Keltic Petrochemicals Inc.
Proposed LNG and Petrochemical Plant
Facilities - Goldboro, Nova Scotia

Environmental Impact Assessment
Final Draft

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Petrochemicals and Liquefied Natural Gas Facility Environmental Assessment Goldboro, Nova Scotia

FINAL REPORT

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LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
ACCDC	Atlantic Canada Conservation Data Centre
ALERT	Atlantic Emergency Response Team
AMEC	AMEC Earth and Environmental
AMP	Administrative Monetary Penalty
APA	??
ASME	American Society of Mechanical Engineers
ASU	Air separation unit
BLEVA	Boiling Liquid Expanding Vapour Explosion
BOG	Boil-off Gas
BOP	Blowout Protector
BSI	British Standards Institute
BTX	Benzene, Toluene and Xylene
CCME	Canadian Council of Ministers of Environment
CCPA	Canadian Chemical Producers Association
CEAA	*Canadian Environmental Assessment Act*
CEF	Communication, Environmental and Fisheries Consultants
CEPA	*Canadian Environmental Protection Act*
CG	Cracked Gas
CIMAH	Control Industrial Major Accidents Hazards
CL	Carapace length
CLC	Community Liaison Committee
CMHC	Canadian Mortgage and Housing Corporation
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COMAH	Control of Major Accident Hazards
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPI	Coalescing Plate Interceptor
CSA	Canadian Standards Association
CSR	Comprehensive Study Report
CTA	Chain Transfer Agent
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
DGPS	Differential Global Positioning System
EA	Environmental Assessment
EC	Environment Canada
EHSS	Environment, Health, Safety and Security
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPC	Engineering Procurement and Construction

EPP	Environmental Protection Plan
FEED	Front End Engineering Design
FEL	Front End Loading
GCIFA	Guysborough County Inshore Fisherman's Association
GHG	Greenhouse Gas
GIS	Geographic Information Systems
HADD	Harmful Alteration, Disruption or Destruction
HAZOP	Hazard and Operability Analysis
HAZROP	Hazards Reliability and Operability Analysis
HDPE	High Density Polyethylene
HFE	Human Factors Engineering
HSE	Health, Safety, and Environmental
IAFU	Induced Air Flotation Unit
IMO	International Maritime Organization
ISA	Instrument Society of America
ISBL	Inside Battery Limited
ISPS Code	International Ship, Port, and Facility Security Code
Keltic	Keltic Petrochemicals Inc.
LDPE	Low Density Polyethylene
LLDPE	Linear Low Density Polyethylene
LNG	Liquefied Natural Gas
M&NP	Maritimes and Northeast Pipeline
MBCA	*Migratory Bird Convention Act*
mLLDPE	metallocene Linear Low Density Polyethylene
MOU	Memorandum of Understanding
MP	Medium Pressure
MSDS	Material Safety Data Sheet
MTSCP	Marine Transportation Security Clearance Program
NBCC	National Building Code of Canada
NFPA	National Fire Protection Association
NO_2	Nitrogen dioxide
NOx	Nitrous oxides
NPRI	National Pollutant Release Inventory
NSDAF	Nova Scotia Department of Agriculture, Fisheries and Aquaculture
NSEL	Nova Scotia Department of Environment and Labour
NSDNR	Nova Scotia Department of Natural Resources
NSDE	Nova Scotia Department of Energy
NSMNH	Nova Scotia Museum of Natural History
NSPI	Nova Scotia Power Inc.
NSPS	New Source Performance Standards
NSRBA	Nova Scotia Road Builders Association
NSTPW	Nova Scotia Department of Transportation and Public Works

NSUARB	Nova Scotia Utility and Review Board
NWPA	*Navigable Waters Protection Act*
OCIMF	Oil Companies International Marine Forum
ORV	Open Rack Vaporization
OSBL	Outside Battery Limited
OSHA	Occupational Safety and Health Administration
OWS-1	Oil/Water Separator No. 1
P&IDs	Piping and Instrumentation Designs
PAG	Potential Acid Generating
PCB	Polychlorinated Biphenyls
PHA	Process Hazard Analysis
PIRI	Partnership in RCBA Implementation
PLC	Programmable Logic Control
PM	Particulate Matter
PM_{10}	Particulate Matter < 10 micron
$PM_{2.5}$	Particulate Matter < 2.5 micron
PMC	Project Management Committee
PSM	Process Safety Management
QA/QC	Quality Assurance/Quality Control
QW	Quench Water
RA	Responsible Authority
RCBA	Risk-Based Corrective Action
RoW	Right-of-way
S&W	Stone & Webster
SARA	*Species At Risk Act*
SCV	Submerged Combustion Vaporization
SHARQ	Eastern Petrochemicals Company
SHP	Super High Pressure
SIGTTO	Society of International Gas Tanker and Terminal Operators
SIL	Safety Integrity Levels
SIS	Safety Instrumentation Systems
SO_2	Sulphur dioxide
SOEI	Sable Offshore Energy Inc.
SOEP	Sable Offshore Energy Project
TC	Transport Canada
TCH	Trans Canada Highway
TDG	Transportation of Dangerous Goods
TERMPOL	Technical Review Process of Marine Terminal Systems in Transshipment sites
the Council	Canadian Endangered Species Conservation Council
the Project	Keltic Petrochemical and LNG Facility Project
TSP	Total Suspended Particulates
TSS	Total Suspended Solids

UK	United Kingdom
US	United States
UTM	Universal Transverse Mercator
VEC	Valued Environmental Component
VHP	Very High Pressure
VOC	Volatile Organic compound
WHIMIS	Workplace Hazardous Materials Information System
Z/N	Ziegler-Natta

LIST OF UNITS

%	Percent
ºC	Degrees Celsius
ºF	Degrees Fahrenheit
µg/m^3	Micrograms per cubic metre
µm	Micrometer
µS	Microseimens
µS/cm	Microseimens per cubic metre
b	bar
bcm/a	Billion cubic metres per annum
BSCFD	Billion standard cubic feet per day
BTU	British Thermal Unit
BTU/ft^2	British Thermal Units per foot squared
BTU/hr	British Thermal Units per hour
C	Runoff coefficient
cm	Centimetre
cm/sec	Centimeters per second
dBA	Decibels
dbh	Diameter breast height
g/t	Grams per tonne
gal/hr	Gallons per hour
gal/yr	Gallons per year
ha	Hectare
hPa	Hectopascal
kg	Kilogram
kg/cm^2	Kilograms per square centimetre
kg/hr	Kilograms per hour
Kg/m^3	Kilograms per metres cubed
kg/s	Kilograms per second
km	Kilometre
km/h	Kilometres per hour
km^2	Square kilometre
kPa	Kilopascal
kTA	Kilotonnes per annum
kV	Kilovolts
kW	Kilowatt
kW/m^2	Kilowatt per square metre
L	Litre
L/min	Litres per minute
lb/hr	Pounds per hour
lb/mmBTU	Pounds per million British Thermal Units
LEL	Lower Explosive Limit
Leq	Equivalent sound level
m	Metre

m/s	Metres per second
m^2	Square metres
m^3	Cubic metres
m^3/day	Cubic metres per day
m^3/hr	Cubic metres per hour
Ma	Million years ago
mg/kg	Milligrams per kilogram
mg/L	Milligram per litre
mg/m^3	Milligrams per cubic metre
ml	Millilitre
mm	Millimetre
mm/d	Millimetres per day
mmcf/hr	Million cubic feet per hour
mmcf/yr	Million cubic feet per year
mmcfd	Million cubic feet per day
mmt	Million metric tonnes
mol%	Mol percent
MW	Megawatt
MWe	Megawatts of electricity
N mi	Nautical miles
NM^3/hr	Normal cubic metres per hour
oz	ounce
ppb	Parts per billion
ppm	Parts per million
ppt	Parts per thousand
psi	Pounds per square inch
psig	Pound per square inch gauge
t	Metric tonne
t/hr	Metric tonnes per hour
t/year	Metric tonnes per year
tcf	Trillion cubic feet
W/m^2	Watts per square metre

EXECUTIVE SUMMARY

Overview

This document presents the Environmental Assessment (EA) of the Keltic Petrochemical and LNG Facility Project (the Project). The Project is subject to a Class II Environmental Assessment under the Environmental Assessment Regulations made pursuant to the *Environment Act*, S.N.S. 1994-95, c.1. The scope for the assessment will include the entire Project and all its components as described below. The federal scope also extends to areas within 25 km of Country Island (due to federal concerns for migratory birds/species at risk). There are a number of federal and provincial laws and municipal by-laws which are applicable to the Project and which are considered in the EA. Finally, there are a number of guidelines, codes, or industry standards relevant to the Project, which are also considered as part of this EA.

Keltic Petrochemical Inc. (Keltic) proposes to construct and operate a Petrochemical and Liquefied Natural Gas (LNG) Facility in Goldboro, Nova Scotia (the Project). The Project components include a liquefied natural gas regasification facility, a petrochemical complex, a marginal wharf, a marine LNG terminal, LNG storage and an electric co-generation facility. The Project will be located adjacent to the existing Sable Island natural gas plant and the Maritimes and Northeast Pipeline (M&NP) in the Goldboro Industrial Park. The processing facilities in Goldboro will require approximately 300 hectares (ha) of land zoned for industrial use.

The marine terminal will allow the delivery of LNG and export of product. The co-generation plant will be fuelled by spent LNG with any remaining spent LNG injected into the existing M&NP pipeline in Goldboro. A freshwater supply system is required for the Project. This includes the construction of a reservoir at Meadow Lake, a wastewater collection and treatment system as well as other site infrastructure and maintenance facilities.

The petrochemical complex will convert liquids extracted from the Sable Offshore Energy Project (SOEP) at Goldboro combined with the liquids extracted from imported LNG to produce ethylene and propylene in order to manufacture polyethylene and polypropylene pellets. These pellets will be used to manufacture plastic products elsewhere in Canada and the United States of America (USA).

The purpose of the Project is to increase petrochemical production in North America. This will help to meet rising demand for polyethylene and polypropylene pellets and provide additional sources of natural gas to the Canadian and Northeastern USA markets in an effort to meet the growing demands for natural gas. The Project will require an investment of approximately $5 billion which will be raised through private-sector investors.

The Proponent, Keltic is a Canadian registered corporation, committed to establishing a petrochemical complex, LNG importing facilities, and a co-generation plant at Goldboro, Guysborough County, Nova Scotia. The head office of Keltic is located in Halifax, Nova Scotia.

Keltic is the corporate leader in this undertaking which will include a variety of national and international investors; major international firms involved with the supply and delivery of LNG; and major international firms who hold licensed processes for the manufacturing of the various

plastic resins. In March 2006, Keltic entered into an agreement with Maple LNG where Maple will acquire 100% of the LNG portion of the Keltic Petrochemicals combined Petrochemical/LNG Project. Keltic has also entered into an agreement with Shaw Stone & Webster for them to act as the Integrating Contractor from the pre- FEED through to the operation phase of the Project.

It is Keltic's corporate commitment to provide an economical and sustainable complex in accordance to the highest level of environmental goals and principles. As the agreements between Keltic and the financial, licensors and petroleum firms are finalized a detailed environmental management system (EMS) will be developed for each component of the Project.

This project is expected to create several thousand direct jobs at the peak of project construction, and several hundred direct jobs at the various facilities during operation. Keltic expects that many other economic spin-off opportunities will be created in the area as a result of a world-scale LNG and petrochemical facility being built in Goldboro, Guysborough County. These direct jobs and economic spin-off opportunities will be created in a region of Nova Scotia that has an unemployment rate well above the provincial and national average. Furthermore, the population of Guysborough County has been in steady decline as a result of the employment situation; this trend is expected to be reversed with the establishment of this industry. This project will improve the overall employment rate from both a local and provincial perspective.

The Keltic Project is in keeping with the Provincial Energy Strategy which supports the convergence of supply at a single location to build the critical mass to enable the development of a world class petrochemical industry (Province of Nova Scotia, "Nova Scotia's Energy Strategy").

EA Objective

The focus of this EA Report is to identify potential Project-related environmental and socio-economic effects. Mitigation has been proposed to address potentially significant adverse environmental effects. Monitoring and follow-up measures have also been proposed, as required, to verify environmental effects predictions and the effectiveness of mitigation measures.

The primary objectives of the EA are to:

- Assist Keltic with environmental management planning for the Project.
- Using the requirements of the Nova Scotia Environmental Assessment Regulations, the Project Terms of Reference and Scoping Document, provide Government Agencies, stakeholders and the public with a complete and accurate assessment of the effects of the Project on the environment and human health, in a such a way to enable reviewers to draw conclusions regarding the initiative as they see fit.
- Obtain regulatory approval.

Public Consultation

Keltic is a major project, which will have substantial effects on many communities. Consultations were therefore extensive and inclusive. To date, several consultations have occurred. These consultations were designed to provide information about the proposed project, respond to questions and concerns the public might have, and gather technical information and input into impacts, mitigation, and monitoring that could be incorporated into the EA.

As part of the public consultation process, Keltic Petrochemicals established a Community Liaison Committee (CLC) in August of 2004. The committee was set up voluntarily by Keltic to involve and inform local communities in the project and will be the primary vehicle used for future consultations. The CLC has a two-fold mandate:

- to provide a forum for the representatives of the residents of Goldboro and surrounding communities to offer their input on the Keltic Project; and
- to provide a forum for representatives from Keltic. to update the community, through the committee, on the various aspects of the Project.

The CLC meets regularly with Keltic and will continue to be used as a sounding board for any issues (such as safety, environmental concerns, employment, etc.) that arise. In addition to the liaison committee, Keltic will continue to liaise with the Guysborough County Regional Development Authority and the Guysborough Journal as a means of communicating any information. Keltic will also liaise actively with local emergency service providers, such as the RCMP, fire and emergency health response.

EA Methodology

The EA Report is written to reflect a project description that describes the full development of all proposed facilities required for the importation of LNG by ocean-going tankers, storage, and re-vaporization of the LNG and the construction and operation of a petrochemical complex to produce ethylene and propylene based on the use of the imported LNG as the primary feedstock, as well as all associated infrastructure requirements. Consideration has been given to all phases of the Project, including activities associated with construction, operation, maintenance, decommissioning/reclamation and unplanned events.

The methodology for the preparation of the EA Report was focused to provide:

- identification of the environmental and socio-economic components of greatest concern;
- consideration of the issues raised by stakeholders;
- incorporation of environmental management planning into the engineering design process;
- inclusion of cumulative effects in the overall EA process; and
- consideration of all regulatory requirements.

In order to attain the above the EA approach entailed:

- identification of temporal and spatial boundaries;
- selection and organization of Valued Environmental Component (VECs);
- evaluation of VEC interactions with the Project;
- the methods for prediction and evaluation of environmental effects; and
- the rationale for development of mitigation measures.

As defined in the Terms of Reference (Nova Scotia Department of Environment and Labour (NSEL), 2005), VECs "are interpreted as environmental; socio-economic; human health; reasonable enjoyment of life and property; and cultural, historical, archaeological, paleontological, and architectural features that may be impacted, whether positive or negative, by the proposed Project."

For the Project, the VEC selection process involved the following steps and considerations:

- review of requirements of the Terms of Reference and scoping document;
- review of the baseline studies;
- review of Project works and activities;
- identification of public, stakeholder, and government concerns;
- consideration of potential Project-environment interactions; and
- identification of public, stakeholder, and government concerns.

The following is a summary of the VECs selected for the Project:

- Land Use;
- Aboriginal Use of Land and Resources;
- Population, Economic Conditions, Employment, Tourism;
- Residential Property;
- Recreational Opportunities and Aesthetics;
- Forestry;
- Fisheries, Aquaculture, and Harvesting;
- Ground Transportation;
- Human Health and Safety;
- Archaeological Resources;
- Air Quality and Climate;
- Noise;
- Surface Water (Quantity and Quality);
- Groundwater;

- Geology, Soil Quality;
- Freshwater Aquatic Species and Habitat;
- Wetlands;
- Marine Species and Habitat; and
- Flora, Fauna, and Terrestrial Habitat.

Potential effects were identified when a pathway or interaction between the Project and a VEC was established. Individual studies were then undertaken to focus on these potential effects. Based on collective knowledge and experience of the EA team and the individual studies and consultations, the following were determined for each predicted effect on a VEC:

- Nature (positive or negative);
- Magnitude;
- geographic extent;
- timing, duration and frequency;
- reversibility;
- ecological and socio/cultural context; and
- probability of occurrence (likelihood).

Positive environmental effects are also identified and explained.

Where an adverse environmental effect has been identified, mitigation has been proposed. Many adverse effects can be avoided through sound engineering design, and timing of project activities and implementation to the proposed environmental management plans.

The general approach taken is to reduce or eliminate the potential negative project-VEC interactions, if feasible. Where not possible, mitigation measures were incorporated into the design and planned implementation of the Project activities in order to eliminate or reduce potential adverse effects. In some instances, remediation and/or compensation may be required where an adverse effect would jeopardize the implementation of the Project.

The above approach results in the identification of Residual Effects – those environmental effects predicted to remain after the application of mitigation outlined in this EA. The EA considers the predicted residual effects for each Project phase (construction, operation, decommissioning, and post-decommissioning). In addition, residual environmental effects are also described for potential accidental events.

For adverse residual effects, the evaluation for the individual criteria was combined into an overall rating of significance:

- Major;
- Medium;
- Minor; and
- Minimal.

An adverse impact was considered "significant" where its residual effects were classified as major; while they were considered "not significant" where residual effects were classified as medium, minor, or minimal.

EA Conclusion

The EA concludes that under normal planned operations none of the predicted Residual Effects are Significant. The results of the assessment have been developed and presented in Table ES-1. The Table describes the predicted effect and the identified mitigation or avoidance measure which could reduce or eliminate the predicted effect.

The EA illustrates that relatively few of the predicted Residual Effects are Significant, with the following exceptions:

- Socio-economic effects – several significant benefits are expected in the local and regional economy
- Effects on terrestrial habitat – because of the Project footprint, a small loss of habitat for terrestrial birds and animals is unavoidable. Impacts are not expected to influence long term populations locally or regionally.
- Effects on fish habitat (Meadow Lake impoundment) – significant changes will occur in aquatic habitat due to creation of the Meadow Lake reservoir including both positive and negative effects. Impacts are not expected to affect fish populations locally or regionally.
- Effects on archaeological resources (Red Head Cemetery) – any disturbance of a cemetery will have significant impacts on the sensitivities of local inhabitants. Public consultation and monitoring during construction will ensure that no unacceptable impacts occur.
- Effects on transportation – significant additional demands on local and regional roadways will result from Project development. Major upgrades in road infrastructure and careful scheduling of Project related traffic will reduce impacts to an acceptable level.

Through careful design and planning, combined with prudent application of proven mitigation measures, Keltic has identified and addressed all potential adverse environmental effects, and reduced the predicted impacts to a low level of significance.

Environmental management practice involving prevention and preparedness training is proposed to reduce the likelihood of unplanned (accidental) events. As well, effective emergency response programs will be developed should an event occur. The Emergency Preparedness planning will include the purchase of required equipment, the careful maintenance of equipment and infrastructure, and the frequent scheduling of training exercises and emergency response simulations. Emergency Preparedness Planning will be integrated into all phases of Project design, planning, and execution. The objective is to achieve a safety and emergency preparedness level higher than the industry average, and continuously to improve upon this standard.

TABLE ES-1 Summary: Effects, Mitigation, and Significance of Residual Effects

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Land Use					
Land Use - lands taken up by the Project and its components will remove the potential for mineral extraction from those areas.	None	X	X	A	Minimal
Aboriginal Use of Land and Resources					
Potential for impacts on Mi'kmaq Land Use (Hunting, Fishing)	• None • Mi'kmaq sea urchin harvesting may be limited in the area of the LNG terminal and marginal wharf, but there are adjacent sea urchin areas that will allow continued harvesting. Sea urchin populations are currently severely depressed by disease.	X	X	A	Minimal
Potential for impacts on Mi'kmaq Land Resources (Fish, Wildlife, Vegetation)	• See mitigation for biophysical VECs	X	X	A	Minimal
Socio-economic Environment					
Potential effects on population size	• Operate construction camp • Major components to be manufactured off-site and transported to the site for installation	X		B (A)	Medium
Potential effects on Economic Structure (increased employment opportunities and tax revenues; spin-off effects)	• Purchasing and tendering policies to support local businesses	X		B	Major
Potential effects on Labour Force (increased demand, employment and training opportunities)	• Advise unions of the occupations and skill levels required • unions will implement, or facilitate the implementation, of training programs	X		B	Medium
Potential effects on Income (increased average income)	• Purchasing and tendering policies to support local businesses	X		B	Minor
Potential effects on Socio-Economic Planning (supportive of municipal strategic objectives)	• None required	X		B	Medium

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Potential effects on Tourism (loss of natural landscape character may reduce outdoor oriented tourism in site vicinity)	• Use of dust suppressants if required • Regular road cleaning at /near the construction access when required • Establish information point/centre to inform on construction and future operation	X		A	Minor
Potential effects on population	• None required		X	B	Minor/Medium
Potential effects on Economic Structure (increased employment opportunities and tax revenues; spin-off effects)	• Purchasing and tendering policies examined to determine how to be organized to facilitate bidding by local businesses • Where practical, tender packages broken into sizes that can be bid on by local firms		X	B	Medium
Potential effects on Labour Force (increased demand, employment and training opportunities)	• Advise unions and local development agencies of the number, type of occupations and skill levels required • Work with unions and local development agencies to advertise employment opportunities and organise training programs		X	B	Medium
Potential effects on Income (increased average income)	• Purchasing and tendering policies to support local businesses		X	B	Medium/Major
Potential effects on Socio-Economic Planning (supportive of municipal strategic objectives)	• None required		X	B	Medium/Major
Potential effects on Tourism (loss of natural landscape character may reduce outdoor oriented tourism in site vicinity; improved income and tax base likely to benefit tourism infrastructure in region)	• Establish interpretative centre at site		X	A (local) B (region)	Minor (adverse effects) and Minor to Medium (beneficial effects)
Residential Property Values					
The presence of approximately 3.000 workers and the expectation of long-term economic development at and near the site can be expected to increase demand for residential property and therefore potentially increase in property prices, in particular rental rates	• Operate construction camp • Major components to be manufactured off-site and transported to the site for installation	X		A	Minor

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Increase in the local population is expected to result in a greater demand for residential property in the area, which is likely to increase prices for residential property	• None		X	B	Medium
Recreational Opportunities and Aesthetics					
Effects on the local visual landscape character	• See Operation Phase • construction-specific mitigation • Ensure good housekeeping • Cleaning of road at and near site entrance when required • During initial site clearing, maintain and protect tree and shrub buffer along site perimeter as visual screen • Design “jogged” road access to prevent unobstructed views from public road into construction site	X		A	Minor
Effects on receptors and receptor locations (recreational opportunities)	• Tree and shrub plantings at receptor locations to screen views • Along Marine Drive, provision of interpretive opportunities with information on the facility and its operation	X	X	A	Minor
Effects on the local visual landscape character	• Tree and shrub planting along site perimeter as visual screen • Use of colour schemes for stacks and higher buildings that support blending in with background • Minimal night lighting • Location of flare stacks at back of site		X	A	Minor
Air Quality					
Emissions of gaseous pollutants from diesel powered construction equipment and marine vessels delivering equipment as well as from workers private vehicles.	• Maintaining vehicles and equipment in good working condition • Minimizing distance between transfer points. • Maintaining speed restrictions on roads • Promote car pooling	X		A	Minimal

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Fugitive dust emissions from excavating and moving earth, construction equipment, and the concrete batch plant	• Cleaning the area around stored materials • Covering stored materials, if necessary • Vacuum sweeping or flushing roads • Applying dust suppressant • Reducing working faces of material piles	X		A	Minimal
Emissions from LNG tankers, gas vent stacks, SCVs, and LNG extraction plant	• Monitoring and maintenance of emission control system • Monitoring of volatile organic compounds (VOCs) prior to and during operation • Maximize efficiency of operations		X	A	Minor
Emissions from the cogeneration facility simple cycle combustion turbine for power supply	• Monitoring and maintenance of emission control system • Maximize efficiency of cogeneration plant		X	A	Minor
Emissions from the Petrochemical facility (vents of plants for production of linear low density polyethylene (LLDPE), low density polyethylene (LDPE), and high density polyethylene (HDPE))	• Monitoring and maintenance of emission control system • Monitoring of VOCs prior to and during operation • Maximize efficiency of operations		X	A	Minor
Project contribution to greenhouse gas emissions (CO_2)	• Integration of individual development component into a highly energy efficient production complex • Power generation via gas fuelled co-generation plant		X	A	Minor
Noise Impacts					
Noise emissions from site preparation (moving earth, blasting) and from construction of industrial components	• Ensure machinery has working noise muffling equipment • Conduct routine noise monitoring • Restrict intensive activity to hours between 700 and 1900 • Supply public with contact numbers in case of noise issues • Give public prior notice of blasting • Maintain treed buffer between worksite and public	X		A	Minimal

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Noise emissions from pile driving	• Alternative techniques will be used for pile driving such as vibratory pile-driving • Recreational and commercial fishery representatives will be contacted to develop seasonal and daily schedules to minimize disruption of fisheries.	X		A	Minimal
Noise emissions from plant operation	• A fully developed noise monitoring program will be implemented to ensure noise levels at nearest occupied properties do not exceed CMHC levels		X	A	Minimal
Surface Water					
Effects on On-site Watercourses (erosion, sediment loading, storm-water discharges, spills)	• Erosion and sediment control plan • Buffer zone • Storm-water management plan • Spill prevention and response plan • Designated fuelling and material storage site	X		A	Minimal
Effects on off-site Watercourses through site (erosion, sediment loading, storm-water discharges, spills)	• See above	X		A	Minimal
Effects on Meadow Lake and Isaac's Harbour River through in-water works and dam and onshore works for dam and intake structure	• See above, plus • Construction of cofferdam • In-water works outside of spawning / fish migration season • Use of silt curtains • Rehabilitation of shoreline upon completion	X		A	Minimal
Effects on- and off-site surface water quality as a result of discharges of Storm-water, Process water, Sanitary waste water	• Implementation of storm-water management plan • On-site waste water treatment plant to collect and treat all waste water streams • Controlled discharge point(s) • Monitoring of discharge quality		X	A	Minor
Effects on Meadow Lake and Isaac's Harbour hydrology (water levels, fluctuations, flow) as a result of water withdrawal and impoundment of Meadow Lake	• Maintain minimal flow conditions in Isaac's Harbour River		X	A	Minor

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Inter-watershed water transfer (resulting potentially in changes in hydrology and water quality)	• Discharge of collected storm-water within respective watershed • Water withdrawn from Meadow Lake to be discharged to Isaac's Harbour / ocean (= ultimate receiver under baseline conditions)		X	A	Minimal
Groundwater					
Siltation of dug and drilled wells and possible permanent decrease in well yield of drilled wells from blasting and vibrations	• Avoid blasting to the extent possible within 500m of residential wells • Pre-blast well survey • Remedial action as necessary to restore damaged wells and/or provide temporary potable water as needed	X		A	Minimal
Water level reductions in dug wells as a result of trenching, site drainage, and large cuts or changes in surface topography	• Monitoring and remedial action as necessary to restore damaged wells and/or provide temporary potable water as needed	X		A	Minimal
Water quality degradation from accidental release of fuel chemicals (equipment failure, handling accident)	• Proper fuel management • Application of Environmental Protection Plan (EPP) • Monitoring and local remedial action as necessary	X		A	Minimal
Reduction of flow in streams and reduced discharge into wetlands during Meadow Lake dam construction	• Assess specific site hydro-geologic characteristics • Dam construction method to provide for continuous minimal flow in Isaac's Harbour	X		A	Minimal
Contamination of wells and/or onsite streams from acidic drainage in areas of known sulphide mineralization on site	• Avoidance of mine tailings within the Project site	X		A	Minimal
Degradation of groundwater and well water due to accidental spills	• Proper management of fuel, product and material storage and handling		X	A	Minimal
Contamination of wells from acidic drainage in areas of known sulphide	• N/A; interaction unlikely as site construction surfaces will be stabilized and rehabilitated		X	A	N/A
Reduction of flow in Isaac's Harbour River and reduced discharge into wetlands as a result of Meadow Lake dam operation	• Assess specific site hydro-geologic characteristics • Dam operation to provide for continuous flow in Isaac's Harbour River • Operation to provide for alternative water supply source during extended dry weather		X	A	Minimal

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Flora, Fauna, and Terrestrial Habitat					
Habitat removal	• Minimize construction envelope • Rehabilitate all temporarily used sites	X		A	Medium
Displacement / Loss of wildlife	• Clearing of site outside of breeding season of migratory birds • Rehabilitate all temporarily used sites	X		A	Medium
Dust impacts on vegetation	• Minimize dust	X		A	Minimal
Noise effects on wildlife (including blasting)	• Minimize noise during sensitive breeding period	X		A	Minimal
Effects of dam at Meadow Lake on bird nesting sites	• Clearing outside of bird nesting period	X		A	Minor
Effects of clearing around and flooding of Meadow Lake on habitat/vegetation	• Minimize area cleared around new shoreline • Use “good housekeeping” procedures regarding disposal of slash, litter, etc.	X		A	Minor
Effects of air emissions on vegetation (deposition)	• Emission controls		X	A	Minimal
Effects of water quality impairment effects on amphibians	• Treatment of water to government standards prior to discharge • Monitor of discharge quality		X	A	Minimal
Lighting effects on migratory birds	• Use lightning that is known to not attract birds • Minimize overhead wires and other obstacles that may cause collisions		X	A	Minor
Disruption of migration corridors of mammals	• Mitigate temporary safe migration route if necessary		X	A	Minor
Meadow Lake (effects of dam on bird nesting sites)	• Mitigate alternate nesting area if necessary		X	A	Minor
Meadow Lake (effects of dam on invertebrate and amphibian populations)	• None		X	B	Minimal
Forestry					
Site clearing at the Project site will have minimal effects on forestry, since the site is considered to have no merchantable timber.	• None	X	X	N/A	None

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Wetlands					
Spills of fuels, lubricants, and hydraulic fluids	• Implementation of EMP with spill prevention and cleanup procedures	X		A	Minor
Erosion, sedimentation, and damage caused by heavy machinery	• Implementation of EMP with erosion and sediment control plan	X		A	Minor
Filling, excavation, and other disturbance of wetlands that may alter hydrological integrity of the site	• Application of a “no net loss” policy	X		A	Minor
Effects on the wetlands of spills, excavation, sedimentation, and erosion from the proposed hydro corridor and LNG pipeline.	• Application of a “no net loss” policy	X		A	Minor
Reduction of wetland water quality resulting from discharges/runoff from project	• Implementation of on-site storm-water management plan; • Controlled discharges to the environment and effluent monitoring • Implementation of EMP with spill prevention and cleanup procedures; •		X	A	Minor
Meadow Lake Impoundment (effect of water level fluctuation on nearby wetlands)	• Application of a “no net loss” policy		X	A	Minor
Fisheries, Aquaculture, and Harvesting					
Disruption of marine fishing activities from equipment transported to site and actual construction of wharf and terminal	• N/A; the marginal wharf is not a major fishing area.	X		A	Minimal
Decrease of marine fishery-related earnings as a result of loss of fish habitat from construction of wharf and terminal	• Implementation of habitat compensation in accordance with Fisheries and Oceans Canada (DFO) requirements	X		A	Minimal
Disturbance of freshwater fisheries (recreational fishing) as a result of disturbance and habitat alteration on-site, at Meadow Lake, and in Isaac’s Harbour Creek	• Implementation of habitat compensation in accordance with DFO requirements	X		A	Minimal

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Disturbance of fishing activities from LNG and cargo vessels in the bay	• Fishermen will be notified of ship arrival so they can shift gill nets in the central part of the bay		X	A	Minor
Impacts on navigation from the narrower entrance to Isaac's Harbour created by the marginal wharf	• N/A; the harbour narrows to a similar width 500m further into the harbour		X	A	Minimal
Marine fish may be attracted by facility lights at night and may perceive noises at a distance from the operation	• Monitoring programs to be followed		X	A	Minimal
Disturbance of freshwater fisheries (recreational fishing) as a result of the Meadow Lake Impoundment (water level fluctuations); low flow conditions in Isaac's Harbour River	• Operation of fish ladder at Meadow Lake dam • Operation of dam to provide for minimal flow in Isaac's Harbour River		X	A	Minimal
Freshwater Species and Habitat					
Potential for harmful alteration, disruption or destruction (HADD) through site development and grading	• Application of a "no net loss" policy; • Erosion and sediment control plan • Maintain 15m buffer zone • Storm-water management plan • Spill prevention and response plan • Designated fueling and material storage site	X		A	Minor
Potential for HADD due to in-water works and dam construction at Meadow Lake	• Application of a "no net loss" policy; • Erosion and sediment control plan • Site and shoreline rehabilitation • See mitigation for Water Quality	X		A	Minor
Potential for fish habitat impairment due to waste water discharges	See mitigation for Surface Water Quality	X		A	Minor
Potential for fish habitat impairment due to dam operation; potential beneficial effects through lake expansion	Dam construction with fish passage		X	B	Medium
Marine Species and Habitat					
Destruction of fish habitat as a result of construction of wharf and marine terminal	• N/A; loss of lobster habitat is only 1.6% of Stormont Bay	X		A	Minimal

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Disturbance of seabird (Roseate tern) nesting habitat on Country Island from vessel movement and noise (blasting)	• N/A; Establishment and adherence to exclusion zone	X		A	Minor
Disturbance of marine mammals from Project-related marine traffic	• N/A; Stormont Bay is not an important marine location	X		A	Minimal
Disturbance of fish habitat from LNG and cargo vessels berthing at wharf and terminal; material handling, unloading	• Environmental management plan • Spill response plan • Effluent discharges to marine Environment to comply with regulatory standards • Effluent quality monitoring		X	A	Minimal
Marine habitat impairment as a result of re-suspension of contaminated sediments from propeller water	• N/A; large vessels to be berthed with support of tugs • No sediment contamination identified		X	A	Minimal
Marine habitat impairment as a result of wastewater discharges to Isaac's Harbour	• Discharges to be in accordance with regulatory standards		X	A	Minimal
Seabirds disturbed by large ships passing close to Country Island (Roseate terns)	• Prescribed navigational route not to pass within the exclusion zone established for Country Island		X	A	Minimal
Seabirds (Petrels) that nest on Country Island could be attracted to flares at night	• N/A		X	A	Minimal
Disturbance of marine mammals through noise from project-related marine traffic	• N/A; Stormont Bay is not an important marine mammal location		X	A	Minimal
Agriculture					
There are no agricultural uses within the proposed construction envelope or the zone of influence of the Project.	• None	X	X	N/A	None
Geological Impacts					
Structural/safety risks associated with former mine workings	• Detailed surveys and mapping of project site • Filling and stabilization as appropriate	X		A	Minimal
Risks of former mine workings regarding groundwater regime	• Detailed surveys and mapping of project site • Grouting where appropriate • Storage of hazardous material will avoid old mine working sites which can act as preferential pathways should spills occur	X		A	Minimal
Disturbance of tailings disposal sites	• Avoidance where possible • Encapsulation if avoidance is not feasible	X		A	Minimal

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Acid drainage	• Avoid excavation of relevant bedrock • Avoid changes to drainage and groundwater regime • Testing for acid drainage potential	X		A	Minimal
Archaeological Resources					
Disturbance of land at the former Red Head Cemetery by marginal wharf and marine facility	• Public consultation with Lincolnville Black community. Monitored backhoe excavation	X		A	Medium
Erosion of sites at Sculpin Cove (1-5) by marginal wharf	• None currently • Investigation if they are subject to erosion	X		A	Minor
Erosion of sites on Hurricane Island by marginal wharf	• None currently • Investigation if they are subject to erosion	X		A	Minor
Impact on McMillan Mine by LNG storage and access road	• Monitoring during disturbance	X		A	Minor
Impact on Dung Cove site by WWTP building	• None currently • Investigation if it is subject to impact	X		A	Minor
Impact on Hattie's Belt by LNG storage	• None currently • Investigation if it is subject to impact	X		A	Minor
Potential impact on South Mulgrave Lead	• Monitoring during disturbance	X		A	Minor
Potential impact to sites at Meadow Lake as a result of construction of dam and resulting submergence.	• None currently. • This area has not been surveyed	X		A	Unknown
Continued erosion of sites at Sculpin Cove (1-5) by potential rise in sea level and wakes.	• None currently. • Investigation if they are subject to erosion.		X	A	Unknown
Continued erosion of sites on Hurricane Island by potential rise in sea level and wakes.	• None currently. • Investigation if they are subject to erosion.		X	A	Unknown
Potential impact to sites at Meadow Lake by continued submergence.	• None currently. • This area has not been surveyed		X	A	Unknown
Transportation Impacts					
Increase in collision rates due to construction-related vehicular traffic	• Flagman at construction site entrance, if required • Along main transport route, adjustment of travel speed, signage, intersection controls, sight lines	X		A	Medium

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Increase in collision rates due to operation-related vehicular traffic	• Controlled site entrance, if required • Along main transport route, adjustment of travel speed, signage, intersection controls, sight lines		X	A	Medium
Human Health and Safety					
Particulate generation may pose safety concerns regarding former mine workings	• Dust control program • Worker health and safety program • Avoid mine workings and tailings areas to the extent possible	X		A	Minor
Potential disturbance of mine tailings from construction of waterfront facilities and pipelines	• None	X		P	Minimal
Air emissions from vessel transportation (delivery of construction materials and equipment)	• None	X		A	Minimal
Dust generation from concrete production	• Dust control program	X		A	Minimal
Potential for runoff from site preparation debris (waste management)	• Erosion control program	X		A	Minimal
Air emissions from vehicular traffic	• Dust control program • worker health and safety program	X		A	Minor
Potential spills from equipment and materials storage	• Spill control plan	X		A	Minimal
Air emissions from marine vessel traffic unloading	• None		X	A	Minimal
Air emissions from unloading LNG vessels to tanks	• Spill control plan		X	A	Minimal
Air emissions from vaporization/regassification of LNG to natural gas	• None		X	A	Minimal
Air emissions and potential spills from chemical manufacturing	• Spill control plan		X	A	Minimal

VEC	Mitigation	Construction Phase	Operation Phase	Type (A-adverse; B-beneficial)	Significance of Residual Effect
Air emissions from power generation	• None		X	A	Minimal
Waste effluent discharges	• Ensure discharges are in compliance with all regulatory requirements		X	A	Minor
Air emissions from vehicular traffic	• Unlikely to impact the public due to distance to receptors		X	A	Minimal
Potential spills from material transfer and storage (other than LNG)	• Spill control plan		X	A	Minimal
Potential remobilization of mine tailings from decommissioning the waterfront facilities and pipelines	• Decommissioning should retain cover for mine tailings		X	A	Minimal
Potential for air emissions, spills from decommissioning of Petrochemical facilities	• Dust control plan • Spill control plan		X	A	Minimal
Particulate generation from reclamation	• Dust Control Program • Worker Health and Safety Program • Avoid mine tailings areas to the extent possible		X	A	Minor