

2.0 PROJECT DESCRIPTION AND SCOPE OF ASSESSMENT

2.1 THE PROPONENT

The Proponent, Keltic, is a Canadian registered corporation with a head office is located in Halifax, Nova Scotia. The Proponent's coordinates are as follows:

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5151 George Street, Suite 603
Halifax, Nova Scotia
B3J 1M5

Contact: Mr. W. Kevin Dunn, President
Tel: (902) 422 4557
Fax: (902) 422 5980
Email: kevin.dunn@kelticpetrochemicals.ca

As the agreements between Keltic and the financial, licensors and petroleum firms are finalized, a detailed Environmental Management Plan (EMP) will be developed for each component of the Project. Keltic will provide detailed EMPs for the respective Project components in compliance with the environmental impact statement and approvals granted.

Keltic's corporate structure is depicted in Figure 2.1-1 and the Project participants and their roles in major stages of the Project are described in following subsections.

2.1.1 Keltic Development Project (KDP) Participants

MapleLNG

By assignment and absolute conveyance made as at August 30, 2006, MapleLNG Limited ("MapleLNG") acquired from Keltic the entire LNG portion of the Project including any rights with respect to thereto subsequently acquired by Keltic. MapleLNG is owned by 4Gas North America Ltd. and Suntera Canada Ltd. 4Gas operates on a stand-alone basis with a management team dedicated entirely to LNG. 4Gas focuses on developing and operating LNG Terminals around the world, including the Dragon LNG project in Milford Haven, Wales and the LionGas project in Rotterdam, The Netherlands. Both of these projects are currently under development; Dragon LNG is expected to be operational in 2007 and LionGas in 2009.

KELTIC CORPORATION

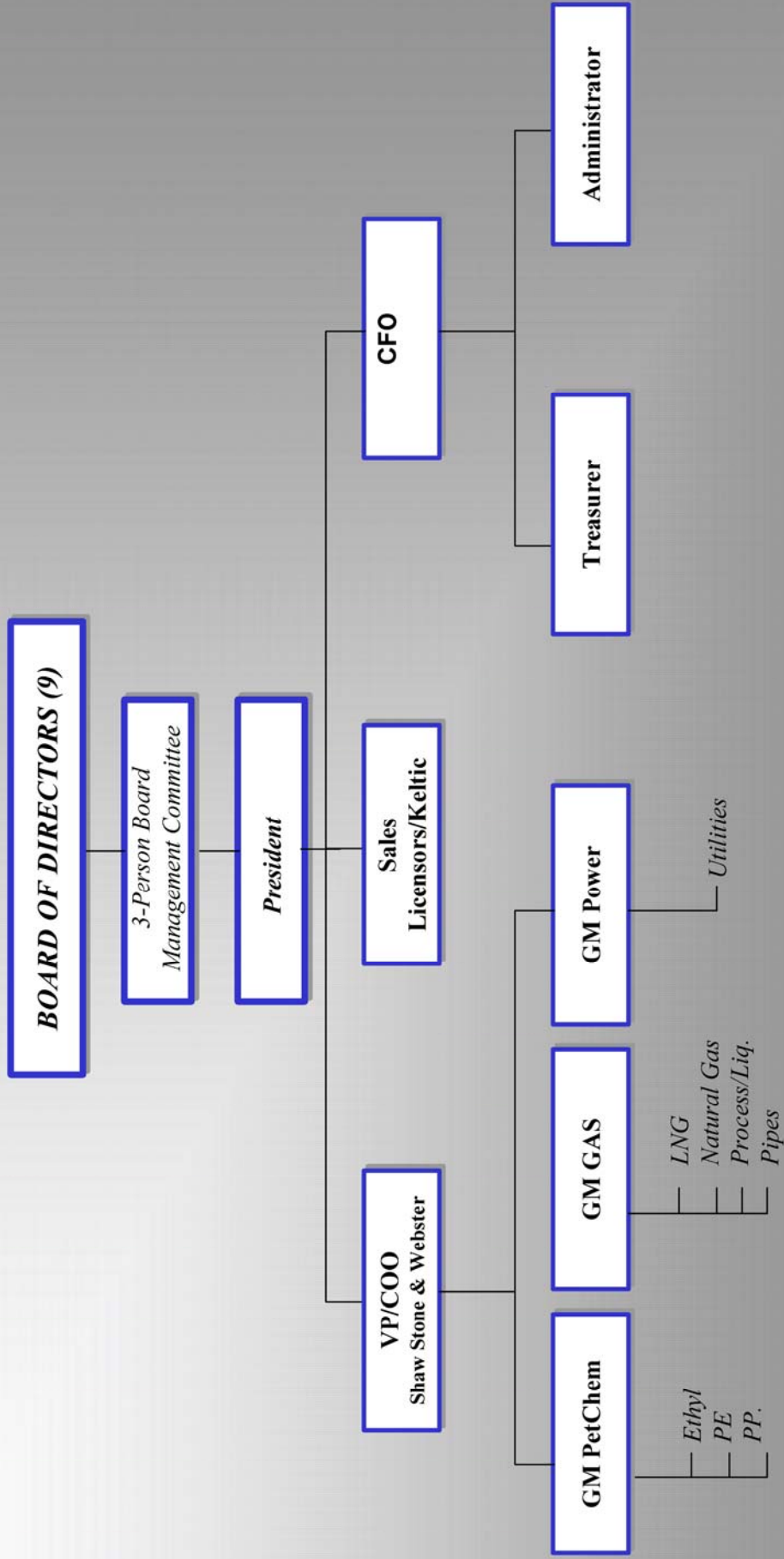


FIGURE No. 2.1-1
 KELTIC PETROCHEMICALS INC.
KELTIC'S CORPORATE STRUCTURE
 JUNE 2007

Stone & Webster (S&W) Inc.

Stone & Webster Inc. (S&W), a subsidiary of The Shaw Group Inc., is an engineering construction company that was founded in Boston in 1889. S&W is a multinational corporation and has been responsible for the development, consulting, engineering, and construction of nuclear, fossil-fuelled, geothermal, and hydroelectric power generation projects. The company has supplied the process technology for over 35% of the world's ethylene capacity constructed since 1995.

The Shaw Group Inc.

The Shaw Group Inc. is a provider of consulting, engineering, construction, remediation, and facilities management services to government and private sector clients in the environmental, infrastructure, and emergency response markets, including services to the power and process industries worldwide. Shaw is headquartered in Baton Rouge, Louisiana, USA. Keltic has entered into an agreement with Shaw S&W for them to act as the Integrating Contractor from the Pre Front End Engineering Design (FEED) through to the operation phase of the Project.

2.1.2 Participants' Roles

During the engineering, procurement, and construction phases, S&W will act as overall Project management contractor for the petrochemical component but with specific engineering procurement and construction (EPC) responsibilities for the ethylene unit and power generation plant. S&W EPC activity will be done upon a lump sum basis with schedule compliance. MapleLNG will have overall Project management responsibility for the LNG component of the Project.

During operations and maintenance, S&W will take the responsibility for developing the Keltic organization and for long-term maintenance at the site. The envisaged Keltic organization will be located at the Goldboro site and also in Halifax. MapleLNG will take the overall responsibility for the operation of the LNG facility and the associated marine terminal.

It should be noted that the polyolefin licensors have agreed to participate in operations and maintenance support. Measures to sustain the asset will be incorporated into the licensing agreements with polyolefin licensors and managed by the Keltic organization.

In the event of significant modification or decommissioning, S&W or, for the LNG component, MapleLNG will take the responsibility for integrating these activities into Keltic's organization.

These relationships and roles are laid out in Figure 2.1-2.

Shaw Stone & Webster Scope

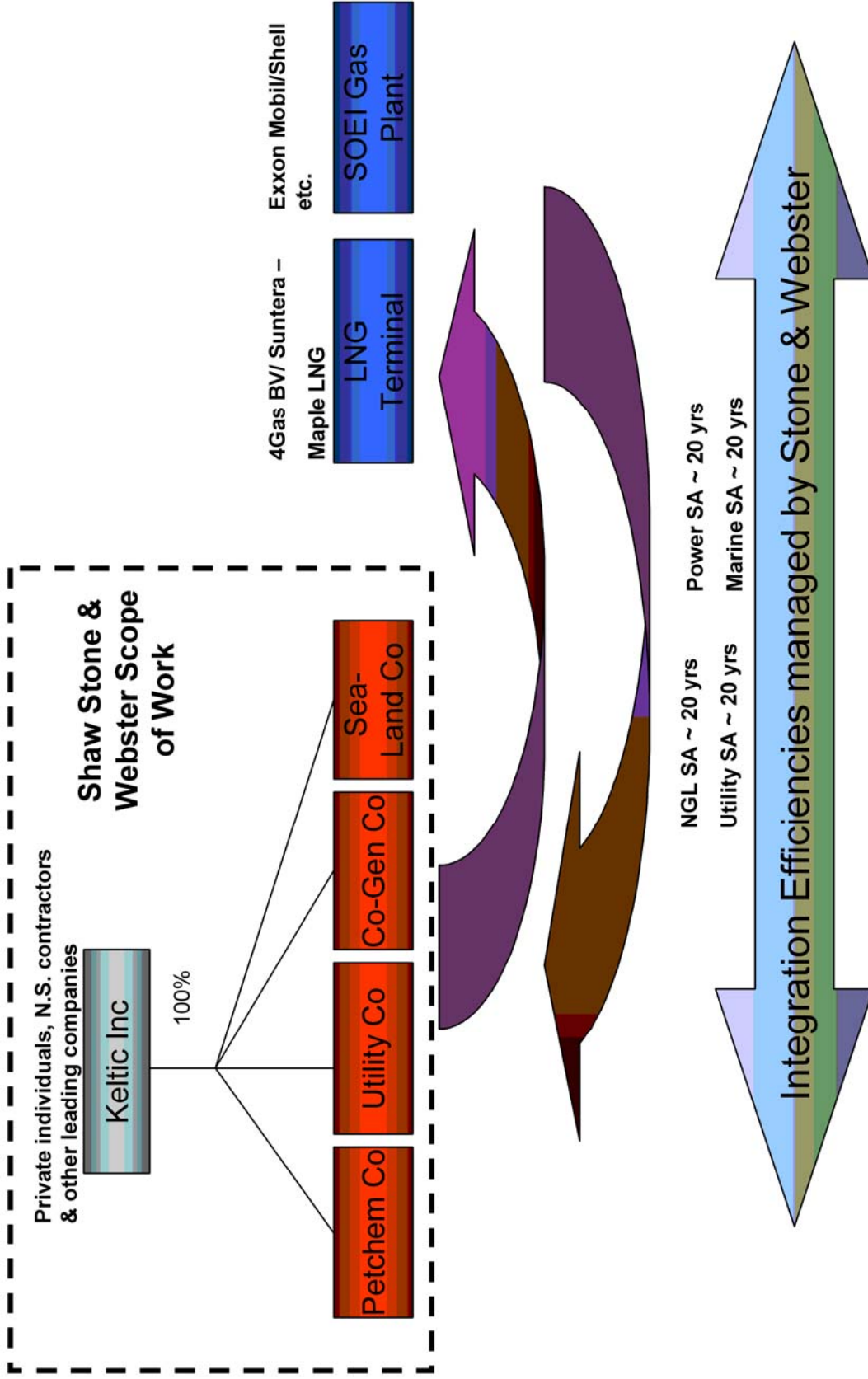


FIGURE No. 2.1-2
 KELTIC PETROCHEMICALS INC.
RELATIONSHIPS AND ROLES OF PROJECT PARTICIPANTS
 JUNE 2007

2.2 KELTIC DEVELOPMENT PROJECT (KDP) DEVELOPMENT PROPOSAL OVERVIEW

This section provides a general overview of the KDP Development Proposal, including aspects of the Project outside the federal scope of the EA. The scope of the federal EA is described fully in Section 2.3.

The KDP will be an integrated facility, receiving LNG by ship, for delivery to the M&NP after regasification, and utilizing the natural gas liquids for the production of polyethylene and polypropylene pellets for shipment to customers across North America. A co-generation plant will be included to supply power and process heat. The Project has a completed pre-FEED study to date and will proceed shortly to final FEED. The essential components of the KDP (i.e., the development proposal) are defined under the following five headings:

- LNG facility, including marine terminal and marine transfer pipeline;
- petrochemical facilities;
- marginal wharf;
- co-generation plant; and
- utilities and support facilities.

Each of these five essential components is briefly described in the Section 2.2.2 and summarized in Table 2.2-1. Figures 2.2-1 and 2.2-2 show the overall layout of the site.

Section 2.2 describes the entire KDP development proposal as a whole to demonstrate the integration of the components; however, the assessment has been completed solely on Project components as scoped by the RAs. The scope of the Project being assessed is described in Section 2.3.

As the provincial EA was completed on the whole development proposal, additional detail on Project components and figures can be found in Keltic's EA Report, Section 2.0 Project Description. This document is available for download on the NSEL Environmental Assessment Branch website (<http://www.gov.ns.ca/enla/ea/kelticpetro.asp>) or can be viewed at NSEL library (5151 Terminal Road, Halifax, Nova Scotia).

The dam and impoundment of Meadow Lake required for water supply likely require approvals from TC and DFO; however, necessary detail for a screening level EA and authorizations will be provided in forthcoming applications.

2.2.1 Location

The KDP Site is located in Goldboro, Guysborough County, Nova Scotia (Figures 1.0-1 and 1.0-2) and is positioned within the Goldboro Industrial Park and other land holdings along the northern shore of Stormont Bay. The associated marine facilities include a marginal wharf and LNG marine terminal to be located on the northeast side of Stormont Bay.

TABLE 2.2-1 Key Characteristics of Essential KDP Components

Component	Description
<p>LNG Facility, including Marine Terminal and Marine Transfer Pipelines</p>	<p>Consists of marine terminal, transfer pipelines, storage, regasification, nitrogen production plant, and extraction facilities, a vapour handling system and associated infrastructure/support facilities including:</p> <ul style="list-style-type: none"> • LNG marine transfer pipeline; • natural gas pipeline connecting to the MN&P pipeline; • natural gas pipeline connecting to the co-generation plant; • natural gas pipeline connecting to the petrochemical plant; • PLC based control system; • emergency shutdown system; • hazard detection system; • security system and facilities; • fire response system; • natural gas flare; • plant air, instrument air and nitrogen systems; • electric power distribution and control systems; • storm-water system; • control building; • access roadways and service buildings; • fire and emergency access roads; and • other facilities as required to support safe, efficient, and reliable operation. <p>The maximum transfer rate from ships will be at 24,000 cubic metres per hour (m³/hr) @ 75 pounds per square inch gauge (psig) -160 degrees Celsius (°C). Storage will be in 3 full containment tanks of 162,500 cubic metres (m³) each (with future expansion to 6).</p>
<p>Petrochemical Facilities</p>	<p>The facility is fed by ethane and propane obtained from the LNG Terminal and the Sable Offshore Energy Inc. (SOEI) plant. The facility produces primarily ethylene and propylene using steam cracking. Polyethylene and polypropylene pellets are subsequently produced for shipment. The following will be produced as pellets for shipment:</p> <ul style="list-style-type: none"> • polypropylene; • High Density Polyethylene (HDPE); • Low Density Polyethylene (LDPE);and • Linear Low Density Polyethylene (LLDPE). <p>The petrochemical facilities use power from the co-generation plant.</p>
<p>Marginal Wharf</p>	<p>Products from the petrochemical facilities are stored in silos at the shipping and logistics area near the marginal wharf.</p>
<p>Co-generation Plant</p>	<p>Includes gas turbines and heat recovery steam generators with a capacity of approximately 200 megawatts (MW) to meet Project electrical energy requirements.</p>
<p>Utilities and Common Support Facilities</p>	<p>Common support facilities include raw water supply sourced by way of a dam with a fish-way, raw water intake and pumping infrastructure at Meadow Lake; raw water treatment plant; wastewater collection; treatment and disposal; storm-water management; central administration and maintenance facilities; emergency medical facilities; fire station and helipad; and upgrades to the rural road network.</p>

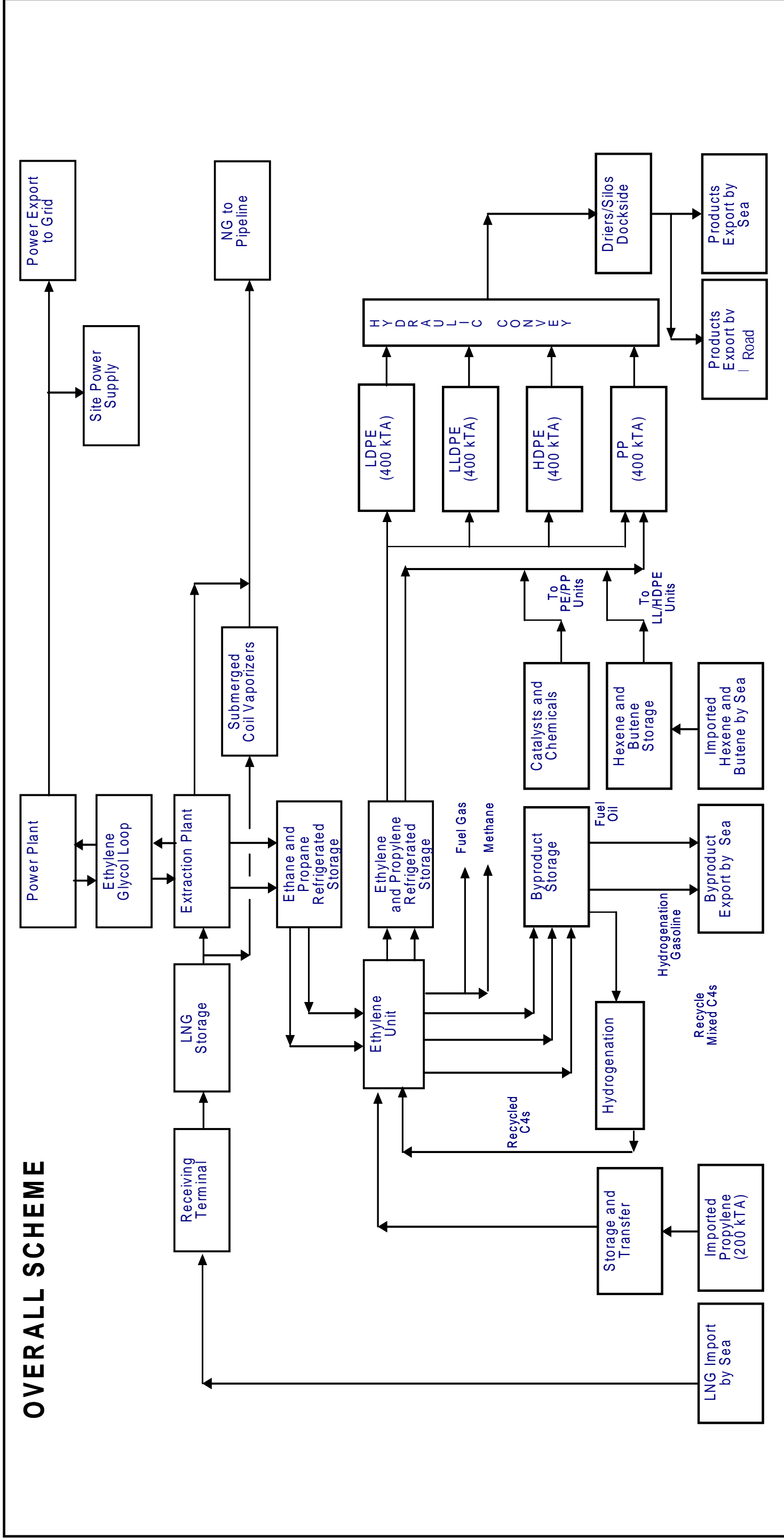
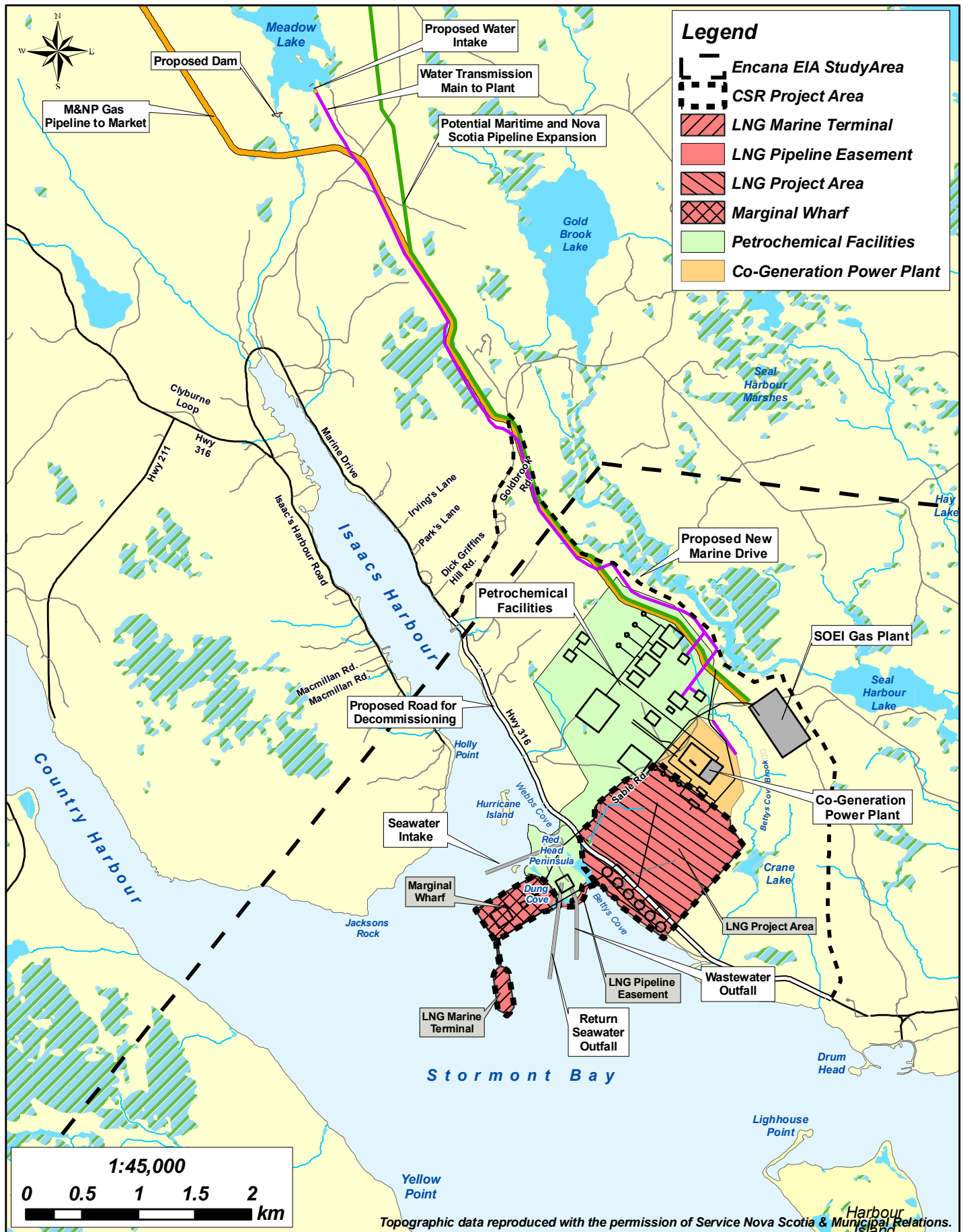


FIGURE 2.2-1
 KELTIC PETROCHEMICALS INC.
OVERVIEW OF THE ESSENTIAL COMPONENTS
OF THE KELTIC PROJECT
 JUNE 2007



June 2007
 Drawn by S. Turner
 Projection: NAD83 CSRS UTM Zone 20N
 Job No.: TV61029

Figure 2.2-2
KELTIC PETROCHEMICALS INC.
Plan of Essential Components of
Keltic Development Project
JUNE 2007

The 240 ha Goldboro Industrial Park is owned by the Municipality of the District of Guysborough (Municipality). The Goldboro Industrial Park is zoned M-3 heavy industrial. Additional land holdings adjacent to the Industrial Park have been or are in the process of being purchased by the Municipality. These lands have been included in the recent rezoning to M-3 heavy industrial to facilitate the development of this Project and similar projects. Sufficient land has been optioned by Keltic and will be purchased from the Municipality of the District of Guysborough.

The Keltic Project is located in proximity to the SOEI gas plant and M&NP metering station, which are situated in the northeast of the Industrial Park. The M&NP also runs along the north boundary of the Industrial Park.

2.2.2 Key Keltic Development Project (KDP) Components

The five main KDP components are discussed in the following sub-sections.

2.2.2.1 LNG Facility Including Marine Terminal and Marine Transfer Pipelines

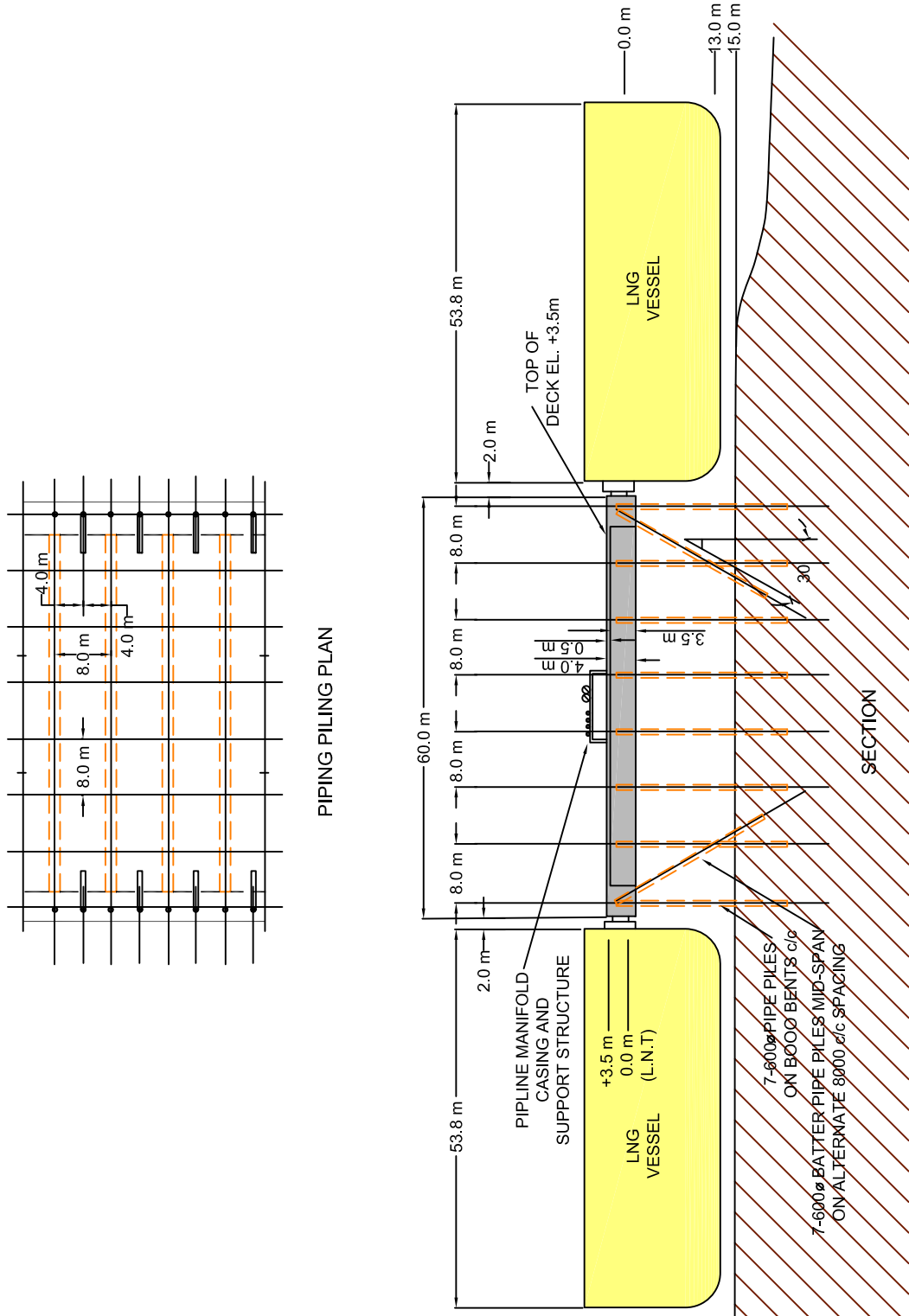
The LNG facility consists of the following six components:

- marine terminal;
- LNG unloading (including marine transfer pipelines);
- LNG storage;
- nitrogen injection;
- LNG regasification; and
- natural gas transport and distribution pipeline to the petrochemical plant, the co-generation unit and to the M&NP.

A two berth piled marine terminal will be connected to a marginal wharf facility by a piled jetty. This marine terminal will be used to receive and transfer product via LNG transfer lines along the jetty and marginal wharf facility to the LNG tanks where it is stored. The jetty location is sheltered within Stormont Bay, and therefore, protected from ocean swells. The terminal will be located such that dredging is not anticipated. A preliminary plan of the marine terminal is shown on Figure 2.2-3.

In the unloading system, the LNG is unloaded from the tanker ships and transported via marine pipelines to the storage tanks. The maximum transfer rate from ships will be at 24,000 m³/hr at 75 psig -160 °C. The storage section consists of three full containment tanks with a gross LNG storage capacity of 162,500 m³ each (with an aggregate capacity of the facility totalling 487,500 m³). With future expansion to 6 tanks, the total gross LNG storage capacity will increase to 975,000 m³. A typical LNG tank design is provided as Figure 2.2-4.

To make the LNG available for use in the M&NP or for direct use in petrochemical facilities, the LNG is extracted of higher hydrocarbons, ethane, and propane which are used in Keltic's petrochemical plant.



Source: MacDonnell Group, Project No. 1080, Nov. 2005

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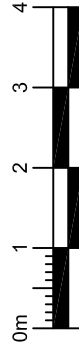
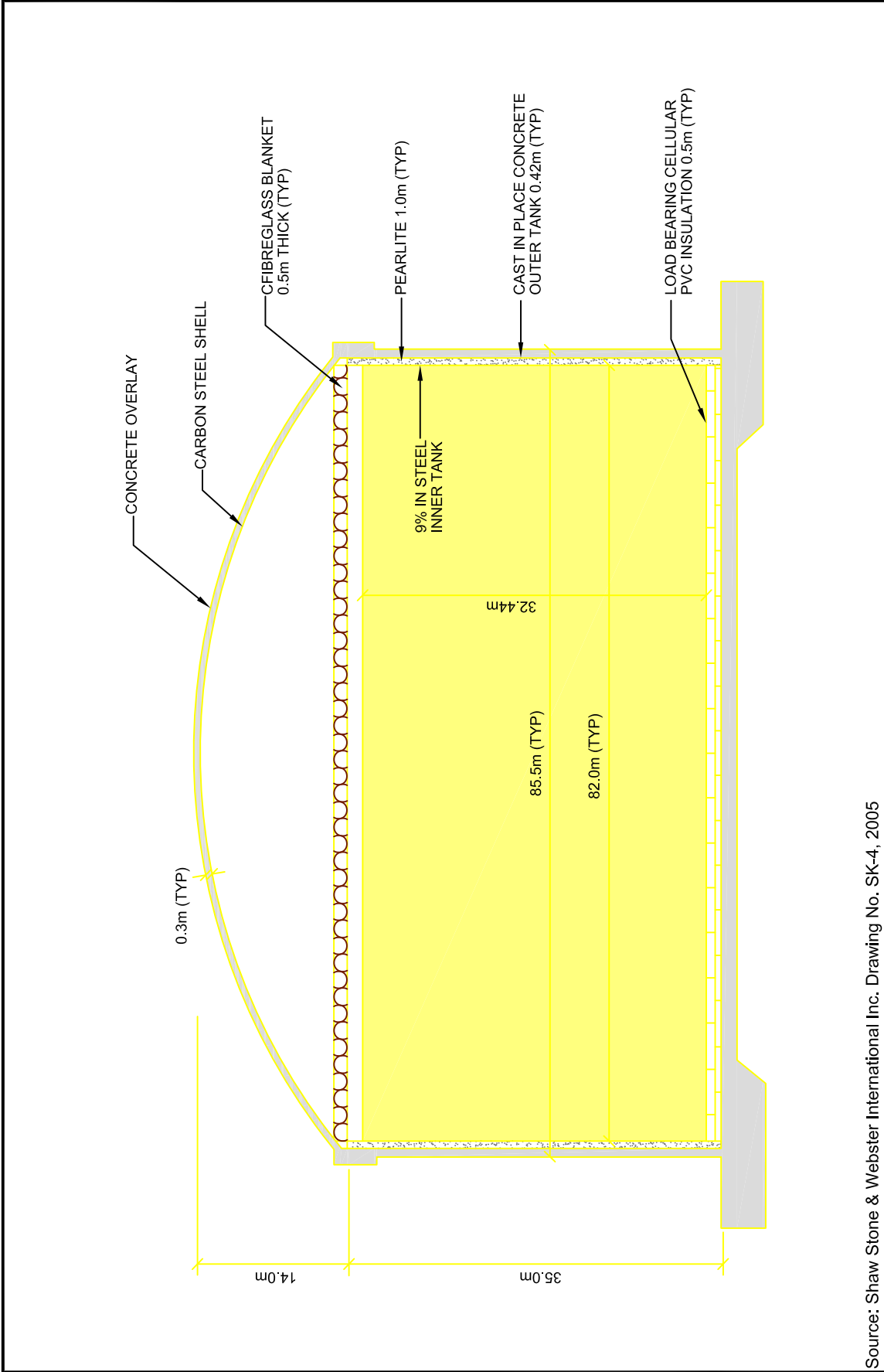


FIGURE No. 2.2-3
KELTIC PETROCHEMICALS INC.
PRELIMINARY PLAN OF LNG MARINE TERMINAL
 JUNE 2007



Source: Shaw Stone & Webster International Inc. Drawing No. SK-4, 2005

1 : 600



FIGURE No. 2.2-4
KELTIC PETROCHEMICALS INC.
TYPICAL LNG TANK DESIGN
 JUNE 2007

The heat required for the regasification of LNG is supplied by low-pressure fuel and/or waste heat from the petrochemical plant and the co-generation unit. The low-pressure fuel is taken as a side stream of the vaporized gas and is reduced to the desired pressure by a system of letdown valves.

The product of the regasification section is natural gas, which is transported to the local end-users, the co-generation plant and the petrochemical plant, and the M&NP by pipeline for further distribution to customers.

Besides the LNG facility, the Project also entails a petrochemical plant for production of ethylene and propylene polymers. Feedstock for this plant is ethane and propane. Therefore, the Petrochemical facility includes an LNG extraction plant in which ethane and higher hydrocarbons are separated from the LNG. The extraction process has a dual function:

- providing feedstock for the petrochemical plant; and
- adjustment of the off-specification gas properties to meet the specifications of the gas consumers (petrochemical plant, co-generation plant, and M&NP).

The LNG facility must always be able to deliver on-specification gas quality (gas send-out). This means that a back-up process is needed for those cases in which extraction can not be carried out at the petrochemical plant (liquid storage is full, extraction plant is down, petrochemical plant not running) and off-specification LNG is delivered/stored. This back-up process involves the injection of nitrogen to bring the send-out gas to specifications. The required nitrogen will be produced from air by an ASU.

The LNG facility will have an annual send-out capacity of nominally 18 BCM (billion cubic metre = 109 normal cubic metres (Nm³)), maximum and peak send out capacity are 140 and 165% of the nominal capacity respectively. This capacity will be realized in two phases of 9 BCM. The extraction plant will have a capacity to provide for 1,480 kTa (kilotonne per annum) ethane and 880 kTa propane (depending on LNG composition) as feedstock for the petrochemical plant. The nitrogen plant will have a capacity to provide for sufficient nitrogen to produce on-specification gas quality at peak send-out based on richest LNG composition.

Three LNG storage tanks each with a gross capacity of 162,500 m³ are required in order to be able to accommodate the amount of LNG supplied (with future expansion to six).

The distances between process units (i.e., LNG storage tanks and LNG regasification section) as well as distances between process units and site boundaries are mainly limited by: standards such as Canadian Standards Association (CSA) 276-01; land use and further quantified by means of a quantitative risk assessment (QRA) (as described in Section 10.1.1.4 Design and Operational Safeguards). The underlying approach is that the malfunction of a process unit must not result in domino effects to other process units or surrounding areas.

2.2.2.2 Petrochemical Facilities

A pre-FEED study for the petrochemical complex planned for Goldboro has been prepared by S&W. For the study, S&W prepared a definition of equipment sufficient to produce an order of magnitude total installed cost for all process units, and defined a preliminary recommendation

for feedstock and product storage. As part of the effort, S&W also prepared a summary of estimated utility consumption and environmental emissions of the complex.

The petrochemical complex is based on the production of olefins, specifically ethylene and propylene, from an ethylene plant. This ethylene plant is based upon S&W's proprietary Ultra Selective Conversion technology for the steam cracking of hydrocarbons. Cracking is the process whereby complex organic molecules are converted to simpler molecules by the breaking of carbon-carbon bonds in the precursors. The Keltic olefins will be produced from the steam cracking of fresh ethane and propane feedstock.

To augment the propylene produced at the Keltic complex, a refinery grade propylene mix will be imported by sea. Any facilities required to treat the refinery grade propylene for contaminants removal will be provided within the ethylene plant. After treating, the refinery grade propylene stream will be fed to the propane (C3) splitter facilities in the ethylene plant.

The polymer grade ethylene produced from the ethylene plant is the feed to a polyethylene plant with a polymerization train for LLDPE and a train for HDPE and an LDPE plant. Three extruder trains and two mixer/melt pump trains are expected to handle the complex's production of polyethylene and polypropylene respectively. The extruders convey and melt the polymer and a melt pump pressures the polymer melt through a steam-heated die-plate with the strands of polymer being cut into pellets by a pelletizer. The pellets will be hydraulically conveyed to the marginal wharf, where the drying and storage will take place before shipment.

The other co-products of the ethylene plant will be exported for sale or consumed as fuel onsite. A stabilized mixed butane (C4s) stream will be produced by a hydrogenation unit in the ethylene plant treating the raw mixed C4's from the debutanizer. The hydrogenated C4 mix containing predominantly butylenes will then be shipped by sea. A hydrotreated gasoline will be produced from a gasoline hydrogenation unit. The gasoline hydrogenation unit will also be contained in the ethylene plant, treating the raw pyrolysis gasoline produced by the steam cracking process. A pyrolysis fuel oil product will be used as auxiliary/power boiler fuel. A residue gas will be produced in the ethylene plant, which will flow to the central fuel gas mix drum of the complex. Any high purity hydrogen that may be required for the polyethylene and polypropylene plants will be produced in the ethylene plant. Vent streams from the polyethylene and polypropylene plants will be diverted to the ethylene plant for collection.

The following feedstock storage systems will be provided:

- ethylene plant feedstock handling and storage systems;
- ethylene plant product handling and storage systems;
- hexene and pentane storage for polyethylene plants;
- outside battery limit storage for fresh caustic;

- demineralized water for boiler feed; and
- outside battery limited storage for spent caustic treatment and process waste water.

The pellets have to be cooled and dried before storage. The storage facilities will consist of elevated silos situated at the marginal wharf. The pellets will be conveyed to the storage area by a hydraulic conveyor system where they are first dried before storing.

The infrastructure support systems required for the petrochemical process include water / steam system, wastewater management and other infrastructure. These are not detailed in the CSR; however, details can be found in Section 2.0 of the provincial EA Report (AMEC, 2006).

2.2.2.3 Marginal Wharf

The marginal wharf area is required for receipt and shipment of products and by-products in support of the petrochemical plant and for receiving supplies and equipment during construction of the entire complex. It will be constructed as one of the first elements of the Project. It will function as follows:

- dockside space for product container ship(s);
- dockside space for ships delivering operating plant supplies/other feedstocks;
- dock side space for tugs and pilot boats;
- customs and immigration facilities for all shipping;
- roll off dock for unloading of equipment and materials from ships during construction; and
- containment structure for product servicing reclamation area.

A warehouse facility will be located at the wharf. The north and western faces of this facility will be designed for berthing tugs, the pilot boat, supply ships, and product carrying ships. The eastern face will be enclosed behind an armour stone blanket, with the LNG transfer pipeline extending from the service trestle en route to the LNG storage site along its deck. Navigation and berthing aids will be provided.

The land extension and infill area behind the caissons of the marginal wharf will constitute the product service area (i.e., storage shipping and logistics area). Pellets will be transported from the petrochemical plant to the wharf by a hydraulic pipeline for storage in silos prior to shipment. The excess water will be removed, and the pellets dried using a centrifuge prior to storage. Water used for transporting the pellets to the wharf will be recovered and returned to the petrochemical plant for reuse. A schematic of the transport and storage system is provided as Figure 2.2-5. The pellets will be stored in multiple silos north of the wharf face with load out facilities for bulk shipment on vessels or on railcars and/or trailers that would be transported by ship. A typical arrangement of the storage silos is shown as Figure 2.2-6.

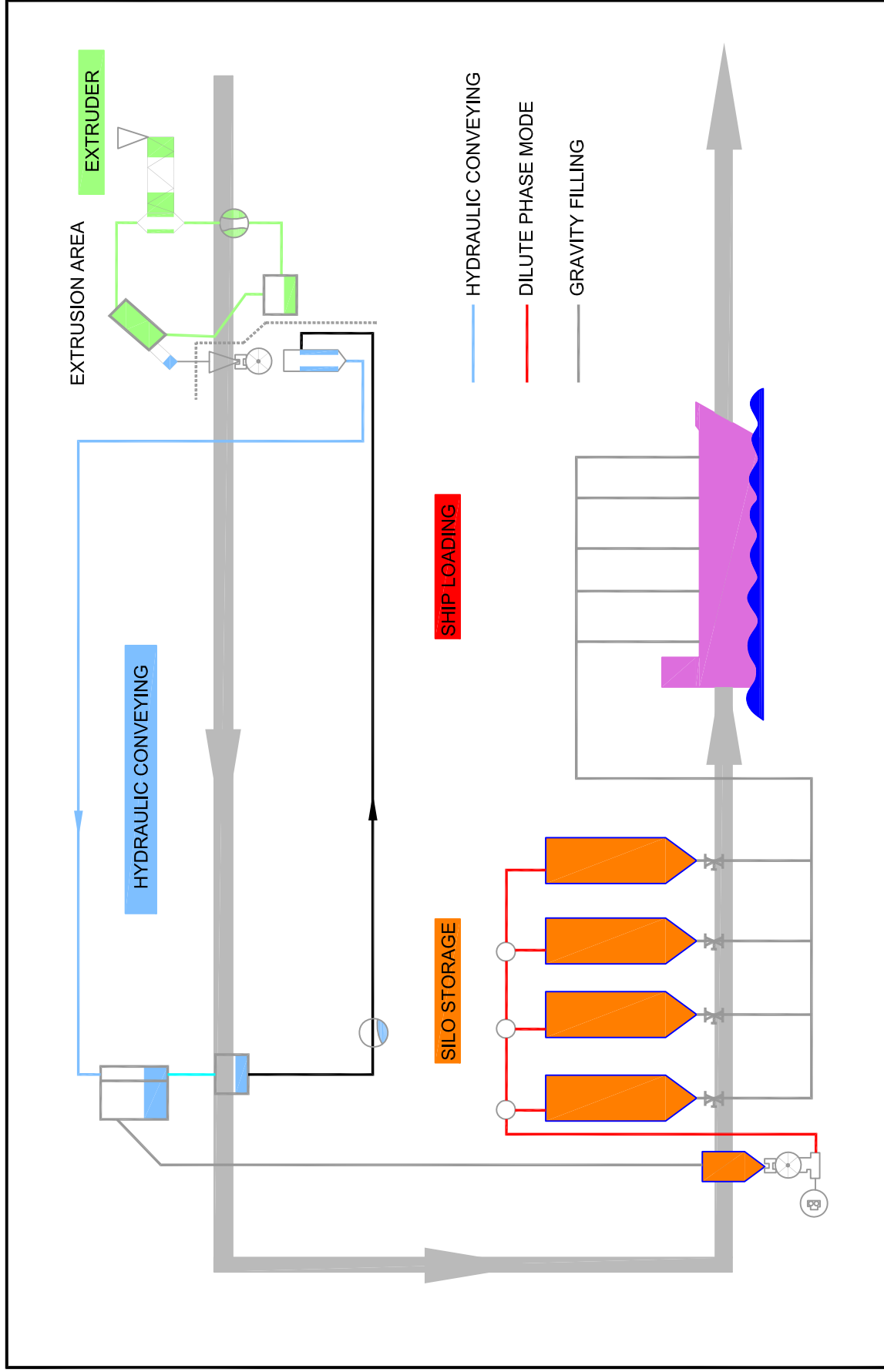


FIGURE No. 2.2-5
 KELTIC PETROCHEMICALS INC.
SCHEMATIC OF PELLET TRANSFER TO THE
WHARF AND STORAGE
 JUNE 2007

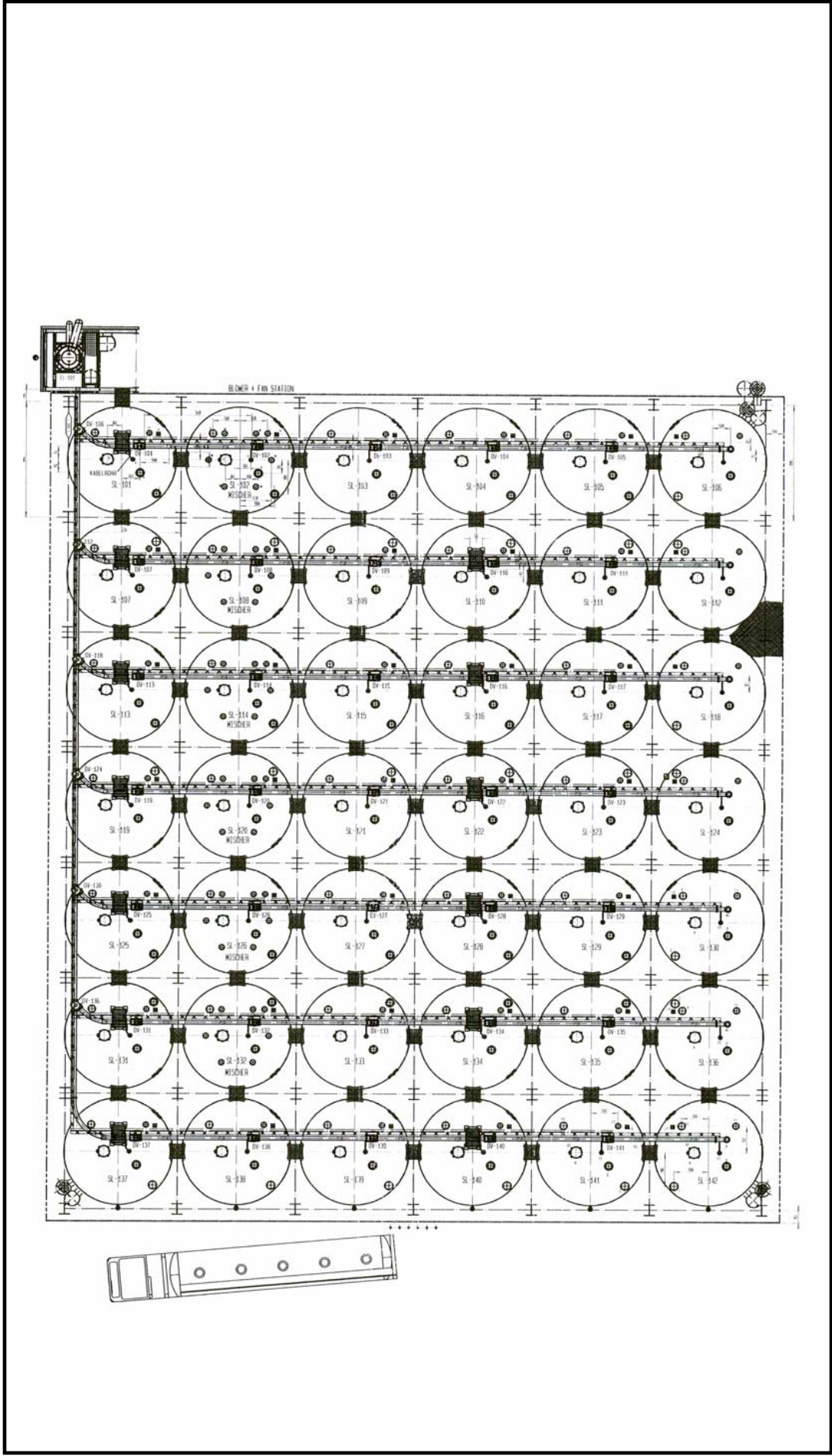


FIGURE 2.2-6
KELTIC PETROCHEMICALS INC.
TYPICAL ARRANGEMENT OF PRODUCT
STORAGE SILOS
 JUNE 2007
 Source:Zeppelin

The wharf will also be used for receiving propylene and for shipping co-products of the ethylene plant such as hydrogenated C4 mix and refinery grade propane.

2.2.2.4 Co-generation Plant

A power plant incorporating gas turbines and heat recovery steam generators will be constructed to provide power to the facility. The LNG Terminal and regasification will have a power demand of 16 megawatts of electricity (MWe). The mature facility (LNG Terminal and petrochemical plant) will have an estimated power demand of 180 MWe. Approximately 40% of this is associated with the LDPE unit compression system.

The Project provides an opportunity for export of surplus power to the Nova Scotia grid. Although this is not part of the current Project, should additional power supplies be required by the province, the Keltic site could be considered as potential source of cleaner energy.

As the installation of the LNG Terminal will precede development of the petrochemical plant, the power plant will be developed in 2 phases:

- Phase I – to meet LNG Terminal and regasification power demand of 16 MWe; and
- Phase II - to meet total facility, power demand of 180 MWe.

The power generation concept is based upon this phased expansion with the following units:

- Phase I (16 MWe) – Two GE LM2500 gas turbines units will most likely be used. These will be simple cycle gas turbines with the addition of a heat recovery steam generation for steam. In the mature facility, these turbines will be used for emergency/back-up power supply.
- Phase II (180 MWe) – The configuration could be 4 x GE6000 or 2 x GE Frame 7 turbines.

2.2.2.5 Utilities and Site Support Facilities

As part of the Keltic Project, there is a need for utilities and common support facilities. These include:

- plant water supply;
- sanitary wastewater;
- storm-water;
- central administration and maintenance facilities;
- emergency medical facilities;
- fire station;
- helipad; and
- upgrades to rural road network.

These are not described in detail in the CSR; however, more information can be found in Section 2.0 of the provincial EA Report (AMEC, 2006).

2.2.3 Applicable Project Design Codes, Standards and Guidelines

Codes, standards, regulations and guidelines relevant to the construction of those components of the KDP that are addressed in this CSR (see Section 2.3.1 and 2.3.2) are listed in Table 2.2-2.

TABLE 2.2-2 List of Environmental Permits, Approvals, and Relevant Legislation

Statute/Regulation Requiring Approval/Compliance	Section Reference	Requirement
I. Provincial Legislation		
<i>Environment Act</i>	S. 50	Prohibits designated activities without holding appropriate approval.
Environmental Assessment Regulation	Schedule A	Storage facility for liquid or gaseous substances including hydrocarbons with total capacity greater than 5000 m ³ designated as a Class I undertaking requiring registration for Environmental Assessment. Petrochemical Plant designated as Class II undertaking requiring a full EA. Project cannot proceed without Minister's approval under this Regulation.
Activities Designation Regulation	S.(1)(d)(e) and (o)	The installation of certain culverts, a bridge, or other watercourse alteration requires an approval.
	S. 5(1)(g)	The construction of a wharf requires approval.
	S. 10(1)(f)	The construction or operation of a site with a chemical storage tank in excess of 2000 L or 2000 kg requires approval.
Air Quality Regulation	Generally	Establishes maximum permissible ground level concentrations of contaminants.
Petroleum Management Regulation	S. 11	Storage tank systems must be registered.
Dangerous Goods Management Regulation	S. 6	Written approval required to store waste dangerous goods.
National Building Code of Canada (NBCC)	Generally	Applied by municipality.
<i>Beaches Act</i>	S.6	Construction activities including trenching and infilling below the ordinary high water mark require permission (permit) from the Nova Scotia Department of Natural Resources (NSDNR).
<i>Crown Lands Act</i>	S 5, 13, 16 (1)	Governs the use and activities on lands owned by the province. Through the Act the province can make crown lands available for the Project through the use of easements, conveyances, leases, or licenses.
<i>Nova Scotia Endangered Species Act</i>	Generally	This Act protects species in Nova Scotia that have been assessed and determined to be at risk of extinction.
II Federal Legislation Requiring Approvals/Assessments		
NWPA	S. 5	Approval of Minister of TC to construct "work" in navigable waters.

Statute/Regulation Requiring Approval/Compliance	Section Reference	Requirement
<i>Fisheries Act</i>	S. 35	Approval required for HADD of fish habitat.
	S. 32	Prohibits destroying fish by any means other than fishing. Most relevant if blasting is required in or near waters containing fish or fish habitat.
	S. 20	Fish passage must be maintained
	S. 22	Minimum flows must be maintained for fish and eggs
CEAA	S. 5(1)	EA required before federal authority may issue "approval"/transfer land.
Law List Regulation	S. 6 and 11	S.5 of the NWPA and s.35 of the <i>Fisheries Act</i> are "triggers" for application of CEAA.
Comprehensive Study Regulation		A comprehensive study is required for this Project for both the LNG Terminal and marginal wharf, as it will be designed to accommodate vessels larger than 25,000 DWT
<i>Marine Transportation Security Act</i> and Regulations	Generally	Post Facility Security Assessment and Facility Site Security Plan required.
III Other Federal Legislation to note		
<i>Fisheries Act</i>	S. 36	Prohibits deposit of deleterious substance in waters frequented by fish.
Petroleum Refinery Effluent Regulation	Generally	Sets minimum standards for effluent quality from "petroleum refinery" as therein defined.
CEPA	Part 5	Regulates the manufacturing and handling of "toxic substance."
<i>Canada Marine Act</i>	Generally	Regulation of marine transportation
<i>Transportation of Dangerous Goods Act</i>	Generally	Documenting handling and placard requirements for transport of dangerous goods
<i>Pilotage Act</i>	Generally	Establishes pilotage authorities and requirements
<i>Canada Shipping Act</i>	Generally	Detailed code for all aspects of shipping in Canada
<i>Ballast Water Control and Management Regulations</i>	Generally	Addresses potential for introduction of invasive species.
<i>Canada Transportation Act</i>	Generally	Applies to transportation matters under federal jurisdiction
<i>Aviation Safety Regulations</i>	Generally	Sets requirements for lighting flare stacks, exhaust stacks, etc.
<i>Migratory Birds Convention Act</i>	Generally	Enacts international treaty for protection of migratory birds
<i>Species at Risk Act</i>	Generally	Protects the wildlife found on federal lands as well as their critical habitat.

In addition to complying with all regulatory requirements, the Project will also be developed in accordance with all applicable international, federal, and provincial guidelines, industry standards, and codes of practice.

The following guidelines, standards, and codes are potentially applicable to the Project:

- Canada – Wide Standards for Particulate Matter (PM) and Ozone, Canadian Council of Ministers of the Environment (CCME), June 2000;
- CSA, Document Z276-01 LNG – Production, storage and handling;
- National Ambient Air Quality Objectives, *CEPA*, S.C. 1999 c. 33;
- International Maritime Organization (IMO), Industrial Shipping Port Facility Security Code, July 2004;
- British Standard Code of Practice for Marine Structure s- Parts 1-6. BS6349: British Standards Institution;
- Society of International Gas Tanker and Terminal Operators (SIGTTO): Site Selection and Design for LNG Ports and Jetties, Information Paper No. 14;
- Oil Companies International Marine Forum (OCIMF): Mooring Equipment Guidelines;
- OCIMF and SIGTTO: Prediction of Wind Loads on Large Liquefied Gas Carriers;
- OCIMF: Prediction of Wind and Current Loads on very large crude carriers (VLCCs) (current forces only);
- LNG Operations in Port Areas: Recommendations for the Management of Operational Risk Attaching to Liquefied Gas Taker and Terminal Operations in Port Areas, SIGTTO, 2003; and
- Canadian Environmental Quality Guidelines, (PN 1299) Update 5.0 – CCME.

2.2.4 Environmental, Health and Safety, and Communications

2.2.4.1 Environmental Management Plan (EMP)

An EMP will be developed to communicate to all KDP participants and stakeholders the commitment and efforts to be undertaken to prevent, manage, and minimize any potential environmental impacts related to the development proposal. The EMP is the principal vehicle for ensuring that mitigation is implemented as directed by all applicable regulatory requirements and provides an opportunity to outline responsible environmental management practices. The EMP is the overarching document under which are the site specific Environmental Protection Plans (EPPs).

The EMP will address the key elements of environmental management for each component of the KDP, including the LNG facility, the co-generation plant, the petrochemical facility, and support systems. The EPPs will address all stages of these components, i.e., construction, operation, maintenance and modification, and decommissioning. Performance criteria for all elements will be determined in the process of EMP development.

The purpose of this EMP is to:

- support the corporate commitments to minimize environmental effects;
- document environmental concerns and appropriate protection measures; and
- provide instructions to relevant Project personnel regarding procedures for protecting the environment and minimizing environmental effects, thereby supporting the Project goal of zero incidents.

The KDP development proposal will involve a wide range of activities necessitating the implementation of environmental management measures that will be developed as the KDP proceeds. All mitigation recommended in the CSR and the provincial EA Report, as well as any regulatory requirements, or conditions of permits/approvals, will be implemented via the mechanisms outlined in the EMP. It also provides implementation guidelines to help ensure compliance with the mitigation, monitoring, and follow-up commitments and requirements identified through the environmental assessment processes.

The EMP will include (at a minimum) the following components:

- establishment of agreed performance criteria and objectives in relation to environmental and social impacts. These should include measurable indicators and standards;
- detailed prevention, minimization and mitigation strategies or action programs (including design standards) for controlling environmental impacts at specific sites;
- details of the proposed monitoring of the effectiveness of mitigative measures against the agreed performance criteria in consultation with relevant government agencies and the community;
- details of implementation responsibilities for environmental management;
- timing (milestones) of environmental management initiatives;
- reporting requirements and auditing responsibilities for meeting environmental performance objectives;
- corrective actions (as options) to rectify any deviation from performance standards; and
- scheduled review (audit) and periodic updates to ensure plan relevance.

Keltic will require all contractors to work in compliance with the EMP. A response and follow up procedure will be included in the EMP to manage any complaints. A proposed table of contents for the EMP is contained in Appendix 3 of this CSR.

2.2.4.2 Environmental Protection Plan (EPP)

The EPPs represent the specific environmental action plans for construction and operation activities. These are specific environmental protection measures, procedures, and mitigations related to a specific activity or area of the development proposal. They are used during all Project stages, but mainly are used in the field as practical reference documents during construction, operation, and maintenance activities, to help ensure environmental commitments are met.

The approach to development of the EPPs will involve:

- A review of all related documentation, such as CSR, Provincial EA Report Conditions of Approval, and any supporting documentation.
- Define the requirement for EPPs based on the review of the above information, including the rationale and intent of each EPP.
- Development of specific environmental protection measures to help ensure the environment is protected.
- Work with the Project design team to ensure proposed environmental protection measures can be coordinated with the Project activities, and conversely, to ensure the design meets environmental protection expectations.
- Input into the plans will be sought from regulatory agencies.
- Update the EPPs as necessary.

Both the generic and the site-specific EPPs will be developed following the provincial and federal environmental assessment reviews for the Project. The EPPs will be finalized as part of subsequent permitting and approvals before the onset of site activities. The plans must be prepared before Project activities commence to allow for training of appropriate personnel. The EPPs will prescribe environmental management measures, mitigation measures, spill prevention protocols, contingency measures, responsibilities, supervision, and reporting measures necessary to ensure the least impact to the environment during Project construction and operation.

As such, the EPPs will specify and detail the provisions of the EMP for which a draft Table of Contents has been provided in Appendix 3 of this CSR.

2.2.4.3 Monitoring

Compliance and effects monitoring programs will be designed and implemented in order to determine the effectiveness of implemented mitigation measures envisaged throughout the life of the KDP. The format of these monitoring programs and reporting methods will be developed to ensure consistency, accuracy, and expediency in report delivery. The effectiveness of the program will depend on ensuring that the workforce can identify and address potential impacts during construction and operation. This will be accomplished through continuous on site training and orientation programs given to employees during construction and operations of the facility.

Through the EMP, the Proponent will provide a site-wide monitoring network to ensure all site activities are regulated and monitored so that the environment is protected. Performance standards will be established for the valued environmental components (VEC), where appropriate. Specifications and standards will be identified against which the various monitoring programs will be validated and measured. Based on the results of the monitoring programs, the Proponent will make necessary modifications to mitigation plans and/or operations, to prevent continued unacceptable environmental effects, to the satisfaction of regulatory agencies.

Typical monitoring activities would include, but are not limited to: effluent monitoring; surface water monitoring; well water survey; groundwater quality monitoring; air quality monitoring;

noise monitoring; and other components as will be identified in the EPP. The program will be maintained, as required, over the lifetime of the Project.

2.2.4.4 Health and Safety

As part of facility management and in compliance with NSEL Occupational Health and Safety Division requirements, a health and safety program will be initiated in order to promote a safe and healthy workplace (Section 28 of the *Occupational Health and Safety Act*). As a means to maintaining a safe and healthy environment and reducing the number and severity of workplace injuries and illnesses, this will include management of a system of ongoing: training, procedural documentation, inspections, reporting, safety record management, and evaluation.

This will cover the full range of on-site and off-site activities accomplished to fulfill the implementation of the development proposal. Each contract/subcontract entity and employee will be held responsible in compliance with safety policy and procedures.

2.2.4.5 Training

A framework will be developed for providing training and orientation to on-site employees. This training addresses environmental, health, and safety aspects and will generally involve:

- Promoting the primary responsibility of employers and employees to create safe and healthy workplaces through the use of safe work practices and suitable equipment.
- Training and education of workers engaged in activities related to hazardous materials and waste generation, removal, containment, transportation and emergency response in compliance with the *Occupational Health & Safety Act* (i.e., Workplace Hazardous Materials Information System (WHMIS) worker training program).
- Educating of the workforce in identifying potential environmental effects during the various stages of construction and operations, as well as effects monitoring, under the Environmental Management System (EMS) and associated EPPs.
- Utilizing the Workers' Compensation Board On-the-Job Programs offering training for workers that have been injured on the job.

2.2.4.6 Best Management Practices

Where possible, eco-efficiency principals were and will be applied to the design. Generally, these include:

- using waste heat from the co-generation plant and/or petrochemical plant as a heat source for the regasification of LNG;
- supply of natural gas to the co-generation plant as fuel for electricity production; and
- supply of natural gas to the petrochemical plant as fuel for heating purposes.

In the design, provisions will be incorporated to make this integration possible. This means that the regasification unit will be designed with the ability of using waste heat from the co-generation plant and/or petrochemical plant as the heat source. The optimal design for this heat integration is not yet determined. The natural gas pipeline will have at least two additional

valved tie-ins with blinds to the natural gas transport pipeline of the co-generation plant and the petrochemical plant. Additional information can be found in Section 2.5.2 of the provincial EA Report (AMEC, 2006).

Where it is feasible to do so, the Proponent will incorporate other eco-efficiency practices into the design, construction and operation of the facility (i.e., application of the Project's LNG "cold potential" in context of the power generation or the extraction of ethane and propane) (Cote and Wright, 2006).

2.2.4.7 Public Information / Community Liaison

Records were retained of the results of public consultation and information sessions, detailing comments and concerns that were raised, how they were addressed, and what commitments were made by Keltic. The records also document the dates and formats for public consultation undertaken, the material presented to the public, and the opportunity provided for receiving public input. The summary tables provided in Appendix 4 shows how the input from consultations was used in the EA and what changes to the development proposal were made as a result of comments provided.

Keltic will develop a public information and communications plan to provide ongoing Project information to area residents, First Nations, businesses, and users of Stormont Bay, including other individuals or groups that express a specific interest in the Project. The program will include an active website, community newsletters, and open houses at key Project milestones as well as designated communications officials within Keltic and an information booth at the facility upon completion.

Consultation with the public has been a significant component of this comprehensive study. More discussion is included in Section 3.2 within this document.

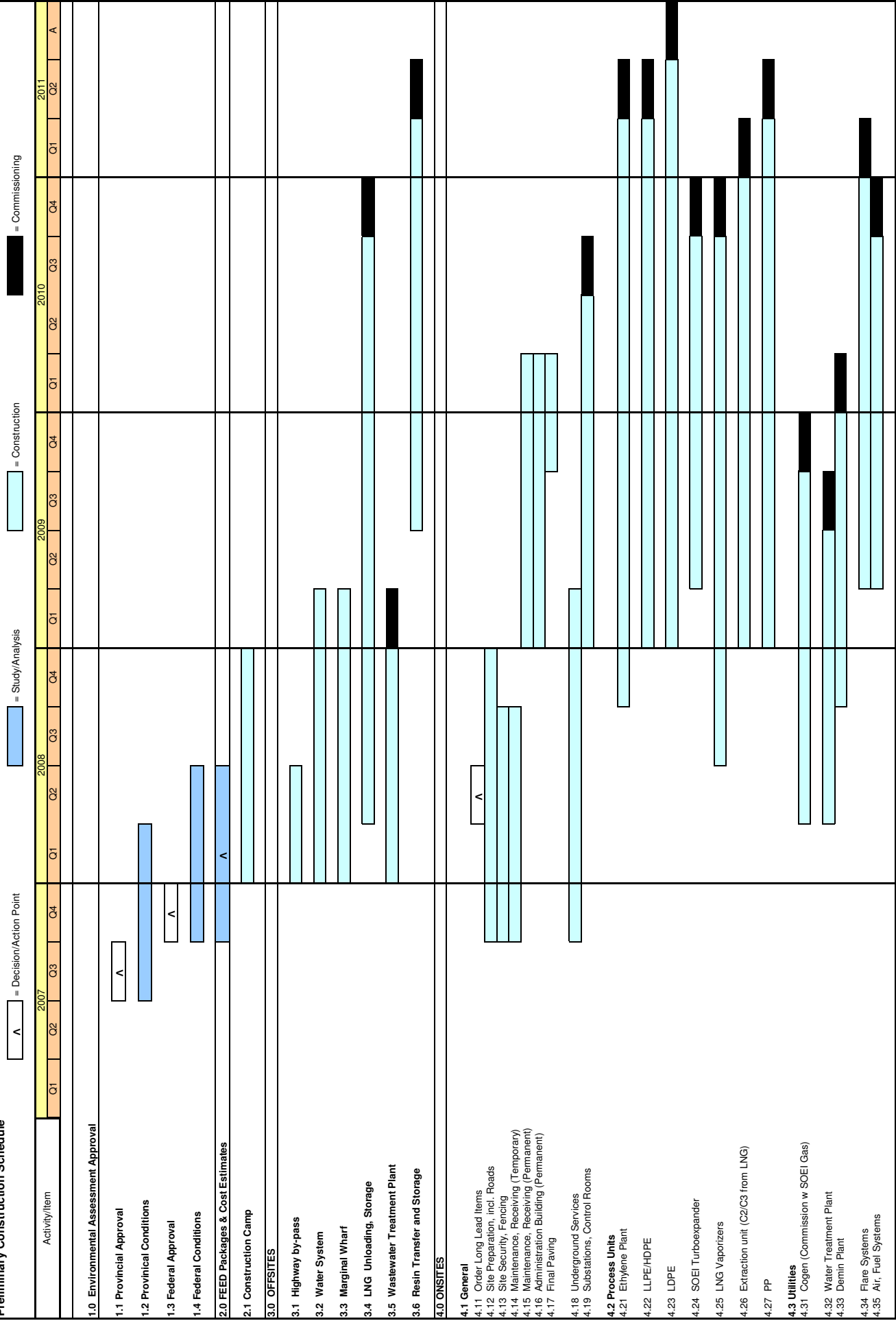
2.2.5 Construction

The sequence of construction would see the overall site activities start with the general site preparation, marine construction, and site utilities. Subsequently, the LNG facilities and the petrochemical construction would start followed by construction of the co-generation plant and the storage and shipping areas. The construction schedule is given on Figure 2.2-7.

All construction activities will be preceded by full construction planning, including FEED, the EMP (including specific EPPs), and health and safety plans, as well as obtaining all necessary approvals and permits from regulatory agencies. Necessary pre-construction surveys and baseline monitoring will also be completed prior to construction.

The following sub-sections briefly outline the general activities associated with construction of the development proposal. Environmental management is integral to each activity and will be managed under the EMP. More detail on the proposed construction activities can be found in Section 2.4 of the provincial EA Report (AMEC, 2006).

**Keltic Petrochemicals
Preliminary Construction Schedule**



2.2.5.1 General

Prior to construction of any specific components of the KDP, several common features need to be constructed. These are supporting pieces of infrastructure to facilitate the Project being completed. They include:

- An access road to the KDP site via rerouting of Highway 316, upgrading of Gold Brook Road and construction of roadways and parking areas within the KDP site.
- A temporary construction work camp, if required, as well as an administration centre to be provided on-site with temporary power, water, wastewater, and solid waste facilities.
- Material storage locations will be provided for materials, including concrete, steel, specialized metal products, electrical wiring and mechanical process piping, as well as diesel, gasoline and fuel.
- Construction staging areas will be prepared on-site within the site boundary or off-site on approved suppliers' property.
- Temporary site services, including power, storm-water management, wastewater, and waste management.

2.2.5.2 LNG Facility Including Marine Terminal

The construction of the LNG facility and the associated marine terminal includes the following major components:

- Designated temporary material storage and laydown areas established within a secure development envelope.
- Security and safety measures associated with ports and marine facilities, including fencing, gates, signage, and lighting.
- Activities associated with site preparation within the development envelope, including storm-water management, clearing, grubbing, and buffering of the small intermittent watercourse in the northeast corner of the site.
- Levelling and grading the site within the development envelope, including earth moving, blasting, crushing, and screening of rock, and backfilling.
- Installation of foundations for major equipment and buildings with associated underground services.
- Marine construction of LNG Terminal constructed of pipe pile mooring piers and berthing dolphins (does not involve dredging).
- Installation of pipe lines associated with the facility.
- Stabilization of shoreline with a blanket of armour stone above the high water mark, as required based on geotechnical investigation, for the placement of the LNG tanks.
- Installation of equipment, storage tanks, pipelines, and all ancillary equipment, that will be delivered by marine or road transport as appropriate given its weight and volume.
- Erection of buildings for site administration, maintenance, and processing.

- Management of wastewater and wastes, including any hazardous material, such as petroleum, oil, and lubricants.
- Management of any contaminated soils and/or acid producing rock, if any, as determined by EMP.
- Rehabilitation of temporarily used sites, including dismantling, removal and proper reuse/disposal of temporary facilities and wastes, and the stabilization of exposed surface by landscaping.

2.2.5.3 Petrochemical Facilities

Commencement of construction of the petrochemical complex will follow that of the LNG complex; however, both will proceed in parallel for some duration. After site preparation for the petrochemical / LNG complex, the activities will shift to the fabrication and erection of the major industrial components and steel framed buildings.

Key construction and site development activities are similar to many of those for the LNG facility and generally include: site clearing and grading; establishing construction laydown areas; major foundation and underground utilities installation; equipment installation; and commissioning and testing.

2.2.5.4 Marginal Wharf

No dredging is anticipated in the construction of the marine facilities. Cranes fixed atop floating or spudded barges will be used for site preparation for the marginal wharf. The storage area at the marginal wharf will be formed by backfilling rock excavated from the Project site area. Rock sources on site will be tested for acid generating potential and metals that may be considered deleterious to water quality and fish habitat.

Construction of the facility will be with pre-cast concrete caissons. The first phase of their construction will take place at a temporary location, most likely on land at an existing launching yard in the Strait of Canso. Partially completed caissons will be floated into place where the top lifts will be completed. Their placement will be on a granular mattress placed on the seabed at such location to provide the required draft for vessels. This will eliminate the need to dredge and dispose of seabed materials.

The area behind the cribs will be filled with filter layers of granular material (stone). The stone will range from coarse at the bottom to a smaller size at top to above the tidal zone. This material will be placed from land, working seaward to the cribs. Due to the heavy loading from the storage facilities, the subgrade needs to be well constructed. Till may be used for fill up to the top of subgrade at the inland area. The subgrade will be followed with base material before asphalt paving.

A section and profile of the wharf construction is shown in Figure 2.2-8.

The environmental and socio-economic issues associated with construction of the marginal wharf are those typically associated with working in a marine environment, including potential effect on water quality and disruption to fish or fish habitat.

2.2.5.5 Co-generation Facilities

This is a power plant incorporating gas turbines and heat recovery steam generators that will be constructed to provide power to the facility. Key construction and site development activities are similar to many of those for the LNG facility and generally include: site clearing and grading; establishing construction laydown areas; major foundation and underground utilities installation; equipment installation; and commissioning and testing.

The environmental and socio-economic issues associated with construction of the co-generation facilities are generally the same as those for construction of the petrochemical facility.

2.2.5.6 Utilities and Support Facilities

Utilities, infrastructure, and support systems dedicated for the KDP will consist of: PLC based control system; emergency shutdown system; hazard detection system; security system and facilities; fire response system; natural gas flare; plant air, instrument air and nitrogen systems; electric power distribution and control systems; storm-water system; two control buildings, one for the process and one for berthing of tankers; access roadways and service buildings; fire and emergency access roads; service water and drinking water systems (Meadow Lake Impoundment); administration and service buildings; and sanitary wastewater system. The process buildings that will be provided on site include: boil-off gas (BOG) compressor shelter; main electrical substation building; jetty electrical substation building; and firewater pump house.

The environmental and socio-economic issues associated with construction of the utilities and support facilities are generally the same types as those for construction of the Project and the overall KDP.

2.2.6 Operation and Maintenance

The following sub-sections briefly outline the operations and maintenance for the main components of the KDP.

Environmental management is integral to each activity and will be managed under the EMP. More detail on the proposed operation and maintenance activities can be found in Section 2.5 of the provincial EA Report (AMEC, 2006).

2.2.6.1 LNG Facility Including Marine Terminal

LNG is unloaded from dedicated LNG carriers at one of the two berths on the jetty via a set of unloading arms. Next, the LNG is transferred via LNG transfer lines along the jetty to the LNG storage tanks. LNG is then transferred to the process area using in tank pumps. At the process area, the pressure of the LNG is increased to the required pressure level for send-out purposes and the LNG is vapourized to the gaseous state by submerged combustion vapourizers. Part of the LNG will be extracted for the generation of ethane and propane as feedstocks for the adjacent petrochemical plant. Additionally to feedstock generation, extraction results in a modification of the quality of LNG. Depending on the sources of LNG, LNG can be rich in liquids or lean. For some LNG cargoes, this modification (i.e. extraction of ethane and propane) is required to meet the M&NP pipeline quality requirements. However, with lean cargoes, no adjustment may be required. An alternative to extracting the liquids, such as in the case when

the petrochemical facility cannot accept the liquids, is that the LNG can be brought to pipeline specification by means of nitrogen injection.

LNG delivery will be via LNG tankers. At the two-vessel proposed output scenario assuming a lower end of tanker capacity of 160,000 m³, one LNG tanker will arrive at the LNG Terminal every 3.5 to 1.8 days. This will result in a total of 105 to 210 LNG tankers per year. This number can be marginally reduced if larger capacity LNG tankers (250,000 m³) are made available. (5.4 to 2.7 days).

The arrival and departure of LNG vessels will be compliant with the Atlantic Pilotage Authority Regulations. Tugboats, a pilot boat and navigation and berthing aids will be used, as appropriate. Refuelling of tankers and other transport and support vessels will not be done at the proposed Keltic facilities, or within the area of Stormont Bay.

LNG facilities are classified as industrial sites and must meet applicable standards, codes, and regulations, which are enforced by federal, provincial and municipal jurisdictions. The CSA, a national standards organization for developing public safety standards in Canada, has a specific standard for LNG Production, Storage and Handling (*CSA Standard CAN/CSA Z276-01*). The Standard establishes essential requirements and minimum standards for the design, installation, and safe operation of LNG facilities.

Additionally, the LNG industry follows regulations, codes and standards established by other organizations such as the SIGTTO, the Gas Processors Association, the National Fire Protection Association (NFPA), and the IMO.

All ballasting activities will be accomplished in accordance with the Ballast Water Control and Management Regulations, the US Coast Guard requirements and with the International Convention for the Control and Management of Ship's Ballast Water and Sediments. LNG vessels will be brought in fully loaded and reballasted offshore.

2.2.6.2 Petrochemical Facilities

The overall scheme of the petrochemical facilities is depicted in Figure 2.2-1. This schematic indicates the interface between the petrochemical plants and the LNG Terminal, LNG storage, extraction plant and power plants.

As explained in Section 2.2.2.2, the petrochemical complex is based on the production of olefins, specifically ethylene and propylene, from an ethylene plant. This ethylene plant produces olefins from the steam cracking of fresh ethane and propane feedstocks. Specific components of the petrochemical complex include:

- cracking of ethane and propane via an ethylene unit with the associated feed preparation, cracking furnaces and intermediate storage;
- production of LLDPE and HDPE pellets;
- production of LDPE pellets;
- production of polypropylene pellets;
- flare and thermal oxidizer;

- sea water cooling system;
- water and steam supply;
- air emissions control system to address nitrous oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOCs) emissions;
- wastewater treatment, including such wastes as sanitary wastewater, oily wastewater, benzene and toluene contaminated wastewater, spent caustic effluent and non-oily process water; and
- incineration of wastes, including waste stream spent caustic, slop oil from ethylene unit, spent gasoline wash from ethylene unit, tars from ethylene unit, flare knock out (KO) drum blowdown, waste polymeric materials, dewatered biological sludge; and laboratory wastes.

Import of the majority of catalysts and chemicals and export of majority of products will be done via the marginal wharf.

2.2.6.3 Marginal Wharf

Materials handling and logistics for the marginal wharf facilities will cover a variety of activities in support of the petrochemical operations and continuing site activities.

Activities planned for the marginal facility include as a minimum the following:

- a dewatering and drying facility for the polyethylene and polypropylene pellets that were slurried from the polyethylene and polypropylene production plants;
- pneumatic conveying system to transfer dried pellets into blenders and storage silos;
- storage silos for the polyethylene and polypropylene resins – quantity of 160 shown on the conceptual layout;
- pneumatic conveying systems to unload the silos;
- traveling conveying lines to bulk load the polyethylene and polypropylene resins into container ships;
- operations centre/control room/substation for all marginal wharf operations and security;
- utilities area for fire water pumps, plant and instrument air;
- waste water treatment facility;
- warehousing facility (marine, safety and process support equipment & consumables); and
- miscellaneous support facilities to be determined during the FEED phase.

Other products will also be maintained through the product storage and shipping logistics area including production byproducts, feedstocks and catalysts. Handling of the liquids and gases will be through a designated loading arm transfer station situated on the marginal facilities. The

product transfer and storage process (which will be developed through the FEED phase) will include as a minimum:

- ethane and propane refrigerated and regasification storage;
- ethylene and propylene refrigerated storage;
- hexene and butene storage and feed systems for LLDPE and HDPE units;
- chemicals and catalyst storage; and
- byproduct storage including fuel oil, hydrogenated gasoline and mixed C4s.

The marginal wharf is required for receipt and shipment of products and by-products in support of the petrochemical plant and for receiving supplies and equipment during construction of the entire complex. It will be constructed as one of the first elements of the KDP. It will function as follows:

- dockside space for product container ship(s);
- dockside space for ships delivering operating plant supplies/other feedstocks;
- dock side space for tugs and pilot boats;
- customs and immigration facilities for all shipping;
- roll off dock for unloading of equipment and materials from ships during construction; and
- containment structure for product servicing reclamation area.

The north and western faces of this facility will be designed for berthing tugs, the pilot boat, supply ships, and product carrying ships. The eastern face will be enclosed behind an armour stone blanket, with the LNG transfer pipeline extending from the service trestle enroute to the LNG storage site along its deck. Navigation and berthing aids will be provided.

In support of the product output, marine traffic for the proposed Keltic facility will include the transshipment of feedstocks, product components, and byproducts. These shipments will increase traffic levels by approximately 200 additional vessels entering the port per year. This means a yearly traffic flow into the harbour of 300 to 400 LNG and product carriers. The total number of ships accessing the zone equals approximately half the number of moves presently managed through the pilot authority. This number does not include the movement of harbour tug, offshore and inshore fisheries vessels or vessels of less than 100 m length overall.

2.2.6.4 Co-generation Facilities

The electric power for the Keltic Facility will be generated in the central utility area using a combined cycle arrangement and will have a nominal rated capacity of 200 MW. The electricity will be generated at 35 kilovolt ampere (KVA), three phase and 60 hertz (Hz). This will enable possible connection to the Nova Scotia Power Inc. (NSPI) grid for purchase of incremental power required by the site and to provide some backup. This will be further investigated during the FEED phase. As the FEED phase is initiated, it is likely that power and process steam efficiency gains will be realized as the overall use in the various plants is integrated. This may result in some modifications to the co-generation design.

In addition, sufficient supply water will be required to meet the process requirements of four heat recovery steam generators with an expected output of approximately 60 metric tonnes (t) of steam per hour each. Water input to support this process will be taken from a closed looped water cooling system. Water make-up required to support this system and provide daily industrial needs will be drawn from the Meadow Lake impoundment.

2.2.6.5 Utilities and Support Facilities

The operation and maintenance of utilities and common support facilities is integral to the ongoing activity of the KDP. The primary activities include:

- operation of dam and intake at service water supply (Meadow Lake) and general monitoring and management;
- wastewater and storm-water management and treatment;
- municipal solid waste, construction and demolition debris and hazardous waste management;
- maintenance of road network;
- specific support systems to petrochemical plant and LNG facilities;
- maintenance shops, receiving and stores;
- plant security and communications;
- administration and laboratory facilities;
- custody metering stations;
- shipping and receiving terminals (i.e., marginal wharf and LNG Terminal); and
- activities associated with emergency medical facilities, fire house and fire truck, and helipad.

Specific support systems to the petrochemical plant and LNG facilities include:

- Plant air flows from the plant air receiver to the utilities area plant air distribution header. Plant air is distributed to users and utility stations within the utilities area and also connects to the interconnecting piping plant air header to the rest of the complex.
- Nitrogen is supplied to the utilities area distribution network from the interconnecting piping distribution header. Nitrogen is distributed to users and utility stations within the utilities area.
- Very high pressure (VHP) steam is distributed within the utilities area.
- Low pressure steam is distributed within the utilities area.
- Instrument air flows from the instrument air receiver to the utilities area's instrument air distribution header, where it is distributed to users within the area and also connects to the interconnecting piping instrument air header for distribution to the rest of the complex.

- Demineralized water is supplied to the utilities area distribution network from the demineralized water tanks. The demineralized water is distributed to users within the utilities area and to the rest of the complex.
- The main source of fuel gas for the site will be natural gas provided by the pipeline network and also the olefins unit. During normal operation, the fuel gas users will be from various buildings, polyethylene unit, flare, incineration unit and the boilers in the utilities area.
- Caustic soda solution is provided to the utilities header from storage within the utilities area.

All chemical and petrochemical storage activity will be accomplished in accordance with the guidelines set-out in CSA Z276-01, 'Liquefied Natural Gas (LNG)s – Production, Storage, and Handling and in compliance with NSDE Code of Practice – LNG Facilities.

2.2.7 Future Modifications and Decommissioning

The nominal design life of the process facilities will be twenty years. It is customary that with maintenance, technical upgrading, and replacement, these facilities continue to operate well beyond the initial design life.

Should any part of the KDP become obsolete, be decommissioned or taken out of service for whatever reason, decommissioning and reclamation of the site and facilities would be undertaken in accordance with the regulatory process at the time. At that time, a site reclamation plan would be developed and regulatory approval obtained before work would commence. The reclamation plan would consider any ongoing or future industrial use to which the site may be useful for or dedicated to and consider the baseline conditions that existed before site development took place. Any portion of the decommissioned facility or part thereof that may be of subsequent use for industrial development will be taken into consideration in the decommissioning plan.

Decommissioning and disposal of all equipment, material, and process units will consider environmental procedures for such disposal. A plan complete with schedule for dismantling and disposal, including location of disposal will be provided for approval at that time.

The plan will specify decommissioning objectives, approach, activities, schedules, and site rehabilitation and will be developed in consultation with the municipality and regulatory agencies. In particular, objectives of the decommissioning plan will be to:

- identify applicable municipal, provincial, and federal regulations and standards;
 - identify and consider objectives of local municipality and adjacent landowners;
 - define the decommissioning objective;
 - protect public health and safety;
 - rehabilitate the plant site in accordance with regulatory standards;
 - reduce or eliminate potential adverse environmental effects beyond decommissioning;
- and

- develop a material management strategy to maximize reuse/recycling options on and off-site or via a material processing facility, and to avoid/minimize disposal in approved landfills.

As a minimum, the plan objectives will define the removal of all hazardous substances, production equipment, and storage tanks. Should the plan objective be the complete decommissioning of the plant site, activities will include the removal of all buildings, roads, storage facilities, and site services. Upon removal of all infrastructures, the site will be rehabilitated. Disposal of waste will be to NSEL and regulations at that time and place of disposal.

Prior to removal of the buildings and facilities, all remaining products and stored materials will be removed from the site in accordance with provincial and federal regulations and guidelines pertaining to handling of hazardous and non-hazardous materials. Materials will be sold to markets or properly disposed of through licensed waste operators.

If no suitable after use is identified, removal of all buildings and infrastructure will be undertaken in full compliance with existing regulatory standards. A demolition permit will be obtained from the municipality. Contractors will be required to follow applicable regulations for material separation, disposal at licensed waste sites, and sales to recycling markets.

The removal of products and storage materials, the demolition of the buildings and removal of infrastructure will be subject to environmental supervision and inspection for compliance with decommissioning plan and regulatory standards.

2.3 SCOPE OF PROJECT

DFO and TC each have a responsibility to ensure that an EA is conducted in accordance with CEAA. As outlined in the Act, Section 15(1), the scope of the Project to be assessed is determined by the RA.

Each of the two RAs has scoped a different Project; however, both Projects are subject to comprehensive study EA processes. As defined in the following sub-sections, the Project scope identified by DFO falls within the Project scope identified by TC.

DFO and TC will work together to conduct a single federal environmental assessment process that will allow both RAs to fulfill their respective responsibilities under CEAA, in a unified non-duplicative manner.

The specific scope of each RA is defined below.

2.3.1 Transport Canada's (TC) Scope of Project

The Project has been scoped by TC to include the construction, operation, maintenance, modification and decommissioning of the following components:

- LNG Terminal;
- Marine transfer pipelines;

- LNG storage tanks;
- Marginal wharf;
- Any temporary marine facilities and structures and equipment that are connected with the movement of goods between ship and shore;
- Regasification plant; and
- Shipping within 25 kilometres (km) of Country Island.

As outlined in the Scoping Document (May 24, 2005), TC scoped the Project based on the anticipated NWPA section 5(1)(a) trigger under the Law List Regulations pursuant to CEAA. This initial scope included all of the above components but shipping within 25 km of Country Island. Based on subsequent consultation with the public in accordance with section 21(1) of CEAA and consultation with expert federal authorities, TC amended its original scope to include shipping within 25 km of Country Island.

2.3.2 Fisheries and Ocean Canada's (DFOs) Scope of Project

DFO scoped the Project to include:

- Construction and operation of the marginal wharf.

The scope of the marginal wharf operation does not include shipping, but does include docking and deberting of vessels.

This scoping is based on the anticipated *Fisheries Act*, section 35(2) trigger under the Law List Regulations pursuant to CEAA.

Based on consultation with the public in accordance with section 21(1) of CEAA and consultation with expert federal authorities, DFO decided that their scope of Project will remain unchanged.

2.4 PROJECT NEED / ALTERNATIVES ASSESSMENT

Consideration of the purpose and need for the Keltic Project is a requirement under CEAA. Similarly, the Proponent is required to demonstrate an assessment of alternatives to the Project itself and assessments of the means of carrying out the Project. The Proponent has used these as decision-making tools from the Project's inception; that is, it has been used as a Project planning tool as opposed to an impact assessment tool.

As defined by the Agency in their October 1998 Operational Statement, consideration of need/purpose, alternatives to and alternative means of the Project will also help the RAs "to establish the conditions under which certain effects may or may not be justified under the circumstances, should such a determination be subsequently required."

Consideration of the need/purpose and the alternatives were made for the KDP development proposal as a whole, whereas alternative means of carrying out the Project were assessed within the scope of this comprehensive study as defined by the RAs.

2.4.1 Project Need / Purpose

Forecasts indicate that natural gas demand in eastern Canada and the Northeastern USA will grow over the next several years and that LNG will be an important part of the energy supply chain. Similarly, the demand for petrochemical products, such as polyethylene and polypropylene, continues to grow in North America as the use of plastic in many industries increases. This provides a need or opportunity for development of an industrial complex that provides both natural gas as well as petrochemical products to satisfy future market demands.

As natural gas is a cleaner burning fuel than some other fossil fuels, an LNG regasification terminal in Nova Scotia will provide supply options to existing energy consumers in Nova Scotia and elsewhere in North America to help reduce air pollution.

The primary purpose of developing a world class petrochemical industry in Nova Scotia is to create added value to the natural gas found offshore Nova Scotia. In fact, the Nova Scotia Energy Strategy (NSDE, 2001) outlines a number of objectives that are addressed by this Project:

- to set the stage of petrochemical industrial development by ensuring natural gas and natural gas liquids supplies are available on a commercially competitive basis;
- to set the stage for expanded industrial, commercial, and residential use of gas and gas liquids in Nova Scotia;
- to create a world-class energy sector that achieves sustainable economic development with high social and environmental standards; and
- the energy needs of the Nova Scotia marketplace are best served by having a diversity of reliable energy sources.

The joint Federal Provincial Environmental SOEP Panel felt that the significant long-term impact of that Project for Nova Scotia and Canada would be found in the area of “other benefits” rather than in direct expenditures for labour and material. The obvious sources are derived from use of other products. The liquids alone could form the base for a provincial petrochemical industry. The SOEP Panel recommended that the Province examine options for an industrial strategy that would include hydrocarbon-based development saying that “if SOEP is truly a seed project for the petrochemical industry then all of the available physical and human resources have to be brought together to make the seed grow.”

To meet the growing demand for natural gas, polyethylene, and polypropylene, Keltic proposes to import LNG, extract the natural gas liquids from the LNG (primarily ethane and propane), convert the liquids into various grades of polyethylene and polypropylene, and export the residual natural gas, polyethylene and polypropylene to customers in Eastern Canada and the Northeastern USA. Keltic will require a co-generation plant to provide power to the Project. Additional utilities and common support facilities will also be required, including a process water supply reservoir in Meadow Lake, a water treatment plant, a wastewater/storm-water collection & treatment system, central administration/maintenance buildings, and emergency medical facilities/fire station/helipad.

The KDP development proposal 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; the establishment of the KDP is expected to contribute to a reversal of this trend and to improve the overall employment rate from both a local and provincial perspective.

2.4.1.1 Conclusion

Based on above discussion, it can be concluded that the KDP development proposal responds to a public need and market opportunity and follows a defined purpose. The need for long-term hydrocarbon-based development with the development of a petrochemical industrial complex has been identified by the Province of Nova Scotia in the 2001 Energy Strategy and in the SOEP Panel (1997), as well as welcomed by the public and municipalities for its economic benefit and supporting infrastructure. Creation of a value-added industry utilizing the existing offshore infrastructure and supplementing with LNG imports creates long-term sustainable economic benefits to the local area of Goldboro and the Province.

Each component works together to make the development proposal technically and economically viable. The primary purpose for each of the four main components is summarized as follows:

LNG regasification facility:

- Allows natural gas to enter North American market and meet strong demand for cleaner energy sources.
- Provides critical mass of feedstock to petrochemical plant.

Petrochemical plant:

- Allows the creation of value-added product from the offshore industry via output of polyolefins.
- Satisfies a key strategy objective of the Nova Scotia Energy Strategy (2001).
- Meets global demand for plastic resins, such as polyethylene and polypropylene.

Electrical co-generation plant:

- Provides sufficient magnitude of power supply and allows backup power.
- Uses principles of eco-efficiency by integrating components to produce electricity at lower economic and environmental costs.

Utilities and common support facilities:

- Support the requirements of all other Project components, including water demand.

2.4.2 Alternatives to the Project

The purpose of the Project as defined by the scope of this CSR is directly linked to the overall KDP. The proposed development of a world class petrochemical industry in Nova Scotia was based on the goal of creating added value to the natural gas found offshore Nova Scotia. The Keltic petrochemical plant would require a natural gas supply that could provide sufficient feedstock needs such as ethane, propane, and butane. In addition, the natural gas source would be used to fire the various petrochemical processes, such as cracking of hydrocarbons under VHP and heat as well as firing a co-generation plant to produce the electrical energy requirements for the development proposal.

2.4.2.1 Alternatives to LNG and LNG Importation

The alternative to importation of LNG would have been to continue to develop and export the natural gas which was expected to be available offshore Nova Scotia at the height of exploratory work being undertaken in the late 1990s. The Pre-Feasibility Study carried out for the petrochemical plant identified the potential for offshore Nova Scotia natural gas resources to provide the total required feedstock for 500,000 metric tonnes per year (t/year) of both ethylene and polyethylene. The constraint was the time required to develop those offshore resources.

In the absence of a sufficient supply of feedstock from the Nova Scotia offshore, a source of feedstock would be to import LNG by special vessels designed for this purpose. It is estimated that the Project will utilize between 25 and 150 million cubic feet per day (mmcf/d) (about 0.7 to 4.3 million cubic metres per day (m³/day)) of natural gas and natural gas liquids obtained from the imported LNG in its proposed petrochemical plant, co-generation electrical power plant, and supporting infrastructure, thus overcoming the current shortfall. During normal operating conditions consumption would be in the 125 to 150 mmcf/d range and during periods of petrochemical plant shutdown, 25 mmcf/d would be consumed by the supporting infrastructure.

The potential to use compressed natural gas (CNG) was considered as an alternative to LNG; however, CNG is stored at VHP and for reasons of safety would require a much more stringent inspection and maintenance regime. Also, CNG requires greater storage area since it cannot be compressed to the same extent as LNG, although major technical research is ongoing to improve CNG storage options. One of the potential benefits of using CNG is that the regasification process would not be required to produce natural gas for market.

2.4.2.2 Alternatives to the Marginal Wharf

There are several alternatives to transporting feedstock to, and product from, the marginal wharf.

Road

Although possible in other settings, the use of road transport for product shipment is not feasible from Goldboro due to the distance from the markets for the product; the volume of product to ship; and the capacity of the local road infrastructure.

Rail

The area is not served by rail. A dedicated rail option was examined in the early stages of the Project but the capital cost estimated for construction of a new railway was considered high. As such, this alternative is not considered feasible.

Ship

Given the technical and economic constraints associated with road and rail shipment to and from the site, shipment of feedstock and product to and from the facility was deemed the most economically feasible alternative as it permits more direct transportation of products to the markets. The alternative considered that a marginal wharf structure would be required for the site. This is considered feasible from technical and cost perspectives.

The use of shipping to transport the majority of the product was determined to be the only feasible method for transport and was forwarded for detailed EA in the CSR. The major portion of the petrochemical facility production will thus be shipped out from the marginal wharf. The wharf is also the site of the storage of the resins. The resins that will be shipped by highway will also originate from the storage at the marginal wharf.

Further details on shipping are provided in relevant sections of the provincial EA Report (AMEC, 2006).

2.4.2.3 Conclusions

Based on the above discussion, it is concluded that the identified alternatives to the Project do not meet the objective(s), are not economically feasible, are less preferred from an environmental perspective, or are outside of the Keltic's corporate mandate. The "Do-Nothing" or "Null-Alternative" to the development proposal would be to continue to export natural gas presently available from offshore Nova Scotia, as well as any new sources developed offshore. Without the importation of LNG and the petrochemical plant, Nova Scotians will not see any value added to its natural gas industry.

Offshore Nova Scotia natural gas projects have and can create considerable economic benefit to Nova Scotia during development and production. Similarly, the overall KDP development proposal will create significant economic benefits during construction of the components and provide sustained economic benefits during operations. The petrochemical component of this development proposal provides new value added industry to Nova Scotia and is a long term alternative to Nova Scotia being solely an exporter of natural gas.

2.4.3 Alternative Means of Carrying Out the Project

This section provides a discussion of other methods that may be used to implement the Project. This involved the identification and evaluation of alternatives to specific Project components within the scope of the comprehensive study. Additional information on assessment of alternatives outside of the RA defined scope can be found in Section 6.0 of the provincial EA Report (AMEC, 2006).

The alternatives discussed in the following sections were initially assessed for technical and economic feasibility. For the alternatives that were determined to be feasible, the environmental effects were reviewed and compared.

The technical and the economic feasibility evaluations, as well as the identification of environmental effects, were conducted on a qualitative level by environmental specialists based on professional judgement. Technical and economic feasibility were employed as screening criteria. Alternative methods that were identified to be technically and economically feasible were subsequently evaluated with respect to their potential environmental effects.

Alternative methods that were considered to have the obvious potential for greater adverse environmental impacts than other alternatives were eliminated from further assessment. In situations where no such decision could be made without further investigations, the methods in question were carried through the comprehensive study.

2.4.3.1 LNG Marine Terminal

Two methods of construction were evaluated for the LNG marine terminal, which will be designed for future berthing of two LNG tankers simultaneously.

Alternatives

Pipe Piling Construction

One alternative for the LNG Terminal construction utilizes pipe piling driven into the seabed. Marine habitat effects are limited with this type of construction. For this alternative, the berthing draft is available at the site without requiring dredging and sea disposal of dredged spoils. This alternative is technically suitable and costs are considered high.

Concrete Caissons on Granular Fill

Another alternative would be placing engineered fill on the seabed with the terminal constructed of concrete caissons. Placement of granular fill on the seabed would result in a larger area of marine habitat disturbance in comparison to pipe piles. Similar to pipe piling, this alternative would not require dredging. This alternative is technically suitable and costs are considered high.

Environmental Effects

Environmental effects associated with the pipe piling construction are considered to be less than that of Concrete Caissons on Granular fill. While both options are similar in technical and cost considerations, there is less area of marine floor disruption required. As such, construction of LNG marine terminal using pipe piling construction was carried forward for detailed EA in the CSR.

Summary

The LNG marine terminal is proposed to be constructed of pipe piling construction. The superstructure will consist of a combination of structural steel and concrete. Further details of

the preliminary design and conceptual plans are provided in relevant sections of the provincial EA Report (AMEC, 2006).

2.4.3.2 LNG Storage Tanks

There are three types of LNG storage tanks are used in the industry. These were investigated as alternatives.

Alternatives

Single Containment

This type involves a single primary container designed to contain the LNG with a secondary outer shell to contain the insulation but not the refrigerated liquid if there is a failure of the inner tank. These tanks are surrounded by a dyke designed to contain 100% of the tank volume in the event of a spill and are most suitable where there is a large area of available land. This alternative is technically suitable and costs are considered moderate. This alternative requires a large thermal exclusion zone which may have restrained the area available for the petrochemical plant and co-generation facility.

Double Containment

A double containment tank is designed such that both walls are capable of containing the refrigerated liquid. A secondary containment is provided by a reinforced concrete wall. The space between the tank and concrete containment presents safety and maintenance issues. This alternative is technically suitable and costs are considered moderate. This alternative requires a large thermal exclusion zone which may have restrained the area available for the petrochemical plant and co-generation facility.

Full Containment

A full containment tank is designed such that both inner and outer tanks are capable of containing the refrigerated liquid. The advantage of full containment is that the outer concrete wall has a higher structural integrity and is able to contain the full capacity of the tank. This alternative is technically suitable and costs are considered high, however, the thermal radiation and vapour dispersion exclusion distances are considerably reduced.

Environmental Effects

The risk to failure and spillage is the highest for single containment LNG tanks as the secondary outer shell does not contain the refrigerated liquid. While there is less risk with the double containment alternative, it is substantially reduced with the full containment option. As such, the thermal radiation and vapour dispersion exclusion distances are the lowest with this option as it provides the least risk of malfunction; therefore, this option was carried forward for detailed EA in the CSR.

Summary

The use of tanks with a steel outer wall would negatively affect the achievable unloading rate resulting in LNG tankers being berthed longer and therefore reducing cost effectiveness. The use of concrete tanks would address this issue. Also, the structural integrity of a concrete outer tank is substantially higher than with a steel tank. In the case of concrete, potential failure of the outer wall due to accidental spillage is not an issue. The codes controlling LNG plants recognize this fundamental difference between the two types of tanks, although tanks with a concrete outer wall are treated more favourably than tanks with steel walls. Therefore, Keltic has optioned for the full containment tank although costs are higher. Further details on full containment tanks are provided in relevant sections of the provincial EA Report (AMEC, 2006).

2.4.3.3 LNG Regasification Facilities

For the vaporization, i.e., changing the LNG from a liquid state back into a natural gas, two principally different alternative methods are available.

Alternatives

Open Rack Vaporization (ORV)

This alternative is common worldwide and uses seawater to heat and vaporize the LNG; however, if the seawater temperature is below approximately 5°C, Open Rack Vaporizations (ORVs) are usually not practical because of seawater freezing within the vapourizing unit. Due to the high cost of the seawater ORV, installations also tend to have a higher installed capital cost.

Given the potential for prolonged winter weather resulting in local seawater temperatures below 5°C, ORV technology at the proposed LNG facility is not considered technically feasible.

Submerged Combustion Vaporization (SCV)

Submerged Combustion Vaporizers are also widely applied in LNG vaporization in the USA, Europe, and Asia. It is often selected for its inherent safety and high operating efficiency. Submerged combustion vaporizers send out gas as a fuel for the combustion that provides vaporizing heat. The submerged combustion vaporizer installations tend to have a higher operating cost because of the fuel charge which in the case of this Project has been assessed in terms the potential revenue loss from not selling the send out gas versus the efficiencies gained in using the gas on site.

The SCV system does not require on-going water requirements with the exception of an initial fill. In addition, submerged combustion vaporizers have a quick start up ability, tolerance for load fluctuations, fuel flexibility, and high thermal efficiency.

Environmental Effects

ORV technology was deemed neither technically nor economically feasible and as a result, the potential environmental effects were not assessed. The submerged combustion vaporizer

technology was determined to be the only method for vaporization and was forwarded for detailed EA in the CSR.

Summary

The proposed Project will utilize submerged combustion vaporizer technology in the regasification facilities. Further details of the regasification are provided in relevant sections of the provincial EA Report (AMEC, 2006).

2.4.3.4 Marginal Wharf

Two methods of construction are being evaluated for the marginal wharf, which will provide area for receipt and shipment of products and by-products in support of the petrochemical process.

Alternatives

Wharf Construction with Precast Concrete Caissons (also known as Concrete Cribs)

The currently presented construction method involves a rock mattress comprised of rock removed from the plant site will be laid on the existing seabed along the periphery of the wharf as shown in Figure 2.2-8. The rock will be deposited at the desired locations by means of bottom discharge barges. Another alternative will be to deposit rock by means of grab buckets. In this operation, the grab bucket will be lowered to the sea bottom and the rock deposited at the desired location. The use of grab buckets will cause the least disturbance to surrounding marine environment, it is also extremely slow and may not be feasible for the entire area. Its use will be limited to the stretches of the mattress close to the shoreline. The caissons will most likely be precast on-shore at an existing facility in the Strait of Canso and floated to the site or precast on floating barges positioned close to the wharf. Subsequently, the caissons will be moved to their final location above the rock mattress, aligned and flooded gradually to ensure that they settle on the rock mattress at their intended positions.

Backfilling will commence after the installation of the caissons has sufficiently progressed. Beginning from the shoreline, the area enclosed within the caissons will be gradually backfilled in layers up to the elevation shown in using excess rock and other suitable back fill material produced from the grading of the plant site. The voids within each caisson will also be filled in with rock and other suitable material.

Silt curtains and debris booms will be deployed, if feasible and necessary, during wharf construction to minimize silting and turbidity in the surrounding marine environment.

Wharf Construction with Steel Sheet Piling (SSPs)

Steel sheet piles will be driven along the periphery of the wharf from shore based cranes as well as floating platforms as necessary.

Beginning from the shoreline, the area enclosed within the steel sheet piles will be gradually backfilled in layers to the required elevation using surplus rock and other suitable fill material produced from the grading of the plant site. As the filling behind the sheet pile progresses, tie back anchors will be installed to restrain the sheet piles against lateral deformation.

Silt curtains and debris booms will be deployed, if feasible and necessary, during wharf construction to minimize silting and turbidity in the surrounding marine environment.

It is noted that the final decision on the type of wharf construction will be based on the outcome of the geotechnical investigation for the proposed wharf site that will be undertaken during the planning stage.

Environmental Effects

The concrete caissons on granular mattresses construction alternative would result in the destruction and alteration of fish habitat in the footprint of the marginal wharf that will be addressed through a Fish Habitat Compensation Plan (FHCP) as required by DFO. Appendix 5 of this CSR contains a Draft FHCP. The SSP methodology does not require a rock mattress on the seabed and would have less fish habitat implications. No dredging, or disposal at sea is required for the marginal wharf as the location of the crib berthing face would be such that dredging and sea disposal of spoils would not be required.

Summary

In order to reflect a cautionary approach to the construction of the marginal wharf, the concrete caissons on granular mattresses method has been carried forward in the CSR. This approach would have the larger impact on fish habitat of the options examined. The potential to employ the sheet piling method, which would result in less disturbance of fish habitat, will be evaluated by the Proponent after further geotechnical investigations. Further details of the preliminary design and conceptual plans are provided in relevant sections of the provincial EA Report (AMEC, 2006).

2.5 SCOPE OF ASSESSMENT

2.5.1 Factors to be Considered

The RAs are required to consider the factors as defined in Section 16(2) of CEAA as part of this EA.

16. (1) *Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:*
- (a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;*
 - (b) the significance of the effects referred to in paragraph (a)*
 - (c) comments from the public that are received in accordance with this Act and the regulations;*
 - (d) measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and*
 - (e) any other matter relevant to the screening, comprehensive study, mediation or assessment by a review panel, such as the need for the project*

and alternatives to the project, that the responsible authority or, except in the case of a screening, the Minister after consulting with the responsible authority, may require to be considered.

(2) In addition to the factors set out in subsection (1), every comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:

- (a) the purpose of the project;*
- (b) alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;*
- (c) the need for, and the requirements of, any follow-up program in respect of the project; and*
- (d) the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.*

Additionally, the RAs will consider the meaning of “environmental effect” under CEAA.

“environmental effect” means, in respect of a project,

- (a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the SARA,*
- (b) any effect of any change referred to in paragraph (a) on
 - (i) health and socio-economic conditions,*
 - (ii) physical and cultural heritage,*
 - (iii) the current use of lands and resources for traditional purposes by aboriginal persons, or*
 - (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or**
- (c) any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada.*

2.5.2 Scope of Factors to be Considered

In order to obtain a good prediction of the effects of a project on the environment, it is important to focus the assessment. “Environmental components” is a term used to describe various aspects of the biological, physical, and social environment. Environmental components can be something physical, such as vegetation; a process, such as biodegradation; or a condition, such as biodiversity.

Environmental components of concern (ECC) are the environmental components that exist in the area, and therefore, could be possibly impacted by the Project scope as identified in Section 2.3. They have been identified via regulatory, stakeholder and public consultations, as well as identified by the Proponent in the process of preparing the CSR.

2.5.2.1 Boundaries

Temporal

Project timelines are based on an expectation of approximately three years to achieve regulatory approval for Project construction and commissioning. Construction activities will consume nearly three years (33 months). The nominal operating life of the Project is 20 years. Closure, decommissioning, and post-decommissioning would be protracted, and the timing of this Project phase is uncertain.

While the nominal design life of the process is twenty years, given normal maintenance, refinement, and re-investment, the operation and maintenance activities will likely extend well beyond the 20-year timeframe. As portions of the Project become obsolete over time they will be removed from service, and the Proponent will undertake decommissioning and reclamation for such portions of the Project as per the legislation and guidelines of the time. For the purposes of this comprehensive study, an operating life of 50 years has been assumed.

Temporal boundaries define the duration over which the Project activities and phases interface with each environmental component. Specific aspects of temporal boundaries are addressed as part of the scope definition for each component, as appropriate, or within individual sections for each ECC in Section 5.0 of this CSR.

Spatial Boundaries

The general study bounds of the comprehensive study have been defined as comprising:

- Project development site situated on the eastern side of Stormont Bay in Goldboro, Nova Scotia;
- area and properties within the community of Goldboro in central Guysborough County, Nova Scotia;
- waters and shore of Isaac's Harbour and its extension into the area of Stormont Bay and beyond up to a 25 km radius of Country Island; and
- any area defined as being potentially within an air emission plume originating from the Project site or other Project related facilities.

It is of note that Meadow Lake, Gold Brook Lake, and Ocean Lake including their respective catchment areas is within the spatial boundaries of the EA for the entire KDP and has been addressed in the provincial EA Report (AMEC, 2006). However, these components are not within the scope of this CSR and therefore are not included within the spatial boundaries applied by the CSR.

Spatial boundaries establish the limits within which the Project interacts with the surrounding environment. The zone of influence reflects an area beyond the Project footprint and incorporates aspects which can act to expand the physical area over which Project features interact with the receiving environment. The spatial boundaries will vary in accordance with each component. Such variations are discussed in the following sub-section, and defined more precisely as needed, within individual sections for each ECC in Section 5.0 of this CSR.

2.5.2.2 Methods

The EA of the Project has been undertaken in a comprehensive manner, with the analysis quality assurance /quality control (QA/QC) focused on those ECCs that are of legal, scientific, ecological, human health and safety, community, and cultural value. These are referred to as the VECs and are the focus of the comprehensive study.

It is widely recognized that there is a need to focus on those environmental components, known as VECs, which have the greatest relevance to the final EA decision (the Agency, 1996; Beanlands and Duinker, 1983). VECs are generally defined as environmental attributes or components of the environment that are valued by society as identified through issues scoping. They are determined on the basis of perceived public concerns. For this Project, VECs were selected from the issues identified and intended to reflect the concerns expressed by regulators, technical specialists, stakeholders, and the interested public.

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

- review of requirements of the federal scoping document;
- review of the baseline studies;
- review of Project works and activities;
- consideration of public concerns, as well as those of stakeholders and government;
- consideration of potential Project-environment interactions; and
- consultation with public, government department and agencies, stakeholder groups, and First Nations.

The identified VECs are presented in Table 2.5-1. The “X” in the table identifies the values and environmental features that the individual VEC represents. The table also includes a brief listing of plausible potential interactions of the Project with the VEC through direct effects and/or effect pathways.

2.5.2.3 VEC Description

The following is a summary of the scope of each VEC, and a rationale for selection. VECs as presented are not ranked by importance. A total of 25 VECs have been identified. It is of note that the rationale for the selection of the VECs focuses on the Project scope as outlined in Sections 2.3.1 and 2.3.2.

Hydrology

The distribution of the earth’s water is important to the quantity and quality of groundwater, freshwater and marine water. In particular, effects to surface water management may impact hydrologic cycles and groundwater levels. The Project has potential to change the hydrology in the local area with site development.

TABLE 2.5-1 Basis for Selection of VECs

VEC	Relevance to Values (as per federal Scoping Document)						Potential Interaction of the Project with the VEC
	Legal	Scientific	Ecological	Human Health	Community / Recreation	Cultural	
Hydrology		X	X		X		<ul style="list-style-type: none"> • Potential for effects on localized hydrology due to development of the Project site.
Freshwater Quality/Quantity	X	X	X	X	X		<ul style="list-style-type: none"> • Potential surface water quality effect as a result of acid generating rock or contaminated soils (construction phase). • Potential sedimentation of surface water due to erosion (construction phase).
Groundwater Quality/Quantity	X	X	X	X	X		<ul style="list-style-type: none"> • Potential for groundwater quality impairment from effect on any surface water effects or risk of spills or leaks. • Potential for effects on local water supply wells due to any effect on freshwater quality.
Marine Water Quality	X	X	X		X		<ul style="list-style-type: none"> • Potential for water quality impairments in marine environment due to storm water discharges and/or re-suspension of contaminants from sediments during marine works.
Soil/sediment Quality (terrestrial and marine)		X	X				<ul style="list-style-type: none"> • Potential for alteration of sediment transport and beach formation and/or erosion. • Potential for effect on quality of soil and sediment via air quality pathway. • Potential for disposition of impacted sediment via disturbance of contaminated soil or leaching of metals via acid generating rock.
Air Quality	X			X	X		<ul style="list-style-type: none"> • Potential for air quality impairments via construction vehicles' combustion exhaust or dust during earth works (construction phase). • Potential for air quality impairments via emissions from plant or combustion exhaust from vehicles, vessels and equipment (operations phase).
Climate Conditions	X				X		<ul style="list-style-type: none"> • Potential for localized changes to climatic conditions. • Potential for contributions to global climate change via emission of greenhouse gases (GHG).
Vegetation (terrestrial and marine)					X		<ul style="list-style-type: none"> • Potential for vegetation removal during site preparation and construction of facilities. • Potential for effect on vegetation from construction and operations via pathways, such as air and water.

VEC	Relevance to Values (as per federal Scoping Document)						Potential Interaction of the Project with the VEC
	Legal	Scientific	Ecological	Human Health	Community / Recreation	Cultural	
Species at Risk	X	X	X			X	<ul style="list-style-type: none"> • Potential for effect on species at risk via disturbance of habitat or individuals. • Potential disturbance in marine, terrestrial, freshwater or wetland habitat.
Fish and Fish Habitat (marine and freshwater)	X		X		X		<ul style="list-style-type: none"> • Potential for HADD due to construction of structures interfacing with fish habitat or storm water discharge to marine and freshwater environments. • Potential for adverse effects on fish species and populations as a result of HADD.
Marine Mammals			X		X		<ul style="list-style-type: none"> • Potential for effects on marine mammal as a result of construction of marine structures. • Potential for effects on marine mammal as a result of operation of marine structures, shipping, and discharge to marine environment.
Wildlife and Wildlife Habitat			X		X		<ul style="list-style-type: none"> • Potential for wildlife habitat removal and/or alteration during site preparation and facility construction. • Potential for adverse effects on wildlife species as a result of effects on changes in terrestrial habitat. • Potential disruption of individuals during construction or operation.
Migratory Birds and Migratory Bird Habitat	X		X		X		<ul style="list-style-type: none"> • Potential for migratory bird's habitat removal and/or alteration during construction. • Potential for adverse effects on migratory bird's species as a result of effects on changes in terrestrial habitat. • Potential effects of facility lighting on migrating birds during construction or operation.
Wetlands	X		X		X		<ul style="list-style-type: none"> • Potential for adverse effects on extent and functions of local wetland habitat due to site development. • Potential for adverse effects on wetlands as a result of effects on changes in hydrology or freshwater/groundwater quality/quantity.
Lighting Conditions	X		X		X	X	<ul style="list-style-type: none"> • Potential for changes in the existing ambient lighting conditions related to operation of the facilities, including the necessary lighting at the wharf. • Potential for adverse effects on migratory birds and visual aesthetics.

VEC	Relevance to Values (as per federal Scoping Document)						Potential Interaction of the Project with the VEC
	Legal	Scientific	Ecological	Human Health	Community / Recreation	Cultural	
Atmospheric and Underwater Acoustic Environment	X		X	X	X		<ul style="list-style-type: none"> Potential for changes in existing ambient acoustic environment relating to both construction and operation stages. Potential for changes in existing underwater acoustic environment relating to both construction of marine structures and shipping.
Physical and Cultural Heritage					X	X	<ul style="list-style-type: none"> Potential for disturbance of resources related to physical and cultural heritage during construction activities.
Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons	X					X	<ul style="list-style-type: none"> Potential for conflict with traditional land uses and land claims during site preparation and construction of the facility.
Structures/Sites of Archaeological, Paleontological or Architectural Significance	X					X	<ul style="list-style-type: none"> Potential for disturbance of site(s) and resources during construction of the facility.
Navigation	X			X	X		<ul style="list-style-type: none"> Potential for the shipping activity (including tugs) to affect the navigability.
Marine Safety and Security	X			X	X		<ul style="list-style-type: none"> Potential for the shipping and associated port activities to have an adverse effect on marine safety and security (including perception).
Human Health and Safety	X			X	X		<ul style="list-style-type: none"> Potential effects on health of workers involved in construction and operation. Potential effects on residents (as a consequence of water and/ or air quality impairments) or malfunctions/accidents.
Fisheries		X			X		<ul style="list-style-type: none"> Potentially reduced (local) production rates/ sales volumes as a consequence of adverse effects on resource (changes in habitat, water quality). Potential for impaired marketability (perception of product quality).
Aquaculture					X		<ul style="list-style-type: none"> Potentially reduced (local) production rates/ sales volumes as a consequence of adverse effects on facilities. (i.e., malfunctions/accidents resulting in changes in water quality). Potential for impaired marketability (perception of product quality).

VEC	Relevance to Values (as per federal Scoping Document)						Potential Interaction of the Project with the VEC
	Legal	Scientific	Ecological	Human Health	Community / Recreation	Cultural	
Tourism					X		<ul style="list-style-type: none"> • Potential for effects on attractiveness for wilderness/nature oriented tourism (change in visual characteristics, increased emissions). • Potential for improved economics (employment, spin off effects, demographics, tax revenues) leading to improvement of tourism infrastructure.

Freshwater Quality/Quantity

Freshwater in form of surface water such as lakes, creeks and wetlands provides drinking water, as well as habitat for a wide variety of species – aquatic vegetation, plankton, fish, waterfowl, and furbearers. Human uses include such activities as recreation, hunting, and fishing. The quality and quantity of surface water is an important ingredient in ecosystem health. Contaminated storm-water run off from the Project site could discharge to surface water. Airborne dust and contaminants could become transported to enter the surface waters surrounding the site during construction and, to a lesser extent, during operations. Resource management of freshwater is a provincial responsibility.

Groundwater Quality/Quantity

Groundwater is important for drinking water and as a recharge source for surface water. The Project will involve extractions, diversions, effluent discharge, and modification to groundwater flow. In addition to its use as drinking water and as habitat, water is a pathway for contaminant transport to the food chain and therefore, relevant for human health. Groundwater quality and quantity is regulated by the province.

Marine Water Quality

Marine water quality including sediment quality is of concern with respect to marine biota and coastal fisheries. Sediment transport is of significance from a navigational point of view and for coastal protection. The construction of the marginal wharf and the LNG Terminal has the potential to affect water and sediment quality through disturbance of contaminated near-shore marine sediments. During operation, spills and other accidental events can lead to temporary water impairment. Marine resources and navigable waters are protected by federal legislation.

Soil/Sediment Quality (terrestrial and marine)

Contaminated sites are known to occur within the Project footprint. Such areas can contain soil contaminated with heavy metals from mining and waste production (tailings). Other contaminants which are typical of mineral extraction activity can be present. In addition, there is a potential for acid generating rock. In some cases, sites may have been improperly de-commissioned; alternately the standards for de-commissioning may not reflect current standards or knowledge. During construction, there is potential to disturb contaminated sites and mobilize contaminants. Depending on land ownership, both the federal and provincial levels of government have regulatory control over contaminated sites.

Air Quality

The quality of our atmosphere is important for the health and safety of people living and working near the Project site, as well as to local wildlife and vegetation. The Project will produce air emissions such as oxides, PM, and VOCs. These discharges will include exhaust from engines and ventilation, as well as dust from blasting, excavation, processing, vehicle operation, road use, and other Project activities. The atmospheric environment is a pathway for contaminants to the food chain due to the transport of particles to the surrounding vegetation and water. Air quality is important to overall ecosystem health and to other VECs. Air emissions are regulated federally and provincially.

Climate Conditions

Climate change has become an important consideration in both the comprehensive study and as part of Project planning. Design criteria based on a calculated return period for natural events may be suspect if the underlying assumptions about climate prove to be inaccurate. Conversely, the reduction and control of air emissions has become one ingredient of a needed effort to address global warming and GHG emissions.

Vegetation (terrestrial and marine)

The Project is a green field development (i.e., the site is primarily undisturbed). Terrestrial vegetation will be disturbed with site preparation for facility construction; similarly, marine vegetation will be disturbed with construction of the marginal wharf, and less so with construction of the LNG Terminal.

Species at Risk

Work associated with this comprehensive study has determined some species at risk that have potential for effect from the Project. Project development may disrupt freshwater, terrestrial (including wetland) or marine habitat and could affect species at risk that may utilize these habitats. Species at risk are defined by provincial and federal governments.

Fish and Fish Habitat (marine and freshwater)

Aquatic species and habitat are important since many aquatic species, especially fish, provide food for people and wildlife. The Project will alter freshwater habitat and construction of a marginal wharf and LNG Terminal may be a harmful or destructive alteration to marine fish habitat. Marine and freshwater fish and fish habitat are addressed by federal legislation.

Marine Mammals

Marine species and habitat are important since many species support commercial, subsistence, and recreational fisheries. During construction, marine habitat will be disrupted as a consequence of wharf construction and associated marine traffic. During operations, marine traffic and cargo transfer at dockside will interact with the marine environment. Marine fish and habitat is regulated by the federal government.

Wildlife and Wildlife Habitat

Wildlife and wildlife habitat are primarily of concern as a food source and as a recreational resource. Project development will diminish or eliminate the productive capacity of some wildlife habitat in the Project footprint. Other indirect interactions (airborne dust, emissions, noise, vibration, light, water extraction, and consumption) may affect species and habitat within the zone of influence of the Project. Most wildlife species and habitat are regulated by the province.

Migratory Birds and Migratory Birds Habitat

Migratory birds and their habitat are an important part of the ecosystem and have legal, scientific, and community resource value. Interactions with the Project may occur during site

preparation (i.e., destruction of nests or habitat) or from operational issues, such as light, sound, air emissions or moving vehicles or vessels. The protection of migratory birds is addressed by federal legislation.

Wetlands

Wetlands act as a source of water and moderate hydrological conditions within watersheds. They provide valuable habitat for waterfowl, furbearers, and other aquatic species. Project construction may interact directly (through removal) and indirectly (through altered surface and groundwater flows) with wetlands. The province has regulatory responsibility for wetlands.

Lighting Conditions

Changes in the ambient lighting environment can affect wildlife by disturbing natural cycles and areas used for travel ways or feeding/foraging. Specifically, birds are known to be sensitive to lighting. The visual landscape characteristics may be altered through lighting schemes associated with large scale developments and may affect the attractiveness of a rural area for wilderness and natural environment oriented tourism. Both Project construction and operation require use of lighting as required by standards for worker safety.

Atmospheric and Underwater Acoustic Environment

Changes in the acoustic environment (i.e., changes in noise levels) can affect humans as well as wildlife. Human responses to changes in noise levels can include general disturbance phenomena, reduced enjoyment of property, disruption of sleep, and health effects. Wildlife can be affected through daily activities such as resting and feeding/foraging. Similarly, underwater noise can impact marine mammals and fish. Acclimation can occur in cases of constant, steady-state levels. In other cases, an avoidance response is elicited such that exclusion occurs from habitat which would otherwise be suitable for occupancy. Noise is regulated by the province.

Physical and Cultural Heritage

Physical and cultural heritage features are resources valued by society for reasons of cultural identity and historic research. Project development could result in the loss or alteration of physical or cultural heritage resources. Historic resources are protected under provincial legislation.

Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons

Aboriginal culture is valued greatly in Nova Scotia. Many Aboriginal people continue to pursue elements of a traditional lifestyle, spending time in the country harvesting resources such as fish, game, berries, and firewood. Aboriginal land/resource use and culture could be affected by the Project development through such effects as the loss or alteration of harvesting areas and reduced access to traditionally used lands. Aboriginal land claims can affect the establishment of clear title for land designated for industrial development and exclusive use. Both federal and provincial governments have responsibilities with respect to aboriginal peoples and the settlement of outstanding land claims.

Structures/Sites of Archaeological, Paleontological or Architectural Significance

Archaeological, paleontological, and architectural resources are important because of the information they reveal about past and contemporary ways of life, cultural identity, and relationships and interactions with other cultures and with the biophysical environment. Project development could result in the loss or alteration of historic resources. Historic resources are protected under provincial legislation.

Navigation

Construction of the LNG Terminal and the Marginal Wharf, as well as shipping of LNG, catalysts / chemicals and products from the petrochemical plant are large components of this Project. These have the potential to affect navigability within Stormont Bay and into Isaac's Harbour. A spatial area of 25 km within Country Island is the zone of influence to be assessed for navigability. Navigation is under federal jurisdiction. Additionally, discharge infrastructure in the marine environment, such as outlet pipes for wastewater, storm-water, process water or cooling water, will be required to comply with the NWPA.

Marine Safety and Security

The operation of an LNG Terminal and marginal wharf and associated ocean going traffic has the potential to affect existing marine safety and security. Marine traffic for the facility will include the transshipment of feedstocks, product components, and by-products. Marine safety and security is handled under federal legislation.

Human Health and Safety

Protecting human health and safety is a priority for this Project. Humans that may be potentially affected by construction, routine facility activities, as well as accidents, malfunctions, and unplanned events are primarily those that work at the facility or live in or near the Study Area. Through pathways, human health and safety is also potentially affected by Project-related changes to other VECs, such as air quality, groundwater, and surface water quality.

Fisheries

An important, sustainable resource use in the region is fisheries. An industrial activity will affect an area of shoreline as represented by the Marginal Wharf and LNG Terminal. Marine traffic has the potential to interact with harvesting activities. In addition, less direct interactions can occur. Planned and unplanned discharges to the aquatic environment can alter water quality and physical habitat characteristics, which in turn can affect life-cycle stages of target species and their food supply. Increased employment opportunities can produce a shift in labour away from fisheries. Commercial fish harvesting is regulated by the Federal Government under the *Fisheries Act*.

Aquaculture

Aquaculture is an established industry in the region. Based on mapping by the Province of Nova Scotia, Aquaculture Sites of Nova Scotia, there are 5 sites located in County Harbour directly across from Isaac's Harbour (Province of Nova Scotia). Similar to commercial fisheries,

aquaculture may be affected via water quality changes. In particular, aquaculture enterprises require pristine water quality in order to establish or maintain operations. Aquaculture operations are regulated by the province. Both federal and provincial government carry out research to support the industry.

Tourism

Tourism is a component of the local economy and has been identified as an issue of concern through consultation. The Project may adversely affect tourism as a result of changes in the visual characteristics of the local landscape and emissions (i.e., noise, air pollutants). Tourism is administered by the provincial government.

2.5.2.4 Strategy for Determining VEC – Project Interaction

Project- environment interactions include direct and indirect effects of the Project. Determining these interactions involved:

- review of Project works and activities;
- analysis of direct effects;
- identification of pathways; and
- assessment of effects through pathways.

Plausible Project-environment interactions were identified based on professional judgment and a preliminary knowledge of the Project and the environmental characteristics of the site and the surrounding areas. These considerations contributed to the determination of the VECs. Subsequently, as part of the effects assessment and for each VEC, these interactions were analyzed in detail. For example, it is plausible to assume that terrestrial habitat is affected by the Project as a consequence of habitat removal on site. During the effects assessment, this interaction was analyzed in detail and the type and geographic extent of the affected habitat specified.

In a subsequent step for each VEC, the potential for Project-related effects through pathways was analyzed. VECs are typically interacting via pathways. Air quality, for example, represents a pathway in that it provides a link between a source (i.e., an exhaust stack) to a receptor (i.e., flora, wildlife, and human). Some VECs can function as both a pathway and a receptor. For example, soil quality can be affected by the Project via air quality (deposition of air-borne contaminants). Soil quality also becomes a pathway through contaminant uptake via plant roots and subsequent human or animal consumption.

This understanding of the links between sources for environmental change and VECs as pathways and receptors was the basis for the assessment of effects associated with pathways. It required that the effects assessment for each VEC also reviewed and incorporated the effect predictions established for other VECs.

The approach to the actual effects assessment is described in the following section.

2.5.2.5 Effects Prediction

In accordance with the provisions of the federal scoping document (TC and DFO, 2005a; amended, 2006; provided in Appendix 1) the environmental effects assessment was conducted in a step-wise fashion involving:

- prediction and evaluation of Project-related environmental effects;
- identification of necessary avoidance, mitigation, remediation, and/or compensation; and
- determination of residual effects and their significance.

Environmental Effects Assessment

The potential effects resulting from interactions with the Project, either directly or indirectly via pathways, were investigated in detail for each VEC. This effects assessment involved qualitative and, where possible, quantitative analyses using existing knowledge, professional judgment, and computer modeling where appropriate and feasible.

Mitigation

Where an adverse environmental effect was identified, mitigation was proposed. Where possible, mitigation measures were incorporated into the Project design and implementation in order to eliminate or reduce potential adverse effects. Mitigation at the receptor end was considered if avoidance and mitigation at the source of the effect was deemed not feasible or not sufficiently effective.

In those instances where an adverse effect is unavoidable and cannot be mitigated to insignificant levels, options for remediation and/or compensation were investigated. For interactions where positive effects are anticipated, opportunities were determined for maximizing the positive effects.

Residual Effects and Determination of Significance

Residual effects refer to those environmental effects predicted to remain after the application of all proposed mitigation measures. The predicted residual effects are considered for each Project phase (construction, operation, decommissioning) and for potential accidental events.

In accordance with the Canadian Environmental Assessment Agency guidelines (1994, 1997), the significance of the residual effects is evaluated for each VEC. For adverse effects, significance is determined based on the following criteria:

- magnitude;
- geographic extent;
- timing, duration and frequency;
- reversibility; and
- ecological and socio/cultural context.

For magnitude, a relative rating was established as defined in Table 2.5-2. The evaluation applied absolute values for the geographic extent, frequency, and duration. Reversibility was considered as the ability of a VEC to return to an equal or improved condition once the interaction with the Project has ended. The judgment about the reversibility was based on previous experience and research and stated as “reversible” or “irreversible.” Subsequently, those effects considered significant would undergo an additional consideration of the likelihood of their occurrence and the level of confidence underlying the effects prediction.

TABLE 2.5-2 Definitions for Levels of Magnitude

Rating	Magnitude
High	An environmental effect affecting a whole stock, population, or definable group of people, or where a specific parameter is outside the range of natural variability determined from local knowledge over many seasons.
Medium	An environmental effect affecting a portion of a population, or one or two generations, or where there are rapid and unpredictable changes in a specific parameter so that it is temporarily outside the range of natural variability determined from local knowledge over many seasons.
Low	An environmental effect affecting a specific group of individuals in a population in a localized area, one generation or less, or where there are distinguishable changes in a specific parameter; however, the parameter is within the range of natural variability determined from local knowledge over many seasons.
Nil	No environmental effect.
Unknown	An environmental effect affecting an unknown portion of a population or group or where the changes in a specific parameter are unknown.

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

- Major: Potential effect could jeopardize the long term sustainability of the resource, such that the effect is considered sufficient in magnitude, aerial extent, duration, and frequency, as well as being considered irreversible. Additional research, monitoring, and/or recovery initiatives should be considered.
- Medium: Potential effect could result in a decline of a resource in terms of quality/quantity, such that the effect is considered moderate in its combination of magnitude, aerial extent, duration, and frequency, but does not effect the long term sustainability (that is, it is considered reversible). Additional research, monitoring, and/or recovery initiatives may be considered.
- Minor: Potential effect may result in a localized or short-term decline in a resource during the life of the Project. Typically, no additional research, monitoring, and/or recovery initiatives are considered.
- Minimal: Potential effect may result in a small, localized decline in a resource during the construction phase of the Project, and should be negligible to the overall baseline status of the resource.

An adverse effect 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.