hours	$90	16	$1,440	lot	$3,000	1	$3,000	$4,440
30kVA, 3P, 600V/347-600V, Dry Type, Lighting Dist. Transformer	hours	$90	8	$720	lot	$1,000	1	$1,000	$1,720
347/600V, 3P, 4W, 225A, Lighting Distribution panel	hours	$90	16	$1,440	lot	$3,000	1	$3,000	$4,440
Fuel Oil Heater Control Panel	hours	$90	8	$720	lot	$1,000	1	$1,000	$1,720
Balance of Plant Fuel Oil PLC Cabinet	hours	$90	8	$720	lot	$1,000	1	$1,000	$1,720
BOP DC Supply (Charger and Batteries)	hours	$90	32	$2,880	lot	$1,000	1	$1,000	$3,880
RO VEDA Drive #1, 50HP, 600V	hours	$90	16	$1,440	lot	$1,000	1	$1,000	$2,440
RO VEDA Drive #1, 50HP, 600V	hours	$90	16	$1,440	lot	$1,000	1	$1,000	$2,440
RO Rectifier #1, 400VDC, 27A	hours	$90	16	$1,440	lot	$1,000	1	$1,000	$2,440
RO Rectifier #2, 400VDC, 27A	hours	$90	16	$1,440	lot	$1,000	1	$1,000	$2,440
1500kVA, 13.8kV/347-600V, Outdoor Pad Mount Transformer	hours	$90	160	$14,400	lot	$10,000	1	$10,000	$24,400
Fire Protection System	hours	$90	80	$7,200	lot	$15,000	1	$15,000	$22,200
Telecom	hours	$90	80	$7,200	lot	$5,000	1	$5,000	$12,200
Replace RO Instrumentation cables	hours	$90	96	$8,640	lot	$10,000	1	$10,000	$18,640
Replace WWT Instrumentation cables	hours	$90	192	$17,280	lot	$10,000	1	$10,000	$27,280
Replace Fuel System Instrumentation cables	hours	$90	192	$17,280	lot	$20,000	1	$20,000	$37,280
Replace BOP 347/600V Power Feeders (Panel LP-01)	hours	$90	48	$4,320	lot	$5,000	1	$5,000	$9,320
Replace BOP 120/208V Power Feeders (Panel DP-01)	hours	$90	96	$8,640	lot	$10,000	1	$10,000	$18,640
Replace BOP 125VDC Power Feeders	hours	$90	48	$4,320	lot	$5,000	1	$5,000	$9,320
Replace short cables associated with the BOP MCC	hours	$90	32	$2,880	lot	$5,000	1	$5,000	$7,880

Attachment G
Fire Protection Requirements and Costing

Email from Adam MacKenzie (MECL) to Winston Bryan (City of Charlottetown) on November 16, 2017 [cc'd: Kent Nicholson (MECL), Mel Cheverie (City of Charlottetown) and Troy Small (GHD)], Subject: Fire Inspector Tour of CTGS - Notes

Summary of the Fire Inspection Tour of CTGS with Winston Bryan (Fire Inspector for the City of Charlottetown), Kent Nicholson and Adam MacKenzie:

- The ECC Building plans were reviewed and the areas intended to be kept and demolished were discussed.
- A Site tour of the Steam Plant Facility was conducted, visiting only the areas that are slated to remain within the building.
- The following areas of concern were mentioned by Winston, which will require further investigation:
  - Currently, approximately 25% of the building that is to remain is serviced by the sprinkler system (e.g., "RO-EDI Plant" and half of "CT3 Balance of Plant" areas) and 75% is not serviced by the sprinkler system. In Winston's opinion, the entire space to remain would be required to be serviced by the sprinkler system.
  - The building currently has an open concept, with very few fire separations. Winston suggested that the space would likely be required to be compartmentalized with separate zone (with appropriate fire ratings) for the following spaces)
    - Electrical Room
    - Generator Room
    - Locker Room
    - Office Space
  - Would likely require proper fire ratings on some of the existing separated zones, such as the RO Room, WWT Room, Welding Shop and Maintenance Shop.
  - Would need to address emergency exiting from all of the spaces within the building which may include stairs to the 2nd and 3rd level spaces.
  - Fire Water Supply Piping will need to be modified as it presently runs through the portion of the building to be demolished.
  - Fire Pump will likely still be required. It will need to be relocated or the renovations/demolition will need to allow to keep that portion of the building.
  - Need to review the ECC Building sprinkler system as it is presently fed off of the fire pump but this would likely be changed to have its own feed for fire water off of the Cumberland Street water main.
  - Winston indicated that MECL may want to get a consultant (similar to RJ Bartlett) to conduct a fire code review of the space to ensure it is suitable from a life safety code point of view

Email from Byron Webber (MECL) to Kent Nicholson (MECL) on November 26, 2017 [cc'd: Troy Small (GHD), Michael Gallahue (GHD) and Adam MacKenzie (MECL)], Subject: Class 5 Cost Estimates for Fire Protection Upgrades Likely for CT3 BOP Area in Retained Portion of Steam Plant Building

Byron Webber reviewed the drawings provided by Kent Nicholson, along with Winston Bryan's comments. Byron compared the information to NFPA 850, 2015 version and also to the methods and logic for similar NB Power facilities to meet, exceed or limit the Code recommendations. The comments were reviewed based on NBC requirements:

1) **Sprinkler the remaining 75% of the building** – NFPA 850 does not recommend the outright sprinklering of any areas that would remain within the existing building. Electrical rooms are to be protected only if there are large concentrations of combustible cables in the room (3 x 2 foot wide trays at the 40% fill CEC were used to allow as a point where they would consider protection) (Section 7.8.4 of 850). Detection is recommended. RO Rooms, WWT Rooms and Locker Rooms are not mentioned in the Code and do not require protection. Offices, Welding and Maintenance Shops should be protected if the combustible content warrants it and if a fire in these areas could endanger critical areas of the remaining building (Section 7.9.2 of 850). Based on Byron's memory of these areas on the site tour, the protection of these areas is not warranted. The diesels do not automatically have to be protected but Byron would recommend they be protected if they remain inside the building, as they currently are.

2) **2 hour separation** - Although not mentioned by Winston, the NFPA 850 recommends a 2 hour separation. NFPA 850 recommends that the Electrical Rooms, Generator Room, Office, Welding and Maintenance Shops be separated, provided this is required based on type, quantity, density and location of combustible material, the location and configuration of the plant equipment, the consequence of losing the plant equipment and existence of suppression or detection in the area. Byron's recommendation would be that the diesel generators definitely be separated, however, since they will be replaced the most cost effective solution may be to locate new skid mounted units exterior the building. Byron would separate the Electrical Room mostly to prevent smoke contamination of any electronics in the MCC's, etc. in the event of a fire elsewhere. Contamination of the electronics could require replacement of MCC tubs needlessly. Winston also did not mention the existing Control and Computer Rooms and Byron did not recall to what extent they have to remain. If they are critical to the operation of CT3 then they should have a 2 hour separation, mostly for smoke control.

3) **Upgrade exiting to meet the NBC including 2nd and 3rd levels** – Enclosed stairwells would be required by the NBC and this is a good improvement to incorporate. As far as travel distances, Byron would advise Winston that the NFPA 101 distances (Section 5.2.2 of 850) be used if needed to reduce or eliminate any horizontal exiting structures. In other words, only perimeter exit doors would be needed, as well as exit hallways connected to vertical stairwells. Travel distances to these stairwells could fall under NFPA 202 to possible limit the number of stairwells required to two.

4) **Rework the fire water supply in demolished area** – It appears that the only sprinkler system that would remain that was based on a fire pump being available would be the ECC Building so it cannot be fed off of Cumberland Street without another fire pump being installed. The existing protection over the RO and diesels appears to use City water pressure (approximately

60 psig). If new diesels are installed on the exterior of the building, Byron would not recommend sprinklers in any areas of the remaining building, therefore is may be cheapest to feed the ECC from Cumberland Street and add a booster pump. The piping in the demolished part of the plant can then be demolished with the building. If the diesels stay interior the building, Byron would not continue to use the existing pre-action sprinkler system. The piping is Sch 10 roll grooved carbon steel which will, in time, pinhole from water remaining in the bottom of the pipe. Since this has been identified as an issue in the past, Sch 40 cut groove is now used to eliminate the trough in each piece of pipe from the roll grooving process. The system also relies on smoke detection which is prone to false trips on something like a diesel which can smoke for many reasons other than a fire. The pre-action sprinkler and ceiling level detection are expensive to access and maintain annually. Byron would recommend that a flat ceiling be built over the diesels to reduce heating costs and then would install a ceiling level wet pipe sprinkler system to protect this area. This would provide the cheapest solution to install and maintain protection that is the most reliable. A new water feed would have to be constructed, most likely from the ECC to the retained BOP. Byron does not have RJB Drawing 6, which is referred to as Protection for the Old Control and Computer Rooms, however, it does not appear these areas were serviced by the sprinkler system and that would not be a typical choice for the type of protection these rooms would warrant. If this is the case then Byron's recommendation above would be still valid.

5) **Existing fire pump house** – Based on Byron's recommendation above, there would be no need to retain this pump house, and it could therefore be demolished.

Email from Byron Webber (MECL) to Troy Small (GHD) and Michael Gallahue (GHD) on November 29, 2017, Subject: Fire Rated Exits

Byron reviewed the fire rated exits that would be required if the BOP for CT3 is kept. The following items were provided to Michael to estimate:

1) Turbine Hall Stairwell 1, East Side, Walls 1548 ft^2, Roof 352 ft^2, Doors 3

2) Turbine Hall Stairwell 2, West Side, Walls 1132 ft^2, Roof 144 ft^2, Doors 3

3) WWT/Boiler 6 Stairwell, Walls 1196 ft^2, Rood 144 ft^2, Doors 4

4) Total, Walls 2328 ft^2, Roofs 640 ft2, Doors 10

Walls to be standard 2 hour rated, 8" block walls with rebar and filled cavities. Roof to be Q deck with 4' to 6" poured concrete. Doors to be single leaf 1-1/2 hour rated. Allow for extra cost to retrofit walls around existing steel, etc., and some possible extra support steel to tie the wall to existing structure. Concrete roof to use concrete pump to place concrete.

Email from Michael Gallahue (GHD) to Byron Webber (MECL) and Troy Small (GHD) on November 30, 2017, Subject: Fire Rated Exits

Michael's costing for the fire rated exits are as follows:

- Concrete block wall costs - $150,000 ($64/ ft^2 for 8" clock wall with reinforcing rod and all cavities grouted)
- Concrete roofs - $25,000 ($36/ft^2 for 4" slab on metal deck)

- Fire doors - $10,000 ($1,000/door installed)
- Allowance for steel tie-ins, alterations to black walls to fit into existing space and structural members, etc. - $10,000

It is noted that $50/lineal foot should be added for supply and installation of fire sealant at the tops of the block walls to create a fire seal between the top of the wall and the roof.

Email from Byron Webber (MECL) to Troy Small (GHD) and Michael Gallahue (GHD) on November 29, 2017, Subject: Electrical Panel Room, BOP Area

A 2 hour room is required to enclose the electrical wall panels on the south wall of the turbine floor. Wall area is 800 ft^2, roof is 444 ft^2 and two doors are required.

Email from Michael Gallahue (GHD) to Byron Webber (MECL) and Troy Small (GHD) on November 30, 2017, Subject: Electrical Panel Room, BOP Area

Michael's costing for the electrical panel room in the BOR area are as follows:

- Concrete block wall costs - $40,000 ($50/ ft^2 for 8" clock wall with reinforcing rod and all cavities grouted). It is noted that there is reduced costing for black walls given that it is a simpler construction than stairwells.
- Concrete roofs - $16,000 ($36/ ft^2 for 4" slab on metal deck)
- Fire doors - $2,000 ($1,000/door installed)
- Allowance for steel tie-ins, alterations to black walls to fit into existing space and structural members, etc. - $10,000

It is noted that $50/lineal foot should be added for supply and installation of fire sealant at the tops of the block walls to create a fire seal between the top of the wall and the roof.

Email from Byron Webber (MECL) to Troy Small (GHD) and Michael Gallahue (GHD) on November 30, 2017, Subject: Final Estimate, Block Walls

Based on the numbers received from Michael, the following block wall cost was generated. Fire sealant quantities are 208 feet for the stairwells and 160 feet for the Electrical Room

- Stairwells: $205,400
- Electrical Room: $66,000
- Total: $271,400