

**REPORT AND RECOMMENDATIONS
TO THE NOVA SCOTIA MINISTER OF ENVIRONMENT
FROM THE NOVA SCOTIA ENVIRONMENTAL ASSESSMENT REVIEW PANEL**

**FOR
THE REVIEW OF THE**

**ENVIRONMENTAL ASSESSMENT REPORT
GOLDBORO LNG PROJECT
NATURAL GAS LIQUEFACTION PLANT AND MARINE TERMINAL
BY PIERIDAE ENERGY (CANADA) LTD.**

Submitted by:

**Nova Scotia Environmental Assessment Review Panel
March 3, 2014**

Environment Assessment Review Panel

March 3, 2014

Honourable Randy Delorey, Minister
Nova Scotia Environment
1894 Barrington Street, Suite 1800
Halifax, NS B3J 2P8

Dear Minister Delorey:

The Nova Scotia Environmental Assessment Review Panel is pleased to present its report and recommendations regarding the proposed Goldboro LNG – Natural Gas Liquefaction Plant & Marine Terminal Project, at Goldboro, Nova Scotia. This Project was referred to the panel on October 18, 2013. The members of the panel were Dr. Tony Blouin, Dr. Charles Schafer, and Mr. Scott Dickey.

There was no public hearing held for this Project as the panel concluded public consultation could be adequately addressed through two written public comment periods.

The panel recommends that the proposed Project should be approved, subject to the terms and conditions recommended by the panel in this report.

The panel would be pleased to meet with you should any questions arise concerning any findings or recommendations in this report.

Respectfully Submitted,

Panel Members



Tony Blouin, PhD, Chair



Charles Schafer, PhD, Member



Scott Dickey, MREM, Member

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Acknowledgements

The Nova Scotia Environmental Assessment Review Panel Chair and members wish to acknowledge the participation of members of the public, First Nations, government agencies and representatives of the proponent, Pieridae Energy (Canada) Ltd., in the public review of the Goldboro LNG Natural Gas Liquefaction Plant and Marine Terminal Project. The Chair and panel members also wish to acknowledge the following individuals for their role in the environmental assessment review process for this Project: Ms. Helen Yeh, Nova Scotia Environmental Assessment Review Panel Administrator, for support throughout the process, and Ms. Melody Harding for administrative support services.

Executive Summary

Pieridae Energy Canada Limited's proposal to construct and operate the Goldboro Liquefied Natural Gas (LNG) Project (the Project) was registered with Nova Scotia Environment on February 18, 2013. In October, 2013, the Minister of Environment referred the Project to the Nova Scotia Environmental Assessment Review Panel (the panel) for review. The Project is to be located near the community of Goldboro, in Guysborough County, Nova Scotia. The purpose the Project is to liquefy natural gas received from continental and offshore supplies, and transport it to overseas markets via LNG carrier ships. The Project would consist of the following components:

- A LNG facility;
- A 180 megawatt gas fired power plant;
- A water supply intake and pipeline for a potable water supply from a nearby lake; and
- A marine wharf and jetty.

The Project triggers a Class II environmental assessment pursuant to the Nova Scotia Environmental Assessment Regulations, and is therefore subject to a review by the panel. In October, 2013, notice was issued that called for public comments on the Project. The panel considered input received during this comment period, and concluded that public hearings were not necessary. The panel opted instead for a second public comment period, which began in January, 2014 after a public notice was issued. The panel considered the input received from the public and interveners during these two public comment periods, as well as Pieridae's responses to these comments, in preparing this report.

In this report, the panel summarizes the Project background (in section 3) and Project description (in section 4). The panel also summarizes (in section 5) the information presented by Pieridae in the environmental assessment report (EAR) on the baseline environmental conditions, predicted interaction between the Project and the environment, and the mitigation strategies proposed by Pieridae to manage the Project's environmental impacts. The panel also summarizes input received from the public and interveners, and makes conclusions based on the risk that the Project poses to the environment, as well as providing recommendations on how this risk can be further reduced. The panel then summarizes Pieridae's approach to consulting the public on the Project (sections 6). Finally, the panel summarizes the commitments that Pieridae has made to conduct additional studies, implement mitigation measures and preparing management and monitoring plans (in section 7).

The Project is proposed to be located within the Goldboro Industrial Park. This is a rural area along Guysborough County's coastline that has little existing infrastructure, except for the # 316 Highway, and the Sable Offshore Energy Inc. gas plant and its pipeline. The Project site itself is a forested area that encompasses a variety of environmental features, including forests, a watercourse, wetlands, coastline, and saltwater ponds. The marine aspect of the Project, including a wharf and jetty, would extend into Isaac's Harbour, which includes habitat for lobster, fish and sea urchins.

The greater Project area in Guysborough County has suffered a steady decrease in population over the past several decades, as well as a shift in demographics towards an aging population. The area is lacking

in significant economic inputs, which has resulted in the area underperforming the provincial average in a number of economic categories.

Pieridae assessed the Project's impacts on a number **of** individual valued ecosystem components (VECs), including:

- Geology and soil quality;
- Groundwater quality and quantity;
- Surface water quality, quantity and transport;
- Air quality and climate change;
- Acoustic environment (noise);
- Ambient lighting;
- Terrestrial habitat, flora and fauna (including species at risk);
- Wetlands;
- Aquatic habitat and species (including species at risk);
- Agriculture;
- Forestry;
- Fisheries, aquaculture and harvesting;
- Socio-economic conditions, including economic conditions, property value, employment and tourism;
- Human health and safety;
- Existing and planned land uses;
- Transportation;
- Recreational opportunities and aesthetics;
- Aboriginal use of land and resources; and
- Archaeological resources.

The impacts for the majority of these VECs would be minimal to moderate, and should be largely curtailed by the mitigation and management plans proposed by Pieridae, or through those recommended by the panel and interveners. The Project would, however, result in a number of residual effects which are summarized below:

- The Project would increase Nova Scotia's greenhouse gas emissions by approximately 18% (above 2010 emission levels);
- The Project's marine component would compromise a number of fisheries in its general area; and,
- The Project would generate significant economic input and employment opportunities for Guysborough Country and Nova Scotia as a whole.

The panel believes that the risk that the Project poses to the environment is largely manageable, and that the Project's ability to contribute to economic prosperity for Guysborough Country and Nova Scotia as a whole is extremely significant. After considering the information provided in the EAR submitted by Pieridae, as well as comments and responses received from the public, First Nations, government departments and Pieridae, the panel recommends that the Project be approved with conditions. The panel's recommendations for conditions of approval are summarized in the following section.

Recommendations

The Nova Scotia Environmental Assessment Review Panel submits the recommendations in the table below. The panel drew these recommendations from the review of Pieridae’s environmental assessment report, as well as comments and responses received from the public, First Nations and government departments and the proponent during public consultation periods. The details leading to these recommendations can be found in section 5 and 7 of this report.

No	Topics	Panel Recommendations
1	Geology, Soil & Sediments (5.1.3)	Special care should be taken with the pyrite-laden argillite deposits identified along the southern edge of Meadow Lake, and in carrying out excavations for the marginal wharf and causeway given the location of the former McMillan mine on the west coast of Red Head Peninsula. Further surveys are recommended to identify any additional tailings deposits and mine openings within the Project area prior to the initiation of any construction work, particularly in areas where mine openings and tailings deposits have already been identified (e.g., Figure 9.1-5 of the EAR and the 1984 Seabright Resources report cited in the EAR).
2		For those areas where acid drainage contamination cannot be avoided, the panel emphasizes that the proponent should always be guided by protocols defined in the Nova Scotia <i>Guidelines for the Management of Contaminated Sites</i> . Relevant guidelines should also be detailed in SBMMP, RMP and EPP plans that are to be formulated during the FEED exercise and approved by appropriate government regulators.
3		Pre-construction surface water discharges into Dung Cove Pond should be measured during all seasons of the year to provide baseline data for regulating future (post-construction) discharges emanating from within the Project area and thereby avoiding or minimizing the remobilization of contaminated Pond basin sediment.
4	Groundwater (5.2.3)	Pre-blast surveys should be conducted for any potentially affected residential wells, as required by regulations or conditions of blasting permits.
5		A well monitoring program should be developed and implemented as a condition of any permits for blasting, in order to detect any adverse changes in well water quality or quantity during the construction phase. Additional monitoring of local residential wells within 500-1000 m of the Project site during a 1-2 year post-construction period should also be mandated.
6		An adequate spill response program should be developed and implemented, including a requirement to conduct further monitoring of any possibly affected residential well as the result of a spill incident.
7		Well monitoring and spill response plans should include details on provision of potable water to local residents, including conditions and criteria that will require this action, the extent of the “temporary” timeframe for such provision, and details on further action to be undertaken if remediation efforts do not restore potable well water within the “temporary” timeframe.
8	Surfacewater (5.3.3)	The EPP and EMP, must include all measures for protection of surface waters committed to by Pieridae in the EAR and in the IR responses (including but not limited to: Wastewater Management Plan, Stormwater Management Plan, Erosion and Sediment Control Plan, Site Grading Plan, Spill Prevention and Response Plan, SBMMP, Blasting Management Plan, Surface Water Monitoring Plan, and appropriate buffers and setback zones), as well as any additional conditions required by NSE. The EPP and EMP should be submitted to NSE and other applicable regulators required by NSE for approval.
9	Air Quality & Climate Change (5.4.3)	Once detailed Project designs have been made available through the FEED process, the proponent should re-run the ADM, and submit a report detailing the results to NSE, HC, EC and NSHW.
10		The proponent should develop an emission and air quality management plan in consultation with NSE, HC, EC and NSHW. This management plan should incorporate an air quality-monitoring program that persists throughout all phases of the Project (construction, operation and decommissioning), as well as a pre-construction (baseline) assessment of air quality in the Project area. The monitoring program

		should be used to inform adaptive management practices if necessary.
11		The proponent should work with NSE to comply with all provincial and federal GHG emissions regulations, and specifically with the proposed new federal regulations for the oil and gas sector. The GHG Management Plan committed to by Pieridae should be developed in close consultation with NSE and other appropriate regulators, and be approved by NSE. This plan should include a mechanism to offset the 3,778,390 t CO ₂ e that the Project is predicted to emit per annum.
12	Acoustic Environment / Noise (5.5.3)	Once the Project's design is finalized, the proponent should re-run sound modeling studies, and present the results to NSE. Should noise exposure levels still exceed guidelines and limits prescribed by the province, the proponent should consult with NSE, HC, NSHW, and the CLC on a management plan that would effectively mitigate the effects of Project related noise levels to the satisfaction of these parties. Consideration of underwater noise levels should be included.
13		Once the Project becomes operational, the proponent must implement a noise monitoring program (to be approved by NSE) to monitor operational noise exposure levels at a number of nearby dwellings, for an appropriate period (prescribed by NSE). Results of this monitoring program should be submitted to NSE for review. Should noise exposure levels still exceed recommended guidelines and limits prescribed in provincial guidelines, the proponent should consult with NSE, HC, NSHW, and the CLC on a management plan that would effectively mitigate the effects of Project related noise levels to NSE's satisfaction.
14	Ambient Lighting (5.6.3)	The proponent, in consultation with the CLC, must incorporate a protocol as part of the EMP to receive and respond to complaints from the public related to Project lighting.
15		As part of the development of the Avian Management Plan, the proponent must consult with NSDNR, EC and BSC on lighting and flaring management that would reduce or eliminate the risk that the Project's lights and flares would pose to birds. Additional recommendations regarding lighting and flaring are provided in section 5.9.3 of this report (recommendation No. 21 and 27 below).
16	Terrestrial Habitat and Vegetation (5.7.3)	The proponent should conduct flora surveys within the finalized footprint of the Project (including the finalized route of the water supply pipeline) immediately prior to construction, and submit a report to NSE for review. Should rare flora be identified in these surveys, the proponent should be required to consult NSE on appropriate mitigation measures.
17	Wetlands (5.8.3)	The proponent should plan the routing of the water supply pipeline in a manner that would minimize its impacts on wetland habitat, and that any unavoidable wetland habitat is compensated for through a Wetland Compensation Plan as per the requirements of the <i>Nova Scotia Wetland Conservation Policy</i> .
18		The proponent should consult with NSE on the design and implementation of a monitoring program that would assess the impacts of water withdrawal from Meadow Lake on its associated wetlands. Such a program should provide a detailed baseline assessment of the vegetative and hydrological conditions in a variety of areas and habitat types (including reference areas) around the lake's associated wetlands, and should monitor these conditions for a period of no less than 4 years after water withdrawals from the lake have commenced. If the results of this program indicate that water withdrawals are impacting the wetlands around Meadow Lake, then the proponent should take adaptive measures in a manner that is satisfactory to NSE.
19		The proponent should compensate for loss of wetlands onsite through allocation of monies for the Wetland Compensation Fund to restore wetland habitat of a globally imperilled plant known as Mountain Avens (<i>Geum peckii</i>) on Brier Island, Digby County that is listed as endangered under SARA and the NSESA (NSDNR recommendation). The panel supports NSDNR's recommendation above, however it is our position that wetland compensation issues lie entirely within the mandate of NSE as per the <i>Nova Scotia Wetland Conservation Policy</i> . We encourage NSE to consider NSDNR's recommendation, but ultimately it is the panel's position that NSE determines the allocation of wetland compensation resources.
20	Terrestrial Fauna (5.9.3)	The proponent should consult with BSC on management practices to reduce the risk that the Project poses to migratory birds when developing the Avian Management Plan for the Project.
21		The proponent should monitor, and undertake research on, the impacts of gas flaring on birds and bats through radar, onsite monitoring and through an adaptive seasonal gas management plan for four years from the start of the operational phase. Methodologies and the approach to research, and monitoring for assaying impacts on birds and bats and the seasonal management of gas flaring

		activities, must be developed with NSE, NSDNR, and EC (NSDNR recommendation supported by the panel).
22		The proponent should monitor impacts of flaring and lighting on the colony of Leach's Petrels on Country Island for a period not less than four years from the date of the Project's full operation (NSDNR recommendation supported by the panel).
23		The proponent should agree to submit copies of all digital wildlife survey data for significant habitats, species at risk and those of conservation concern in the form of shape files and point location information to the NSDNR (NSDNR recommendation supported by the panel).
24		The proponent should agree to submit an annual progress report with results and all data to a standard as defined by NSDNR for monitoring mainland moose and another report summarizing bird/bat monitoring. Both reports should be submitted by January 15th in each calendar year to NSE, and NSDNR and EC (NSDNR recommendation supported by the panel).
25		Site preparations that include deforestation, clearing and grubbing should be undertaken between September 1st and April 15th in order to minimize impacts on breeding birds (NSDNR recommendation supported by the panel).
26		The proponent should develop and initiate a monitoring program for Roseate tern (<i>Sterna dougallii</i>), and implement adaptive measures if required, prescribed in IR # EC 1 (EC recommendation supported by the panel).
27		The proponent should confirm the presence and location of species at risk and implement appropriate avoidance and mitigation measures as part of an Avian Management Plan, prescribed in IR # EC 2 (EC recommendation supported by the panel).
28		The proponent should incorporate EC's recommendations (as prescribed in IR # EC 3) regarding lighting and flaring operations as part of the Avian Management Plan (EC recommendation supported by the panel).
29		The proponent should incorporate EC's recommendations (as prescribed in IR # EC 4) regarding compliance with the Migratory Birds Convention Act as part of the Avian Management Plan (EC recommendation supported by the panel).
30		The proponent should incorporate EC's recommendations (as prescribed in IR # EC 5) on measures regarding wildlife as part of spill response plans (EC recommendation supported by the panel).
31	Freshwater Species & Habitat (5.10.3)	The Habitat Compensation Plan must be approved by appropriate regulators. Development of the Plan must include discussions with the MODG, DFO, GCIFA and First Nations who have fisheries interests.
32	Marine Species & Habitat (5.11.3)	The proponent should investigate the use of precast concrete artificial reefs to offset lobster habitat loss in Stormont Bay instead of piles of rock. Precast concrete artificial reefs may prove to be less expensive to install, would offer reduced disturbance of surrounding habitat during installation, and may account for the offset of relatively larger areas of habitat compared to the same number of rock piles.
33		The proponent should establish a FLC to address marine habitat loss issues, as opposed to attempting to resolve matters concerning harmful alteration, disruption or destruction of fish habitat through the CLC pathway. The proponent should consult all interested parties, including First Nations, local fishers and fisheries licence holders, GCIFA, DFO, and Nova Scotia Department of Fisheries and Aquaculture on the committee's representation and objectives (GCIFA recommendation supported by the panel).
34		The proponent should initiate a research program, in collaboration with the GCIFA and DFO, to assess effects on fish habitat, particularly in those areas immediately surrounding the jetty and wharf (GCIFA recommendation supported by the panel).
35	Species at Risk (5.12.3)	The proponent should consult with BSC on management practices to reduce the risk that the Project poses to Leach's storm-petrel (<i>Oceanodroma leucorhoa</i>) and Roseate tern when developing the Avian Management Plan.
36		The proponent should monitor, and undertake research on, endangered Mainland moose both onsite and offsite in a collaborative and cost-shared effort with NSDNR to document landscape level impacts on moose and habitat use. Methodologies, approach and scope of research and monitoring required by the company on mainland moose must be developed with NSE, and NSDNR (NSDNR recommendation supported by the panel).
21-		Recommendations No. 21 to 30 above apply also to section 5.12.3: Species at Risk.

30		
33	Socio-Economic Environment (5.13.3)	Recommendation No. 33 above also applies to section 5.13.3: Socio-Economic Environment.
37	Existing & Planned Land Uses (5.14.3)	The proponent should make efforts to align the route of the water supply pipeline within the easement of the SOEI pipeline as much as possible to reduce cumulative effects on land uses.
38	Transportation (5.15.3)	The Panel supports Pieridae's commitment to integrate and implement the outcomes of the TERMPOL review process with its marine designs and operational plans.
39		The proponent should consult with NSTIR to determine how the Route 316 re-alignment work would impact the proposed Goldboro LNG Project schedule. Note that this recommendation need not form a part of this project approval.
40	Archaeological Resources (5.16.3)	The proponent must implement all mitigation strategies provided by Davis (2004) that are described in section 9.12.1.1 of the EAR, as well as the mitigation strategies provided by NSCCH that are described in section 9.12.2 of the EAR.
41		The proponent must continue to consult with NSCCH as the Project proceeds to the design phase on a plan to monitor and report additional historical resources discovered during the Project's construction.
42		The proponent must consult with NSCCH and develop a monitoring plan to assess the shoreline in the Project site area during the Project's operational phase for additional historical resources that may become exposed from wave action or rising water levels.
43	Malfunctions & Accidental Events (5.17.3)	The proponent should consult and work with local and regional emergency responder organizations such as fire departments, medical authorities and police to ensure adequate training and preparation for a range of possible malfunctions or accidental events.
44		The ERP must clearly delineate responsibilities between on-site and off-site fire and emergency response personnel, and plans for liaison with regional and provincial/federal emergency responders.
45		The following should be provided by the proponent and approved by the appropriate regulators: Spill Response Plan, Contingency and Emergency Response Plan, sensitive coastal shoreline mapping, and a Quantitative Risk Assessment.
46		The proponent should extend the 2002 EnCana shoreline study to other parts of Stormont Bay and Isaac's Harbour that are close to the Project site. This data should be used to more precisely map the environmental sensitivities of those nearshore areas, in order to have a robust baseline for identifying changes that may occur during the operational phase of the Project. The panel concurs with EC recommendation regarding the use of their SCAT Manual as a guide for shoreline sensitivity mapping.
47	Effects of Environment on Project (5.18.3)	The proponent should adhere to the precautionary approach outlined in section 10.18 of the EAR for both land-based and marine-based operations, and give special attention to any potential adverse environmental effects on the Project that could result in a negative impact on VECs.
48		The proponent, using a worst case scenario approach, should ensure that the Project's marine components (jetty & wharf) are designed to withstand storm surges that could be coincident with high tide and high waves.
49	Cumulative Effects (5.19.3)	Recommendation No. 11 above also applies to section 5.19.3: Cumulative Effects.
50	Pieridae Committed Studies, Reports & Plans (7.3)	The proponent should carry out the suite of studies, reports and plans regarding baseline, mitigation and management, and follow-up monitoring, committed in the EAR and in their IR responses.
51		Responsible government agencies should ensure these committed studies, reports and plans are carried out appropriately by the proponent to meet the intended objectives.

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Section 1 – Introduction

On October 10, 2013, the Nova Scotia Minister of Environment (the “Minister”) at the time, the Honourable Sterling Belliveau, received the Environmental Assessment Report (EAR) - Goldboro LNG Project Natural Gas Liquefaction Plant and Marine Terminal. The proponent, Pieridae Energy (Canada) Ltd., proposes to construct and operate a Liquefied Natural Gas (LNG) liquefaction and export facility, an electrical power generation plant, associated marine terminal, and a water supply. This Goldboro LNG Project (the “Project”) was deemed a Class II undertaking, as defined in the Nova Scotia *Environmental Assessment Regulations*, and hence on October 18, 2013, the Minister referred the EAR to an appointed Nova Scotia Environmental Assessment Review Panel (the “panel”).

The panel is required to:

- review the EAR referred to the panel by the Minister;
- consult with the public in accordance with the *Environment Act* and the *Environmental Assessment Review Panel Regulations (2013)*; and
- prepare a report to the Minister recommending the approval or rejection of the undertaking, or approval of the undertaking with conditions.

In August of 2006, Keltic Petrochemicals Inc. submitted an environmental assessment report for a proposed LNG import facility and associated petrochemical plant, to be located in the Goldboro Industrial Park. The report was referred to the NS Environmental Assessment Board for review. The Board appointed a Panel which held public hearings on the proposal, and submitted their report to the Minister on February 21, 2007. The Panel recommended that the Keltic project should be approved, with a number of conditions attached. The Keltic project did not proceed, for economic reasons.

The EA Review Panel for the present Goldboro LNG Export Facility, proposed by Pieridae Ltd., has reviewed the extensive material available from the Keltic proposal, including the Keltic environmental assessment (EA) report, the public hearing transcripts, public and intervener submissions, and the EA Board report to the Minister. The Keltic and Pieridae Goldboro LNG projects are similar in dealing with LNG, and in proposing to locate on the same footprint in the Goldboro Industrial Park. The environmental impacts of the projects are in many ways similar, and the findings of the EA Board in 2007 remain relevant to the present proposal. The 2007 EA Board report to the Minister is available at: <http://www.novascotia.ca/nse/ea/kelticpetro.asp>.

This panel report to the current Minister, the Honourable Randy Delorey, concludes the panel’s review of the Goldboro Project, as proposed by Pieridae Energy (Canada) Ltd. (Pieridae).

A federal EA was not required for this Project under the *Canadian Environmental Assessment Act*. However, certain components of this Project will however require federal permits or authorizations. Information submitted to the panel has been shared with several federal authorities.

Section 2 – Legislative/Regulatory Framework

The Environment Act

Up until 2011, Nova Scotia had a permanent Environmental Assessment Board, with members appointed for defined terms. In December of 2011, Bill 122 (Clauses 13 to 19) amended the *Environment Act*, eliminating the board and replacing it with appointed panels for the review of specific projects referred by the Minister.

The panel is created pursuant to Section 42 of the provincial *Environment Act* (the "Act"). The Minister must refer an EAR for a Class II undertaking received to the panel. Pursuant to Section 39(1) of the Act, upon referral, the panel shall conduct a public hearing or review, submit a report, and make recommendations to the Minister to approve the undertaking, reject the undertaking, or approve the undertaking with conditions. The panel is given specific authority under Section 42(2) of the Act to conduct public hearings or reviews and carry out other functions assigned to the panel by the Act, or as prescribed by the regulations.

The duties of the panel are set out at Section 43 of the Act, and are listed in Section 1 of this report.

As part of the panel's review of an EAR, Section 44(1) of the Act mandates the panel to consult with the public "by inviting written submissions from the public, by conducting a public hearing or review or in such other manner as determined by the review panel." Section 44(2) of the Act provides that a public hearing or review conducted pursuant to Section 44(1) shall be conducted in accordance with the regulations.

The Nova Scotia *Environmental Assessment Regulations* and *Environmental Assessment Review Panel Regulations* provide the procedural and regulatory framework for the panel to conduct a review of an EAR, consult with the public, and make recommendations with respect to the environmental effects of an undertaking to the Minister.

Environmental Assessment Regulations

For Class II undertakings, Section 23(3) of the *Environmental Assessment Regulations* provides that public notices and consultation shall be in accordance with the requirements of the *Environmental Assessment Review Panel Regulations*.

Section 24(2) of the *Environmental Assessment Regulations* requires the Minister to refer an EAR on a Class II undertaking to a review panel.

Environmental Assessment Review Panel Regulations

In carrying out the objective of reviewing the environmental effect of an undertaking, the panel is guided by the definition of the phrase "environmental effect" as set out at Section 3(v) of the Act:

"3(v) 'environmental effect' means, in respect of an undertaking,

- (i) any change, whether negative or positive, that the undertaking may cause in the environment, including any effect on the socio-economic conditions, on environmental health, physical and cultural heritage or on any structure, site or thing including those of historical, archaeological, paleontological or architectural significance, and

(ii) any change to the undertaking that may be caused by the environment, whether the change occurs inside or outside the Province;"

Where the Minister refers an EAR to the panel, the panel shall submit its report and recommendations to the Minister not later than 110 days following the date of referral to the panel (Nova Scotia *Environmental Assessment Review Panel Regulations*, Section 26(1)). Under Section 26(2) of the panel Regulations, the Minister may, in writing, extend the 110 day period for the panel to file its report and recommendations, and the Administrator shall advise the proponent of the extension and the reason for the extension.

Under Section 26(1) of the *Environmental Assessment Regulations*, within 21 days following receipt of the report and recommendations by the panel, the Minister shall advise the proponent in writing whether the undertaking is approved without conditions, approved with conditions the Minister deems appropriate, or is rejected, in accordance with Section 40 of the Act.

Section 3 – Background

In August 2006, Keltic Petrochemicals Inc. submitted an EA report for provincial government review for a proposed LNG import facility and associated petrochemical plant, to be located in the Goldboro Industrial Park. The EA was referred to the Nova Scotia Environmental Assessment Board for review. The board recommended that the Keltic project should be approved with conditions. Despite receiving provincial EA approval, the Keltic project did not proceed likely due to un-favorable economic conditions at that time.

Pieridae's proposal to operate a LNG liquefaction facility in Goldboro was registered with Nova Scotia Environment (NSE) on February 18, 2013. The final Terms of Reference for the Project's EAR was issued by NSE in May of 2013, and the final EAR was submitted to NSE by Pieridae during October, 2013. This EAR is the subject of this panel review. The Project triggers a Class II EA pursuant to the Nova Scotia *Environmental Assessment Regulations* as it includes a 180 Megawatt (MW) power plant. The Project is proposed to be located within approximately the same footprint as its predecessor, the Keltic project. The Goldboro Project however is smaller in scope than the Keltic project, as it focuses solely on liquefying natural gas for export to overseas markets, and does not provide the capability to synthesize other petrochemical products that the Keltic project would have included.

Two separate notices were issued in October 2013 and January 2014, that called for public comments on the Goldboro Project. They were published in the Royal Gazette, the Chronicle Herald, the Antigonish Casket, and the Guysborough Journal.

Although public hearings are usually held as part of a Class II EA, there was no public hearing held for the Goldboro Project. The panel considered all of the information available to date. This included the present EAR and the previous EA carried out at Goldboro in relation to the previous Keltic Petrochemicals and LNG Import Facility project, including associated public comments, the public hearing record, and the EA Board Report to the Minister in 2007. The panel also examined the Goldboro EAR, and associated public and government comments received during the first public comment period. The panel found that the information base from the previous review remains relevant to the present Goldboro Project. Few new issues were raised, and the majority of the public had expressed support for the Goldboro Project. The panel thus decided that no public hearings would be required for the Goldboro LNG Project. In the absence of a public hearing, the panel provided a second opportunity for the submission of written comments from the public, First Nations, and government. During both public consultation periods, Pieridae provided two written response documents to comments and questions submitted, entitled "Environmental Assessment (Class 2 Undertaking) – Information Requests & Proponent Responses" on January 10 and January 31, 2014. Information extracts from these documents are referred to as Information Requests (IRs) in this report.

Section 4 – Project Description

Section 3.0 of the EAR provides a detailed description of the Project. It should be noted that the Project design is still in preliminary stages. Should the Project receive EA approval, the front end engineering design (FEED) process would commence, which would finalize the many Project design elements.

Table 3.1-1 from the EAR (see below) summarizes the key components of the Project.

Table 3.1-1 Key Components - Goldboro LNG Project

Components	Description
Natural Gas Liquefaction Plant	<ul style="list-style-type: none"> A facility for converting 10 Mtpa of natural gas from the M&NP pipeline into LNG at atmospheric pressures and approximately -162 Degrees Celsius (°C) for export to overseas markets. Refer to Section 3.1.2, below.
LNG Storage Tanks	<ul style="list-style-type: none"> Full containment LNG cryogenic storage tanks shall be utilised each with a net storage capacity of 210,000 m³ which equates to a gross capacity of around 230,000 m³. Two LNG tanks are considered for Phase 1, with potential for an additional one depending on storage required during Phase 2 determined by results of studies.
Marine Facilities	<ul style="list-style-type: none"> A jetty trestle for the LNG transfer lines and access road, and two LNG ship loading berths (the second berth for future development). A marine wharf for the unloading of construction equipment and materials and for mooring of the tug and pilot vessels.
180 MW Power Plant	<ul style="list-style-type: none"> On-site (gas turbine) power generation to support the LNG facility and support services. Emergency diesel generator sets provided for essential loads.
Feed Gas Pipeline and Inlet Facilities	<ul style="list-style-type: none"> Supply pipeline from the M&NP pipeline including pigging and metering.
Potable Water Pipeline and Intake Structure	<ul style="list-style-type: none"> Supply pipeline from a new intake structure at Meadow Lake to Facility for necessary treatment.
Buildings and Utilities	<ul style="list-style-type: none"> Various administrative, control and maintenance buildings. Utilities units to support the liquefaction and export facilities. On-site power generation suitable for 114 kiloVolt-amperes (kVA).
Temporary Work Camp	<ul style="list-style-type: none"> For the duration of the construction phase, the Project will include a work camp situated along the northern site boundary.
Information Centre	<ul style="list-style-type: none"> With the start of the construction activities Pieridae is planning on operating an information centre at the Project site.

The Project consists of three main phases over its lifetime: construction, operation, and decommissioning. The construction phase is planned for 2015 and is expected to last approximately 4 years. Construction activities would include, but would not be limited to the following:

- site clearing, grading and levelling;

- preparation of lay down areas;
- construction of the fresh water supply system;
- temporary site construction facilities and site office;
- construction of road network system within the plant areas;
- construction of all foundations, sub-structures including shoring and superstructures for all buildings;
- construction of a storm management system;
- construction of a sanitary and process waste collection and disposal system;
- construction of cable, pipe trenches and ducts;
- tank foundations and associated berms; and
- landscaping.

Construction would proceed in a phased approach with critical Project infrastructure being built first. Once operational, additional infrastructure would then be brought online throughout the four year construction phase. The operation phase is planned to commence in 2019. The length of the operational phase could vary depending on the economic feasibility of the Project. The infrastructure itself is expected to be able to function for at least four decades, if not decommissioned sooner due to changing economic landscapes with respect to supply and demand for LNG products. General operation phase activities would include start up and shut down procedures, the operation of the power plant, the management of potentially dangerous chemicals such as refrigerants and the LNG products themselves, the coming and going of LNG carrier ships, etc. Finally, the decommissioning phase is expected to be largely similar to the construction phase, but carried out in reverse order. It is not clear at this point how long the decommissioning phase would take, or what state the Project site would revert to once decommissioning is complete. The decommissioning phase would likely require a substantial environmental remediation program, as well as significant deconstruction activities.

Section 5 – Environmental Impacts Assessment

5.1 – Geology, Soil and Sediments

5.1.1 – Overview

Section 9.1 of the EAR describes the topography, geology, soils and sediments of the Project area, and Section 10.1 describes possible environmental effects. The topography of the region in which the proposed Project is located consists of low ridges and intervening hollows that have encouraged the development of swampy flats. Soils are generally thick and acidic and their drainage is poor. Peat bogs are common and chains of lakes, streams and still-waters occur throughout the area. Goldboro is located within the Meguma Zone in which the geology comprises mostly fine-grained sandstones and shales. The bedrock structural geology of the Project area is the direct result of complex tectonic events that are manifested by steeply dipping Goldenville Formation rocks which underlie the entire site. Halifax Formation slates are present generally as narrow bands along major synclinal axes south of Meadow Lake.

Eastern Canada features a relatively low rate of earthquake activity. However, the magnitude 7.2 Grand Banks earthquake (1929) triggered a large submarine slump. In Nova Scotia, there was minimal damage from earthquake vibrations and the Goldboro LNG site was classified by the Geological Survey of Canada (GSC) to be just at the edge of the “minor damage” zone for the November 18, 1929 tsunami that was generated by the earthquake.

About 44% of the soils in Guysborough County (GC) have developed from glacial till. The southern portion of the main Project area is blanketed by Aspotogan Series soils made up of poorly draining and coarse-textured glacial tills. The central part of the main Project area is comprised of Halifax Series soils (medium and moderately coarse-textured tills). The work camp area is occupied by both Halifax and Aspotogan soils, while Red head Peninsula is dominated by interbedded coarse sand and gravel that is classified as Herbert Series soil. A total of 24 test pits were completed on the Goldboro Industrial park property in 2007. Subsurface conditions are described as 1 to 4 m of overburden overlying Goldenville Formation bedrock with an average depth to bedrock of 2.72 m. Gold mill tailing deposits from past mining and a number of gold mines and test pits exist within the Project boundary (e.g., Hattie’s Belt and mine openings associated with the Griffin Lead and another location near Betty’s Cove).

Coastline deposits in the area are generally rocky with few sand beaches. The offshore areas of Stormont Bay are predominantly covered with fine sand and silt with scattered rock shoals. Baseline surveys completed in 2008 sampled marine sediments in Dung Cove, Isaac’s Harbour and Stormont Bay. Trace metal values were found to be below the probable effects limits for marine sediments except for manganese which was up to three times the acceptable limit of 112 mg/kg in all samples.

Four tailings disposal areas featuring mercury-contaminated sediment have been located in the Project area, and there are tailings present in Dung Cove Pond that could be disturbed should there be a need to do work in this body of water. In addition, there are two narrow bands of sulphur-containing Halifax Formation rocks that cross the route of the proposed water supply pipeline between Meadow Lake and the Project site. The proponent indicates that no disturbance of acid-generating rock will occur during the operation of the LNG plant and that no potential effects related to acid-generating rock or

abandoned mine workings are anticipated during decommissioning of the plant and restoration of the Project area.

Past mining contamination of local marine sediments has been documented, showing elevated concentrations of metals such as mercury in near-surface marine sediment. Findings from earlier sampling programs carried out from 2003 to 2006 have demonstrated that most mine sites contained large volumes of unconfined tailings that have, in certain cases, been subject to offshore and alongshore transport by streams, rivers and tidal currents.

5.1.2 – Conclusions

The geophysical environment of the Project site was identified as a Valued Ecosystem Component (VEC) due to the potential for disturbance of acid-generating rocks and because of the existence of abandoned mine workings and their associated contaminated tailings deposits. Significant effects could therefore include an unmanaged release of acid rock drainage or trace metal remobilization that exceeds established government guidelines and that could contaminate surface water or groundwater. A total of 28 abandoned mine workings have been identified within the Project area of which many are poorly mapped and poorly documented. The proponent raises issues of health and safety concerns for workers involved in site preparation and plant construction work. The Halifax Formation is sulphide-bearing and has the potential to become acidic when exposed to oxygen or water, as might result from an earthquake/tsunami event, or from vibrations associated with excavation and other construction activities. Argillite containing pyrite and arsenopyrite associated with the Halifax Formation was identified along the southern edge of Meadow Lake and may pose a problem during the excavation for water intake and water pipeline infrastructures.

24 test pits were excavated in the area where the LNG liquefaction facilities and storage tanks are to be located. Sulphur measurements ranged from 0.008% to 0.085% (i.e., well below the 0.4% sulphur limit) established by NSE. There may be additional undocumented mine workings in the Project area, but they are predicted to be concentrated mainly in areas where other workings have been identified during earlier surveys by the Keltic project proponents and private exploration companies.

To date, geological mapping and preliminary geotechnical investigations suggest to the proponent that it is unlikely that acid-generating material will be encountered during construction activities within the LNG facility footprint. In regard to the water supply pipeline, the proponent argues that the required shallow and narrow trench needed for the pipeline might only disturb an “insignificant” amount of acid-generating rock, and that the resulting small amount of acid runoff would be entirely buffered by any receiving water body. The proponent also indicates that for abandoned mines located within the Project’s footprint, detailed geotechnical surveys will be completed before any construction work is initiated. Those mine workings that are deep and/or extensive and deemed to pose a risk to the groundwater regime, will be sealed where possible using low permeability grout. A similar precautionary approach is offered by the proponent for dealing with tailings deposits. Construction activities in the vicinity of tailings deposits will be guided by protocols defined in the *Nova Scotia Guidelines for the Management of Contaminated Sites*. These government guidelines will also be incorporated into the proponent’s Risk Management Plan (RMP) and Environment Protection Plan (EPP) to avoid the uncontrolled release of contaminated dust, sediment, surface water, or groundwater.

Installation of the access road for the marginal wharf will pass over the cobble beach at the south end of Dung Cove Pond and serve to both protect the beach from erosion during severe storms and isolate contaminated sediments that have accumulated in the Pond itself. In addition, runoff directed to Dung Cove Pond will have to meet pre-development discharge conditions to prevent the potential for disturbance and remobilization of contaminated Pond sediment.

Acid-generating rock areas are to be more clearly defined and the bedrock in those areas where there might be acid drainage potential (e.g., locations where excavation for grading is needed) may require modifications to construction designs to resolve the problem. With proper mitigation measures in place, the panel believes that the significance of residual effects of acid drainage is expected to be minimal and/or manageable in ways that will contain contaminated solids and liquids and prevent their wider dispersal into the environment.

An unpublished Natural Resources Canada manuscript by Dr. Michael Parsons on mercury and arsenic contamination of Isaac's Harbour sediments concluded that elevated but acceptable concentration levels are confined to near surface sediment layers in outlying areas of the harbour. However, alongshore transport of remobilized contaminated mine tailings is manifested by an increase of metal concentrations in nearshore environments that may be disturbed by construction activity.

5.1.3 – Panel Recommendations

The panel provides the following recommendations:

- Special care should be taken with the pyrite-laden argillite deposits identified along the southern edge of Meadow Lake, and in carrying out excavations for the marginal wharf and causeway given the location of the former McMillan mine on the west coast of Red Head Peninsula. Further surveys are recommended to identify any additional tailings deposits and mine openings within the Project area prior to the initiation of any construction work, particularly in areas where mine openings and tailings deposits have already been identified (e.g., Figure 9.1-5 of the EAR and the 1984 Seabright Resources report cited in the EAR).
- For those areas where acid drainage contamination cannot be avoided, the panel emphasizes that the proponent should always be guided by protocols defined in the Nova Scotia *Guidelines for the Management of Contaminated Sites*. Relevant guidelines should also be detailed in Sulphide Bearing Materials Management Plan (SBMMP), RMP and EPP plans that are to be formulated during the FEED exercise and approved by appropriate government regulators.
- Pre-construction surface water discharges into Dung Cove Pond should be measured during all seasons of the year to provide baseline data for regulating future (post-construction) discharges emanating from within the Project area and thereby avoiding or minimizing the remobilization of contaminated Pond basin sediment.

5.2 – Groundwater

5.2.1 – Overview

Section 9.2.1 of the EAR describes the existing groundwater environment. Background characterization of the Project site hydrogeology was obtained using the data from the proposed Keltic project. Refer to Section 5.1 of this report for a brief discussion of site geology. Monitoring wells were used to characterise site hydrology. Groundwater chemistry was found to be typical of the area, with some exceedances of Canadian Council of Ministers of the Environment (CCME) drinking water guidelines for pH, iron, arsenic and manganese. Surveys found up to 40 wells in the local community area (within 1 km). The zone of impact from the Goldboro Project for groundwater wells is projected to include wells north of the Project for a distance of up to 1 km, with impacts depending on the type of well and distance from the Project site. Possible impacts of the Project on wells include blasting and vibration damage, reduction in groundwater levels and well yields, and groundwater contamination from possible accidental releases or siltation events. Acidic drainage from sulphide-bearing materials is also a source of possible impacts. Changes in groundwater levels may also modulate base flow and discharge in local surface water streams. NSE has commented that compliance regarding contaminants and chemical spills should follow the new *Contaminated Sites Regulations*. Drinking water must meet the requirements of the *Water and Wastewater Facilities and Public Drinking Water Supplies Regulations*.

5.2.2 – Conclusions

Section 10.2 of the EAR describes the predicted environmental impacts on groundwater. The proponent suggests that potential impacts are controllable through rapid spill responses, pre-blasting well surveys, avoidance of blasting within 500 m of residential wells, and monitoring and remedial action as necessary to detect and restore damaged wells or groundwater impacts. Provision of temporary potable water as required is also proposed. The extent of possible impacts is stated to be minimal to minor. NSE has commented that post-construction groundwater monitoring should continue for 1-2 years within 500 m of the Project site, including some local residential wells in areas potentially affected. Nova Scotia Health and Wellness (NSHW) has recommended that wells be monitored within 800 m to 1 km of blasting sites both during and following construction.

5.2.3 – Panel Recommendations

The panel provides the following recommendations:

- Pre-blast surveys should be conducted for any potentially affected residential wells, as required by regulations or conditions of blasting permits.
- A well monitoring program should be developed and implemented as a condition of any permits for blasting, in order to detect any adverse changes in well water quality or quantity during the construction phase. Additional monitoring of local residential wells within 500-1000 m of the Project site during a 1-2 year post-construction period should also be mandated.
- An adequate spill response program should be developed and implemented, including a requirement to conduct further monitoring of any possibly affected residential well as the result of a spill incident.

- Well monitoring and spill response plans should include details on provision of potable water to local residents, including conditions and criteria that will require this action, the extent of the “temporary” timeframe for such provision, and details on further action to be undertaken if remediation efforts do not restore potable well water within the “temporary” timeframe.

5.3 – Surfacewater

5.3.1 – Overview

Sections 9.2.1 and 9.5.1 of the EAR describe the existing surface freshwater environment. Project impacts will include disturbance of surface waterbodies at the Project site, the use of Meadow Lake as a water source, and the construction of a water transmission line from Meadow Lake to the Project site. The water line will primarily follow an existing right-of-way, potentially impacting a number of wetlands. Water withdrawal from Meadow Lake will be up to 600 m³ per day. This is approximately 1.2% of base flow, and 12% of the allowable withdrawal amount. The volume of water use proposed for the present Project is significantly less than that proposed for the Keltic project, likely because the present Project will not require the use of water for petrochemical (or any other) industrial processes.

Surface water resources in the Project area were documented for the Keltic project. Identified uses of surface waters included recreational and commercial fishing in near-shore marine areas. No permanent downstream uses at Meadow Lake or at the Project site were identified.

Water quality of Meadow Lake has been found to be similar to other lakes in Nova Scotia that are influenced by acidic bog drainage with high organic content and low pH, and with elevated aluminum concentrations. Water quality may also reflect limited buffering capacity of the underlying bedrock. The water is considered corrosive, requiring treatment for further use.

5.3.2 – Conclusions

Section 10.3 of the EAR describes the predicted environmental impacts on surface waters. The anticipated effects on surface waters include those from land and construction disturbances, as well as runoff of wastewater and stormwater discharges. Environment Canada (EC) has expressed concern over runoff from blasting zones, and from old mine tailings or acid-bearing rock to adjacent water bodies, impacting water quality. A remediation plan should be developed including details of runoff management.

Effects of runoff may include elevated total suspended solids, reduced pH, elevated metals, residual hydrocarbons, or lime from concrete production. Erosion control measures and runoff management details should be specified in the EPP and/or Environmental Management Plan (EMP), including site grading plans.

Project wastewater will be treated and discharged to Isaac's Harbour during the construction and operations phases. The EAR mentions the possibility of collection and trucking of wastewater to an as-yet unidentified treatment facility off-site during the initial construction phases. A stormwater management system will also be constructed by Pieridae to adequately treat stormwater runoff from the site, including settling ponds and sequestration of uncontaminated and contaminated water with appropriate treatment.

NSE has recommended confirmation of monthly stream flow from Meadow Lake, and use of 30-m buffers from surface waters and 100-m setbacks for fuel and chemical storage. NSE also recommends further baseline monitoring of surface waters.

NSE has noted that there are 9 out of 13 wetlands impacted which have red-rated functions (rather than the 7 wetlands noted in the EAR). Consequently, additional or enhanced compensation may be required for impacted wetlands.

See also section 5.8.3 of this report regarding the Wetland Compensation Plan.

5.3.3 – Panel Recommendations

The panel provides the following recommendation:

The EPP and EMP, must include all measures for protection of surface waters committed to by Pieridae in the EAR and in the IR responses (including but not limited to: Wastewater Management Plan, Stormwater Management Plan, Erosion and Sediment Control Plan, Site Grading Plan, Spill Prevention and Response Plan, Sulphide Bearing Materials Management Plan, Blasting Management Plan, Surface Water Monitoring Plan, and appropriate buffers and setback zones), as well as any additional conditions required by NSE. The EPP and EMP should be submitted to NSE and other applicable regulators required by NSE for approval.

5.4 – Air Quality and Climate Change

5.4.1 – Overview

Section 9.3.1 of the EAR describes the existing climate of the Project area. The Project site is located on Nova Scotia's Atlantic coast. This area typically receives slightly less sun than the rest of the province, and receives slightly more precipitation. Temperatures in this area are buffered by the Atlantic Ocean, with a mean summer temperature of 14° C, and a mean winter temperature of 3° C. This area is often exposed to a number of unique weather conditions such as severe storms, high winds, and thermal inversions which can trap cooler pockets of air near the ground for an extended period of time.

Section 9.3.2 of the EAR describes the baseline air quality of the region. The air contaminants that are of the most interest for the Goldboro Project are:

- Sulphur dioxide (SO₂), formed when fuel containing sulphur, such as coal and oil, is burned, and when gasoline is extracted from oil, or metals are extracted from ore;
- Nitrogen oxide (NO_x), generated when fuel is burned at high temperatures as in a combustion process;
- Carbon monoxide (CO), formed from the incomplete combustion of carbon-containing fuel;
- Total suspended particulates (TSP), particulate matter (PM) with aerodynamic diameter less than a nominal 10 micrometers (PM₁₀) and less than 2.5 micrometers (PM_{2.5}) - terms for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets;
- Volatile organic compounds (VOCs).

The Sable Offshore Energy Inc. (SOEI) plant is located near the proposed Project, which may contribute to background levels of the above contaminants. Despite this, there is scant data collected in the area on the baseline levels of these contaminants. Limited air quality monitoring was conducted in Seal Harbour in the summer of 2004. Data collected at this time showed that the levels of the above noted contaminants were well within provincial air quality guidelines (as prescribed in Nova Scotia's *Environment Act*, and CCME's *Canadian Ambient Air Quality Standards*).

With regard to greenhouse gas (GHG) emissions, Nova Scotia's GHG emissions have increased approximately 7% between 1990 and 2010 from 19.1 Mt CO₂e (million tonnes of carbon dioxide equivalent) to 20.4 Mt CO₂e. The only major source of GHG emissions in the Project area is the SOEI plant, which in 2010, was responsible for approximately 0.5% of the province's total GHG emissions.

Section 10.4 of the EAR describes the predicted effects that the Project would have on air quality and climate change. The construction phase is expected to last approximately four years, and generate atmospheric contaminants and GHGs from the use of internal combustion engines. The main concern however would be fugitive dust (which would present itself in the form of increased PM₁₀ and PM_{2.5} levels) generated from construction activities. Effects would be similar during the decommissioning phase. Section 10.4.3 of the EAR describes the detailed inventory of emissions sources for air contaminants and GHG emissions. The proponent ran an air dispersion model (ADM) based on preliminary Project design. This model incorporates background pollutant levels, meteorological data, terrain and emission source data to produce conservative estimates of the highest annual pollutant levels. The results of the model indicate that the predicted annual values for SO₂, NO₂, TSP and CO fall well below Nova Scotia's annual air quality objectives. Regarding GHG emissions, the EAR provides an

inventory of all sources of GHG emissions based on preliminary Project design. The Project is predicted to generate approximately 3,778,390 t CO₂e per year.

The proponent describes a number of mitigation strategies in section 10.4.5 of the EAR. They involve a number of plans to reduce and monitor fugitive emissions, and manage GHG emissions by developing a GHG management plan, which would include contributions for carbon emission offsets.

Although the studies undertaken while preparing the EAR to not indicate any significant impact to air quality, the panel, public and interveners did raise a number of concerns (see IR #s Environmental Assessment Review Panel (EARP) 48; Health Canada (HC) 1-23; NSE 2-3; concerned citizens (CC) 117) with respect to the effect that the Project would have on air quality in the area. Most of the concerns were regarding the lack of specific information due to the lack of a final Project design.

5.4.2 – Conclusions

The Project would result in an increase in the atmospheric levels of a number of harmful pollutants for the Goldboro area, however pollutant levels are predicted to be well below provincial and CCME guidelines. The anticipated GHG emissions that the Project would emit would raise Nova Scotia's total GHG emissions by over 18% (above 2010 levels), and the Goldboro LNG facility would be the largest single GHG emitter in the province. Nova Scotia has committed to reducing GHG levels. The province has committed to reducing GHG emissions to 10% below 1990 levels by 2020 as part of the *Environmental Goals and Sustainable Prosperity Act* (EGSPA). The proponent has committed to developing a GHG management plan and contributing to carbon offset programs (the exact nature of these commitments is yet to be determined), but despite this, it is still likely that the province's ability to achieve the goals laid out in the EGSPA would be compromised. With regards to the Project's predicted effects of pollutants on the atmospheric environment, the panel finds that the Project could proceed within an acceptable level of risk, as long as the mitigation strategies that the proponent committed to, as well as the recommendations summarized below, are adhered to. With regards to GHG emissions and the Project's potential contributions to climate change, the panel commends the proponent for committing to mitigate these impacts, but stresses that this issue will be one of the Project's most significant adverse residual effects.

5.4.3 – Panel Recommendations

The panel provides the following recommendations:

- Once detailed Project designs have been made available through the FEED process, the proponent should re-run the ADM, and submit a report detailing the results to NSE, HC, EC and NSHW.
- The proponent should develop an emission and air quality management plan in consultation with NSE, HC, EC and NSHW. This management plan should incorporate an air quality-monitoring program that persists throughout all phases of the Project (construction, operation and decommissioning), as well as a pre-construction (baseline) assessment of air quality in the Project area. The monitoring program should be used to inform adaptive management practices if necessary.
- The proponent should work with NSE to comply with all provincial and federal GHG emissions regulations, and specifically with the proposed new federal regulations for the oil and gas sector. The GHG Management Plan committed to by Pieridae should be developed in close consultation

with NSE and other appropriate regulators, and be approved by NSE. This plan should include a mechanism to offset the 3,778,390 t CO₂e that the Project is predicted to emit per annum.

5.5 – Acoustic Environment (Noise)

5.5.1 – Overview

The proposed Project site location is in a rural area with a relatively low population density. The closest residence is on Red Head Peninsula located approximately 300 m from the Project site perimeter, and another one is about 800 m from the Project site perimeter on the east side of Betty's Cove Brook. Although the Project site is in an area zoned for industrial use, it is primarily un-used with the exception of the SOEI gas plant, located approximately 200m east of the Project site boundary. Section 9.3.3.2 of the EAR describes the existing acoustic environment of the area. Sound monitoring conducted in September of 2004 at the SOEI Gas Plant indicated that, despite the operational noise generated by the SOEI gas plant, background noise levels in the area are still typical for a rural environment.

There are a number of international, federal, provincial as well as municipal guidelines and regulations that pertain to noise that would apply to the Project. These are described in section 9.3.3.1 of the EAR. Of note are the provincial guidelines listed below, which provide acceptable equivalent continuous sound levels (Leq) for different times of the day, and the sound levels are measured in A-weighted decibels dB(A).

- Leq of 65 dB(A) between 0700 to 1900 hours;
- Leq of 60 dB(A) between 1900 to 2300 hours; and
- Leq of 55 dB(A) between 2300 to 0700 hours.

The Project would generate noise during all Project phases. During the construction phase, which is expected to last approximately four years, noise would be generated by operating equipment, blasting activities, component assembly, etc. During operation of the LNG plant and the marine terminal (jetty), noise will be generated by the LNG incinerator used for gas removal, by the refrigerant compressor gas and power generating turbines, by gas flares and emergency diesel generator sets, and by the LNG carriers. Banks of fin fan air-cooled heat exchangers will produce high on-site noise levels. Noise levels during decommissioning are expected to be comparable to construction phase noise levels.

Section 10.5.2 of the EAR describes the predicted noise levels generated during each stage of the Project. During the construction phase, it is expected that noise levels generated by construction activities should for the most part be lower than the maximum level of 65 dB(A) prescribed in the provincial regulations. However it is possible that temporary exceedances of this threshold may occur. This situation is expected to be the same for the decommissioning phases. During the operational phase, the proponent employed a sound modeling study to predict noise exposure levels for the general area. Based on the preliminary design of the Project, it is expected that the closest nearby receptors would be exposed to a continuous noise level of about 60 dB(A). While this is within the provincial guidelines between 0700 to 2300 hours, it is a 5 dB(A) exceedance at nighttime between 2300 to 0700 hours.

Section 10.5.3 of the EAR describes the mitigation measures proposed by the proponent. The proponent has committed to taking all reasonable measures to ensure that noise levels are kept at a minimum during all phases of the Project (i.e. ensuring equipment is kept in a good state of repair, ensuring noise muffling devices are used where possible, limiting operations during evening and night

time hours, etc.). Additionally, the proponent has committed to considering technologies that will limit operational noise when preparing detailed Project design plans. Finally the proponent has committed to developing a protocol for managing noise related complaints for all phases of the Project.

Concerns were raised by the panel and a number of interveners regarding noise that the Project is predicted to generate (see IR # HC 8 to 13 & 20 to 23; EARP 39 & 60; NSHW 1; NSE 2; CC 6). The majority of these concerns were related to potential impacts of noise levels on human health.

5.5.2 – Conclusions

The Project is predicted to generate noise levels that exceed a number of guidelines and regulations, including provincial guidelines on sound exposure levels for industrial developments. However the proponent has committed to refining the Project design and implementing a number of mitigation strategies to reduce the effects of Project related noise on nearby receptors to acceptable levels. Yet lingering concerns remain given the lack of a final Project's design, and the potential for excess noise to affect human health. While the panel is thus far satisfied with the proponent's approach to managing noise related issues, we think it is necessary to provide further recommendations to ensure the proper management of noise related issues, should the Project be approved. Underwater noise levels should also be considered (see section 5.11 of this report).

5.5.3 – Panel Recommendations

The panel provides the following recommendations:

- Once the Project's design is finalized, the proponent should re-run sound modeling studies, and present the results to NSE. Should noise exposure levels still exceed guidelines and limits prescribed by the province, the proponent should consult with NSE, HC, NSHW, and the Community Liaison Committee (CLC) on a management plan that would effectively mitigate the effects of Project related noise levels to the satisfaction of these parties. Consideration of underwater noise levels should be included.
- Once the Project becomes operational, the proponent must implement a noise monitoring program (to be approved by NSE) to monitor operational noise exposure levels at a number of nearby dwellings, for an appropriate period (prescribed by NSE). Results of this monitoring program should be submitted to NSE for review. Should noise exposure levels still exceed recommended guidelines and limits prescribed in provincial guidelines, the proponent should consult with NSE, HC, NSHW, and the CLC on a management plan that would effectively mitigate the effects of Project related noise levels to NSE's satisfaction.

5.6 – Ambient Lighting

5.6.1 – Overview

There were no studies done to assess the baseline lighting conditions in the Project area as part of the EAR. However, it can be assumed that, given the Project's location in a semi-rural area, there are low levels of artificial light. The SOEI plant is equipped with lights around the plant itself as well as on the flair stack.

The Project would require lighting to illuminate the LNG plant for the safety of the workers at night, as well as to equip the flair stack with navigation lights, as is required by Nav Canada. Temporary lighting would also be required during the construction and decommissioning phases, as work crews would regularly work around the clock. The resulting light would emit light pollution, which could be irritating to nearby residences, especially at night. The lights may also attract birds, especially in low visibility conditions during the spring and fall migration periods. This may result in the mortality of birds as they collide with plant infrastructure after being attracted or disorientated by the bright artificial lights.

The proponent proposes a number of mitigation strategies in section 10.6.3 of the EAR. These strategies include a number of management measures that would minimize the Project's contribution to increased ambient lighting levels in the area, as well as a number of strategies that would reduce the potential for the Project's lighting to cause bird mortality.

A few concerns were raised by the panel as well as interveners. These concerns were related to the effects that increased ambient lighting would have on migratory birds.

5.6.2 – Conclusions

Given the Project's location within a semi-rural environment, it is inevitable that it would increase ambient light levels, especially at night, for the whole area. This would result in a change in the visual landscape, and may irritate some residents, and affect birds migrating through the area. The proponent has committed to implementing a number of management measures that would keep the Project's impact on ambient light levels in the area at a minimum, and reduce (but not eliminate) the risk to migrating birds. The panel is satisfied with the proponent's proposed mitigation and management measures, as long as the recommendations provided below are incorporated into the proponent's lighting management strategies.

5.6.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent, in consultation with the CLC, must incorporate a protocol as part of the EMP to receive and respond to complaints from the public related to Project lighting.
- As part of the development of the Avian Management Plan, the proponent must consult with Nova Scotia Department of Natural Resources (NSDNR), EC and Bird Studies Canada (BSC) on lighting and flaring management that would reduce or eliminate the risk that the Project's lights and flares would pose to birds. Additional recommendations regarding lighting and flaring are provided in section 5.9.3 of this report.

5.7 – Terrestrial Habitat and Vegetation

5.7.1 – Overview

As described in section 9.4.1.1 of the EAR, terrestrial habitat and vegetation is influenced by climate, landform and soil type. The Project area falls within the Eastern Shore ecodistrict (820), which stretches from St. Margaret's Bay to the Canso peninsula. This ecodistrict is influenced more by the climate created by the Atlantic Ocean than soil type, which has excluded a variety of vegetation that is not suited to these harsh conditions. This has resulted in this ecodistrict supporting a relatively low diversity of primarily short-lived coniferous forests dominated by Black spruce (*Picea mariana*), and Balsam fir (*Abies balsamea*).

Section 9.4.1.1 of the EAR describes the habitat types found in the area of the LNG facility, along the proposed water supply pipeline route, and around Meadow Lake. Habitat types found in these areas are typical for this ecodistrict. However historical anthropogenic activities (mining, forestry, etc.) in some areas have altered the natural vegetative composition to include opportunistic species that thrive in disturbed areas. A number of wetlands were found during habitat surveys. Wetlands are discussed in detail in section 5.8 of this report.

Vegetation composition in these habitats has been made largely predictable by a variety of databases maintained by the Nova Scotia Museum of Natural History, NSDNR and the Atlantic Canadian Conservation Data Center (ACCDC). Vegetation surveys were also performed in the Project area as part of the EA for the Keltic project. A detailed inventory of the flora found in the Project area is provided in Appendix D of the EAR. Desktop reviews, and a review of the research conducted for the Keltic project's EA, indicate that there is potential for a number of rare flora species to occur in the Project area. However studies conducted in the summers of 2012 and 2013 for the Goldboro EAR only identified two flora species of conservation concern (SOCC). SOCC are discussed in section 5.12 of the EAR.

As discussed in section 10.7 of the EAR terrestrial habitat and vegetation would suffer direct and indirect impacts as a result of the construction, operation and decommissioning of the Project. These effects may include:

- mortality of plants and loss of habitat;
- adverse effects on plants and habitat as a result of erosion, sedimentation and fugitive dust;
- introduction of invasive species;
- increased levels of toxic and deleterious substances (e.g. herbicides and salt); and
- potential adverse effects as a result of spills, malfunctions and accidents.

The proponent has committed to a number of mitigation measures to reduce impacts on terrestrial habitat and vegetation, which are described in section 10.7.3 of the EAR.

5.7.2 – Conclusions

During Project construction phase, the Project would result in the destruction and alteration of a variety of terrestrial habitat types in its area, as well as the vegetation contained therein. The Project would also have an on-going influence on terrestrial habitat and vegetation in the area for the duration of its operational and decommissioning phases. However, with the exception of wetlands (which are

discussed in details in section 5.8), the terrestrial habitat types in the Project area are commonplace through much of Nova Scotia. While impacts on habitat should always be taken seriously and mitigated effectively, the panel is satisfied that the Project would not result in a significant loss of rare or important terrestrial habitat or vegetation. As long as the proponent implements their proposed mitigation measure, as well as those detailed in the recommendations below, the panel finds that the Project's impacts on terrestrial habitat and vegetation are acceptable. There appear to have been changes in the habitat type in the Project area between the time that the EA was conducted for the Keltic project, and when the EA for the Goldboro Project was completed. This indicates that the habitat in this area is undergoing dynamic changes with respect to habitat maturation and vegetative succession, which may affect the diversity and distribution of rare flora. These changes will likely continue between now and when construction would begin (assuming Ministerial approval is obtained). Additional work is required to inventory flora within the finalized Project footprint.

5.7.3 – Panel Recommendations

The panel provides the following recommendation:

The proponent should conduct flora surveys within the finalized footprint of the Project (including the finalized route of the water supply pipeline) immediately prior to construction, and submit a report to NSE for review. Should rare flora be identified in these surveys, the proponent should be required to consult NSE on appropriate mitigation measures.

5.8 – Wetlands

5.8.1 – Overview

Wetland provides a variety of vital ecosystem services that include but are not limited to: improving surface water quality, ground water recharge, storm surge buffering, carbon sequestration and providing vital habitat for countless flora and fauna species. There are four main types of wetland habitat in Nova Scotia; fens, bogs, swamps and marshes. These wetland types each provides a unique array of important functions that constitute the ecosystem services described above.

The EAR identifies thirteen wetlands within or downstream of the Project area, and these would therefore be impacted by the Project. Additionally, Meadow Lake is surrounded by wetland habitat within the lake basin, and a number of wetlands have been identified along the water supply pipe route between the Project site and Meadow Lake.

Wetland habitat is described in section 9.4.2 of the EAR. Wetland habitat in the Project area consists of a variety of swamps, bogs, fens and marshes. Wetland habitat around Meadow Lake consists largely (95%) of fen and marsh habitat, with a small amount of bog type habitat (5%). Wetland habitat along the route of the water supply pipeline is a mosaic of bog, fen, swamp, and marsh type habitat. The wetlands that occur along the route of the water supply pipeline were not surveyed as part of the EAR as the exact routing of the pipeline will be determined during the FEED process. The EAR commits to avoiding wetlands to the greatest extent possible when routing the pipeline.

Section 10.8 of the EAR describes the impacts to the wetlands that occur within the Project area. Wetlands may be impacted either directly or indirectly by the Project. Direct impacts would be primarily caused by infilling during construction. Wetlands that are close to the Project infrastructure or downstream of impacted wetlands may suffer indirect impacts. Indirect impacts are more speculative, and may include impacts to wetland hydrology, exposure to sediment runoff or dust, or being subject to the introduction of invasive species.

The EAR poses a number of strategies to mitigate wetland impacts in section 10.8.3. First and foremost is to avoid as much wetland habitat as possible. Secondly, the EAR poses a number of management strategies to reduce impacts on the wetlands in the Project area that are specific to their characteristics and function.

Concerns are raised by the panel and government departments about wetland impacts and proposed mitigation measures. The panel is concerned about the lack of proposed management measures that correspond to the wetlands that surround Meadow Lake (see IR # EARP 53) given that the lake's hydrological regime would be altered slightly to facilitate its use as a potable water supply for the Project. NSE (IR # NSE 1), and NSDNR (IR # NSDNR 4) raise concerns about the loss of high functioning wetlands that would occur should the Project be approved.

5.8.2 – Conclusions

Based on the design of the Project as discussed in the EAR, a number of high functioning wetlands would either be completely lost, or partially altered. However the proponent has made commitments to reduce impacts to wetlands to the greatest extent possible through responsible design, and the implementation of well-researched mitigation measures. Furthermore, the proponent has committed

to compensating for lost or altered wetland habitat in a manner consistent with *Nova Scotia Wetland Conservation Policy*. Provided that the proponent adheres to these commitments, as well as to the recommendations provided below, the panel is satisfied that the impacts that the Project would have on wetlands are acceptable.

5.8.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent should plan the routing of the water supply pipeline in a manner that would minimize its impacts on wetland habitat, and that any unavoidable wetland habitat is compensated for through a Wetland Compensation Plan as per the requirements of the *Nova Scotia Wetland Conservation Policy*.
- The proponent should consult with NSE on the design and implementation of a monitoring program that would assess the impacts of water withdrawal from Meadow Lake on its associated wetlands. Such a program should provide a detailed baseline assessment of the vegetative and hydrological conditions in a variety of areas and habitat types (including reference areas) around the lake's associated wetlands, and should monitor these conditions for a period of no less than 4 years after water withdrawals from the lake have commenced. If the results of this program indicate that water withdrawals are impacting the wetlands around Meadow Lake, then the proponent should take adaptive measures in a manner that is satisfactory to NSE.

The following recommendations are provided by NSDNR, and are supported by the panel:

- The proponent should compensate for loss of wetlands onsite through allocation of monies for the Wetland Compensation Fund to restore wetland habitat of a globally imperilled plant known as Mountain Avens (*Geum peckii*) on Brier Island, Digby County that is listed as endangered under the *Species at Risk Act* (SARA) and the *Nova Scotia Endangered Species Act* (NSESA).
 - The panel supports NSDNR's recommendation above, however it is our position that wetland compensation issues lie entirely within the mandate of NSE as per the *Nova Scotia Wetland Conservation Policy*. We encourage NSE to consider NSDNR's recommendation, but ultimately it is the panel's position that NSE determines the allocation of wetland compensation resources.

5.9 – Terrestrial Fauna

5.9.1 – Overview

The area in and around the Project site provides suitable habitat for a diverse array of animal life, including invertebrates, mammals, amphibians, reptiles, and birds. The EAR provides a detailed baseline assessment of animal life in the area of the Project site, as well as an assessment of how animal life would be impacted by the project. Below is a brief summary of the EAR's findings with respect to terrestrial fauna.

Invertebrates (Odonates and Butterflies)

An odonate and butterfly expert was contracted to conduct a survey within the Project footprint during the summer months of 2012 and 2013. Forty species were observed, mostly in the areas of wetlands and water bodies, but also in the upland areas of the Project site. All but one of the species observed are listed as 'Green' (not at risk) by NSDNR. One species, the Sweetflag spreadwing (*Lestes forcipatus*) is listed as 'Undetermined', meaning there is insufficient evidence available to determine the species classification. Generally the precautionary principle is applied to species listed as 'Undetermined' by NSDNR, so they are treated as a species at risk. Of note, a Monarch butterfly (*Danaus plexippus*) was observed within the Project footprint. While this species is listed as 'Green' by NSDNR, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists it as of 'Special Concern' (particularly sensitive to human activities or natural events). In addition to field surveys, the results of a review of the Maritimes Butterfly Atlas (MBA) were summarized in the EAR. According to the MBA, 12 species have been recorded previously near the Project site, none of which are considered rare for the region.

The EAR concludes that construction activities would result in the loss of breeding and feeding habitat availability for the invertebrates within the Project footprint. Dust from construction activities may increase sediment loading in surrounding aquatic and riparian habitats, as well as coat food plants which would affect feeding butterfly larva. The EAR also concludes that operational activities would not have on-going impacts on invertebrate populations; however, some insects (particularly moths) may be attracted to the artificial lights at the Project site.

Mammals

Twenty mammal species were observed while conducting field surveys on the Project site, either for the previous Keltic project, or the current Goldboro Project. All of these mammals are considered common and largely ubiquitous throughout the province. Although not directly observed, the EAR also lists another 14 mammal species (all of which are rodents, and are difficult to observe in the wild) that are likely present in and around the Project site as suitable habitat is present. The EAR discusses the likelihood of Canada lynx (*Lynx canadensis*), that is listed as 'Endangered' by NSESA, occurring on the Project site. It concludes that Canada lynx is not likely to be found anywhere on mainland Nova Scotia, inclusive of the Project site area. A large number of White-tailed (*Odocoileus virginianus*) deer were observed near the Project site, and NSDNR identifies a 'deer wintering area' within close proximity. Mainland moose (*Alces alces americana*) sign was also observed near the Project site. This species is discussed extensively in section 5.12 of this report. In addition, two bat species were observed on the site. Bats are also discussed extensively in section 5.12 of this report.

The EAR concludes that the impacts of construction activities on mammals other than moose and bats would include loss and fragmentation of habitat, and the temporary displacement of animals due to human activities and noise. Deer may suffer particularly adverse impacts since many areas of the site are known as deer wintering areas. The EAR also concludes that operational activities may cause changes in the diversity and relative abundance of local mammal populations, as animals that are well adapted to human presence (i.e. racoon, red fox, striped skunk, etc.) would be attracted to the Project area.

Herpetiles (Amphibians and Reptiles)

Six species of amphibian (all frogs) were observed on the Project site during field assessments for the Keltic and Goldboro projects. Another eight amphibian species (both frogs and salamanders) have potential to occur on the Project site based on habitat availability, but none were observed. Three reptile species were observed at the Project site (all snakes), and another four reptile species (1 snake and 3 turtles) could be present based on habitat availability. Wood turtle (*Glyptemys insculpta*), which is listed under the SARA and COSEWIC as 'Threatened', NSESA as 'Threatened' and NSDNR as 'Yellow', may be present on the Project site as it falls within their known range and since the proper habitat is available. Snapping turtle (*Chelydra serpentina*) which is listed under SARA and COSEWIC as of 'Special Concern', and in the NSESA as 'Vulnerable', may also be present on the Project site for the same reasons.

The EAR concludes that the impacts of construction activities on herpetiles would include the loss and fragmentation of habitat, as well as increased sediment loading in aquatic and riparian areas from dust generated by construction activities, which would temporarily alter breeding and feeding habitat. The EAR also concludes that impact of operational activities on herpetiles would result if water levels or surface water drainage patterns were to change, and/or if there is a change in water quality from operational procedures.

Birds

The EAR presented data collected from field surveys as well as literature reviews. Field surveys included land bird surveys, shorebird surveys, as well as seabird and waterfowl surveys. These surveys were conducted over a number of years (2004 to 2013) spanning the assessments for the Keltic and Goldboro projects, and were primarily done during the summer months. Literature reviews included a review of the Maritimes Breeding Bird Atlas, and data from the Christmas Bird Count conducted near Sheet Harbour. A total of 128 species were observed during field assessments, of which 44 species were confirmed as breeding on or near the Project site, 28 species were likely breeding at or near the Project site, and 54 species were considered migrants or non-breeders. The EAR however provided very little detail on the behavior of birds migrating through the area of the Project site in the spring and fall migration periods.

The EAR concludes that the impacts of construction activities on birds would include the loss of breeding and feeding habitat, the displacement of birds from human activities and construction noise, and potentially the destruction of nests, nestlings or eggs if clearing and grubbing is conducting during the breeding season (May 1st to August 31st). The EAR also concludes that the impact of operational activities on birds would result in a number of direct and indirect impacts to local and migratory bird

populations. The effects of decommissioning to all terrestrial fauna would include temporary negative effects from human activity, noise, and dust.

In section 10.9.4, the EAR provides mitigation strategies for impacts to terrestrial fauna during the construction and operation phase of the Project. These mitigation measures include reducing the Project footprint, limiting noise and dust, educating workers on wildlife stewardship, as well as a number of very specific management practices related to reducing impacts to birds.

The EAR concludes that with the successful implementation of these mitigation measures, Project activities (related to construction, operation and decommissioning of Project components) are not likely to result in significant adverse residual adverse effects on terrestrial fauna, excluding species at risk, that are discussed in section 5.12 of this report.

Intervenors raised concerns about the impact to deer (see IR # NSDNR2) as a deer wintering area is identified in the area of the Project site. Noise and human presence during the construction and operation phase of the Project would result in a 'zone of influence' that deer would avoid. The zone of influence was initially assessed by the proponent as a 500m radius around the Project site boundaries, but was amended to 1000m after comments were received by NSDNR. The proponent argued that deer would eventually adjust to the human activity and return to the zone of influence, and that mitigation measures (as summarized above) would eliminate any on-going residual effects on deer, which NSDNR did not refute. Similar concerns were raised about Mainland moose, which are discussed in detail in section 5.12 of this report.

A number of concerns were raised by intervenors, and panel members (see IR # EARP 49; NSDNR 1, 2 and 4; EC 1 to 4; BSC 1). These concerns were largely related to the proponent's approach to the assessment of the potential impacts of flaring on birds migrating through or nesting near the area of the Project site. The general consensus was that the proponent did not adequately assess the risk that flaring poses to avifauna, and that they did not propose adequate management protocols to mitigate this risk. Consider that in September 2013, approximately 7500 migratory songbirds were killed in one night as a result of flaring at the CanPort LNG facility (Saint John, New Brunswick). This precedent showed that flaring can result in significant events of avian mortality in Atlantic Canada if proper management protocols are not developed and implemented at facilities equipped with flair tips. In response to these concerns, the proponent committed to measures that are outlined in the panel recommendation section below.

5.9.2 – Conclusions

The Project would result in a reduction in breeding and feeding habitat availability, as well as increased fragmentation of habitat, for a variety of native animal species. The effects would be at their worst during the initial construction phase, after which the natural equilibrium in the diversity and abundance of animal species in the area would shift to favour animals that are better adapted to living near humans once the Project becomes operational. By far, the most concerning impact of the Project on terrestrial fauna is to avifauna. However, the proponent has thus far made commendable efforts to satisfy the concerns of the panel and intervenors. The panel is of the opinion that, so long as proper management protocols are developed and implemented, the risk that the Project poses to avifauna, and other terrestrial fauna, can be mitigated to acceptable levels.

It is possible that after the Project is decommissioned, the area can be returned to a naturalized state similar to pre-construction conditions, but predicting reclamation horizons is difficult, especially given that the Project site lies within an industrial zone, which is likely to see further development in the future. It should be assumed that the Project will result in a legacy of lingering effects that will influence a variety of environmental components, including wildlife diversity and abundance, for an indefinite timeframe after the Project has been decommissioned.

5.9.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent should consult with BSC on management practices to reduce the risk that the Project poses to migratory birds when developing the Avian Management Plan for the Project.

The following recommendations were provided by NSDNR, and are supported by the panel:

- The proponent should monitor, and undertake research on, the impacts of gas flaring on birds and bats through radar, onsite monitoring and through an adaptive seasonal gas management plan for four years from the start of the operational phase. Methodologies and the approach to research, and monitoring for assaying impacts on birds and bats and the seasonal management of gas flaring activities, must be developed with NSE, NSDNR, and EC.
- The proponent should monitor impacts of flaring and lighting on the colony of Leach's Petrels on Country Island for a period not less than four years from the date of the Project's full operation.
- The proponent should agree to submit copies of all digital wildlife survey data for significant habitats, species at risk and those of conservation concern in the form of shape files and point location information to NSDNR.
- The proponent should agree to submit an annual progress report with results and all data to a standard as defined by NSDNR for monitoring mainland moose and another report summarizing bird/bat monitoring. Both reports should be submitted by January 15th in each calendar year to NSE, and NSDNR and EC.
- Site preparations that include deforestation, clearing and grubbing should be undertaken between September 1st and April 15th in order to minimize impacts on breeding birds.

The following recommendations were provided by EC, and are supported by the panel:

- The proponent should develop and initiate a monitoring program for Roseate tern (*Sterna dougallii*), and implement adaptive measures if required (as prescribed in IR # EC 1).
- The proponent should confirm the presence and location of species at risk and implement appropriate avoidance and mitigation measures as part of an Avian Management Plan (as prescribed in IR # EC 2).
- The proponent should incorporate EC's recommendations (as prescribed in IR # EC 3) regarding lighting and flaring operations as part of the Avian Management Plan.

- The proponent should incorporate EC's recommendations (as prescribed in IR # EC 4) regarding compliance with the *Migratory Birds Convention Act* as part of the Avian Management Plan.
- The proponent should incorporate EC's recommendations (as prescribed in IR # EC 5) on measures regarding wildlife as part of spill response plans.

5.10 – Freshwater Species and Habitat

5.10.1 – Overview

Sections 9.5 and 9.7.2 of the EAR describe the existing environment for freshwater species and habitat. The Project will impact three ponds on Red Head Peninsula (Dung Cove Pond, primarily fresh water; and two un-named brackish water ponds); an un-named tributary to Dung Cove Pond; Meadow Lake (the proposed water supply); and two freshwater watercourses which will be crossed by the water supply pipeline from Meadow Lake (Branch Gold Brook and Betty's Cove Brook). The brackish ponds support stickleback species. Fish species documented on the Project site are Brook trout, eel, stickleback, killifish and mummichog. Meadow Lake also supports these species, as well as White sucker, Golden shiner, Blacknose shiner, Yellow perch, and Atlantic salmon (which is thought to be rare in this system).

Construction at the Project site will require re-location of the unnamed tributary to Dung Cove Pond, potentially impacting resident Brook trout and American eel. While Dung Cove Pond will remain in place, the two brackish ponds on Red Head Peninsula will be partially removed. Use of blasting, clearing and re-grading of the Project site, disturbance of old mine tailings and acid-generating bedrock, and changes in drainage will all impact freshwater habitat and species. Any spills of wastewater, hydrocarbons, etc. could also impact freshwater systems.

Proposed mitigation for fish habitat includes the development of a Habitat Compensation Plan, possibly including habitat enhancements at Crusher Brook and Betty's Cove Brook, as well as support for local First Nations fisheries. The proponent has made no specific commitments in regard to these proposed compensation options. Further discussions with Fisheries and Oceans Canada (DFO), local authorities and First Nations will be required to finalise the compensation requirements.

A number of specific mitigation measures are proposed in the EAR.

5.10.2 – Conclusions

Section 10.10 of the EAR describes the predicted impacts on freshwater species and habitats. Effects on freshwater habitat and species, and on fish in particular, are proposed to be minimal, or minor in the case of displacement or destruction of habitat, after consideration of the proposed mitigation measures, and the panel concurs. Specific mitigation measures will need to be documented and required through subsequent approvals and permitting processes. These processes will necessitate development of specific requirements for compensation through the Habitat Compensation Plan.

5.10.3 – Panel Recommendations

The panel provides the following recommendation:

The Habitat Compensation Plan must be approved by appropriate regulators. Development of the Plan must include discussions with the Municipality of the District of Guysborough (MODG), DFO, the Guysborough County Inshore Fishermen's Association (GCIFA) and First Nations who have fisheries interests.

5.11 – Marine Species and Habitat

5.11.1 – Overview

Section 9.6 of the EAR describes the existing marine environment, and Section 10.11 describes the possible environmental effects on marine habitat and species.

Physical Environment

Monthly wind rose data for the mouth of Stormont bay indicate a predominance of winds from the northeast and west during the winter and from the southwest in the summer. The largest offshore waves are from the south and southeast with heights ranging from 5.5 m (1 yr. return) to 9.9 m (100 yr. return). Estimates of extreme significant wave heights near the site of the wharf are lower than for offshore exposed environments ranging from 3.8 m (1 yr. return) to 5.6 m (100 yr. return). Tidal currents tend to flow back and forth parallel to the shoreline. Freshwater inflows from the Country Harbour and Isaac's Harbour rivers contribute to an increased estuarine circulation during the spring freshet. Ambient freshwater inflow to the two harbours and to Stormont Bay creates estuarial conditions that support a variety of marine organisms such as algae, phytoplankton, zooplankton, marine invertebrates, and estuarial freshwater and pelagic fish species. Current measurements made at a depth of 10 m near the site of the wharf in 18 m of water rarely exceed 0.3 m/s. Highest Astronomical Tide, Mean Sea Level and Lowest Astronomical Tide are estimated respectively at 1.94 m, 0.97 m and 0.00 m above chart datum.

The coastline near the Project site is submerged and is generally rocky with a few sand beaches. The sub-tidal zone of Stormont Bay, extending up to 15 m below mean low water, consists predominantly of sand and gravel bottom. In Stormont bay and surrounding areas, there is a significant variation of marine habitat in water depths of less than 20 m and up to 1 km from shore, while the deeper central part of the Bay features a bottom covered with soft muddy sediment. Kelp and other seaweeds are generally abundant in all nearshore areas of the Bay. The nearshore marine habitat at Red Head Peninsula consists mostly of a substrate of boulders, cobbles and pebbles interspersed with fine sand and gravel. A narrow band of coarse sediments having a relatively sparse cover of macro algae stretches from the shoreline seaward for approximately 50 m. Several species of seaweeds and invertebrate shells were observed in the strand line at the high tide mark.

Biota

The marine habitat of Stormont Bay supports a typical range of marine and estuarine species and nearshore shallow areas of the Bay support various plant species. Lobster is by far the most important species in terms of economic value within the Bay, and its' habitat preferences change with the age of the animal. Much of the habitat within the marginal wharf footprint and throughout Stormont Bay is considered to be appropriate for lobsters and, according to the proponent, the habitat lost as a consequence of wharf construction represents about 0.38% of the total available lobster habitat. Invertebrates that do not have the ability to move to a new location will be lost during the construction of the marginal wharf. Sedimentation from onshore wharf construction activities has the potential to smother nearshore sessile benthic invertebrates and demersal fish eggs in proximal nearshore areas.

EnCana Corporation conducted benthic sampling within the Project area in 2002 to characterize the benthic habitat along the nearshore sections of the Deep Panuke pipeline route to the shore. Rocky

substrate in the nearshore was dominated by barnacles, whelks, hermit crabs, sea urchins, lobsters, rock crabs, blue mussels, horse mussels, polychaete worms, bryozoans, sponges, tunicates, and other invertebrates. Important lobster habitat has been identified in the shallower waters of eastern Stormont Bay between Red Head Peninsula and Harbour Island.

Atlantic salmon begin their migration up Country Harbour and Isaac's Harbour rivers by April and spawn between late October and mid-November. Smolts migrate to the sea from mid-May to mid-June. Other marine species of importance in local bays and harbours include Atlantic smelt, American eel, Brook trout, and groundfish species such as Atlantic cod, haddock, American plaice, and Yellowtail flounder. Some of these species move into shallower water on the banks as surface waters warm in the spring. Among the indigenous pelagic fish there are important prey species such as Atlantic herring and Atlantic mackerel that represent important food sources for some commercial species such as swordfish, for some Odontocetes species (e.g., Harbour porpoise and Atlantic white-sided dolphin) and for certain pinnipeds (e.g., Harbour Seals).

Additional longer-term measurements will be done to further characterize the local marine environment. Site-specific measurements of wind, waves, currents, and water levels will typically be part of the FEED work. In general, coastal plant and animal communities were found to be more productive in relatively rocky areas than in beach areas that feature finer sediment substrates. As such, the rocky beach areas are worthy of receiving enhanced environmental oversight attention during the construction phase of the Project.

Marine habitat variations mapped in Stormont Bay and surrounding areas by the GCIFA in 2001 indicated that they were comparable to what predominates in nearshore areas elsewhere in the Bay. There are well-known food chain relationships between smaller fish species that tend to reside in shallow coastal waters and larger marine species that point to the importance of working toward maintaining pristine conditions in productive nearshore environments that lie close to and within the Project's footprint.

5.11.2 – Conclusions

A significant adverse effect on the marine environment and its associated biota is defined as one that is likely to cause adverse changes to critical habitats, serious harm to various fisheries, impairments to the normal ecological functioning of the biotic community, or increased ecological risk that predicts long-term effects on the health of aquatic biota.

The release of ballast water or wastewater by ships entering or exiting Stormont Bay can impact water quality or introduce invasive species to the area that may out-compete native species. However, the proponent indicates that LNG vessels approaching Nova Scotia with ballast water will be required to discharge it offshore in accordance with Transport Canada's (TC) *Ballast Water Regulations*. Stormwater runoff from the Project site that is discharged into the marine environment may introduce contaminants into Stormont Bay that might adversely impact some fauna and flora species. In addition, tailings present in and around Dung Cove may become disturbed should there be a need to work in this body of water to install marginal wharf and jetty support infrastructure.

Construction of the marginal wharf will have an adverse effect on marine habitat in the immediately surrounding area arising from infilling and from armouring the shoreline for the wharf, which will result in the destruction of marine habitat within its footprint. The jetty's footprint is much smaller (36,000 m²

for the wharf versus 972 m² for the jetty) and therefore should generate fewer adverse effects. Construction activities will also disturb the substrate and potentially release sediment into the marine environment through runoff. Potential impacts from the construction phase include siltation, direct mortality of individuals and loss of habitat through infilling and the avoidance of the area by marine mammals due to underwater noise. Invertebrates that are unable to move to a new location will be lost during the construction phase through smothering. Aside from accidental spills, there are few anticipated impacts to the marine environment during operation of the marginal wharf and jetty except that the wharf has the potential to increase sedimentation within its vicinity. Construction of the marine components of the facility will undoubtedly result in some losses and alterations of fish and aquatic habitat that cannot be mitigated. Pieridae will be required to identify offsets for these losses (approximately 3 ha of inter- and sub-tidal habitat). Alterations to the satisfaction of DFO will be needed so as to achieve a “no net loss” of fish habitat. If vessels are used during the construction phase, re-suspension of sediment is possible but is anticipated to be of a short-term nature and to be localized to shallower areas adjacent to the marginal wharf.

Underwater noise will be produced during construction of the jetty and marginal wharf. In addition, on-shore blasting may be required for site preparation and contouring, which may generate high underwater noise levels for marine fauna. Underwater noise can also be produced by vessels being used for construction tasks. Noise generated by propeller cavitation can represent up to 83% of the underwater acoustic field of large vessels. The effects of noise on marine mammals include changes in behavior such as avoidance, changes in migration routes, and changes in reproductive or feeding behavior.

Potential impacts of underwater noise for marine mammals include interfering with communication between individuals, foraging, echolocation, and breeding. Physical effects of noise on fish include transient stunning, internal injuries, egg/larval damage, and mortality. The use of tugs should aid in the abatement of LNG carrier vessel noise from propeller cavitations. Other underwater noise mitigation strategies include working during low tide and outside of sensitive periods, and by masking noise using bubble curtains, and by opting for the use of low noise pile driving technologies.

Specific effects of decommissioning activities on the marine environment will very much depend on the extent of the decommissioning. Of key importance is the question of whether or not the marginal wharf would be removed. Decommissioning objectives and the approach used will be discussed with all relevant stakeholders at the time and will need to be implemented in compliance with contemporary regulatory standards.

The panel concludes that, with the specified mitigation measures, the project impacts on marine habitat and species will be acceptable.

5.11.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent should investigate the use of precast concrete artificial reefs to offset lobster habitat loss in Stormont Bay instead of piles of rock. Precast concrete artificial reefs may prove to be less expensive to install, would offer reduced disturbance of surrounding habitat during installation, and

may account for the offset of relatively larger areas of habitat compared to the same number of rock piles.

The following recommendations are provided by GCIFA, and are supported by the panel:

- The proponent should establish a Fisheries Liaison Committee (FLC) to address marine habitat loss issues, as opposed to attempting to resolve matters concerning harmful alteration, disruption or destruction of fish habitat through the CLC pathway. The proponent should consult all interested parties, including First Nations, local fishers and fisheries licence holders, GCIFA, DFO, and Nova Scotia Department of Fisheries and Aquaculture on the committee's representation and objectives.
- The proponent should initiate a research program, in collaboration with the GCIFA and DFO, to assess effects on fish habitat, particularly in those areas immediately surrounding the jetty and wharf.

5.12 – Species at Risk

5.12.1 – Overview

The term SOCC is used in the EAR to define a species at risk. To be considered a SOCC, a species must satisfy one or more of the following criteria:

- Be listed as extirpated, endangered, threatened, or special concern under the federal SARA;
- Be listed as extirpated, endangered, threatened, or special concern by COSEWIC;
- Be listed as endangered, threatened or vulnerable under NSESA;
- Be listed as red (at risk), or yellow (sensitive) by the NSDNR's species status rankings; or
- Be listed as S1 (extremely rare), S2 (rare) or S3 (uncommon) by ACCDC.

The EAR presents a three-step process to determine if SOCC occur in the Project area. First, a short list of SOCC whose known geographic range overlaps with the Project site area was compiled. Second, this list was further restricted to SOCC whose known habitat preferences or requirements are present within the Project area. Finally, field surveys, such as animal tracking surveys, botany surveys, breeding bird surveys, and bat echolocation studies were performed to confirm the presence or absence of SOCC in the Project area. Even if these studies were un-able to confirm the presence of certain SOCC, these species may still occur at the site.

As described in section 9.7 of the EAR, 73 SOCC have the potential to occur at the Project site based on overlapping geographic range and habitat suitability. Forty six of these species were reported within the Project area, as described in section 10.12 of the EAR.

Potential impacts to these SOCC through the different phases of the Project's lifespan may include: direct mortality, habitat loss or alteration, disturbance or displacement, exposure to increased noise (including blasting effects), exposure to increased dust, increased human presence, sedimentation or erosion, decreased air quality, decreased water quality or quantity, alterations of hydrology, establishment of invasive species, exposure to increased lighting, exposure to contamination, and even possibly creation of suitable habitat.

A number of mitigation measures for reducing the risk and/or severity of impacts on SOCC are described in section 10.12.5 of the EAR. These include measures such as reducing the Project's footprint, avoiding specific areas, conducting monitoring programs and implementing adaptive measures if necessary, making monetary contributions to species recovery programs, and a number of other species specific management objectives.

Concerns were raised by a number of interveners (see IR #s NSNDR 1, 2 and 4; EC 1-5; BSC 1) about the proponent's approach to assessing and managing impacts to a number of SOCC including Mainland moose, bats and a number of birds. Specific concerns were raised that the impacts to Mainland moose populations may have been underestimated. Also, as was discussed in detail in section 5.9 of this report, concerns were raised about the danger that flaring activities poses to birds and bats. Finally concerns were raised about the proximity of the Project site to a large colony of the globally imperilled Roseate tern (*Sterna dougallii*) and Leach's storm petrels that reside on the nearby Country Island.

5.12.2 – Conclusions

The Project will likely have direct impacts on the habitat quality, as well as pose a direct and indirect threat of mortality to a variety of SOCC. However, the panel believes that the Project can proceed within an acceptable level of risk to SOCC as long as the proponent makes all reasonable efforts to reduce or compensate for the potential impact on SOCC habitat, and mitigates the risk that the Project poses to SOCC through implementing monitoring programs and taking adaptive and measures where necessary.

5.12.3 – Panel Recommendations

The panel provides the following recommendation:

- The proponent should consult with BSC on management practices to reduce the risk that the Project poses to Leach's storm-petrel (*Oceanodroma leucorhoa*) and Roseate tern when developing the Avian Management Plan.

The following recommendations are provided by NSDNR, and are supported by the panel:

- The proponent should monitor, and undertake research on, endangered Mainland moose both onsite and offsite in a collaborative and cost-shared effort with NSDNR to document landscape level impacts on moose and habitat use. Methodologies, approach and scope of research and monitoring required by the company on mainland moose must be developed with NSE, and NSDNR.
- The proponent should monitor, and undertake research on, the impacts of gas flaring on birds and bats through radar, onsite monitoring, and an adaptive seasonal gas management plan for 4 years from date of operation. Methodologies and approach to research, monitoring for assaying impacts on birds and bats and the seasonal management of gas flaring activities must be developed with NSE, NSDNR, and EC.
- The proponent must monitor impacts of flaring and lighting on the colony of Leach's petrels on Country Island for a period not less than four years from the date of the Project's full operation.
- The proponent should agree to submit copies of all digital wildlife survey data for significant habitats, species at risk and those of conservation concern in the form of shape files and point location information to NSDNR.
- The proponent should agree to submit an annual progress report with results and all data to a standard as defined by NSDNR from monitoring Mainland moose and another report summarizing bird and bat monitoring. Both reports should be submitted by January 15th in each calendar year to NSE, and NSDNR and EC.
- Site preparations that include deforestation, clearing and grubbing should be undertaken between September 1st and April 15th in order to minimize impacts on breeding birds that may include endangered and threatened species listed under SARA and/or NSESA during spring and summer months.

The following recommendations are provided by EC, and are supported by the panel:

- The proponent should develop and implement a monitoring program for Roseate tern and implement adaptive measures if required (as prescribed in IR # EC 1).
- The proponent should incorporate EC's recommendations (as prescribed in IR # EC 2) to confirm the presence and location of species at risk and to implement avoidance and mitigation measures as part of an Avian Management Plan.
- The proponent should incorporate EC's recommendations (as prescribed in IR # EC 3) regarding lighting and flaring operations as part of the Avian Management Plan.
- The proponent should incorporate EC's recommendations (as prescribed in IR # EC 4) regarding compliance with the *Migratory Birds Convention Act* as part of the Avian Management Plan.
- The proponent should incorporate EC's recommendations (as prescribed in IR # EC 5) on measures regarding wildlife as part of spill response plans.

5.13 – Socio-Economic Environment

5.13.1 – Overview

Section 9.9 of the EAR describes the socio-economic conditions in GC, as well as throughout Nova Scotia as a whole. The Project would be built in the Goldboro Industrial Park. The closest towns to the Project site are Antigonish and Guysborough. Although the area is known to have been frequented by Mi'kmaq families in the past, there are no First Nations communities in the general Project area (the closest being the Paq'tnekek First Nation, which lies 77 km north of the Project site).

GC has been suffering a steady population decline over the past several decades. Demographics in the county have also been shifting towards an older population. Household incomes in GC are also significantly lower than the provincial average, and unemployment rates have consistently been above the provincial average.

Section 10.13.2 of the EAR includes an economic impact assessment on effects that the Project would have on the local and provincial economy. In summary, the Project would:

- Offer significant temporary and permanent employment opportunities to GC and the rest of Nova Scotia;
- Result in significant economic spin off effects to GC, Nova Scotia and Canada; and
- Generate significant tax revenues for municipal, provincial and federal governments.

The Project however would potentially have a number of adverse socio-economic effects, which are listed below:

- Adverse effects to fisheries, aquaculture and marine harvesting, which are largely due to loss of fishable areas from the construction and operation of the marine jetty and from marine vessel traffic.
- Potential adverse effects to human health from:
 - Fugitive dust from construction and decommissioning activities;
 - Contaminated well water from hazardous materials stored on site and from blasting activities; and
 - Reduced air quality from fugitive emissions.
- Adverse effects on the visual landscape from the construction of the facility itself.

Section 10.13.8 of the EAR describes the mitigation strategies that the proponent proposes to reduce or eliminate the adverse effects discussed above.

The Project is well received by the public. During the public comment periods, the panel received many letters of support (summarized in Appendix D of this report) from members of the public, as well as from local and regional organizations and businesses, and municipal government. The general nature of

these comments was an expression of support for the Project due to the employment opportunities and economic benefits that it would bring to the area. Concerns however were raised about impacts to human health (see IR #s EARP 48 and 60; NSE 2 and 4; EC 7, 9, and 11; GCIFA 1-6; CC 6 and 117; NSHW 1-2; HC 1-23), impacts to fisheries (see IR # DFO 1; CC 51), and the proponent's approach to consulting with First Nations (see IR #s Nova Scotia Office of Aboriginal Affairs (NSOAA) 1; Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) 1, and 2).

5.13.2 – Conclusions

The Project would bring significant economic benefits to an area of Nova Scotia that has, for a long time, suffered from a lack of economic inputs. These benefits would also reverberate throughout the province, and result in significant economic spinoffs. The proponent has made significant efforts to ensure that the local economy would receive maximum benefits. It should also be noted that the proponent, through the development of a CLC has made commendable efforts to communicate potential opportunities with the public, and receive input from the public, specifically First Nations, and fishers. Despite the economic upsides, there remains a legitimate concern about impacts to fisheries, and potential impacts to human health. The panel wholeheartedly supports the proponent's efforts to maximize local economic benefits, but insists that the recommendation discussed below be implemented as a condition of the Project's approval. The comments that the panel has received from the public and interveners have indicated that fishery issues are a significant concern to a number of individuals and organizations. The panel acknowledges that the proponent has made significant efforts to negotiate directly with affected parties in a fair and transparent manner. However, it is apparent that concerns over fisheries issues are significant, and that the proponent themselves have indicated that the Project would have a residual effect on fisheries, aquaculture and marine harvesting. These issues may need a dedicated forum to facilitate the necessary dialogue and to conceptualize appropriate management measures.

The majority of public and intervener concerns relate to air quality (section 5.4 of this report) and noise (section 5.5 of this report); see these respective sections for their corresponding recommendations.

5.13.3 – Panel Recommendations

The panel provides the following recommendation:

The proponent should establish a FLC to address marine habitat loss issues, as opposed to attempting to resolve matters concerning harmful alteration, disruption or destruction of fish habitat through the CLC pathway. The proponent should consult all interested parties, including First Nations, local fishers and fisheries licence holders, GCIFA, DFO, and Nova Scotia Department of Fisheries and Aquaculture on the committee's representation and objectives.

5.14 – Existing and Planned Land Uses

5.14.1 – Overview

Section 9.10 of the EAR describes the existing and planned land uses for the Project area. The Project lies within an area designated as I-3 (industrial resource) under the MODG's municipal land use bylaws. This designation targets the marine aspect of future industrial developments. The proposed water supply pipeline route runs through this I-3 zone, as well as an area of largely un-occupied land zoned as MRR-1 (mixed use rural residential), and finally an area zoned NR-1 (natural resources) used primarily for forestry. Meadow Lake lies within this NR-1 zone.

Land use concerns fall under several categories. The baseline conditions, as described in section 9.10 of the EAR will be summarized in the paragraphs below, followed by predictions of the expected effects that the Project would have on these land use categories.

Land ownership

The MODG owns the area zoned as I-3 on which the Project would be located. This land will be purchased from the MODG. Land along the proposed water supply line's route is a combination of privately owned and crown land. Negotiations will be needed to establish easements for the pipeline and water intake structures.

Mining and sub-surface rights

The Project area had traditionally been used for mining, with a number of abandoned mines scattered throughout the Project area. Mining activities ceased in 1948, but a number of companies are interested in the area for future gold and mineral mining operations. Permission is required from the landowner (in this case, the MODG) to access the site for mineral exploration. While there are claims to the subsurface mineral rights, mineral rights holders must obtain permission from the landowner to access these resources. Pieridae would be the landowner of the Project lands, and it would be within their right to deny access to mineral right holders, but they make no commitments as to their intentions.

Tourism, Culture and Recreation

The Guysborough County Heritage Association (GCHA) maintains a number of heritage and historical sites across GC. Most of these sites are related to coastal communities and heritage features. The exhumation and relocation of remains from the Red Head Cemetery (discussed further in section 5.16 of this report) is the only recent example of GCHA activities in the Project site. The Project area also offers a variety of recreational activities including hunting, angling, all-terrain vehicle trails, scuba diving, boating, hiking, etc., which attract tourists to the area. Over the long term, the Project is expected to have positive effects on tourism for the area by creating economic opportunities for local businesses (including hotels and restaurants) to expand. Hunting and angling opportunities may suffer due to the alteration of habitat and exclusion of prey animals in the general Project area, but conditions in these locations were traditionally never considered overly bountiful for hunting or angling.

Agriculture and Forestry

The Project area does not currently support any agriculture although, historically, a small farm was located within the Project's footprint. Soils on the Project site are considered unsuitable for agriculture (see sections 9.1.3.5 of the EAR). Therefore, no interaction between the Project and agricultural activities is expected. Timber resources within the Project site are largely non-merchantable, with the exception of a small amount of merchantable softwood stands that may exist along the route for the water supply pipeline. Consequently, the Project is expected to have minimal impacts, if any, on forestry, yet the proponent commits to salvaging any merchantable timber encountered during construction.

Mi'kmaq Interests

The Mi'kmaq have a claim to all lands in Nova Scotia and have an interest in the Project site area. Mi'kmaq Ecological Knowledge studies (MEKS) were conducted for the Keltic project's EA, and updated for the current Goldboro Project. These studies concluded that a number of culturally significant resources are present within the Project site, including plants, animals and fish that continue to be harvested by the Mi'kmaq. These resources however are also found in other areas of Nova Scotia where there is greater access and opportunity for Mi'kmaq harvesters. The MEKS study found no reference to Mi'kmaq burial sites within the Project site. The Project would disturb a number of resources of interest to the Mi'kmaq including archaeological resources, wildlife, fish, plants, water quality, and air quality. These impacts, along with suggested mitigation strategies are presented in section 10.14.6 of the EAR.

A number of mitigation strategies specific to the categories above are discussed in section 10.14.7 of the EAR. No significant residual effects to the categories noted above are expected as a result of the Project. No concerns were raised by the panel or by interveners with regard to the categories above.

5.14.2 –Conclusions

The Project would have impacts on a number of categories of land use within the general area. These impacts, however, would be largely negated by the positive socio-economic benefits that the Project would have in the general area. The panel is satisfied that any negative impacts that the Project would have on current and perspective land uses in the area would be mitigated by the strategies proposed by the proponent, and by the recommendation provided by the panel.

5.14.3 – Panel Recommendations

The panel provides the following recommendation:

The proponent should make efforts to align the route of the water supply pipeline within the easement of the SOEI pipeline as much as possible to reduce cumulative effects on land uses.

5.15 – Transportation

5.15.1 – Overview

Section 9.11 of the EAR describes the existing transportation infrastructure. The Project is expected to generate traffic on Trunk 7, Route 276, and Route 316 for traffic to and from the Project site. These are local two-lane roads without controlled access. Work for the prior Keltic project measured traffic volumes on these roads and projected future traffic. A Traffic Impact Review has been conducted for the Goldboro LNG Project.

The proposed Project requires the re-alignment of provincial Route 316 to avoid the Project site; however, this Project component has been excluded from this EA. In a comment submitted to the panel, Nova Scotia Transportation and Infrastructure Renewal (NSTIR) has indicated that this road re-alignment is only in the early planning stages and that it may require a separate EA. The planning and design phase typically takes 18 to 24 months for such projects, with another two years for construction. Pieridae has indicated that the road re-alignment is a critical aspect of their Project (as indicated in IR # EARP 23 and NSTIR 1), and that, should the re-alignment schedule interfere with the Project's construction schedule, this circumstance may affect the LNG Project's viability. A final decision on this by Pieridae is expected in 2015 as part of their "Final Investment Decision".

NSTIR has indicated that permits may be required for working within the highway right-of-way, and for moving of oversize/overweight loads. NSTIR has requested additional information on the types of trucks to be used and their possible impact on structures along routes that are to be used.

The EAR indicates that during peak construction, 1,260 vehicle trips will be made to and from the Project site, by a combination of buses, trucks and cars.

The proponent will participate with TC in a voluntary Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL). This process will consider further details of shipping and navigation issues for the Project. Many of the specific issues to be considered will be developed during the FEED process. The TERMPOL process will be initiated after the EA process, during early stages of the FEED process.

5.15.2 – Conclusions

Section 10.15 of the EAR describes predicted impacts on transportation. The EAR indicates that road upgrades by both the local municipality and the province will be required for this Project. Impacts of the Project are expected to include increased traffic volume, and oversized loads during construction and operation phases. According to the proponent, the impacts are projected to be minimal. The re-alignment of Route 316 would appear to be a potential problem since it is identified by the proponent as a critical need, and NSTIR indicates a 4-year timeframe for completion.

5.15.3 – Panel Recommendations

The panel provides the following recommendations:

- The panel supports Pieridae's commitment to integrate and implement the outcomes of the TERMPOL review process with its marine designs and operational plans.

- The proponent should consult with NSTIR to determine how the Route 316 re-alignment work would impact the proposed Goldboro LNG Project schedule. Note that this recommendation need not form a part of this project approval.

5.16 – Archaeological Resources

5.16.1 – Overview

Archaeological studies were conducted in 2004 and 2007 as part of the EA for the Keltic project. These studies consist of historical background studies, informational interviews and field surveys. The results of these studies are presented in section 9.12.1 of the EAR. They showed that the Goldboro area hosted at least three Mi'kmaq encampments. European settlers spread to the area by the mid to late 1800s, likely as a result of mining activities. The name 'Goldboro' was given to the community in 1898 as a result of the area's mining history, which lasted from the mid-1800s to 1943. The area was also settled by a number of Black Loyalists. A Black Loyalist Cemetery was present at Red Head Peninsula (where construction of the marginal wharf is intended), but this cemetery was assessed and mitigated in 2001 as a result of concerns over shoreline erosion. Remains found in the cemetery were relocated at this time. A total of five heritage resource sites are identified within the proposed footprint for the LNG facility, with an additional 11 sites occurring nearby (within 300m of the Project site's boundary). Most of these sites are related to historic European settlement, (old farms, houses, mines, etc.). No sites are identified along the proposed route of the water supply pipeline.

The construction phase of the Project would permanently destroy or significantly alter any archaeological resources within the footprint of the Project site. Ground disturbing activities (grading, grubbing, filling, etc.) would be of greatest threat to these irreplaceable resources. The exact impact that the Project would have on the five heritage resource sites within the Project's footprint is not yet fully known because the exact disturbance area of the Project is yet to be determined in the FEED process. It is confirmed however that the Red Head Cemetery would be disturbed by activities associated with the construction of the marginal wharf. In addition, the operational phase of the Project may result in disturbance to archaeological resources located on the coast from wave action generated by ships. No additional impacts to archaeological resources are expected from the decommissioning phase of the Project.

The proponent has received advice from archaeological survey contractors as well as from Nova Scotia Communities, Culture and Heritage (NSCCH) on mitigation strategies to reduce the Project's impacts on archaeological resources. These strategies are presented in section 10.16.3 of the EAR and IR responses, and include employing a trained archaeologist to conduct monitoring during construction and operation phases of the Project, training construction workers in archaeological sensitivity and awareness, as well as recommendations that are specific to particular archaeological resources identified in the area.

No significant concerns were raised regarding archaeological resources by the public or interveners.

5.16.2 – Conclusions

The Project would result in permanent disturbance to at least five historical resource sites within the proposed Project footprint during the construction phase. Up to another 9 or 10 historical resource sites located along the coast may be disturbed by wave action created by LNG carriers during the operational phase. While mitigation measures may preserve important archaeological elements (artefacts, remains, etc.), the pre-development integrity of many of the resources could be altogether lost should the Project proceed. Nevertheless, the panel is satisfied that the proponent's mitigation

approach would sufficiently preserve the integrity of the area's history, and the dignity of the area's former residents, provided the following recommendations are implemented.

5.16.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent must implement all mitigation strategies provided by Davis (2004) that are described in section 9.12.1.1 of the EAR, as well as the mitigation strategies provided by NSCCH that are described in section 9.12.2 of the EAR.
- The proponent must continue to consult with NSCCH as the Project proceeds to the design phase on a plan to monitor and report additional historical resources discovered during the Project's construction.
- The proponent must consult with NSCCH and develop a monitoring plan to assess the shoreline in the Project site area during the Project's operational phase for additional historical resources that may become exposed from wave action or rising water levels.

5.17 – Malfunctions and Accidental Events

5.17.1 – Overview

Section 10.17 of the EAR describes predicted malfunctions and accidents, and plans proposed to address these conditions. The EAR indicates that, apart from the types of accidents possible during any industrial activity, there are particular concerns with a facility handling natural gas and LNG. These include release of natural gas in vapour or liquid form and associated fire risks, both on land and at sea, on LNG transport vessels. Natural gas has a varying risk of flammability depending on the concentration of natural gas mixed with surrounding atmospheric gases. Explosion is not considered likely except in the case where natural gas is released within a confined space. Additional types of accidental events include spills of fuel or chemicals, vehicle or ship collisions, improper exchange of ballast water, and worker accidents.

As part of the pre-FEED work conducted for the Goldboro LNG Project, a Hazard Identification (HAZID) has been completed and presented in the EAR. Pieridae commits to adopt a Hazard Management System to identify, reduce, detect, control, and mitigate risks. A number of mitigation measures and systems are identified to be deployed at the Project site.

EC has provided specific guidance in comments submitted for Project planning and design to address hazardous material releases.

Significant adverse environmental effects resulting from the malfunctions and accidental events described are, in each case, characterised in the EAR as “unlikely to occur”.

5.17.2 – Conclusions

The HAZID and an Emergency Response Plan (ERP) will be developed in detail during the FEED and TERMPOL processes. While some general mitigative and response measures are outlined in the EAR, regulators will need the full detail from the Emergency Response Plan to adequately assess the proposed measures for compliance with all applicable requirements.

Local fire services are volunteers in nature. It will be important for the proponent to work with local municipalities and fire services to ensure adequate training and preparation for a range of potential accidental events. Emergency Response plans will need to establish protocols for liaison with local, regional, provincial and/or federal emergency responders for cases of significant events.

5.17.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent should consult and work with local and regional emergency responder organizations such as fire departments, medical authorities and police to ensure adequate training and preparation for a range of possible malfunctions or accidental events.
- The ERP must clearly delineate responsibilities between on-site and off-site fire and emergency response personnel, and plans for liaison with regional and provincial/federal emergency responders.

- The following should be provided by the proponent and approved by the appropriate regulators: Spill Response Plan, Contingency and Emergency Response Plan, sensitive coastal shoreline mapping, and a Quantitative Risk Assessment.
- The proponent should extend the 2002 EnCana shoreline study to other parts of Stormont Bay and Isaac's Harbour that are close to the Project site. This data should be used to more precisely map the environmental sensitivities of those nearshore areas, in order to have a robust baseline for identifying changes that may occur during the operational phase of the Project. The panel concurs with EC recommendation regarding the use of their SCAT Manual (shoreline cleanup assessment technique) as a guide for shoreline sensitivity mapping.

5.18 – Effects of the Environment on the Project

5.18.1 – Overview

Section 10.18 of the EAR describes the potential effects of the environment on the Project. The EAR considered severe weather, extreme marine conditions, climate change, and earthquake/tsunami issues. Significant potential effects of the environment on the Project include a long-term delay in the Project's construction schedule, a long-term interruption of LNG export services, damage to plant infrastructure that poses a risk to human health and safety, and damage to plant site infrastructure that would not be technically or economically feasible to repair. Minor effects of the environment on the Project are ones that would produce a short-term delay in the construction schedule, frequent short-term disruptions in service and increased operating or maintenance costs.

Storms have the potential to delay construction, disrupt the loading of LNG tankers or damage Project infrastructure. High winds could cause some delays in the construction schedule and might also impact vessel operation and loading. Heavy rain can cause stoppages of outdoor work, worksite erosion, flooding and the failure of erosion and sediment control infrastructure. Exceptional early snowfall could delay construction and/or increase construction costs. Freezing rain, hail, ice, and snow can interfere with the operation of vehicles on the highway. Extreme wind can produce high waves that can affect vessel navigation, the ability of LNG vessels to berth and de-berth at the jetty, and may increase the likelihood for collisions with other ships. Safe working conditions aboard a vessel can be impeded by freezing spray as could some work tasks at the marginal wharf and jetty. Accelerated surface currents caused by persistent high winds pose a concern for ship's handling tasks and therefore may impact the safe operation of LNG vessels during their approach or departure from the jetty. Storm surge-related high water levels could interfere with loading and unloading operations at the jetty.

Climate change predictions of an approximately 45 cm rise in mean sea level over the life of the Project, if realized, could enhance storm surge heights especially if the surge occurs at high tide. For a 100 year return storm surge, the predicted increase in sea level during high tide could raise the water height to 3.25 m above datum. No potential for interaction of the Project with seismic events is anticipated.

5.18.2 – Conclusions

As part of the Project's ongoing pre-design activities, and ultimately during the FEED, potential effects of the environment on the Project will be studied and Project designs modified accordingly. By addressing potential climate change effects at an early stage in the Project's development, the proponent can potentially reduce operational costs associated with both the maintenance of vulnerable infrastructure and GHG emissions. Currently, predictions regarding an increase in the severity and number of extreme weather events remain to be verified. Consequently, such extreme events cannot be distinguished from those predicted from recent trends. Nevertheless, the proponent has taken a precautionary approach and has indicated that climate change predictions with respect to rising sea level, and to an increased frequency of storm events, will be addressed during the FEED. Thus, elevations and dimensioning of the marine terminal (jetty) will be based on extreme site-specific marine conditions that have been tentatively predicted to result from climate change effects.

Measures aimed specifically at minimizing the potential for adverse effects of environmental conditions on the Project include dimensioning the storm water management system for low frequency extreme events, the implementation of erosion and sedimentation control plans during the construction phase,

the development of an Operations Plan that defines weather conditions during which land-based operations will be restricted or halted, and consideration of long-term sea level rise in the design and engineering of wharf and mooring facilities. Marine-based infrastructure will be subject to detailed design and engineering of marine components on the basis of existing marine data. The Operations Plan will include criteria that define weather conditions during which berthing will not be permitted. Specific consideration of extreme marine conditions will also be addressed in the TERMPOL review exercise. Management of operations during extreme weather and extreme marine conditions will be supported by continuous monitoring of weather and sea-state conditions at the jetty and through routine communications between approaching vessels and the jetty. Operational plans will be developed for all major components of the marginal wharf and LNG jetty in close consultation with all relevant government agencies.

Although the historical record suggests that there is very low risk to the Project from seismic events, the possibility of a tsunami event arising from a distant offshore earthquake should not be totally dismissed given the long time span of the Project.

5.18.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent should adhere to the precautionary approach outlined in section 10.18 of the EAR for both land-based and marine-based operations, and give special attention to any potential adverse environmental effects on the Project that could result in a negative impact on VECs.
- The proponent, using a worst case scenario approach, should ensure that the Project's marine components (jetty & wharf) are designed to withstand storm surges that could be coincident with high tide and high waves.

5.19 Cumulative Effects

5.19.1 – Overview

Section 10.19 of the EAR describes the predicted cumulative effects of the Project. Cumulative effects are those that in combination can result in greater impact through interactions of the effects, typically of other projects or activities. For the purpose of this EA, the effects of the proposed Project are considered in combination with possible effects of future projects (planned or reasonably foreseeable) that might interact with the present Project. In the case of the Goldboro LNG Project, cumulative effects are considered for the following as indicated in Section 10.19 of the EAR: Route 316 Re-alignment; closure of SOEI gas plant; other potential regional LNG developments; future development of Goldboro Industrial Park; and GHG emissions.

Section 10.19.2 of the EAR discusses potential cumulative effects. The Route 316 re-alignment is considered to be critical to the success of the proposed Project (see Section 5.15 of this report). The EAR indicates that additional terrestrial and aquatic impacts are anticipated to be of medium significance.

Minimal adverse environmental effects are predicted from the closure of the SOEI gas plant.

Both negative and positive economic effects are predicted from other regional LNG projects, with temporary shortages in goods and labour. Cumulative positive overall impacts are predicted.

Overall impact on GHG emissions for the province will be negative, with emissions increasing as a result of the Goldboro LNG Project and any other regional LNG projects. Any increase in the rate of forest clear cutting could decrease the province's CO₂ sequestering capacity, which in combination with LNG projects would increase net GHG emissions. The Goldboro LNG Project is projected to contribute 0.5% of annual national GHG emissions for Canada (see Section 5.4 of this report).

5.19.2 – Conclusions

The cumulative effects of increased GHG emissions of the Goldboro LNG Project, in combination with other proposed or planned regional LNG facilities or other power generation facilities, on provincial GHG emissions and targets must be carefully considered. NSE has noted that 2011 GHG emission levels were 20.4 million tonnes (Mt), while the provincial target by 2020 is 10% below 1990 levels, or 17.1 Mt. The Goldboro LNG Project alone is expected to increase the present emission level for Nova Scotia by 18%. The proponent argues that this increase will be offset in large part by foreign customer's replacement of coal by Pieridae natural gas.

Other than for GHG emissions, there will not likely be other significant cumulative effects with other planned or foreseeable projects.

5.19.3 – Panel Recommendations

The panel provides the following recommendation:

The proponent should work with NSE to comply with all provincial and federal GHG emissions regulations, and specifically with the proposed new federal regulations for the oil and gas sector. The GHG Management Plan committed to by Pieridae should be developed in close consultation with NSE

and other appropriate regulators, and be approved by NSE. This plan should include a mechanism to offset the 3,778,390 t CO₂e that the Project is predicted to emit per annum

Section 6 – Public Consultation

Public Consultation Conducted by Proponent

Section 13.1 of the EAR indicates that the proponent's public consultation program components include a website, the compilation of a stakeholder database and mailing list, public information sessions or open houses, agency and stakeholder meetings, the establishment of a semi-annual newsletter, a Community Liaison Committee, and the organization of a public opinion telephone poll. The proponent's website offers continuous public access to Project information, advertises opportunities for consultation, solicits public feedback on Project-related issues, and provides a mechanism for interested vendors to register with the Project. The website will also serve to advertise procurement opportunities during the implementation stage of the Project.

Open House or information sessions have featured a number of basic communications vehicles aimed at encouraging dialogue between Pieridae and the public. Public notices of meetings were advertised in local newspapers, radio stations and through e-mail distributions to about 400 contacts on the proponent's mailing list. Those stakeholders that provided contact information for the mailing list are able to sign up to receive occasional electronic announcements from Pieridae. At information or open house sessions, Pieridae distributed factsheets about the Project and/or provided a series of display panels that addressed a range of topics such as the Project's description and schedule, the EA process, existing environments, potential environmental effects, environmental mitigation and management, consultation opportunities, and contact information. According to the proponent, all Open Houses were very well attended by typically more than 100 members of the public and the material presented was well received by those attending. That observation appears to be reinforced by the results of the opinion poll which indicated that there was a high level of awareness of the Project among those residents contacted and that a majority (86%) spoke in support of the Project. Of the 11% of residents that were opposed to it, one-third identified environmental impact as their main reason, and another one-third identified safety concerns as their main reason.

Pieridae also established a CLC during the summer of 2013 to provide a forum for local communities to engage in Project planning, learn about the proposal and provide feedback to the Pieridae's planning team. Subsequently, the proponent invited 10 people from among the interested parties to sit on the CLC. At the first meeting, CLC members decided that the CLC would meet quarterly. Pieridae has established a permanent office at 1718 Argyle Street in Halifax. In addition to its Project management and coordination activities, the office also serves as a location where Project information is disseminated. The Halifax office is to be complemented by an information centre located at the Project site.

The proponent has also demonstrated proactivity at the outset of the EA process by identifying five federal and eight provincial agencies that have a potential interest in the Project. Pieridae's public and agency consultation program has been crafted to allow it to continue beyond the EA process (i.e., throughout the planning, design, construction phase, and operational phase). Special effort appears to have been demonstrated to address the concerns of First Nations. The proponent has entered into negotiations with the Assembly of Nova Scotia Chiefs and KMKNO to formulate a comprehensive Cooperation Agreement and a Collaborative Benefits Agreement. Future engagement activities with the

Aboriginal community are to be coordinated through specifically designated First Nations representatives serving as members of the CLC and, for certain issues, directly with the KMKNO.

The proponent has implemented a public consultation program that is intended to be active during the entire Project development process and during the operation of the Project. The panel concludes Pieridae's approach to consultation and engagement has been reasonably proactive and relatively comprehensive.

Public Consultation Conducted by Panel

In addition to Pieridae's public consultation, the panel has held two public consultation periods through written comment submissions, from October 30 to December 16 of 2013, and from January 7 to 24 of 2014, respectively. Public notices were published in the Royal Gazette, the Chronicle Herald, the Antigonish Casket and the Guysborough Journal, to announce the start of these public consultation periods. In addition, e-mails and/or letters on public consultation were sent to relevant municipal, provincial and federal government agencies, a regional Member of the Legislative Assembly, First Nations, as well as many non-government or non-profit interested parties (who subscribe to the government's mailing list). Furthermore, hard copies of information such as the EAR, public and government comments on the Project, and Pieridae's responses to these comments, were provided at six public viewing locations in Halifax, Antigonish and Guysborough. A summary of the public, First Nations and government comments received during these two public consultation periods is provided in Appendix D of this report.

Section 7 – Pieridae Committed Studies, Reports and Plans

7.1.1 – Overview

Throughout the EAR, the proponent commits to carry out a suite of follow-up monitoring plans post-EA. Many of these plans are not detailed in the EAR, and the proponent in many cases indicates the plans will be finalized post-EA and during FEED. Objectives of the monitoring programs and surveys are aimed at assisting the proponent in verifying effects predictions and the effectiveness of mitigation measures described in the EAR. Pieridae’s monitoring programs will also have the capability to formulate adaptive mitigation measures if the proposed mitigation is not effective in preventing or minimizing the impacts. All of the programs and plans have the potential to provide data that will demonstrate compliance with regulatory permits, approvals and requirements.

In addition to monitoring plans, Pieridae also commits in the EAR and in IR responses to conduct, update or finalize various studies, reports, and plans, which are relevant to baseline, mitigation, management and follow-up monitoring. Many of these studies, reports or plans are to be finalized post-EA and during FEED. Pieridae indicates they will consult and seek approval from relevant regulators and interested stakeholders on some of these studies, reports and plans. These key studies, reports and plans are summarized in Table 7.1 below.

7.1.2 – Conclusions

Table 7.1 below summarizes key studies, reports and plans committed by Pieridae in the EAR and IR responses. There are other commitments (e.g. proposed mitigation and management measures) made by Pieridae that are not present in this table. The page number for the first noted occurrence of each commitment in the EAR and/or IR response is given in the table. The potential oversight of these studies, reports and plans will fall mostly within the Government of Nova Scotia’s jurisdiction, with few exceptions such as fisheries where DFO will assess detailed fishery concerns at the permitting stage.

Table 7.1: Pieridae Committed Studies, Reports and Plans

Title	References	Oversight
Air Dispersion Model: to be updated during FEED	IR # HC 1	NSE & HC
Archaeological Awareness & Sensitivity Training	EAR p. 3-68	NSE & NSCCH
Archaeological Monitoring & Contingency Plan	IR # NSCCH 1	NSE & NSCCH
Archaeology pre-construction surveys	EAR p. 10-189	NSE & NSCCH
Avian Management Plan	IR # EARP 49	NSE, EC & NSDNR
Community Liaison Committee	EAR p. viii	NSE
Community Relations Plan	IR # EARP 14	NSE
Comprehensive Site Investigations	EAR p. 3-13	NSE & EC
Decommissioning Plan	EAR p. 3-52	NSE
Environmental Awareness Training	EAR p. vi	NSE
Environmental Management Plan	EAR p. vi	NSE, EC & HC
Environmental Protection Plan	EAR p. xv	NSE, EC & HC
Freshwater Fish Habitat Compensation	EAR p. 10-100	DFO
Freshwater and marine compensation plan monitoring	EAR p. 12-4	DFO
GHG Management Plan and GHG offset strategies	EAR p. 10-41	NSE & EC
Health and Safety Plan	EAR p. vi	NSE
Lighting plan	EAR p. 10-62	NSE, EC & NSDNR
Marine environment studies and monitoring such as bathymetry survey and met-ocean conditions monitoring	EAR p. 12-4	NSE & TC
Marine Fish Habitat Compensation Plan	EAR p. 10-116	DFO
Marine Terminal Manual	EAR p. vi	NSE & TC
Memorandum of Understanding: with GCIFA	IR # GCIFA 2	NSE & GCIFA
Memorandum of Understanding and Collaborative Benefits Agreement: with Assembly of Nova Scotia Chiefs through KMKNO	EAR p. ix	NSE & KMKNO
Mi'kmaq Fisheries Study	IR # KMKNO 2	DFO & KMKNO
Mapping of sensitive coastal shoreline	IR # EC 6	NSE & EC
Moose and bat recovery program	EAR p. xiii	NSE & NSDNR
Moose research and monitoring	IR # NSDNR 4	NSE & NSDNR
Noise study	IR # HC 10	NSE & HC
Noise monitoring	EAR p. 10-58	NSE & HC
Qualitative and quantitative risk assessments	EAR p. xiv	NSE & EC
Risk Management Plan	EAR vi	NSE
Road infrastructure assessment update	IR # NSTIR 1	NSE & NSTIR
Roseate Tern monitoring and adaptive management (where needed)	IR # EC 1	NSE & EC
Seasonal gas management plan, research/monitoring via radar on flaring impacts on birds and bats, and monitoring of Leach's Petrel colony on Country Island	IR # NSDNR 4	NSE, NSDNR & EC
Sub-sea pipelines approach navigation protocols	EAR p. 3-46	NSE & TC
TERMPOL review	EAR p. vii	NSE & TC
Well water survey	EAR p. 12-2	NSE
Wetland compensation	EAR p. xiii	NSE
Wildlife digital data provision	IR # NSDNR 4	NSE, EC & NSDNR
Wildlife annual reports provision	IR # NSDNR 4	NSE, EC & NSDNR

Note that Pieridae has indicated in the EAR and/or the IR responses that a number of plans committed to, will form part(s) of other plans. For example the EMP will include (but not be limited to) the following:

- Sulphide bearing materials management plan;
- Waste management plan;
- Blasting management measures;
- Stormwater management;
- Wastewater management;
- Erosion and sediment control plan;
- Dust control;
- Noise control;
- Environment effects monitoring;
- Environment compliance monitoring;
- Contingency and emergency response planning; and
- Training and education on health and safety, emergency response, archaeology awareness and sensitivity.

The Avian Management Plan will include (but not be limited to) the following:

- Confirm presence and location of bird species at risk in the Project area (prior to construction);
- Light and flaring management plan;
- Mortality monitoring for birds and bats;
- Mitigation and management measures for migratory birds; and
- Observation of breeding and nesting habits of rare species such as the Roseate tern.

7.1.3 – Panel Recommendations

The panel provides the following recommendations:

- The proponent should carry out the suite of studies, reports and plans regarding baseline, mitigation and management, and follow-up monitoring, committed in the EAR and in their IR responses.
- Responsible government agencies should ensure these committed studies, reports and plans are carried out appropriately by the proponent to meet the intended objectives.

**Appendix A – Letter of Referral from the Nova Scotia Minister of Environment
to the Nova Scotia Environmental Assessment Review Panel**



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Canada B3J 2P8

(902) 424-1850 T.
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www.gov.ns.ca/nse

In reply please quote our file number: 40100-30-159

OCT 18 2013

Mr. Tony Blouin
Chair
Environmental Assessment Review Panel
Halifax Water
450 Cowie Hill Road
PO Box 8388 RPO CSC
Halifax, NS B3K 5M1

Dear Mr. Blouin:

**Subject: Referral to the Environmental Assessment Panel
Class II Environmental Assessment - Goldboro LNG Project**

On October 10, 2013, Pieridae Energy (Canada) Limited submitted an Environmental Assessment Report for the proposed Goldboro LNG Project at Goldboro, Nova Scotia.

I hereby refer the Report to the Environmental Assessment Review Panel, in accordance with the *Nova Scotia Environment Act*, the *Environmental Assessment Regulations* and the *Environmental Assessment Review Panel Regulations*. The Panel shall submit its report and recommendations to the Minister of Environment no later than 110 days from October 20, 2013.

Sincerely,

Sara Jane Snook
Deputy Minister

c: Helen MacPhail, Acting Manager, Environmental Assessment
Helen Yeh, Environmental Assessment Review Panel Administrator

Appendix B – Membership of the Nova Scotia Environmental Assessment Review Panel

Panel Chair:

Dr. Anthony C. Blouin

Panel Members:

Dr. Charles T. Schafer

G. Scott Dickey, MREM

Appendix C – Critical Dates Schedule: Goldboro LNG Project

Nova Scotia Environment - Environmental Assessment Branch:	Date:
Project registered	February 18, 2013
Final Terms of Reference issued	May 7, 2013
Final EAR submitted	October 10, 2013
Ministerial referral to the Environmental Assessment Review Panel (panel)	October 18, 2013 (10 days from receipt of EAR)
Panel Activity:	Date:
Panel Referral Day 1	October 20, 2013
Public Release of EAR	October 30, 2013
Actual last date of publishing notice of release of EAR, and 1 st public review	October 30, 2013
Deadline for comments from 1 st public review	December 16, 2013 (48 days from last publication date)
Deadline for proponent response to 1 st public review comments	January 10, 2014
Publication date for notice of 2 nd public review	January 8, 2014
Deadline for comments from 2 nd public review	January 24, 2014
Deadline for proponent response to 2 nd public review comments	January 31, 2014
Deadline for submission of panel's report and recommendations (R & R) to Minister	March 3, 2014 (110 days from referral)
Subsequent Activity:	Date:
Ministerial Decision	21 days following receipt of R&R from panel
Commencement of the Project	with 2 years of Ministerial approval

Appendix D – Analysis of Public Comments

This report analyses 166 letters received as part of the two public consultations for the Goldboro LNG Project, of which 130 were submitted from the public. Note that there are multiple cases where letters from the public come from the same individual or organization, and these letters are considered as one submission. Therefore, there are really only 126 submissions that come from the public. The remaining letters were sent by a First Nations organization, and from federal, provincial and municipal government agencies and departments. More than 95 % of the letters from the public indicate support for the Project with approximately two-thirds of the letters in form letter format. There are also several letters from government representatives that indicate support for the Project. Lastly, there are several letters from the public that raise specific concerns about the Project, with one letter indicating opposition to the Project.

Form Letters

Approximately 80 form letters were received from the public during the public consultation periods, and all are in support of the Project. Note that there are a few cases where form letters come from the same individual, and these letters are considered as one submission of support. The letters come from individuals, individual businesses, union members, union representatives, business organizations or other non-government organizations. Many of these letters are from within Nova Scotia, and many are from counties close to the Project location such as Antigonish and Pictou. Note that there are multiple letters where addresses are not provided. The origins of these form letters are listed below:

Antigonish	34
Colchester	1
Guysborough	2
Halifax Regional Municipality	6
Pictou	14
Richmond	3
Victoria	1
Unknown	21

Individual Letters

Approximately 45 individual letters were received from the public during the public consultation periods, and forty of these letters are in support of the Project. There are six letters indicating concerns about the Project with one letter opposing the Project and a few letters indicating support but with some concerns. The support letters are from individuals, individual businesses, union members, union representatives, business organizations, non-profit organizations or other non-government organizations. In addition, there are several support letters from municipal governments (e.g., MODG and Town of Port Hawkesbury), and one letter from a Member of Parliament. The letters expressing concerns are from individuals and non-profit organizations. Many of the letters are from within Nova Scotia, close to the Project location from counties such as Antigonish and Guysborough. Note that some of these letters indicated that they were sent from work locations such as New Brunswick and Halifax, away from home. Also, there are multiple letters where addresses are not provided.

The origins of individual letters are listed below:

Antigonish	9
Cape Breton	5
Guysborough	8
Halifax Regional Municipality	5
Pictou	1
Richmond	2
New Brunswick	1
Unknown	13

Appendix E – Acronyms and Units

Table 1: Acronyms

ACCDC	Atlantic Canadian Conservation Data Center
Act	Environment Act
ADM	Air Dispersion Model
BSC	Bird Studies Canada
CC	Concerned Citizens (in relation to IRs)
CCME	Canadian Council of Ministers of the Environment
CLC	Community Liaison Committee
CO	Carbon Monoxide
CO ₂ e	Carbon Dioxide Equivalences
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EAR	Environmental Assessment Report (for the Goldboro Project)
EARP	Environmental Assessment Review Panel
EC	Environment Canada
EGSPA	Environmental Goals and Sustainable Prosperity Act
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
ERP	Emergency Response Plan
FEED	Front End Engineering Design
FLC	Fisheries Liaison Committee
GC	Guysborough County
GCHA	Guysborough County Heritage Association
GCIFA	Guysborough County Inshore Fishermen’s Association
GHG	Greenhouse Gas
GSC	Geological Survey of Canada
HAZID	Hazard Identification
HC	Health Canada
IR	Information request response documents provided by Pieridae on January 10, and January 31 of 2014, entitled “Environmental Assessment (Class 2 Undertaking) – Information Requests & Proponent Responses”. The two response documents are provided in response to comments received during public consultation periods.
KMKNO	Kwilmu’kw Maw-klusuaqn Negotiation Office
LNG	Liquefied Natural Gas
M&NE	Maritimes and Northeast gas pipeline
MBA	Maritimes Butterfly Atlas
MEKS	Mi’kmaq Ecological Knowledge Study
Minister	Minister of Environment (for Government of Nova Scotia)
MODG	Municipality of the District of Guysborough
MREM	Masters of Resource and Environmental Management
NO _x	Nitrogen Oxide
NSCCH	Nova Scotia Communities, Culture and Heritage
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment
NSESA	Nova Scotia Endangered Species Act
NSHW	Nova Scotia Health and Wellness
NSOAA	Nova Scotia Office of Aboriginal Affairs
NSTIR	Nova Scotia Transportation and Infrastructure Renewal
Panel	Nova Scotia Environmental Assessment Review Panel
Pieridae	Pieridae Energy (Canada) Ltd.

PM	Particulate Matter
PM ₁₀	Particulate Matter less than 10 micrometres diameter
PM _{2.5}	Particulate Matter less than 2.5 micrometres diameter
Project	Goldboro Natural Gas Liquefaction Plant & Marine Terminal Project
RMP	Risk Management Plan
SARA	Species At Risk Act
SBMMP	Sulphide Bearing Materials Management Plan
SCAT	The Arctic SCAT Manual – A Field Guide to the Documentation of Oiled Shorelines in Arctic Regions, published by Environment Canada in 2004
SO ₂	Sulphur Dioxide
SOCC	Species of Conservation Concern
SOEI	Sable Offshore Energy Inc.
TC	Transport Canada
TSP	Total Suspended Particulates
TERMPOL	Technical Review Process of Marine Terminal Systems in Transshipment Sites
VEC	Valued Ecosystem Component
VOC	Volatile Organic Compound

Table 2: Units

°C	Degrees Centigrade
dB(A)	Decibels (A-Weighted)
ha	Hectare
km	Kilometer
kVA	Kilo-volt Amps
Leq	Equivalent continuous sound level
m	Meter
m/s	Meter per second
Mt	Million tonnes
Mtpa	Million tonnes per annum
MW	Megawatts
t	Tonnes
tCO ₂ e	Tonnes of CO ₂ equivalent
yr	Year