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ACRONYMS AND ABBREVIATIONS

| Acronym/Unit | Definition |
|-----------------|--|
| 3PSc | A fishing area regulated by DFO |
| ALARP | As Low As Reasonably Practicable |
| ALERT | Atlantic Emergency Response Team |
| APA | Atlantic Pilotage Authority |
| BATEA | Best Available Technologies Economically Achievable |
| bpd | barrels per day |
| ° C | Degrees Celsius |
| C ₃ | Propane |
| C ₄ | Butane |
| CASARA | Civil Air Search and Rescue Association |
| CCG | Canadian Coast Guard |
| CCME | Canadian Council of Ministers of Environment |
| CEAA | Canadian Environmental Assessment Agency |
| CNA | College of the North Atlantic |
| CO ₂ | Carbon Dioxide |
| COPD | Chronic Obstructive Pulmonary Disease |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CSA | Canada Shipping Act |
| CSR | Comprehensive Study Report |
| DFO | Department of Fisheries and Oceans |
| DOEC | Department of Environment and Conservation NL |
| ECRC | Eastern Canada Response Corporation |
| EIS | Environmental Impact Statement |

| Acronym/Unit | Definition |
|------------------------------------|---|
| EMT | Emergency Medical Technician |
| EPP | Environmental Protection Plan |
| CSZ | Construction Safety Exclusion Zone |
| FFAW | Fisheries Food and Allied Workers Union |
| HADD | Harmful alteration, disruption or destruction |
| HAZMAT | Hazardous materials |
| HRU | Health Research Unit |
| IFC | Issued for Construction |
| IMO | International Maritime Organization |
| km | Kilometre |
| LPG | Liquefied Petroleum Gas |
| LPG C ₃ /C ₄ | Liquefied Propane Gas |
| MCTS | Marine Communications and Traffic Services |
| M/S | Meters per second |
| MUN | Memorial University |
| NAFO | Northwest Atlantic Fisheries Organization |
| NARL | North Atlantic Refinery Limited |
| NLEMO | Newfoundland Emergency Measures Organization |
| NLRC | Newfoundland and Labrador Refining Corporation |
| NLEMO | Newfoundland and Labrador Emergency Measures Organization |
| NTL | Newfoundland Transshipment Limited |
| OHF | Oil Handling Facility |
| OPEPs | Oil Pollution Emergency Plans |
| OPPPs | Oil Pollution Prevention Plans |

| Acronym/Unit | Definition |
|--------------------------------------|---|
| PAHs | Polycyclic aromatic hydrocarbons |
| PAO | Provincial Archaeology Office |
| PBS | Pilot Boarding Station |
| PM _{2.5} / PM ₁₀ | Suspended Particulates |
| PTMS | Point Tupper Marine Services |
| RCMP | Royal Canadian Mounted Police |
| REET | Regional Environmental Emergency Team |
| RO | Response Organization |
| SAR | Search and Rescue |
| SARA | Species at Risk Act |
| SO ₂ | Sulfur Dioxide |
| TC | Transport Canada |
| TCH | Trans-Canada Highway |
| TERMPOL | Technical Review Process of Marine Terminal Systems and Transshipment Sites |
| UA | Unit Area |
| VECs | Valued Ecosystem Components |
| VOCs | Volatile organic compounds |
| VSEC | Valued Social Ecosystem Component |
| VTMP | Vessel Traffic Management Plan |

1.0 INTRODUCTION

The Proponent, Newfoundland and Labrador Refining Corporation (NLRC) proposes to construct and operate a new, 300,000 barrels per day, refinery that could be expanded to 600,000 barrels per day (bpd) at some future date, at Southern Head, between North Harbour and Come By Chance Bay, at the head of Placentia Bay, Newfoundland and Labrador (Figure 1.1).

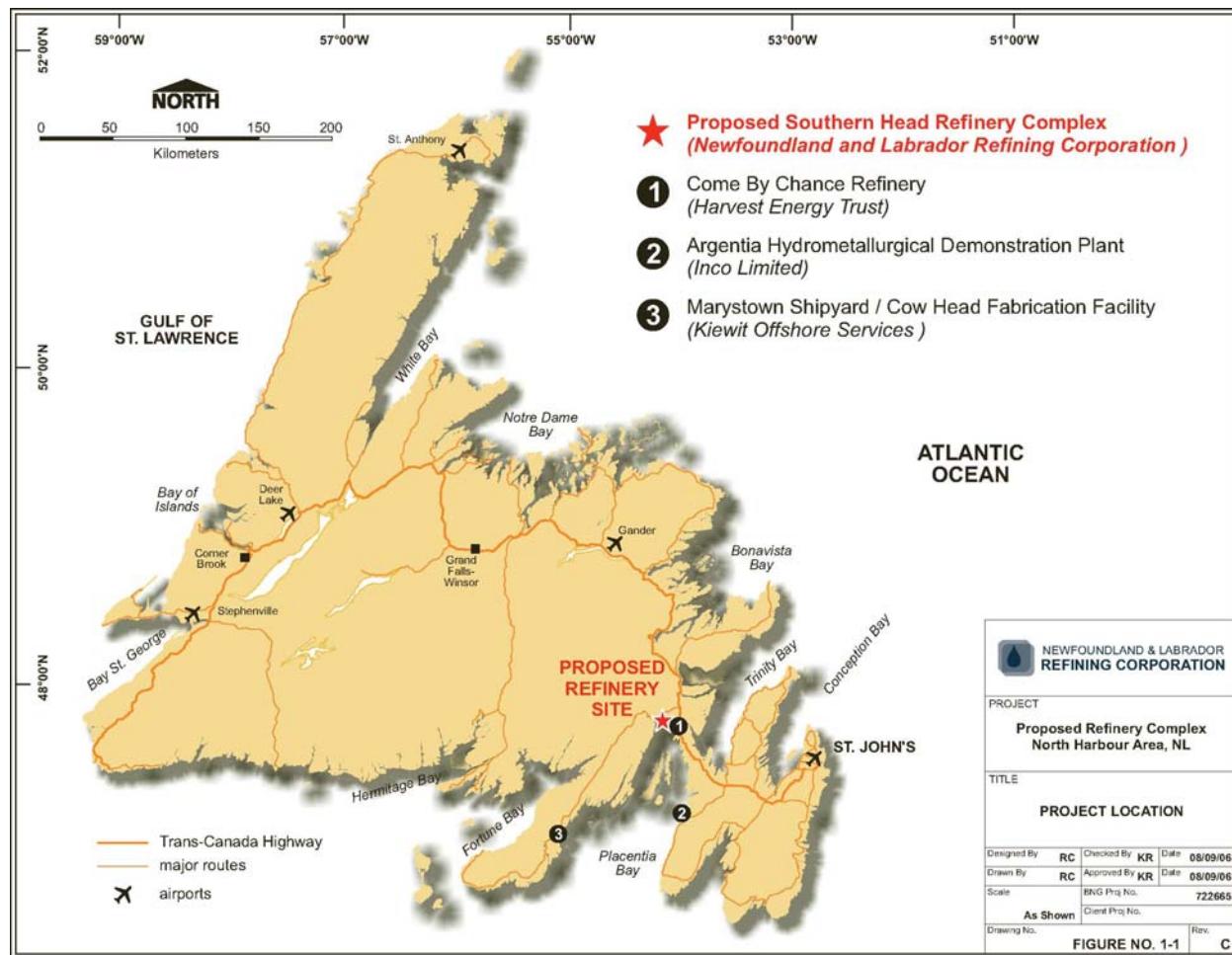


Figure 1.1 Project Location

The Newfoundland and Labrador Refining Corporation is required through the provincial and the federal environmental assessment process to prepare an Environmental Impact Statement (EIS)/Comprehensive Study Report (CSR) for the proposed Newfoundland and Labrador Refinery Project.

This five-volume Document was prepared pursuant to the *Newfoundland and Labrador Environmental Assessment Act* and the *Canadian Environmental Assessment Act* and is in full compliance with the *EIS/CSR Guidelines* issued by the Newfoundland and Labrador Department of Environment and Conservation (June 19 2007).

This volume is a summary of an Environmental Impact Statement (EIS) prepared to meet the requirements of provincial and federal environmental assessment processes, and to form a basis for public dialogue and acceptance. The EIS outlines plans for the construction and operation of a major oil refinery, and examines its potential relationship to the natural environment of the community. The Newfoundland and Labrador Refining Corporation has spent the last eighteen months examining site locations, financing options and engineering design, and conducting site investigations, background studies and preparing the EIS. A key input to this process has been consultation with government departments, environmental specialists, economic analysts and, most significantly, the general public, particularly the residents of the neighbouring communities.

Newfoundland and Labrador Refining Corporation (NLRC) is a private company registered in Newfoundland and Labrador and based in St. John's. The founding investors in NLRC include Newfoundland and Labrador based Altius Resources Inc. and a core group of established European entrepreneurs with proven track records in both equity and debt financing arrangements for major development projects.

The site selection process has identified Southern Head, Placentia Bay, in the province of Newfoundland and Labrador as offering the best possible solution to the Project's requirements: an accessible deepwater, ice-free port; a highly-skilled local workforce; a mature, existing oil processing industry and an appropriate and available site.

The EIS is composed of five Volumes: this Project Summary is Volume 1.

Volume 2 is a concise and complete description of the Project, describing the physical and process design, operations and project philosophy, construction methods, project implementation, and environmental, health and safety management.

Volume 3 describes the biophysical environment in which the refinery will operate, including the assessment of possible interactions with marine and land-based species, and the methods for mitigating or eliminating adverse impacts.

Volume 4 studies the socio-economic Environment, in short, the human environment and the effect of the Project on communities, individuals, businesses and the economy and wellbeing of those affected by the Project.

Volume 5 reviews the approach that NLRC has taken to consulting the public, adapting to public input, creating solutions to expressed concerns and accepting the community as a full partner.

2.0 THE PROPOSER

Name of Corporate Body:

Newfoundland and Labrador Refining Corporation (NLRC)

Address:

Newfoundland & Labrador Refining Corporation
P. O. Box 385
St. John's, NL A1C 5J9

Chief Executive Officer:

| | |
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|--------------------------|---|

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3.0 THE PROJECT

NLRC was formed in February 2006 to examine the feasibility of building and operating a second crude oil refinery in Placentia Bay, in close proximity to the existing oil refinery, oil transshipment terminal and major offshore oil and gas fabrication industry. The Project area with surrounding industries and communities is shown in Figure 3.1. The movement of oil in large tankers is well understood and managed in the Bay, and tanker traffic has coexisted with the important commercial fisheries in the area for over 30 years. Placentia Bay also lies adjacent to major shipping routes to and from countries with abundant crude oil supplies, and countries with an increasing need for reliable sources of refined products.

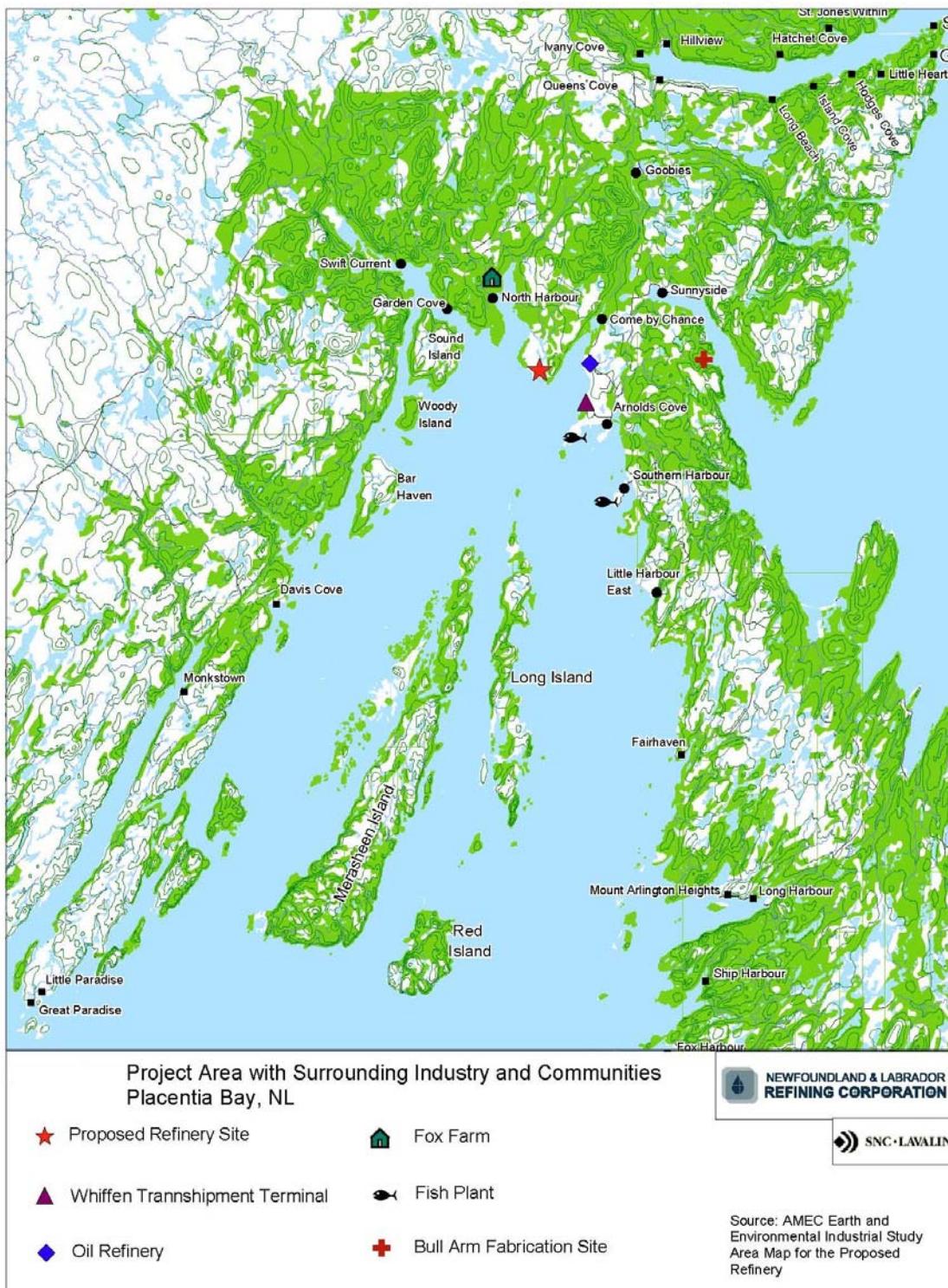


Figure 3.1 Project Area

3.1 The Rationale

The steadily increasing global economy of the twenty-first century is fuelled by refined hydrocarbons. The North American capacity for refining crude hydrocarbons has been relatively stagnant for almost 25 years, and has suffered major upsets in the past decade due to aging infrastructure, extreme weather and other unforeseen events. This has resulted in an economic impact not seen since the energy “crunch” of the 1970s, with rapidly rising costs and demand exceeding supply in some sectors.

This has created an opportunity to establish Newfoundland and Labrador as a major, state-of-the-art refining site to service North American and European markets. NLRC has undertaken extensive economic, social and siting studies, coupled with community consultation, to take advantage of this opportunity. The results of these efforts are contained in this Environmental Impact Statement.

3.2 The Alternatives

Several sites were considered during the course of this study, including an existing Placentia Bay refinery owned by North Atlantic Refinery Limited (NARL), and undeveloped land adjacent to that property and the Wiffen Head Newfoundland Transshipment Limited terminal. Neither offered the combination of site availability and development potential. The NARL site was transferred to a new owner during the initial studies for this project, and is no longer an option.

With one exception, the alternative sites presented significant environmental, logistic and fabrication challenges. The site selection process identified Southern Head, a greenfield site at the northern end of Placentia Bay as the most favourable candidate for development.

The Southern Head site provides ready tanker access in an already well-used waterway, and will maintain a sizeable buffer zone between the refinery, adjacent communities and established commercial activities. At the same time, it would provide access to an experienced skilled workforce and local industrial capabilities.

Other design alternatives were considered, including the location of the marine terminal to avoid some fishing grounds, adding a second access road as recommended by the community of North Harbour and residents of the Bruin peninsula, and building a new intersection that will serve the communities of Come By Chance and Sunnyside as well as the new refinery.

3.3 Project Philosophy

As the first new refinery constructed in Canada in almost 25 years, NLRC is proud to adopt a set of project design principles that will provide a modern refinery at the forefront of the crude oil refining industry.

The following design principles will establish a set of guidelines for the implementation of the Project:

- Highest Safety Standards;
- Loss Control – As Low As Reasonably Practicable (ALARP);
- Best Available Technologies Economically Achievable (BATEA);
- Precautionary Approach;
- Emissions Reductions;
- Climate Change Considerations;
- Energy Efficiency;
- Sustainable Development;
- Operational Efficiency;
- Quality Control;
- Environmental Stewardship and Best Environmental Protection Practices;
- Community Participation;
- Maximization of local benefits;
- Security; and
- Third Party Review (TERMPOL Process).

3.4 Employment Principles

NLRC has consulted extensively with the local communities: this effort is described in Volume 5 - Public Consultations. These consultations have shown that the proposed refinery would be a welcome addition to the Placentia Bay community. Participants in open house meetings have indicated that their top two interests are local employment and local benefits.

The Proponent is committed to maximize the employment of residents of Newfoundland and Labrador, particularly the greater Placentia Bay area residents. Pending approval of this project, hiring plans and policies will be put into place to ensure that first consideration for training and employment opportunities are offered to residents, and in particular, the neighbouring communities. Initial meetings have been held to provide advance notice of project needs as input to government labour policy planning. The proponent has also met with trade schools in the area (Clarenville and Marystow) and the College of the North Atlantic in St. John's, as well as local unions, to address training and employment expectations.

Information and experience gained from previous major projects in the area has enabled communities to plan and manage the short-term effects on housing, infrastructure and training. The difference with the refinery is that with its long-term presence in the area, long-term solutions can be implemented.

The Proponent is committed to the advancement of women in occupations where they have historically been and are currently under-represented. Women's Employment Plans and Employment Equity Plans will be developed following approval of the Project. There has been a shortage of opportunities available for women to enter into work traditionally done by men, such as in the trades, technology and operations. Due to this imbalance, and also considering the potential for a shortage of skilled workers in the province, efforts will be made to promote the training and hiring of women throughout the duration of this project. A Women's Employment Program will be monitored during the construction, operation, and decommissioning stages. "Family Friendly", "No Harassment" policies will also be developed to ensure the establishment of a working environment that both attracts and retains a stable workforce.

4.0 PROJECT OVERVIEW

The refinery has been designed to accept 300,000 barrels of crude oil feedstock per day on a year-round basis. The Project will process imported medium and heavy, high-sulphur crude oils into fuel products suitable for the export market. The main products of this refinery will be gasoline, kerosene/jet fuel, and Ultra-low Sulphur Diesel with by-products including Liquefied Petroleum Gas (LPG - C3/C4), Sulphur and Petroleum Coke. The accompanying tank farm will have a storage capacity of approximately 6,000,000 barrels for crude oil, 3,975,000 barrels for semi-refined intermediates, and 4,900,000 barrels for refined products. Liquefied Propane Gas (LPG) will be stored in spherical pressurized tanks. All storage tanks and associated pipelines are designed to meet or exceed contemporary codes and standards, regulations for design, fire safety, containment and environmental protection.

The Project will require the construction of new marine facilities to handle large ocean-going oil tankers and bulk carriers, as all inputs and outputs from the refinery will be transported by sea. The original design and siting of the terminal has been modified based on consultation with the local fishing industry, minimizing the impact on established harvesting areas. The marine terminal design has been favourably reviewed by the Placentia Bay Traffic Committee and the Placentia Bay representatives of the Atlantic Pilotage Authority. An overall site layout showing the Project site and access roads is shown in Figure 4.1 and a more detailed general site layout is shown in Figure 4.2.

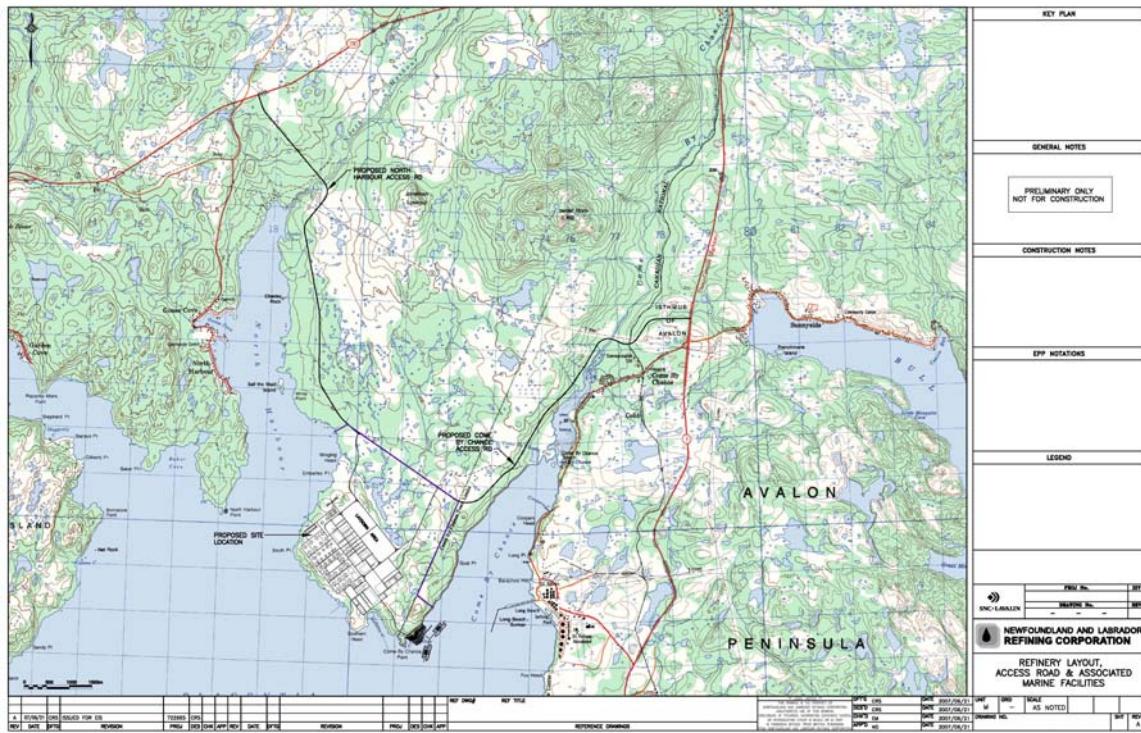


Figure 4.1 Overall Site Plan with Access Roads

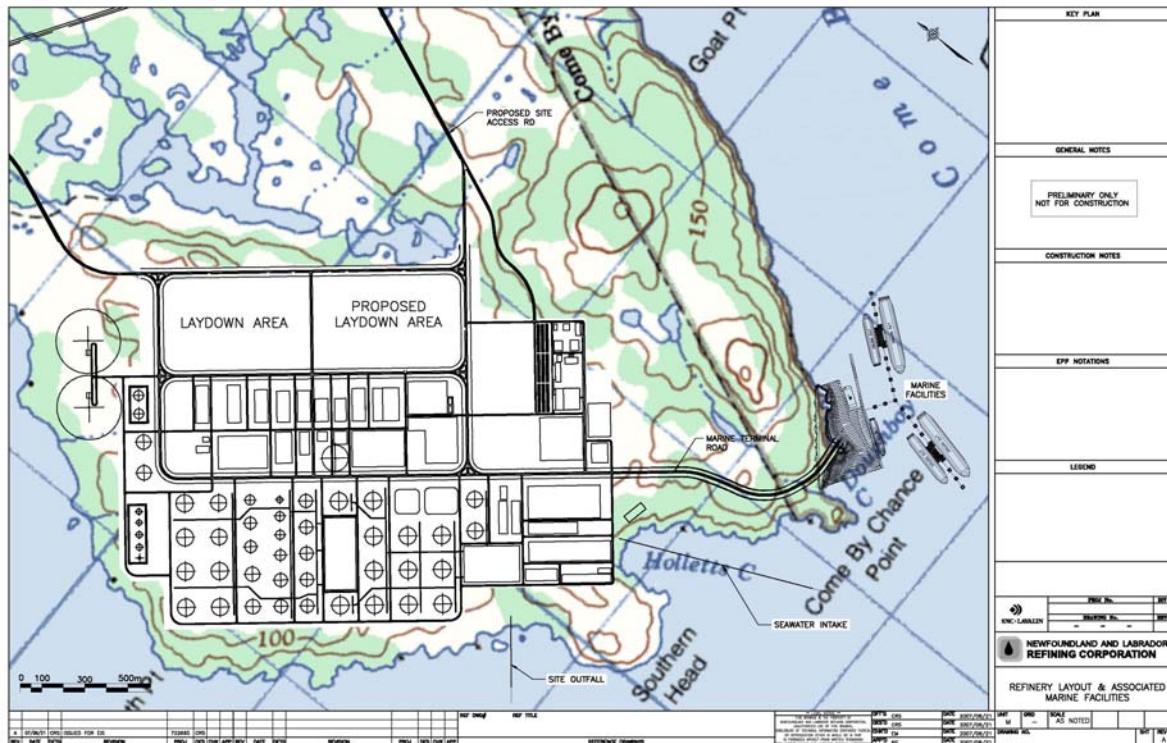


Figure 4.2 Detailed Site Plan

4.1 Project Components and Activities

The refinery will consist of a processing area at the center of the site, a tank farm for crude and refined product storage to the south, a water treatment plant on the southwest corner, and administrative and support buildings to the northeast of the refinery site. A detailed drawing showing the refinery plant layout is shown in Figure 4.3.

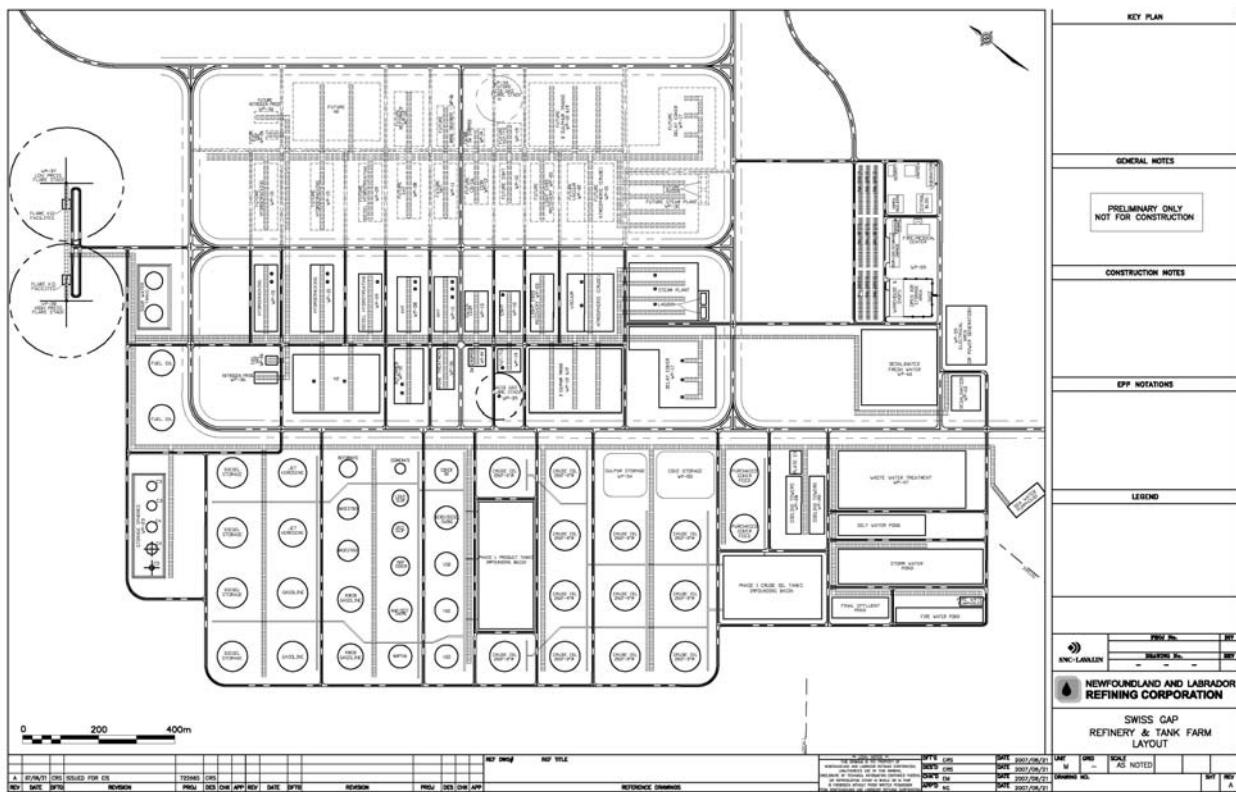


Figure 4.3 Refinery Plant Layout

The new marine terminal will be located to the southeast corner near Doughboy Cove. The New refinery marine terminal will include, heavy lift construction dock, tug berth and causeway, jetty and offshore berthing facilities, and jetty control and emergency response building. A general layout of the refinery marine terminal is shown in Figure 4.4.

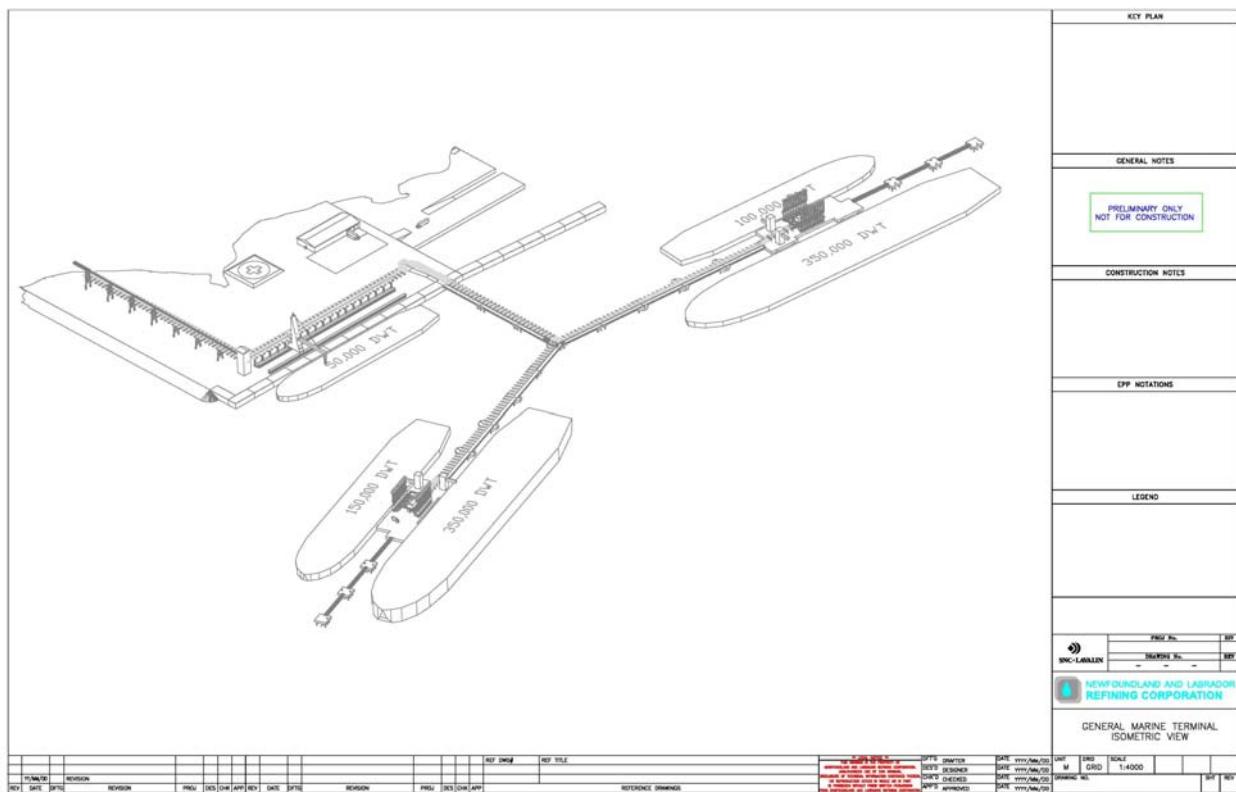


Figure 4.4 **Marine Terminal Layout**

The Project will also require new access roads (a 9.2 km road linking the site with TCH near Come By Chance and an 12.1 km road to North Harbour), a power line, utilities and associated infrastructure. The area required for the refinery site is approximately 5 square kilometres.

A project of this magnitude and complexity will inevitably lead to some environmental and social disturbances, as detailed in the subsequent volumes of the EIS. NLRC is committed to monitoring and mitigating project effects to the highest level achievable throughout the construction, operation, maintenance and decommissioning of the project.

4.2 The Construction Phase

Construction of the refinery and associated support structures is proposed to begin in January 2008, and is expected to be completed within four years. Incoming shipments of crude oil are anticipated to begin by the end of 2011.

All construction activities will comply with the Construction Environmental Protection Plan, dealing with erosion avoidance, removal of surface water, dust generation and watercourse protection.

The construction workforce is expected to peak at approximately 3,000 on-site employees. Many of these people will be drawn from the local labour force, within commuting distance; workers from outside the local area will be accommodated in a construction camp at the Bull Arm site. The Bull Arm site has operational waste and wastewater treatment systems in place; a certified waste management company will dispose of solid waste in an existing landfill. Reusing the Bull Arm site illustrates a concept that is fundamental to the entire project: wherever practical, use local existing infrastructure and limit waste materials by reuse, reduction and recycling. This includes waste material generated by site preparation.

Initial site preparation will involve construction of access and service roads, and conventional clearing using excavation equipment and blasting. Blasting will be undertaken by licensed contractors, and will not occur in marine areas or in the presence of wildlife.

In several instances, site roads and project infrastructure will require stream crossing. Culverts will be installed at stream crossing locations on the site access roads; clear-span bridges will be built where more substantial rivers or streams are involved. All site development will meet or exceed provincial and federal requirements.

During the early construction phase the project will operate two shifts per day, which could help distribute vehicular access to the site and minimize the project-related traffic impact on the Trans-Canada Highway.

Much of the materials and equipment required during construction will be delivered to the site by sea, further limiting impact on local roads. All vessels and barges will comply with the Canada Shipping Act (CSA) and international regulations under the International Maritime Organization (IMO), including pollution prevention and inspection for seaworthiness.

A variety of hazardous materials will be used during construction, ranging from hydrocarbons and chemicals to explosives. Transportation, handling and storage regimes for these materials will be enforced throughout the site, and subject to inspection and compliance with relevant requirements and acts.

4.3 The Operations Phase

The refinery will be operated and maintained by trained, knowledgeable and experienced personnel following proven standard practices that result in a safe, efficient and environmentally responsive workplace. Management systems will be in place that comply with all regulatory requirements. These systems will cover, but not be limited to, the following:

- Operating and maintenance manuals and procedures;
- Equipment monitoring and inspections;
- Equipment and unit turnarounds;
- Risk management and mitigation systems;

- Loss control management;
- Equipment drawing and design specification data;
- Vendor equipment and catalogues;
- Continuous improvement protocols/tools;
- Emissions and discharges monitoring and control procedures;
- Operations training; and
- Workplace safety training.

4.3.1 *Marine Operations*

Marine Terminal operations will be carried out in accordance with established national and international regulations, standards and codes of practice. The terminal will develop a set of safety standards and operational procedures for the safe and efficient operation of the terminal as well as “Marine Terminal Regulations and Information” manual. This manual will be provided to vessel owners, operators, charterers and master mariners of tankers and bulk carriers, and will give a description of facilities and available services, conditions for acceptance for a vessel to berth at the facility and the safety regulations to be followed. Placentia Bay has a well-established Vessel Traffic Management System and a well-defined traffic lanes.

4.4 Environmental Management

The Newfoundland and Labrador Refining Corporation is committed to stewardship of the environment in which it seeks to operate, and will design and execute the project in a manner that will eliminate or minimize the potential adverse effect on the environment in all phases of the project.

NLRC has established their proactive approach to environmental management in the Design Principles for the project: these are outlined in the preface of every volume of the EIS/CSR. Prior to any site work, NLRC will develop an overall Environmental, Health and Safety Management (EHSM) system.

NLRC is committed to prevent pollution and to continually improve the integration of environmental protection practices in all its activities. NLRC will ensure that project activities are carried out in full compliance with all applicable environmental, health and safety laws and regulations by applying the best available technologies and highest standards.

4.4.1 *Environmental Protection Plan*

The Environmental Protection Plan (EPP) is the cornerstone for implementing environmental protection measures during all phases and all activities of the project. The EPP will provide a practical framework for implementation of the environmental requirements for the project and

consolidate all proposed mitigation and monitoring procedures for construction, operation, and decommissioning and abandonment.

The EPP is a working document for use in the field for project personnel and contractors, as well as at the corporate level, for ensuring commitments made in the proponent's policy statements are implemented and monitored. EPP provides a quick reference for project personnel and regulators to monitor compliance and to make suggestions for improvements. The EPP will be structured to allow for updates and revisions as required to meet the needs of the reviewers, and as engineering design and work methods are further defined. Each EPP, and revision thereof, will be reviewed and approved by the Proponent.

4.4.2 Implementation

An EPP will be implemented for each phase (construction, operations and decommissioning) of the Project to deal with environmental issues specific to each individual phase. Revisions and additions to the EPP will be made to reflect new and site-specific construction sequences, work methods and environmental protection requirements and responsibilities. All Issued for Construction (IFC) drawings will be annotated with environmental considerations and/or EPP notation boxes referencing specific sections of the EPP to be consulted by contractors/field personnel when carrying out activities in the area defined by the IFC drawing. "EPP notation" will be included on the drawings to highlight important environmental protection measures relevant to given construction activity (e.g., buffer zones, stream crossings, etc.).

4.4.3 EPP Content

The style and format of the EPP is intended to enhance its use by project personnel in the field and to provide a bridge between the overall approach to environmental protection planning and the specific requirements contained in various permits, approvals and authorizations issued for project development and activities.

The following is a generic contents list of the Project EPP:

- Section 1: outlines responsibilities of project personnel
- Section 2: overview of environmental concerns and standard environmental protection measures
- Section 3: key sources of information
- Section 4: provides contingency plans for all potential accidents and malfunctions:
- Section 5: provides the names and numbers of key contacts for the project.
- Section 6: contains the site-specific EPPs for the principal work areas for construction

The content for the EPP for Construction can be seen in section 9.3.3 of Volume 3. The EPP for Operations will provide the general protection procedures for routine activities associated with the operation of a refinery and marine terminal and identify applicable permits, authorizations, licences and certificates required. Standard environmental protection procedures will be developed for all activities in the site work areas.

4.4.4 Waste Management

Solid wastes will be generated during all phases of the project. Waste management practices will adhere to applicable regional, provincial and federal waste management acts, regulations, and guidelines. A Waste Management Plan will be included in the EPP.

NLRC is committed to managing its wastes as resource materials. NLRC intends to reduce waste generation at all project phases through appropriate system design and operation. Wherever possible, waste materials will be reused to prevent the use of virgin or reprocessed materials. For example, recycling of refining additives such as catalysts and caustics will be incorporated into the refinery design. Recycling of waste materials that require additional processing will be off-site at an approved facility.

Waste management is discussed in further detail in Volume 2, Project Description.

4.4.5 Water Management

A Water Management Plan will be developed and implemented to ensure that water is treated as a valuable renewable resource. It will be especially important to ensure that discharge from the site is properly treated and controlled. Conservation and re-use efforts will be in place to minimize the water quantity required from marine sources. Water quality and quantity, desalination processes, treatment processes and final discharge will be managed in accordance with the mitigation measures outlined in Volume 2, Project Description.

4.5 Health, Safety and Regulatory Regime

NLRC will incorporate the highest health and safety standards in the design, construction and operations of the Project. An Occupational Health and Safety Plan will also be developed, to ensure the undertaking is carried out in accordance with the *Occupational Health and Safety Act* and *Regulations*. These measures will provide the necessary equipment, systems and tools to ensure a safe workplace is maintained. Proper information, instruction, training, supervision, and facilities will also maintain the health and safety of personnel for all stages of the project. Zero Harm Policy will be adopted and safety indicators will be established, tracked and monitored. Regular safety audits will be carried out. This safety culture will be recognized as an integral part of employee's duties.

4.6 Emergency Response, Safety and Firefighting Facilities

NLRC planning and design efforts have focused on prevention as the best mitigation measure for limiting the potential for emergencies. NLRC has defined a group of emergency response plans which will ensure that employees have the training and on-site/off-site resources to respond to incidents that may affect personnel safety, public safety, the environment and property.

The Project's on-site emergency response, safety and firefighting facilities will be a self-contained emergency response group with the capability to deal with all anticipated emergency scenarios on site. The Proponent anticipates forming strategic mutual aid agreements with other local industries and the surrounding towns, to jointly support existing capacity in the area and improve the area infrastructure, training and emergency response capability. The project will develop an Emergency Procedures Plan that includes consideration of the following:

- Types of emergency;
- Hazardous materials stored on-site;
- Emergency scenarios and consequences;
- Internal emergency resources, including: alarms, assembly areas, shutdown systems, gas detection systems, power supply, safety and emergency equipment, spillage collection and retention;
- Incident control centre and command structure responsibilities and duties;
- Procedures covering a range of projected emergency scenarios;
- Responsibilities for emergency communications;
- Emergency training, exercises and evaluation; and
- Plan review and revision.

4.6.1 Hazard Awareness

All refinery personnel, contract workers and unescorted visitors will be required to complete an annual or introductory basic facility hazards awareness program, prior to proceeding into the operational area. This program will include training to recognize emergency alarms and the appropriate response.

4.6.2 Refinery Employees

Refinery employees, as well as contractors, will undergo regular site safety training. This will cover hazard identification and avoidance, basic first aid, location of muster areas, escape routes, use of self-contained breathing apparatus, basic awareness of the refinery's firefighting equipment, fire extinguisher training and use of a fire hose.

4.6.3 *Firefighting*

The project will construct an on-site fire station with appropriate firefighting vehicles. A hazardous materials (HAZMAT) response trailer will also be stored on-site. The number and sizes of the firefighting equipment will be determined during detailed design when full hazard identification and response requirements are completed. NLRC is considering a live firefighting facility on-site.

The refinery will maintain a core group, fully trained and certified as a Fire Brigade and comprised of facility personnel that respond to refinery emergency situations involving fires and/or hazardous materials. The primary response group will be composed of on-shift operations personnel, with trained back-up provided by day staff. The Fire Brigade personnel are expected to receive their initial training at the MUN Marine Institute Fire Training School in Foxtrap, and will have regular upgrading and training exercises to maintain skills. Training will be coordinated with local area industries and Towns where possible.

4.6.4 *Medical Facility and Personnel*

The project will have a fully outfitted clinic with an ambulance. Selected personnel will be trained to respond to medical injuries at a basic emergency care level. The refinery will also have designated full-time employees who are certified as Emergency Medical Technicians (EMTs). Facilities will be in place to respond to all anticipated medical emergencies, stabilize the injured and provide rapid transportation to the hospital in Clarenville (half an hour away) or St. John's (one-and-a-half hours away). A helipad will be installed on site for emergency evacuation of the critically injured.

4.6.5 *Incident Command*

Selected refinery employees will be trained as Incident Commanders. They will receive extensive training in emergency response and coordination. The refinery will conduct regular tabletop drills to reinforce the training and refine the procedures.

The refinery will be equipped with a central control room that can control the facility remotely during an emergency; field control centres for individual units will provide backup in an emergency. An emergency operations centre will be located close to the central control room; it will have direct communications links with the control room and radio communications with the response teams.

4.6.6 *Off-site Responders Coordination*

The refinery's Fire Brigade will participate in drills with other local industrial and town Fire Departments, creating an efficient local area response team and fostering off-site capability.

Emergency events, spills and fires will be reported to local and provincial authorities. On-site emergency response teams will be first responders with immediate call-in of support as the situation requires.

The Proponent intends to actively promote a local area Mutual Aid Organization, including the local town fire departments as well as the North Atlantic Refining and Whiffen Head fire departments. This mutual aid organization could provide additional response equipment, materials and personnel in the event of a large emergency anywhere in the local area.

4.6.7 Community Notification

The refinery will develop an emergency notification and response program to provide information and procedures for local area residents and industry. The program will be communicated directly to the local residents and other potentially affected groups.

4.6.8 Oil Spill Preparedness, Prevention and Response

For its part, NLRC has and will continue to take steps to minimize the risk of an oil spill and prepare to respond quickly and effectively should such event occur, regardless of its magnitude. The refinery will be a designated oil handling facility (OHF) pursuant to the Federal Oil Handling Facility Regulations.

As owner/operator of an OHF, NLRC is responsible for spills originating at the marine facilities or the refinery itself. The refinery and marine terminal will have the capability on site to respond to a spill event from the facility. An oil spill response plan, supported by appropriate training and exercises, will be implemented to address all phases of construction and operations. This planning will also include a contractual arrangement with Eastern Canada Response Corporation (ECRC) to provide spill response support to NLRC in the event of an incident.

Tankers and bulk carriers using the marine terminal will be chartered vessels and are responsible for their own spill response arrangements while in transit to and from the Project site.

NLRC will have specific terminal requirements to ensure vessels coming to and from the terminal will be in compliance with the Canada Shipping Act. The potential effects of a spill from a tanker in Placentia Bay have been included in the assessment and are discussed in Volume 3 - Biophysical Assessment, with the potential effects on the commercial fisheries discussed in Volume 4 - Socio-economic Assessment.

The risk and consequences of oil spills are well known based on worldwide statistics of spill history from marine oil tanker operation over the past 30 to 35 years. It is also well known and recognized that oil spill size and frequency is significantly reduced as a result of improved

technologies, regulations, government and industry management practices. In Canada much better performance is being consistently achieved than in the worldwide statistics. Both North Atlantic Refinery Limited (NARL) and the Whiffen Head Transhipment Terminal site have operated with excellent records under the Canadian Regulatory regime.

NLRC recognizes that the consequences of large spills in Canadian coastal waters are unacceptable to Canadians. NLRC commits to work diligently to prevent spills and, through careful design and good operating practice to lower the probability of spills. With respect to the proposed tanker operations through Canadian waters to and from the NLRC Refinery, NLRC strongly supports a TERMPOL Review by Transport Canada together with other government agencies. The major focus of this TERMPOL Review will be on the prevention of tanker incidents and associated spills through systematic analysis of the incident risk points and consideration of prevention measures that can be implemented to further reduce risk. NLRC recognizes that the tanker safety and management systems that are now in place have a very good track record, however in light of changing vessel traffic circumstances, a TERMPOL Review will be of benefit.

Spill prevention is a key consideration in design and in operations planning for the refinery and the marine terminal. International, national and industry prevention measures over the past several years have been successful in greatly reducing the frequency of marine spills. The role of IMO in requiring all new tankers to be double-hulled and the phasing out of existing single hulled tankers by 2015 is especially notable.

In Placentia Bay, spill prevention has been enhanced by the active monitoring and management of vessels through the Marine Communications and Traffic Services (MCTS) Centre; the Transport Canada requirements for vessel condition reports well in advance of approaching the Bay; the requirement for proper charts and pilotage before proceeding well into the Bay; and the practice of both the existing refinery and the transhipment terminal to provide escort tugs for laden tankers. NLRC will adopt comparable procedures.

In addition to ensuring its own preparedness, NLRC recognizes that its preparedness will contribute to and enhance the inherent capability to respond to any significant spill event in Placentia Bay. NLRC will coordinate and collaborate fully with the other major industries in Placentia Bay – the Come-By-Chance refinery, the Transhipment Terminal and if they are established, the Grassy Point LNG Terminal and the Voisey's Bay Nickel Processing facility in Long Harbour. This will ensure effective coordination and cooperation in spill planning, training and exercises and actual response should it ever be required.

Transport Canada is responsible for the oil spill response regime in Canada. The Canadian Coast Guard, a Special Operating Agency within the Department of Fisheries and Oceans, is the operational agency within the regime.

The Canada Shipping Act sets out the basis and requirements for oil spill preparedness and response for owners/operators of both oil handling facilities (OHF) and vessels (tankers over 150 gross tonnes and all vessels over 400 gross tonnes). Work is ongoing on additional regulations that will require Oil Pollution Prevention Plans (OPPPs) as well as Oil Pollution Emergency Plans (OPEPs).

The basis of the regime is that the polluter must be prepared to respond to a spill. One of the fundamental components is the requirement for an OHF or vessel to have an agreement in place with an accredited Response Organization. The Response Organization for eastern Canada, accredited with response capability for a spill of 10,000 tonnes, is Eastern Canada Response Corporation (ECRC).

NLRC will have a spill response capability in compliance with the Canada Shipping Act. NLRC will also consult the government of Newfoundland and Labrador with respect to its spill response requirements as well as spill waste disposal provisions. NLRC will work with ECRC, to insure close integration of response planning, training and exercises.

NLRC will work closely with the Placentia Bay Integrated Management Committee, the Traffic Committee, fisheries organisations and union (FFAW) and stewardship groups in order to coordinate their activities with other stakeholders.

Through its liaison process with communities and the fishing industry NLRC will involve the public and stakeholder groups in spill preparedness planning by involving them in planning and exercises and providing appropriate training, especially to fishers, whose capabilities and existing infrastructure will be of value in any actual spill response.

Response Strategies

Experience with spill response throughout the world has provided guidance for response strategies and for determining sensitivities. The OPEP will contain site-specific strategies for areas potentially affected by a spill at the refinery and the marine terminal. Initial considerations for appropriate response strategies are based on an understanding of the fate and behaviour of the oils that will be handled, and familiarity with response equipment and countermeasure techniques.

Oil containment at the refinery wharf or jetty will be a fundamental strategy for environmental protection in a spill response. This strategy clearly recognizes the sensitivity of the area surrounding the refinery. Key sensitivity maps will be included in the OPEP.

Final development of response strategies will be done in conjunction with regulatory agencies and the communities. In case of an actual spill event, response strategies would be developed in collaboration with the Regional Environmental Emergency Team (REET). REET is a multi-agency advisory group, chaired by Environment Canada, that can be pulled together very quickly to assist with spill-response planning and implementation.

Resources

The OPEP will clearly identify the location and access to resources needed for spill response, including equipment, materials and personnel.

The OPEP addresses spills on land as well as in the marine environment. While personnel resources are similar, equipment and materials differ for a land spill. Stockpiles of basic containment and clean-up materials will be strategically located around the refinery: a variety of sorbent materials, containment booms and temporary oil storage tanks, drums, plastic liners and bags. The tank farm will be designed and built with appropriate containment dykes, lined and fitted with drainage system that is connected to oil-water separation and treatment system for treatment before being discharged to the environment. The tank farm (tanks and protective dykes) will be built to BATEA standards and government requirements.

Oiled Wastes Management

A number of solid and liquid wastes result from an oil spill and oil spill clean-up. The volumes of waste can be significant and without effective management can be an obstacle to continuing with clean-up.

NLRC is incorporating oil spill waste management into the design of wharf and plant infrastructure and will work with industry and government toward a management plan for oily wastes.

5.0 DECOMMISSIONING AND SITE REHABILITATION

The initial design life of the refinery is 25 years. However, with continuous maintenance, re-fit, expansion, upgrading, modifications, etc., the final operating life of the refinery will be much longer and could extend to 50 years or more, at which time it will be decommissioned. The decommissioning and abandonment phase will help to reduce and remediate environmental impacts that are a result of Project infrastructure and activities. Re-usable equipment and machinery will be transported to other locations. Above-ground installations will be removed and underground installations will be either removed or left in place, depending on the environmental benefits of each option. Environmental contamination, if any, will be remediated in accordance with applicable environmental guidelines. Upon abandonment, the site will either be rehabilitated to a semi-natural state, or used for an alternate industrial or commercial development.

Site rehabilitation will begin with the removal of machinery and structures related to refinery operations. Once deconstruction and demolition are complete, the area will be prepared for further assessment to determine the presence or absence of environmental contamination.

Native vegetation will be restored to areas where excavation and remodelling occur. Areas where soil and rock materials are compacted will be scarified to allow for aeration and increase soil moisture content. Hardy plants, bushes or trees will be planted where stabilization is required. Redundant roadways will be removed and seeded. Other exposed soil areas will be revegetated with appropriate seed material. Any infrastructure that unnecessarily prevents the recovery of vegetation will be removed.

6.0 BIOPHYSICAL ASSESSMENT

NLRC is committed to protecting the environment, drawing on local experience, the experience of other industries in the area and contemporary advances in engineering design and production technology. Volume 3 – Biophysical Assessment of the EIS is the first step in achieving that goal: researching, defining and understanding the environment and the place of the Project within it.

The various component studies and multiple surveys, site investigations and background studies identify potential positive and negative environmental effects, and examine methods to mitigate or eliminate negative effects. In cases where effects cannot be entirely avoided, the EIS has evaluated practical, responsible plans to limit environmental impact and respond to residual effects that cannot be mitigated.

This information will allow decision makers and the public to consider the biophysical environmental implications of the Project and determine its acceptability.

6.1 Impact Assessment Methodology

The biophysical assessment followed well-established methods, consistent with those of the Canadian Environmental Assessment Agency and the Newfoundland and Labrador Department of Environment and Conservation. Both levels of government have provided specific requirements and supporting guidance throughout the assessment.

The key steps in developing the biophysical portion of the EIS included:

- Developing a detailed project description;
- Defining the geographic and temporal scope of the Project;
- Consulting with the public, subject matter experts and government agencies;
- Carrying out field and modelling studies to collect site-specific data;
- Identifying and defining the Valued Ecosystem Components (VECs) against which the potential effects of the Project are evaluated;
- Characterizing and evaluating any potential environmental effects on VECs;
- Evaluating the nature and risk of accidental events;
- Developing mitigation methods, including rehabilitation and management methods;
- Determining the nature and significance of any residual effects;
- Determining potential cumulative effects over the life of the project; and

- Proposing a monitoring program to confirm the accuracy of the EIS identify any unanticipated effects of the Project.

Two general types of effects are considered in this document:

1. Effects of the environment on the Project; and
2. Effects of the Project on the environment, including the biophysical and human environments.

The *Guidelines* for the Environmental Impact Statement / Comprehensive Study Report for the Newfoundland and Labrador Refinery Project specifically listed the following VECs that require detailed assessment, as related to the Bio-physical Environment:

- Air Quality;
- Water Resources;
- Migratory Birds (including seabirds, shorebirds, waterfowl, songbirds and other land birds within the footprint of the Project, with emphasis on species at risk or species under hunting pressures);
- Fish and Fish Habitat (Freshwater and Marine species and habitat); and
- Flora and Fauna Species at Risk (including rare and endangered plant species, including those listed on Schedule 1 of the federal *Species at Risk Act (SARA)*, those listed by Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and those listed by provincial *Endangered Species Act (ESA)*).

This impact assessment also covered the flowing VEC:

- Marine Mammals, River Otters and Sea Turtles

The VECs addressed in the Refinery Socio-economic Assessment are:

- Economics;
- Employment and Business;
- Commercial Fisheries and Aquaculture;
- Health and Community Services;
- Education and Training;
- Land Use and Municipal Planning;
- Infrastructure and Services;
- Emergency Infrastructure; and
- Historic Resources.

The above VECs are discussed at varying levels of detail depending on the potential for significant effects. Air Quality is treated as a VEC in the biophysical assessment in Volume 3 but is also referenced in the discussion on Community Health and Well-being in Volume 4.

In addition, the following Component Studies are required to be submitted with the EIS.

- Air Quality;
- Migratory Birds (seabirds, shorebirds, waterfowl, songbirds and other land birds);
- Fish and Fish Habitat (both marine and freshwater);
- Historic Resources; and
- Socio-Economic.

6.2 Data Gaps

NLRC conducted a thorough review of relevant existing information and data to identify data gaps that must be filled to carry out adequate assessment of the Project with a reasonable degree of certainty. Information gaps from lack of previous research or practices or lack of long term coverage were assessed. Data extrapolation, manipulation, and modeling predictions (numerical or stochastic) were used to supplement or otherwise complete such data gaps (e.g., air quality and effluent discharge modelling).

6.3 Existing Biophysical Environment

Southern Head, Placentia Bay, is on the estuary of the Come By Chance river, west of the North Atlantic Refinery. The landscape here, along with most of the Placentia Bay area falls within the Southeastern Barrens of the Maritime Barrens Ecoregion of the island of Newfoundland.

The Study Area for the Environmental Impact Assessment is shown in Figure 6.1. Placentia Bay is comprised of a long, irregular shoreline characterized by a diverse mix of rock cliffs and shelves, cobble, boulder beaches, estuaries and mudflats, and nearshore islands of diverse sizes and habitats.

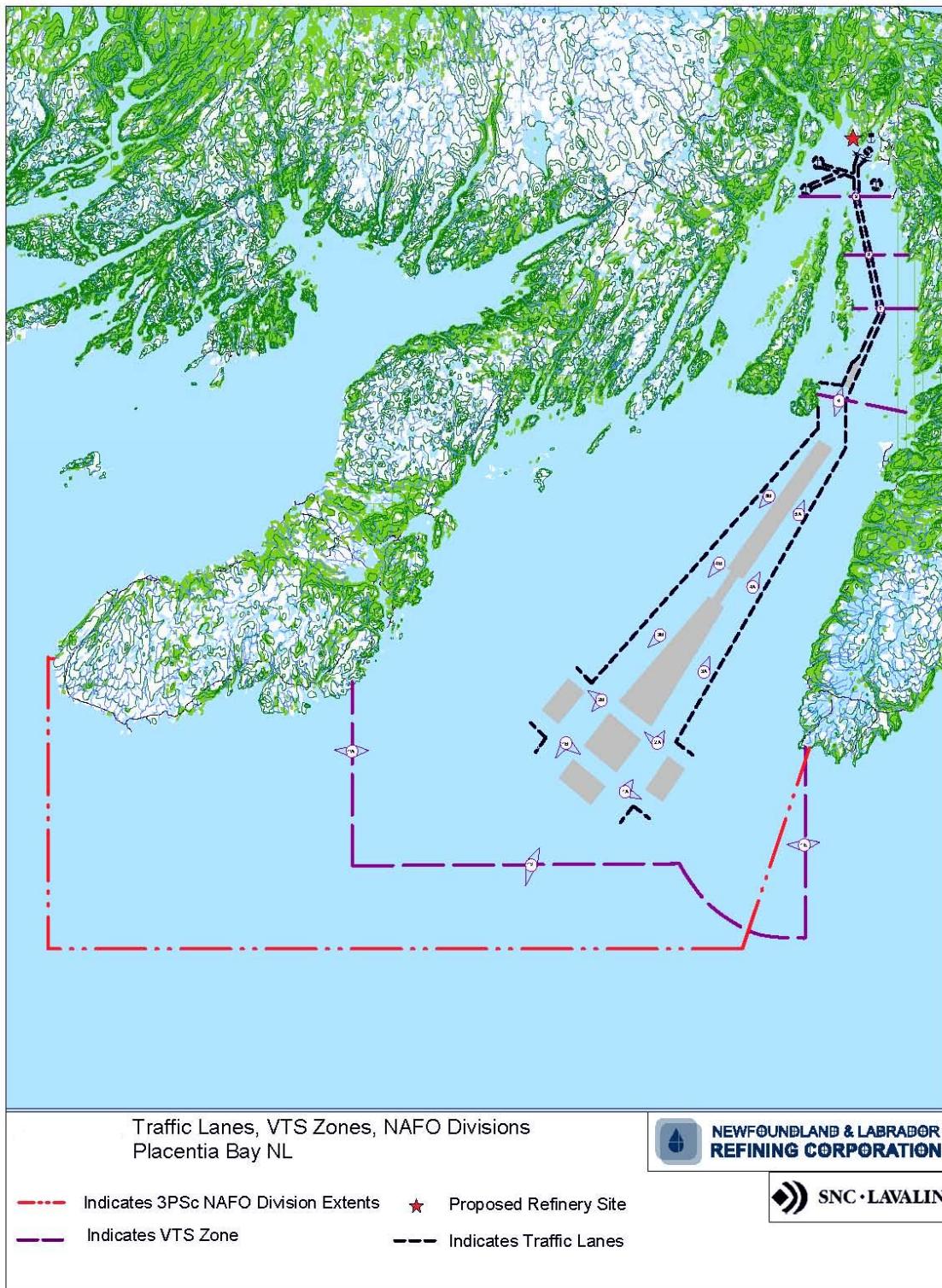


Figure 6.1 Biophysical Study Area

To gain an understanding of the biophysical environment, NLRC undertook an evaluation of information available from government scientific literature, consultations with local communities, stakeholders and acknowledged subject specialists. Original baseline data gathering included:

- Seabird surveys in Placentia Bay;
- Marine mammal surveys in Placentia Bay;
- Sediment and water quality sampling off Come By Chance Point on Southern Head;
- Vegetation and geotechnical surveys;
- Terrestrial bird surveys;
- Fresh water fish and fish habitat surveys;
- Marine Fish and Fish Habitat surveys;
- Freshwater Quality measurements;
- Physical oceanographic measurement programs (site specific current and CTD measurements at the proposed marine outfall/diffuser, SmartBay Buoy program);
- Historical Resources Surveys;
- Met/ocean climate data; and
- Air quality data (existing background concentrations).

6.3.1 *Weather and Climate*

The climate of the study area is strongly influenced by its proximity to the waters of Placentia Bay and Trinity Bay. Placentia Bay is effectively ice free and generally warmer than Trinity Bay, which is more strongly affected by the Labrador Current.

Records for adjacent communities were used to establish historical climate trends in the area. Air temperatures range from a low of minus 25°C to 28°C in winter and a high of plus 28°C to 29°C in summer, a span of close to 60°C. Annual rainfall ranges from 110 cm to 119 cm; snowfall is in the order of 124.5 cm.

Wind is a key factor for those using Placentia Bay. Much of the year the most frequent wind direction is south-west. Winter, however, brings with it a higher proportion of north-west winds, which in the spring can give way to more frequent north-easterly winds. The highest monthly maximum wind speed is 25.8 m/s.

Visibility, which is a result of several factors that vary over the year, is also an important factor to all users of Placentia Bay. Fog is most associated with a southerly wind and is most frequent in the spring and summer months. ‘Good shipping weather’ (which takes into account fog, hours of

daylight, precipitation and blowing snow) is defined as greater than 2 nautical miles vicinity in less than 25 knot winds. In Placentia Bay good shipping conditions range from a low of 58 % of time in January to a high of 78% of the time in September.

6.3.2 *Air Quality*

Data from the Newfoundland and Labrador Department of Environment and Conservation show that existing air quality in the communities surrounding the proposed refinery site is well within its regulatory requirements for sulphur and nitrogen dioxides and particulates. This is with two oil-related industries already operating in the vicinity: the North Atlantic (Come By Chance) facility has been producing refined products for more than 30 years, directly across Placentia Bay from the project site; Newfoundland Transshipment Ltd. has operated the Whiffen Head Transshipment Terminal, just east of refinery, since 1977.

It is interesting to note the result of a study by the Health Research Unit, Division of Community Health and Humanities, Faculty of Medicine, Memorial University of Newfoundland, on the health status of the residents of an area within approximately 50km radius from the proposed oil refinery location. This baseline data on the health status of the local population is of value in determining the potential impact from future operations on human health in the study area. The results of this report related to air emission effects (epidemiological / respiratory diseases) where certain diseases of the respiratory system are more likely to be aggravated by emissions from refineries. Those of particular concern are Chronic Obstructive Pulmonary Disease (COPD) and asthma. The study showed that over the surveyed years (1999 to 2004) the Study Area had lower rates of hospitalization for COPD and asthma than Eastern Regional Integrated Health Authority, the province or Canada.

6.4 *Terrestrial Environment at the Refinery Site*

The refinery site and marine terminal will occupy approximately 311 ha of land and shoreline on the Southern Head peninsula, and an additional 72 ha for the construction of access roads connecting to the Trans-Canada Highway and Route 210, the Burin Peninsula Highway. The site footprint is designed to accommodate possible expansion.

6.4.1 *Landscape, Geology and Vegetation*

The site lies within the Southeastern Barrens subregion of the Maritime Barrens Ecoregion, and is characteristic of the area around Placentia Bay. This ecoregion has extensive barren areas that consist of dwarf shrub heaths, bogs and shallow fens.

The project footprint contains approximately 30% bedrock exposure of which 50% is covered with thin glacial till and 20 % with bog and water. The geology of the Southern Head area has dominant rock types consisting of red and green sandstones, granite, diorite and gabbro dikes, and minor pebble conglomerate.

Prior to the establishment of NLRC there had been very limited investigation of the vegetation and lichens in most of the area. To fill this data gap, NLRC commissioned a study of the vegetation that could be affected during construction and operation of the refinery. Field studies were carried out over a 1200 ha area.

Of the seven broad vegetation types identified, bog and scrub spruce forest are the dominant; consequently, they are the ones most likely to be affected by the location of the refinery, marine terminal and access roads.

In the process of carrying out the study the researchers discovered the existence of Boreal Felt Lichen (*Erioderma pedicellatum*), which is listed as of Special Concern under Schedule 1 of the federal Species at Risk Act (SARA) and Vulnerable by the Newfoundland and Labrador Environmental Site Assessment Act. While the field surveys have not shown that this species occurs within the footprint of the proposed refinery, it has been found in forested habitats near the site and surveys will continue.

6.4.2 Water Resources and Quality

Water resources are vital to human and ecosystem health. The Project will have direct and indirect affects on four watersheds in the Southern Head area: the North Harbour River, Come By Chance River, Watson's Brook and Hollett's Brook. Of these, 4.2 per cent of Watson's Brook watershed and all of Hollett's Brook (a relatively small watershed) will be within the footprint of the facility, and will be most affected due to the infilling of existing ponds and stream courses during site preparation and construction. The remaining watersheds will be less affected; stream and river crossings, where required, will meet or exceed Department of Fisheries and Oceans requirements for water quality and protection of fish habitat.

Within the area of these watersheds the twelve hundred ha of Southern Head encompassed by the project site boundary was studied and mapped in detail. Approximately sixty-five ha of the existing surface area is open water in the form of ponds and streams. Water quality is currently being studied to amass baseline data. NLRC has signed a Memorandum of Agreement with the Newfoundland and Labrador Department of Environment and Conservation to establish a Real-Time Water Quality Monitoring Network in the vicinity of the proposed new refinery. With the potential exception of deposition from air emissions from existing industries at the Head of Placentia Bay, there has been no other development on the Southern Head Peninsula to affect the natural water quality of these ponds and streams.

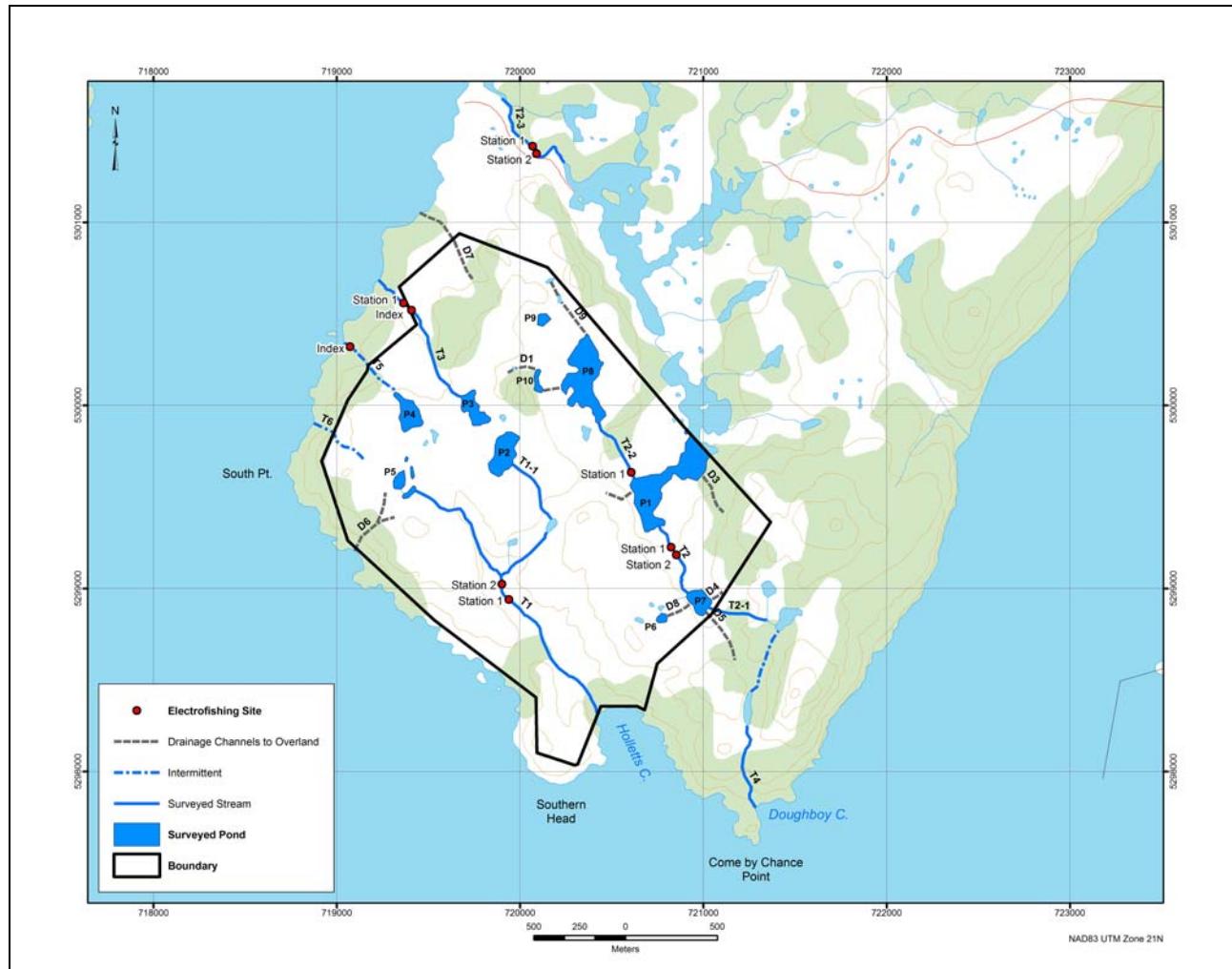


Figure 6.2 Surveyed ponds and streams within the general Project Area.

6.4.3 Fresh Water Fish and Fish Habitat

Freshwater fish and fish habitat in the areas adjacent to the project site are VECs subject to potential environmental impact during construction and operations. NLRC contracted a thorough study of these resources to determine the type, extent and risk to fish and habitat. The freshwater fish species identified during field studies included brook trout, Atlantic salmon, three-spine stickleback and American eel. The Atlantic salmon has been identified as a species at risk.

The North Harbour River, Come By Chance River, Watson's Brook, and their tributaries form the major freshwater fish habitat in the area. It should be noted that all other streams and ponds within the study area are not considered fish habitat, as they did not contain fish or were small, flooded, overland flows with no suitable habitat.

Any loss to fish habitat required during construction of the Project would be subject to Department of Fisheries and Oceans Fish (HADD) Habitat Compensation Regulations, and NLRC mitigation measures.

6.4.4 *Terrestrial Birds and Mammals*

Terrestrial Birds

The project area was surveyed to define resident bird species that are primarily terrestrial in nature, their population densities, behaviour and potential impacts from the refinery. At least 47 species of birds, ranging from songbirds and waterfowl to raptors are known to occur in the study area. At least 20 of these species are breeding or may breed in the area of the refinery footprint on Southern Head. The most common species observed during the surveys were swamp, savannah, and white-throated sparrows and blackpoll warblers.

The species common in the Southern Head area, such as flycatchers and kinglets, are generally present in the late spring, summer and fall, but generally do not overwinter. Fourteen of 20 species known or likely to be breeding in the area were observed within the black spruce scrub and forested habitats that comprise much of the project area.

Several species of raptors and owls might be expected to exploit the area's habitats but are not known to be common. The large Bald Eagle population, well known in Placentia Bay, is discussed in the Coastal and Pelagic birds section.

Waterfowl tend to breed in relatively low densities in the project area. Surveys at Southern Head in fall 2006 and summer 2007 confirmed that Ring-neck and Black Ducks were nesting in the wetlands that make up 2.4 percent of the area.

The length and diversity of the Placentia Bay shoreline and island habitats provide habitats for a large number of bird species that exploit the coastline and/or the ocean environment of Placentia Bay. The EIS indicates that there are approximately ninety-two species of birds that are considered to use Placentia Bay in this manner. These species are discussed in the context of the marine environment section that follows.

Several terrestrial bird species that may occur in the Southern Head area are deemed to be at some level of risk under federal or provincial legislation. These include the short-eared owl, grey-cheeked thrush, rusty blackbird and red crossbill. None of these species was identified at the Project site during the study.

Terrestrial Mammals

The mixture of forest, heath, bog and scrub habitats, intermixed with streams and ponds, provides a diverse habitat for at least 17 species of terrestrial mammals. Among the larger species, moose are known to be most common on the eastern side of the Southern Head

Peninsula based on site surveys and hunting success information. Woodland caribou have been recorded, in small numbers, at the proposed site, on an adjacent nearshore island and in the general area. The larger carnivores and omnivores including lynx, black bear, coyote occur but are not common on the peninsula. The most common species are the small mammals and fur bearers ranging from shrews, mice, voles and red squirrels to snowshoe hare, beaver, mink, ermine, red fox and river otter. Site surveys show that river otters in particular are common on the peninsula.

At this time no mammals that frequent the Southern Head area are considered at risk pursuant to Federal or Provincial legislation.

6.5 Marine Environment of the Study Area

6.5.1 Waves and Currents

Recent studies by Memorial University of Newfoundland and Labrador and the Bedford Institute of Oceanography have shown that surface currents in Placentia Bay flow counter-clockwise. Surface current speeds are approximately 17.6 cm/s (6.3 km/hr) coming up the east side of the bay and generally slow down until reaching the mouth of the bay. On the west side surface current speed is approximately 7.1 cm/s (2.5km/hr). There is data that indicates that a similar counter clock wise current flow occurs in deeper water to about 55 meters.

Near the site of the Project currents flow generally towards the south/southwest and bottom current are approximately .03 to .22 m/sec, also south/southwest.

Information about the wave climate in Placentia Bay came from three primary sources: the MAST data set: hindcasting by SNC Lavalin for the transshipment terminal in 1996; and SmartBay.

MAST and SmartBay data are comparable. Mean wave heights range from 1.0 m in June to 2.8 m and 2.9 m in January and February in the outer bay. Maximum wave height was 9.1 m in January. Direction is typically from the southwest.

Closer to general Project Area, long term wave patterns for Come By Chance and Whiffen Head are not as extreme with the mean significant wave height of 0.19 m in May and 0.24 m in January, most frequently from the west and southwest.

6.5.2 Marine Water and Sediment Quality near the Refinery Site

The Project has collected pre-development water and sediment quality samples from the area immediately offshore of marine terminal site. Analysis of the water samples taken from three depths at five stations show that levels of chlorophyll, pH, oxygen, salinity, particulates, total oil and grease and other typical parameters are consistent with expectation for Placentia Bay.

Sediments taken from the seafloor at these same stations show values for a wide range of metals and other potential contaminants that are generally below detection limits and/or less than the values recommended by the Canadian Council of Ministers of Environment (CCME) environmental quality guidelines for marine sediments. The only departures from this generalization are localized values of arsenic at two stations that were marginally higher than the CCME guidelines and similarly copper values at three stations, which were variably higher. The only other finding of note was that PAH (indicating hydrocarbons) levels along a transect into Hollett's Cove were higher than those found at other stations, however, all stations had PAH levels less than the CCME guidelines.

6.5.3 Marine Fish and Fish Habitat

Placentia Bay supports an important and diverse inshore fishery that exploits a wide range of species chief among which are cod, crab, lobster and scallop. A detailed discussion of this subject can be found in Volume 4, Section 5.0, Commercial Fisheries, Aquaculture and Processing.

NLRC has studied the marine habitat that will be directly affected by the footprint of the marine terminal. Combined, the marine terminal and tug berth, jetty, the facility's water intake and wastewater outfall will affect approximately 11.3 ha of seafloor fish habitat.

The seafloor habitats that will be affected include the rock faces, outcrops and shelves, boulders, cobbles, sands and gravels that typify this type of shorelines in Placentia Bay. The bedrock, boulder and cobble of the shoreline changes to a patchy intermix of boulders, cobbles, gravels and sands in deeper water. This patchy intermix of hard surfaces and clean gravels and sands supports a wide variety of marine algae providing a diverse habitat overall. The rocks and boulders and coarse gravels provide attachment points for the marine algae ranging from the commonly seen rockweed along the shorelines, to crustose marine algae that grow on rock throughout the area, to various species of kelp along shorelines, in the intertidal zones and deeper waters.

As might be expected these nearshore rock/gravel/sand habitats and their attendant marine algae shelter a variety of species from anemones, barnacles and sponges sea urchins and sand dollars to mussels and scallop and hermit crabs to lobsters, and small numbers of cod, flounder and plaice.

6.5.4 Marine Mammals, River Otters and Sea Turtles

Two groups of marine mammals occur within the study area – whales, dolphins and seals. There are four species of large baleen (filter feeding) whales and five species of dolphin and porpoise that fall into the toothed whale category. Three species of seal occur, of which harbour seals occur year-round and harp and grey seals occur less frequently.

Among the nine whale species that can potentially occur in Placentia Bay the blue whale and the North Atlantic right whale are listed as endangered species under Canadian Federal law, which reflects the international consensus on the status of these species. The leatherback turtle also falls into this category. To date, however, there are no recorded sightings of either of these species occurring in Placentia Bay. However, both the fin whale and harbour porpoise both common in the Study Area are deemed to be of special concern by COSEWIC, the independent body that advises the federal government on species at risk issues.

By contrast, as noted above, leatherback turtles have been recorded in southern and central Placentia Bay and at least one record of a leatherback near the northern tip of Merasheen Island. The range of the leatherback sea turtle, listed as an endangered species includes the outer portion of the Study Area in Placentia Bay. Available data suggests that sightings of these turtles are most frequent in late summer and early fall.

River otters are common and widely distributed in Placentia Bay based on scientific surveys and evidence from trappers, however, no comprehensive population estimate exists for this species in Placentia Bay. Close to 20 haul out sites have been recorded within or near the Project's footprint during NLRC surveys, and construction activities and infilling on Southern Head will eliminate at least some of these sites.

6.5.5 Coastal and Pelagic Birds

As previously noted, a wide diversity of birds are known to exploit the shorelines and open ocean habitats for Placentia Bay. NLRC surveys recorded forty-three species in coastal habitats and thirty pelagic or open-ocean species during fifteen surveys over 7 months from August 2006 to April 2007. Surveys are continuing.

The habits of this group of birds varies, ranging from the coastal scavenging life style of the large resident breeding population of bald eagles that use the coastlines and islands of Placentia Bay, to the various pelagic species that use the open ocean waters year round, to the numerous species of shorebirds and waterfowl whose migratory patterns take them to and from the beaches and barachois of Placentia Bay on a regular basis. Local and scientific knowledge shows that while Placentia Bay has diverse and large species populations year round, the numbers of species and individuals increase in spring and again to an even higher level in fall in response to migratory behaviour.

The importance of these bird populations cannot be understated. Significant segments of the breeding populations of some of these species use Placentia Bay and there are several important colonies around the coastline with Cape St. Mary's seabird sanctuary being perhaps the best known.

Among the coastal species that use Placentia Bay, both the Barrow's Goldeneye and the Harlequin Duck are recognized as species at risk under Federal and Provincial legislation. The

Barrows Goldeneye is rare but the Harlequin is more common. The NLRC surveys of costal and pelagic birds in Placential Bay has put particular focus on Harlequin Ducks in an effort to improve the knowledge of the distribution and occurrence of this species.

6.6 Species at Risk

Newfoundland and Labrador's Endangered Species Act and Canada's Species at Risk Act provide the framework for identifying, monitoring and protecting species determined to be at risk due to natural causes or human activities. Within the Project study area there are a total of fifteen species identified by either or both pieces of legislation (Tables 6.1 and 6.2).

Table 6.1 Marine Species at Risk

| Species | Federal Species at Risk Act Status | Provincial Endangered Species Act Status |
|----------------------------|------------------------------------|--|
| Fish | | |
| Atlantic Cod | Special concern | Not listed |
| Northern Wolffish | Threatened | Not listed |
| Spotted Wolffish | Special concern | Not listed |
| Atlantic Wolffish | Special concern | Not listed |
| Birds | | |
| Harlequin Duck | Special concern | Vulnerable |
| Whales | | |
| Blue Whale | Endangered | Not listed |
| North Atlantic Right Whale | Endangered | Not listed |
| Reptiles | | |
| Leatherback Sea Turtle | Endangered | Not listed |

Table 6.2 Terrestrial Species at Risk

| Species | Federal Species at Risk Act Status | Provincial Endangered Species Act Status |
|---|------------------------------------|--|
| Fish (fresh water & anadromous species) | | |
| Atlantic Salmon | Endangered | Not listed |
| Banded Killifish | Special concern | Vulnerable |
| Birds | | |
| Barrow's Goldeneye | Special concern | Vulnerable |
| Red Crossbill | Endangered | Endangered |
| Short-eared Owl | Special concern | Vulnerable |
| Peregrine Falcon (anatum subspecies) | Threatened | Threatened |
| Peregrine Falcon (tundrius subspecies) | Special concern | Threatened |
| Gray-cheeked Thrush | - | Vulnerable |
| Eskimo Curlew | Endangered | Endangered |
| Plants | | |
| Boreal Felt Lichen | Special concern | Vulnerable |

Apart from the species formally designated “at risk” under COSEWIC, the body of independent experts that advise the federal government have recommended several other species that occur in the Project Study area for protection under legislation. In the marine environment these include the porbeagle shark, the white shark, the short fin mako shark, the blue shark, the cusk, the fin whale the harbour porpoise and the Red Knot, a shore bird. From a terrestrial perspective COSEWIC has recommended the American eel and the Rusty Black bird for consideration.

6.7 Effects Assessment

The construction and operation of the NLR facility carries with it risks for the environment. Chapter 4.0 of Volume 3 of the NLRC Environmental Impact Statement (EIS) documents and evaluates the potential effects of the Project. Effects on the marine and terrestrial environments to be affected by the Project are discussed as are the risks and potential effects of accidental events, particularly oil spills to the marine environment from tankers or due to refinery operations.

The assessment focuses on the potential effects of project construction and operation on valued ecosystem components (VECs) within the Study Area. For the NLRC Project the valued ecosystem components defined for the purposes of the biophysical assessment portion of the EIS are:

- Air quality;
- Water Resources;
- Fish and Fish Habitat;
- Migratory Birds;
- Marine Mammals, River Otters and Sea Turtles; and
- Species at Risk.

These VECs were defined based on extensive stakeholder consultations, prior experience with projects of this nature and the professional expertise of the Project Assessment Team. A detailed description of the stakeholder consultations and their outcome can be found in Volume 5.

The Study Area defined for the biophysical assessment of the Project was established based on the footprint of the Project facilities at Southern Head and the area of Placentia Bay and its approaches most likely to be affected by tanker traffic en route to and from the proposed refinery.

The effects assessment also considered the implications of accidental events as the cumulative effects on the Placentia Bay study area from considering the NLRC Project in the context of existing and anticipated projects planned for the Placentia Bay.

The two key pathways of effects on the environment are project effluents and project air emissions.

6.7.1 *Effluents Modelling*

There will be one outfall pipe approximately 400m with a 100m diffuser at its end, located west of Southern Head point in about 15 to 18 m water depth. The actual concentrations of various substances in the treated effluent are not known at present and will be determined as detailed engineering progresses. However, all discharges will be in compliance with the Newfoundland and Labrador “*Environmental Control Water and Sewage Control Regulations and Associated Guidelines*.” Where specific substances are not addressed in these regulations, permissible levels have been supplement with those listed in the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life.

Treated wastewater from the wastewater treatment plant will be combined with other discharges from the site: cooling water from the main closed loop cooling system, cooling water from the thermal desalination process, and desalination brine from the thermal desalination process. The principal components of concern in the combined discharge are high salinity and temperature. Site-specific models will be prepared to ensure these parameters fall within acceptable ranges for marine discharge.

CORMIX is a USEPA-supported mixing zone model and decision support system for environmental impact assessment of regulatory mixing zones resulting from continuous point-source discharges. The system emphasizes the role of boundary interaction to predict steady-state mixing behaviour and plume geometry, appropriate for modelling the outfall at Southern Head.

The dispersion of the effluent is affected by several factors such as discharge characteristics (flow-rate and density), ambient characteristics (water column density profile, currents speeds, and wind speeds etc.), and outfall configuration (length of diffuser, size and space of discharge ports, orientation of ports etc.).

The effluent considered has four components: 1) cooling water at a rate of 13,300 GPM (Gallons per Minute); 2) desalination (cooling) reject water at a rate of 20,000 GPM; 3) brine at a rate of 7,000 GPM at 1.5 times ambient seawater salinity; and 4) treated wastewater at a rate of 2,218 GPM. The total discharge rate of combined discharge is 42,518 GPM.

The temperature of the combined discharge is 32 °C. This temperature is about 26.6 °C (May) and 15 °C (August) higher than the temperature of ambient seawater. The salinity of the combined discharge is about 33.18 psu, which is only about 1~2 psu above the salinity of ambient seawater. The discharge may also contain various pollutants, such as heavy metals and PAHs.

The ambient seawater characteristics for the modelling were based on field measurements from sampling conducted in June near the actual proposed outfall location and additional ambient profiles from literature.

It should be noted that wind was not considered in the simulation to produce a conservative analysis. With the presence of wind, additional mixing will be introduced and lower excess temperature will result, producing a smaller zone of influence.

In this study, a submerged multi-port diffuser was used to maximize dilution. The 100 m diffuser is located at the end of the outfall pipe, about 300 m away from shore and is positioned perpendicular to the mean current direction. The internal diameter of the diffuser pipe is 1.2 m with 100 ports, each oriented 45 degrees upward. The outfall pipe could be a steel pipe coated with concrete, high-density polyethylene or fibreglass. C

The model's predicted zone of influence for the cooling/effluent discharge is within less than 100 m radius for the outfall diffuser and the impact on receiving water is localized (limited to the diffuser length). The effect of effluent on receiving water is insignificant.

6.7.2 Air Emissions and Air Quality

NLRC has conducted a review of air quality in the study area, modelled the expected emissions from its proposed operations and conducted a human health risk assessment and an ecological risk evaluation of potential effects. The emissions modelled included sulphur dioxide and nitrogen oxides, carbon monoxide, particulates, and benzene.

The study followed guidelines established by Canadian and international regulatory agencies, including Environment Canada, Health Canada, the Canadian Council of Ministers of the Environment and the United States Environmental Protection Agency. An intentionally conservative, worst-case approach was taken in the evaluation.

The chemicals of concern evaluated were carbon monoxide, nitrogen oxides and sulphur dioxides, volatile organic compounds (VOCs), petroleum hydrocarbon, polycyclic aromatic hydrocarbons (PAHs) and particulates.

The modelled simulation indicated that the atmospheric concentrations of chemicals of concern beyond the project site boundaries are significantly below regulatory limits, even when the current maximum background concentrations were added (Table 6.3).

Table 6.3 Summary of Air Quality Model Results at Project boundary and nearby Communities in comparison with NL DOEC Guidelines

| Pollutant | Time Frame | NL DOEC Standard ($\mu\text{g}/\text{m}^3$) | NLRC Property Line ($\mu\text{g}/\text{m}^3$) | Communities | | | | | | | | | |
|-------------------|------------|---|---|--|-------|---|-------|--|-------|---|-------|--|-------|
| | | | | Arnold's Cove ($\mu\text{g}/\text{m}^3$) | | Come-by-Chance ($\mu\text{g}/\text{m}^3$) | | North Harbour ($\mu\text{g}/\text{m}^3$) | | Southern Harbour ($\mu\text{g}/\text{m}^3$) | | Sunnyside ($\mu\text{g}/\text{m}^3$) | |
| | | | | NLRC | Total | NLRC | Total | NLRC | Total | NLRC | Total | NLRC | Total |
| SO_2 | 1-hour | 900 | 734 | 136 | 484 | 120 | 399 | 169 | 369 | 78 | 253 | 122 | 357 |
| | 24-hour | 300 | 251 | 32 | 111 | 40 | 114 | 54 | 74 | 21 | 51 | 27 | 97 |
| | Annual | 60 | 21 | 1.5 | 3.5 | 2.3 | 7.3 | 4 | 5.0 | 0.7 | 1.7 | 1.4 | 7.4 |
| NO_2 | 1-hour | 400 | 297 | 58 | 158 | 60 | 135 | 69 | 129 | 41 | 71 | 43 | 88 |
| | 24-hour | 200 | 163 | 15 | 27 | 20 | 60 | 23 | 29 | 11 | 16 | 14 | 24 |
| | Annual | 100 | 16 | 0.9 | 1.9 | 1.4 | 2.4 | 2.2 | 3.2 | 0.36 | 1.4 | 0.8 | 1.8 |
| CO | 1-hour | 35,000 | 123 | 23 | 2,223 | 25 | 2,225 | 28 | 2,228 | 20 | 2,220 | 14 | 2,214 |
| | 8-hour | 15,000 | 38 | 9 | 1,409 | 11 | 1,411 | 15 | 1415 | 6 | 1,406 | 10 | 1,410 |
| PM_{10} | 24-hour | 50 | 11 | 3.1 | 17 | 4.1 | 18 | 4.1 | 17 | 2 | 14 | 2.8 | 18 |
| | Annual | N.A. | 1.1 | 0.12 | 7.1 | 0.21 | 7.2 | 0.35 | N.A. | 0.05 | 7.1 | 0.13 | 7.1 |
| $\text{PM}_{2.5}$ | 24-hour | 25 | 8.7 | 2.3 | 12 | 3 | 13 | 3.0 | 12 | 1.5 | 10 | 2.1 | 13 |
| | Annual | N.A. | 0.9 | 0.08 | 5.1 | 0.16 | 5.2 | 0.26 | 5.3 | 0.04 | 5.0 | 0.1 | 5.1 |

NLRC: NLRC refinery emissions only

Total: cumulative concentrations from NLRC and other sources

6.8 Human Health

The study of the current health status of the communities at the Head of Placentia Bay, carried out by the Health Research Unit, specifically considered the concern of sulphur dioxide and potential respiratory effects. The study did not observe any significant difference between the local population and general population of the province. Given the results of the air quality modelling and the health effects evaluation, it is not anticipated that the refinery would affect health statistics in the local community.

The human health study found that the atmospheric concentration of the chemicals of concern outside the project site boundaries (and particularly in the surrounding communities of Come By Chance, Arnolds Cove, Sunnyside, and North Harbour) are below the applicable regulations and the World Health Organization's guidelines. This continues to be the case when the current levels of atmospheric contaminants are taken into account.

From the perspective of cancer risk values for long-term exposure to carcinogenic chemicals, the expected emissions of VOCs and PAHs are all below the negligible risk level of one-in-a-hundred thousandth (1×10^{-5}).

Hazard quotients for non-carcinogenic chemicals (predicted exposure dose ÷ chronic toxicity reference value) associated with the non-carcinogenic chemicals, VOCs, PHCs and PAHs are all well below 0.2. It was concluded that no measurable adverse health effects would be expected to occur in the vicinity of the proposed refinery.

6.9 Ecological Risk

The ecological risk study determined that the predicted incremental soil concentrations from atmospheric emissions would not be discernable from background concentrations. A comparison of the predicted incremental soil concentration against available CCME Soil Quality Guidelines (Parkland) identified no potential issues. A quantitative assessment of the exposure to contaminants to the selected receptors was also conducted and indicated that there are no adverse effects on ecological receptors. Potential adverse effects of gaseous air pollutants (NO_x and SO_2) on vegetation were also considered in the assessment. The maximum 24-hour and annual concentrations of SO_2 and NO_2 were below phytotoxicity levels in vegetation indicating that no potential adverse effects will occur.

The impacts of the air emission was also assessed as a pathway to other VEC's (e.g., birds, vegetation, marine habitat and mammals).

The overall impact of air emission from the new refinery (even when added to existing background concentrations) was assessed to be insignificant.

6.10 Effects on Terrestrial Environment VECs

6.10.1 *Fish and Fish Habitat*

The freshwater fish species of concern in this context are brook trout, Atlantic salmon and three-spined stickleback that inhabit the five local drainage basins that will be directly affected by the access roads, refinery and marine terminal footprints.

There will be a loss of approximately sixteen hectares of stream and pond environments that provide habitats for the various life stages of the fish species of concern. Therefore, NLRC in collaboration with the Department of Fisheries and Oceans is developing a plan to that will seek to enhance spawning habitat for salmonid species within the Watson's Brook system. NLRC considers this is the most effective method to replace and enhance the salmoid productivity that will be lost during project construction. Watson's Brook is currently limited in terms of suitable spawning gravels. The strategic placement of suitable spawning gravels is predicted to create a net increase in the amount of spawning habitat, thereby more than compensating for the fish habitat loss. NLRC will continue to work with DFO, SAEN and other stakeholders to achieve this objective.

From a species at risk perspective, planned mitigative measures will help protect Atlantic salmon and the above noted compensation will ensure no detrimental affect on local populations of this species. Similarly, banded killifish, if present, will be provided some level of protection by these measures, as will American eel.

6.10.2 *Birds and Bird Habitat*

The construction and operations of the refinery and its attendant marine facilities will have an effect on the terrestrial bird species and their habitats on Southern Head. The long-term loss of habitat, and disturbance due to noise, activity and lighting will result in the greatest effects.

An estimated two hundred and sixteen hectares of forested habitat used by various bird species will be lost directly due to project construction and operations. Part of this forested habitat contains coastal balsam fir forests with a herb-rich component that include some uncommon plant species. The diversity provided by this vegetation is expected to attract terrestrial birds, but given the small proportion of this vegetation found within the refinery and access road footprints 0.5 and 2.7 ha respectively, compared to the distribution of these habitats in the area, generally, these losses will not be significant. In addition, approximately 203 ha wetland habitats used by water fowl and shore birds will be lost. Overall, the effect of these habitat losses on the long term integrity of bird populations in the Southern Head area is predicted to be insignificant.

No nationally or locally significant bird populations or habitats are known to occur in the Southern Head area.

Disturbance from noise and activity during construction and operations is predicted to affect areas within 500 m of the refinery and access road footprint during construction and reduce to an area within 200 m during operations. Similar to direct habitat loss, these disturbances will not have a significant effect on land bird populations. Lighting of the area during construction and operations may serve to attract some bird species with the risk of resultant mortality. While the effect on bird populations in the area is deemed to be insignificant, mortality rates and the species involved will be monitored to confirm this prediction.

While it is recognized that the effect of airborne emissions on terrestrial birds is difficult to predict, NLRC's air emissions and human health and ecological risk studies indicate that air emissions outside the boundaries of the project site will be significantly below both regulatory limits and World Health Organization Standards. The ecological risk study that estimated contaminant deposition concluded that levels of contamination as a result of airborne emissions would not be distinguishable from current background levels. As a result, effects on birds outside the project site boundaries are not predicted to be significant and negligible within the site boundary.

6.10.3 *Wildlife*

Like birds the various wildlife species in the area of the refinery and marine terminal footprints will be affected by loss of habitat, noise and disturbance associated with project construction and operations. The primary effect will be to displace individuals and the effect is negligible.

6.11 Effects on Marine Environment VECs

6.11.1 *Fish and Fish Habitat*

The primary effect of construction activities on fish and fish habitat will clearly be on the habitat. Approximately 113 ha of rock outcrop, boulder/cobble/ sand and gravel habitat and its attendant marine algae will be lost to infilling activities. To offset this loss of productive habitat NLRC will continue, in consultation with the Department of Fisheries and Oceans and local fishers, to develop a detailed fish habitat compensation plan that will describe how habitat suitable for adult lobster will be created. The overall strategy for the detailed plan will be based has been accepted by DFO. Based on its marine habitat surveys, NLRC has determined that 38,730 ha of adult lobster habitat will have to be improved to compensate for the natural lobster habitat affected by construction.

The new lobster habitat will be created by integrating it into the armour stone design and specification for the marine terminal and wharfage. If the design cannot provide the total habitat

area needed, NLRC will consider the construction of either artificial reef habitat for adult lobster or scallop shell habitat to enhance productivity for other species elsewhere.

Other potential effects on marine fish and fish habitat relate to potential discharges and emissions to the marine environment from construction and operations. Implementation of appropriate permit requirements and mitigation measures as outlined in the EIS, and enforcement through the NLRC Environmental Protection Plan and management system will ensure that there are no significant effects on marine fish and fish habitat.

The implementation of best available technologies and treatment systems for atmospheric emissions and effluent discharges will ensure that no significant detrimental effects will occur. As a check on these predictions, NLRC plans to implement a compliance monitoring plan for atmospheric emissions and effluent discharges, and a marine environmental effects monitoring plan to check for potential effects.

Atlantic cod and three species of wolffish are identified by Federal and Provincial species at risk legislation. It is not expected that Atlantic cod will be significantly affected by project construction; some aspects of the habitat compensation work may also be a benefit for this species. The three species of wolffish noted tend to occupy deeper offshore water and are unlikely to be affected by construction and operations.

6.11.2 Marine Mammals, River Otters and Sea Turtles

Noise generated by Project construction and operations activities and vessel traffic have the potential to affect marine mammals and sea turtles. Placentia Bay supports 9 species of whales and dolphins and 3 species of seals. Leatherback turtles are also not infrequent visitors to the outer reaches of Placentia Bay.

The blue whale and the north atlantic right whale are listed as endangered species under Canadian Federal law, which reflects the international consensus on the status of these species. The leatherback turtle also falls into this category. To date however, there are no recorded sightings of either of these whale species occurring in Placentia Bay. By contrast, as noted above, leatherback turtles have been recorded in southern and central Placentia Bay and at least one record of a leatherback near the northern tip of Merasheen Island.

While the endangered species are of special importance, noise from the project and the increased vessel traffic may also impact other whale and dolphin species.

The Project will implement mitigative measures to protect marine mammals and leatherback sea turtles during construction. Onshore blasting and pile driving will not be undertaken if these species are observed within a safety zone defined by a measured sound level. If necessary, bubble curtain technology could be employed to help dissipate sound levels. This same

measures will be used to protect river otters. Seals which are deemed be somewhat less sensitive to this kind of impact, will also be protected.

6.11.3 Coastal and Pelagic Birds

Coastal and pelagic bird populations are recognized as an important feature of the Placentia Bay Study Area. While some species will suffer disturbance and displacement due to the direct effects of construction and operations on Southern Head, the key concern for this component of the Placentia Bay ecosystem is the consequence of an oil spill either from the NLRC facilities or a tanker. This concern has and will continue to exist in Placentia Bay with or without the Project. The conclusion of the EIS is that the consequence of a major oil spill on the populations of coastal and pelagic seabirds in Placentia Bay would be significant. In recognition of this risk, NLRC has and will continue to take measures aimed at both preventing and responding such an event. The approach to spill planning and response is discussed in brief in the following section and in the detail available to date in Volume 2 of the EIS.

The project site Environmental Protection plan will detail prevention measures to be undertaken on a routine basis ranging from inventories of spill response equipment and materials, deployment of containment booms around tankers at the wharf as a precaution, the construction and re-vegetation of an extensive berm around as much of the site as feasible to contain an runoff or spills and direct them to containment and treatment ponds to protect the adjacent marine environment.

6.12 Species at Risk

Vegetation surveys of the Southern Head area by NLRC outside the project footprint has identified the presence of Boreal Felt Lichen, a species at risk under federal and provincial legislation and sensitive to airborne emissions from refinery operations. While this species has not been recorded in the footprint of the project, the proximity of its recorded occurrence on Southern Head in the conifer forest habitats that support it, cause the assessment of the potential effects on this species to be significant.

As a result NLRC will exercise special precautions, including further surveys for this species within the project site boundaries and a policy of avoiding the habitats in which it is found, if at all possible.

As refinery emissions are expected to affect this species in the vicinity of the refinery NLRC will undertake to develop a monitoring program in consultation with subject matter specialists and regulatory agencies.

6.13 Accidents or Malfunctions

From the perspective of the biophysical environment and equally the socioeconomic perspective the risk of an oil spill remains a key concern notwithstanding the efforts to minimize the risk. From a biophysical perspective an oil spill is considered a significant impact from both the perspective of coastal and pelagic seabirds and the fishery in Placentia Bay.

NLRC has and will continue to take steps to minimize the risk of an oil spill and prepare to respond quickly and effectively should such an event occur. The refinery will be a designated oil handling facility pursuant to the Federal Oil Handling Facility Regulations. The refinery and marine terminal will have the capability on site to respond to a {150 tonne} spill event from its facility. An oil spill response plan, supported by appropriate training and exercise initiatives, will be implemented. This planning will also include an arrangement with Eastern Canada Response Corporation (ECRC) to provide spill response support.

NLRC spill response resources will enhance efforts to respond to any significant spill in Placentia Bay. NLRC will coordinate and collaborate fully with the other major industries in Placentia Bay to ensure effective coordination and cooperation in spill planning, training and exercises.

NLRC will involve the fishing industry in response preparedness planning, as worldwide experience has shown that fishers local knowledge, capabilities and existing infrastructure will be of value in any actual spill response.

6.14 Cumulative Environmental Effects

The analyses conducted during the environmental assessment considered the nature and magnitude of any cumulative effects that might occur due to interactions among various effects both internal and external to the project.

Within the Project, no significant cumulative effects were identified, due to the mitigations inherent in the refinery design and the active mitigative measures to be taken during construction and operations.

When interactions with other projects and activities within the Project Study Area – effectively Placentia Bay - the following potential cumulative effects were identified.

Notwithstanding that air emissions will be significantly below regulatory standards and pose no threat to human health or the biophysical environment there will be an incremental effect on air quality in the Project Study Area. NLRC's compliance, air quality and environmental effects monitoring programs will address this issue and the outcome will be shared with regulatory agencies and stakeholders. Similarly, there will be a contribution to green house gas emissions from project operations. NLRC has developed a Green House Gas Management and Reporting

plan to address this issue as a companion process to the implementation of best available technology economically available to minimize its green house gas emissions.

NLRC also recognizes that there will be an incremental increase in vessel movements in and out of Placentia Bay via the existing vessel traffic management system. NLRC's support for this system though active tanker management and coordination with the system will be the primary means of managing this issue in consultation with its stakeholders.

NLRC recognizes that project operations will contribute to the overall risk of a spill. However, NLRC believes that the spill response planning and capability it will bring to the Placentia Bay area, in coordination with other area industries and stakeholders, will be an essential tool in mitigating this risk.

6.15 Residual Effects and Environmental Significance

Residual environmental effects are those predicted effects on valued ecosystem components considered to be significant and cannot be partially or wholly avoided or mitigated in the context of carrying out the project.

In the context of this project the following table identifies these effects.

| Effect | Receptor(s) | Mitigation |
|---------------------------------|----------------------------------|--|
| Accidental Event – Oil Spill | Pelagic and Coastal Birds | Safe operating procedures; Spill response plans; Training and equipment. |
| Air Emissions – Sulphur Dioxide | Boreal Felt Lichen; Human Health | Surveys and avoidance for lichen; Air quality monitoring network; Community consultation and transparency. |

6.16 Environmental Management

Construction and operation of the Newfoundland and Labrador Refinery Project will, like other major projects of its type, require a management system to ensure its success. Part of that management system must involve an environmental management process.

An Environmental management process must provide sufficient personnel and resources to implement the environmental measures required under applicable legislation, the commitments and conditions arising from the project approval process and the policies and procedures established by the proponent. Monitoring and reporting both internally and externally are also key parts of this management process as is the ability to use monitoring information to identify and correct problems that may arise.

The Project will put an Environmental Protection Plan in place for the construction, operations, and decommissioning. An environmental protection plan or plans will be prepared to address

legislative, procedural, monitoring and reporting requirements that must be complied with at the various phases of the project.

As part of the Project's emergency response management process and oil spill response plan will be developed and exercised on a regular basis to provide the framework for responding to an oil or other large scale accidental release of pollutants or contaminants arising from either refinery or tanker operations within the jurisdiction of the Project.

6.17 Monitoring and Follow-up

Verification of the assumptions and predictions of an environmental assessment process for project is part of the suite of best management practices currently expected and required of proponents.

Environmental Effects Monitoring (EEM) programs will be used to measure the effectiveness of mitigation and/or avoidance measures taken to protect the environment from the project; to compare the actual effects of a project with those predicted by the EIS; and to identify problem areas and set priorities for stricter environmental controls or enforcement action.

EEM programs will be developed according to regulatory conditions and in consultation with regulators and the Community Liaison Committee (NLRC Project Registration, 2006). Details for all EEM programs will be submitted to regulatory agencies for approval. The results of environmental effects monitoring will be summarized and made available to the public on a regular basis.

NLRC is continuing field programs in order to enhance the data set available for the design of monitoring programs and confirmation of the discharge outfall design and the oil spill probability contours used in the assessment: these include additional current data collection, *Erioderma* surveys, seabird and marine mammal surveys.

Air Quality

In addition to compliance monitoring for air emissions, NLRC will institute three specific programs to monitor potential associated effects: human health, lichen contaminant uptake and health; and the pH of nearby freshwater ponds and streams.

Fresh Water

NLRC has documented water quality and freshwater habitat information from Watson's Brook and from the Come By Chance River. Furthermore, NLRC is contributing to the provincial/federal hydrometric station monitoring program in the province. NLRC intends to install a fully automated hydrometric (flow and quality) station on Watson's Brook as soon as practical and, in the interim, is taking measurements manually. NLRC will also have a fresh water fish habitat compensation program.

NLRC proposes to develop and carry out a freshwater monitoring program in the general area of the refinery in collaboration with ongoing community stewardship initiatives such as the Come By Chance Wetlands and the newly formed Salmon Stewardship group.

Terrestrial

The EIS Guidelines require that the proponent develop a monitoring plan for eagles. One of the densest breeding concentrations of Bald Eagles in eastern North America is in Placentia Bay. Another raptor species, osprey, is less numerous than the Bald Eagle but occurs regularly from late April to September (NLRC Project Registration, 2006). The proponent proposes to conduct raptor monitoring around the perimeter of the proposed project area and along the new transmission line to ascertain if the area or any infrastructure is being used as perches. NLRC will design and implement a raptor monitoring program in collaboration with the provincial Wildlife Division.

Marine

NLRC will include monitoring of effects on marine organisms that are used for human consumption. The present intent is to use blue mussels from aquaculture facilities in Placentia Bay. Mussels would be transported to the monitoring site(s) and placed in cages suspended in the water column at strategic locations. Samples from these cages will undergo tainting evaluation and analyzed for oil content and other deleterious substances. The potential for a monitoring program that includes the newly established scallop 'reef' in North Harbour will also be considered.

6.18 Personnel and Planning

The companies and key individuals who contributed to environmental assessment of the proposed new refinery are indicated in the Preface, Acknowledgements. Authors of the Component Studies are listed in those documents.

7.0 ASSESSING THE HUMAN ENVIRONMENT

The human environment encompasses the people affected by the project, and the things that enrich and support their lives – their work, the roads they drive on, the schools their children attend, emergency services, health and community services, local governments, the natural environment – everything that contributes to the quality of life. The Project has the potential to make a significant contribution to this human environment.

NLRC has studied the social and economic factors likely to be affected, and examined the potential effects with the objective of achieving the best possible outcome as the Project moves through construction to operation.

NLRC has developed the socio-economic assessment in compliance with federal and provincial environmental assessment guidelines. This includes a description of the regional socio-economic environment, and various mitigation measures to enhance the benefits of the project. Public consultation has played a major role in this study.

Where possible the assessment predicts effects and their significance (positive and negative, direct and indirect, short and long term, residual, and cumulative) and the mitigation measures necessary for each Valued Ecosystem Component (VEC) selected for the socio-economic assessment.

7.1 Economic Effects

Most of the communities in the area have small populations (fewer than 1,000 residents), and have standard community services for their size. The main service centres are Arnold's Cove, Clarenville, Placentia and Marystow. The current population of the area is just over eighteen thousand and has been in steady decline since 2000.

The refinery will generate significant business activity for Newfoundland and Labrador (and other regions of Canada), augmenting existing industrial fabrication, refining, oil storage and environmental and marine management infrastructure. This in turn has the potential to attract and support further related industrial activity in the region.

The refinery will have an immediate and long-lasting impact on the provincial economy. Over thirteen million person hours of employment will be generated, with approximately fifty per cent of this labour to be sourced provincially.

Table 7.1 outlines the one-time cumulative impact to the provincial economy for the period 2007–2011. The pre-operation phases will generate approximately \$4.3 billion in the short term, with substantial positive impacts on employment levels and incomes.

Table 7.1 Short-Term Economic Impacts of NLRC Refinery Project

| 2007-2011 | Direct Expenditure Impacts | Indirect or Induced Impacts | Total Economic Impacts |
|-----------------------|---|--|--|
| Employment | 9108 person years (or 1822 annual average) | 19582 person years (or 3916 annual average) | 28690 person years (or 5738 annual average) |
| Incomes | \$ 726.4 million | \$ 1016.9 million | \$ 1743.3 million |
| Provincial GDP | \$ 1380 million | \$ 2925.6 million | \$ 4305.6 million |

The ongoing economic benefits to the provincial economy relate to the operation of the facility over a 25-year period, along with the decommissioning phase. The impact on the economy is estimated at approximately \$1.4 billion annually supplemented by increased knowledge, skills and potential economic activity in a range of related industrial sectors in the province. Table 7.2 outlines these impacts.

Table 7.2 Annual Long-Term or Ongoing Economic Impacts of NLRC Refinery Project 2011–2036*

| | Direct Expenditure Impacts | Indirect or Induced Impacts | Total Economic Impacts |
|----------------|-------------------------------|---------------------------------|---------------------------------|
| Employment | 825 person years annually | 1567.5 person years annually | 2392.5 person years annually |
| Incomes | \$ 71.3 million annually | \$ 62.0 million annually | \$ 133.3 million annually |
| Provincial GDP | \$ 620 million annually | \$ 800 million annually | \$1425 million annually |

(* Assessment excludes decommissioning phase (post-2036) when direct expenditures are estimated at between \$40 million - \$50 million annually for two years.)

The region's service sector will see a positive economic impact. Small and medium-sized fabrication, construction and industrial supply firms will benefit as suppliers and sub-contractors to larger contractors. Some of these firms will also benefit from resultant spending on residential construction and retail purchases. The economic impact will also be positive during the operations phase, although not at the same intensity as during construction.

There will also be evolutionary economic impacts from an expanded skilled workforce, small business spin-offs and start-ups, and increasing knowledge transfer, innovation and business opportunities.

Where possible, NLRC will hire and purchase locally. Mitigation measures will be undertaken to enhance the economic benefits, particularly in the local region. Training, workforce development, employment, business and procurement statistics will be monitored throughout the project.

7.2 Employment and Business Effects and Mitigation Measures

The Project will generate significant employment: 3,000 jobs during peak construction and 750 during operations. The labour market in the region has experienced both temporary and long-term out-migration, and this has reduced the size of the labour force, notably among skilled trades people. This may offer challenges in securing qualified labour. However, unions have indicated their confidence that much of the labour force that has left the province in recent years will return. If this does not happen, the challenge will be to attract workers from elsewhere in a very competitive market.

It is estimated that fifteen hundred of the three thousand person construction workforce will come from the region; the remainder will come mainly from the rest of the province and the return of former residents living outside the province. Of the seven hundred and fifty person operations workforce, approximately fifty per cent will most likely be recruited from the construction workforce.

Tables 7.3 provide estimates of the labour requirements for the construction phase of the Project. Table 7.4 provides a breakdown of the occupations and number of personnel that are anticipated for the operations phase of the project.

Table 7.3 Skilled Labour/Trade Requirements (Construction)

| Occupation/Skills | Total Estimated |
|-------------------------|-----------------|
| Pipefitter | 690 |
| Millwright | 280 |
| Construction Management | 280 |
| Labourer | 270 |
| Electrician | 240 |
| Equipment Operator | 230 |
| Pipe Welder | 200 |
| Insulator | 200 |
| Painter | 140 |
| Boiler maker | 100 |
| Carpenter | 90 |
| Ironworker | 90 |
| Sheetmetal Worker | 90 |
| Welder-Structural | 70 |
| Concrete Finisher | 30 |
| Total | 3,000 |

Table 7.4 Breakdown of Occupations (Operations)

| Occupation | | # of People |
|---------------------------------|---|-------------|
| Management | Plant manager | 1 |
| | Maintenance manager | 1 |
| | SH&E manager | 1 |
| | Corporate Services manager | 1 |
| | Planning and Technical Services manager | 1 |
| | Marketing Manager | 1 |
| | Commercial manager | 1 |
| Maintenance | Reliability-Field Services | 200 |
| | Inspection | 25 |
| | Warehouse | 38 |
| | Turnaround (Pipefitters and welders) | 35 |
| Production | Chief Steam Engineer | 1 |
| | Area managers | 20 |
| | DCS | 5 |
| | Training | 7 |
| | Process operators | 200 |
| SH&E | Environment | 8 |
| | Safety, Fire Protection and Security | 20 |
| | Industrial Hygiene | 4 |
| Corporate Services | Accounting | 24 |
| | Human Resources | 6 |
| | Information technology | 9 |
| | Purchasing | 10 |
| Planning and technical Services | Operations Scheduling | 6 |
| | Long Term planning | 4 |
| | Operations Support Engineering | 4 |
| | | 50 |
| | Laboratory | 40 |
| | Marine | 30 |
| Total | | 750 |

Note: These estimates do not include out-sourced/contracted services or construction personal for turn around, which is estimated to range from 300 – 750 depending on activities at the refinery.

Table 7.5 presents a comparison of the availability of skilled labour with the potential demand during the construction phase of the Project.

Table 7.5 Demand for skilled labour relative to provincial supply (construction)

| | <i>Availability*</i> | <i>Demand**</i> |
|---------------------|----------------------|-----------------|
| Pipe fitter | 870 | 690 |
| Millwright | 361 | 280 |
| Labourer | 800 | 270 |
| Electrician | 808 | 240 |
| Equipment Operator | 132 | 230 |
| Operating Engineers | 1100 | - |
| Pipe Welder | 280 | 200 |
| Insulator | 165 | 200 |
| Painter | 108 | 140 |
| Boiler maker | 486 | 100 |
| Carpenter | 1270 | 90 |
| Ironmaker | 210 | 90 |
| Sheetmetal Worker | 95 | 90 |
| Welder-Structural | 205 | 70 |
| Concrete Finisher | 291 | 30 |
| Total | 7181 | 2720 |

Occupational shortages are noted for equipment operators, insulators and painters. A thin margin exists between the demand and availability of pipe fitters, millwrights, pipe welders, insulators and sheet metal workers. Most unions believe they will be able to meet the demand for labour. For the operations phase, it is believed that the demand for skilled trades workers can be fully met from the workforce within the province.

The project will provide economic stability and growth to businesses and local communities, and help to reverse the current economic trend. It has already substantially contributed to the economy during the feasibility study and the preparation of the Environmental Impact Statement through local contracts.

Specific labour market mitigation measures to be undertaken by NLRC include the development of both a labour market and human resources strategy that addresses labour force availability, skilled trades recruitment, competitive wages and benefits, diversity in recruitment, and training.

7.3 Commercial Fisheries And Aquaculture - Effects and Mitigation Measures

The study of the economic effects on fisheries and aquaculture in the area encompasses all of Placentia Bay contained by Northwest Atlantic Fisheries Organization (NAFO) Unit Area (UA) 3PSc. Fishing is a year-round commercial activity with marked seasonal irregularity, taking place throughout the Bay. The majority of the fishing enterprises in the area operate vessels that are less than 35 feet in length, operate closer to shore than larger vessels and closer to their home ports and ports of landing. Although difficult to assess with certainty, the industry has a likely value of approximately five to six million dollars annually.

The commercial fishery in the area has undergone drastic changes since the imposition of moratoria limiting access to groundfish stocks. The industry has proven to be resilient, evolving by diversifying into other, more valuable, species, including lobster, snow crab and lumpfish roe. The fishery has also changed in structure and licensing, creating “core” enterprises that have increased the level of professionalism and decreased the number of participants. Aquaculture also plays an increasing role in Placentia Bay, with 15 existing and 8 planned operations involved in cod grow-out and mussel farming. The value of aquaculture is still relatively small, but growing.

Placentia Bay also includes a wide variety of processing plants accepting landings from the Bay and other locations. The ownership and operation of some plants in this area (and other areas) are in transition, and their future structure and numbers are not settled.

NLRC, in conjunction with the Fish, Food and Allied Workers Union (FFAW) met with Placentia Bay fishers from communities around the Bay, to identify concerns and potential mitigation measures. These meetings identified many aspects of the Project, which could have a potential effect on the fishery. Volume 4 – Socio-Economic Assessment identifies these factors and describes measures that can be implemented to eliminate or lessen the impact.

The inshore areas in the vicinity of the proposed refinery site are busy with small boat harvesting activities. The locations of the fixed and mobile gear fisheries have been mapped, recognizing that industrial activities and vessel traffic have a greater potential to conflict with fixed gear fisheries than with mobile gear.

During consultations with fishers, NLRC noted the concern that an increase in tanker traffic associated with the Project could make fishing more difficult, in an area that already serves an oil refinery and a transshipment facility. Fishers have several existing and on-going concerns, including vessel safety, the potential for an oil spill, and gear damage and loss.

The construction phase will be particularly challenging to the fishery, given the establishment of a Construction Safety (exclusion) Zone (CSZ) in the nearshore area surrounding the marine terminal, and additional CSZs for intake and discharge pipe installation. There are concerns

with a potential loss of traditional fishing grounds, gear damage, underwater noise and general interference with the industry in the area.

The consultations with local fishers and the FFAW has already led to modifications in the Project plans to limit the impact of the marine facilities to avoid encroachment on local fishing grounds. Following Project approval, NLRC will establish a Fisheries Liaison Committee to facilitate an ongoing consultation process, and employ a full-time Fisheries Liaison Manager to facilitate the process during construction and operations.

The timing of construction will be modified as practical to coincide with periods of lower harvesting activity. Compensation programs will be put in place to mitigate gear, vessel and fishing ground access impacts.

It is expected that there will be an average of 17 vessel movements a week associated with the Operations Phase. NLRC's Vessel Traffic Management Plan (VTMP) will be similar in scope to those developed for other marine construction projects in the area, such as the Hibernia GBS construction project and the Newfoundland Transshipment Terminal at Whiffen Head. All inbound and outbound traffic will be tracked, monitored and regulated by the Canadian Coast Guard (CCG) Marine Communications and Vessel Services Centre (MCTS) in Placentia, and conform to the relevant traffic lanes and separation requirements.

However, many small fishing vessels are not required to coordinate with the MCTS, even while fishing within and near the controlled area. NLRC will continue its liaison with the Placentia Bay Traffic Committee, chaired by Transport Canada, which the Project believes is the appropriate forum to identify, discuss and where possible, resolve traffic-related issues.

The nature of the aquaculture industry means that the Project will have little, if any, effect, with the possible exception of potential floating debris from the site. Appropriate precautions will be taken to prevent the escape of debris from onshore and marine sites

Accidental events (specifically, oil spills or other accidental hydrocarbon releases into the marine environment) may cause loss of access to the resource, lost opportunity, increased operating expenses, gear damage and potential market impacts. The type and level of effect would depend on the specific nature of the incident.

The Project will provide economic stability and growth to businesses and local communities, and help to reverse the current economic trend. It has already substantially contributed to the economy during the feasibility study and the preparation of the Environmental Impact Statement.

Specific labour market mitigation measures to be undertaken by NLRC include the development of both a labour market and human resources strategy that addresses labour force availability skilled trades recruitment, competitive wages and benefits, diversity in recruitment and training.

7.4 Health and Community Services Effects, and Mitigation Measures

An important aspect of the human environment is the health and well-being of the residents. The Health Research Unit (HRU) at Memorial University was contracted to prepare a community health profile. The HRU took a holistic view, and addressed not only the standard indicators of illness and mortality but also the basic determinants of health. The report noted that certain diseases of the respiratory system are more likely to be aggravated by emissions from refineries. Those of particular concern are Chronic Obstructive Pulmonary Disease (COPD) and asthma. Overall, the area's population did not show any large discrepancies for most health indicators when compared to the Eastern Health region and the rest of the province. It should be noted that an existing refinery in the region has been in operation for more than 30 years.

Eastern Health services communities from St. John's to Port Blandford, including all communities in the Study Area. It manages the Dr. G.B. Cross Memorial Hospital in Clarenville that services the immediate area of the proposed refinery site, the Dr. William H. Newhook Community Health Centre located in Whitbourne that is used as a teaching facility for Memorial University's Faculty of Medicine, the Placentia Health Centre, and the Burin Health Care Centre located in Salt Pond, Marystow. Other communities in the area have community health offices, public health nursing, and international travel health clinics.

Eastern Health also operates the several hospitals in St. John's that provide a mix of tertiary and secondary care services. Depending on the nature of the illness or accident, these hospitals are equipped or have access to almost any type of specialists and major equipment, and act as referral centers for the other hospitals in the region.

Eastern Health also provides a wide range of other community and family social services. These services address such issues as family violence, addictions, youth protection, child welfare, persons with disabilities, mental health issues, senior's issues, and persons with special needs. Eastern Health supports the work of the Eastern Regional Wellness Coalition that is active in the area.

The Project will have some effects on health and community services and other social services administered by provincial agencies, but these are expected to be at a minimum.

One immediate impact on the system will result from an influx of workers, particularly during construction, for pre-employment medicals. Project-related accidents could also put some additional stresses on the system in both the short and long term. Potential indirect effects may be realized through relocation of families into the area, requiring access to a full range of acute, primary, public health and other health care services. There will be some additional demand on other community and family social services.

NLRC holds the health and safety of its employees as one of its core values, and will undertake a range of mitigation measures to address potential adverse impact on the health and community services system.

7.5 Housing Effects and Mitigation Measures

Housing statistics for the region from 1996 to 2001 show that only Clarenville had an increase in the number of occupied dwellings. A decrease in occupied dwellings was recorded in the other three larger centres, Marystow, Placentia and Arnold's Cove. In all cases the number of owned dwellings was more than the number of rented dwellings. The number of owned dwellings increased in Arnold's Cove, Clarenville and Come By Chance but decreased in all other area communities. Rentals increased in Clarenville and in Garden Cove, North Harbour and Swift Current, but dropped in all other area communities. Average housing values rose in all area communities with the exception of Placentia. Housing prices in Clarenville are comparable to those available in St. John's. Recently, Clarenville, Marystow and, to a lesser extent, Arnold's Cove, are the only communities where residential construction activity has been occurring. Currently, two new subdivisions are being constructed in Clarenville, with a third planned to begin in the spring of 2007. Housing prices in the communities have not increased during the past year. Housing sale activities are low, as owners appear to be taking a "wait and see" approach regarding the Project.

Apartments are available in Marystow and Placentia. Low-income housing is provided by Newfoundland Labrador Housing (NLH) in Clarenville, Shoal Harbour, Arnold's Cove, Goobies, Sunnyside, Come By Chance and Placentia. NLH also has rental units in five communities on the Burin Peninsula: St. Lawrence, Fortune, Grand Bank, Burin and Marystow. Long-term tenants rent most units with few vacancies.

The area contains seven hotels with a total of 335 rooms, nineteen B&Bs with a total of sixty to seventy-five rooms, three resorts, two boarding houses with eight rooms and over three hundred and fifty campsites. Occupancy rates increase in the summer peak months (June – September) to a maximum of sixty-seven per cent. The data also show that occupancy rates are higher for the Southern Head communities in the peak period compared to Placentia and Marystow. In the off-peak periods, Placentia has the lowest occupancy rates, followed by Marystow and Southern Head.

The project has the potential to affect housing in the area by increasing demand, which has a positive effect on the housing industry and increases the municipal tax base, but a negative effect if housing availability cannot meet demands in the short term. An increasing cost for housing has a positive effect on the real estate industry, but a potentially negative effect in increasing purchase price property taxes.

These effects will be mitigated and enhanced by NLRC through such mitigation measures as accommodating approximately half of the construction work force (fifteen hundred workers) at the Bull Arm work camp.

Overall, there will be a measurable change in housing supply and demand but no permanent negative effect. NLRC will maintain a consultation with its employees, regional municipalities, NLH, CMHC and local builders and landlords regarding housing-related issues.

7.6 Education and Training Effects, and Mitigation Measures

The Eastern School District administers the primary, elementary and secondary education system in the Study Area. Enrolment data for the fourteen schools in the area show a slight, steady decline, with the exception of the schools in Clarenville which show relatively stable enrolments. Without exception, capacity exists for more students in each school in the area by as much as 2,533 more students. Future plans for the region include construction of several new schools, closure of older buildings and amalgamation of others.

The College of the North Atlantic (CNA) has campuses within the Employment Catchment Area located in Burin, Clarenville, Placentia, Seal Cove and St. John's. Keyin Tech is located in Clarenville and Marystow. There are no Memorial University (MUN) campuses in the area, although many of the area residents attend the university. Each institution offers courses relevant to the skills required by the Project.

The regional labour force is considered to be highly skilled, as a result of other large industrial projects that have been undertaken in the area. The two major potential effects on education and training are an improvement in educational attainment and an increasing demand on educational resources.

There are four licensed childcare centres in the area: one each in Placentia and Marystow, and two in Clarenville. There is some room for a few additional children with the exception of the centre in Marystow, which is operating at capacity.

During construction it is not anticipated that a significant number of workers (male or female) will re-locate permanently to the area with their families and, during this period, there will be no significant effect on the education system. However, throughout the operations phase, some workers are expected to re-locate into area communities with their families. This will increase demand for childcare spaces and increase school enrolments in primary schools. With an increased demand for labour, women are more likely to enter the workforce, which will drive up childcare demand in the region. While increased demands for primary school student spaces can easily be accommodated in the present school system, increased demands for childcare spaces will likely outstrip current supply. In the medium term this will likely spur on additional child care businesses to meet demand, but in the short-term additional demands will likely be

met by family members (grandparents, older siblings) and could limit the ability of women to enter the labour force.

With the overall increase in population in the region, there is greater potential for higher student enrolment in post-secondary institutions in the province including CNA, private colleges and MUN. While MUN has capacity to accept more students, CNA, which is currently short of classroom space and instructors, will have more challenges accommodating new students.

There are a number of human resource strategies that NLRC can support and participate in to ensure the local labour pool has the required skills, certifications and/or other criteria. However, these strategies cannot be implemented by NLRC alone. The unions, post-secondary educational institutions and government will have to work in partnership to coordinate a comprehensive strategy and execution plan.

NLRC will undertake and participate in a range of specific mitigation measures to manage education and training needs resulting from the Project with a particular focus on apprenticeship training and building a diverse work force.

The effect on education and training will be positive and long-term, but may have a short-term adverse effect on CNA as it musters the additional resources to meet an expected increase in demand for its training programs. During construction there could be some effect on early childhood education if women in trades become involved in the Project. The residual effect on the school system is largely neutral since few new families are expected to relocate to the area.

NLRC will compile statistics on training, including type, numbers, certification, certificate or diploma, location, and relevance to the Project, in cooperation with the provincial Department of Education, and on the impact on early learning and child care through the Department of Health and Community Services.

7.7 Land Use and Municipal Planning, and Mitigation Measures

Historic resource assessment, anecdotal information and observations by field crews indicate that there has been, both historically and in recent times, limited use of the proposed refinery 'footprint' area. While not within the immediate Study Area, the renewed and increasing use of the islands of Placentia Bay for both recreation and in relation to the commercial fisheries is of interest.

The bulk of the area is sparsely populated Crown land with communities located almost exclusively along the coastline and highway systems. During the feasibility study and environmental assessment phases, the Crown lands in the area were 'frozen' to allow for the assessment process to provide the necessary consideration of the proposed use.

One of the largest fox farms in North America is located in North Harbour. There are plans to double operations over the next five years. Several other fur and sheep farms are located near Cape St. Mary's. Other farms are located on the east side of Placentia Bay including dairy, sheep, beef, root crops, hay, greenhouse-floral, fox, cattle, emu, ostrich and Christmas tree.

The greater Placentia Bay area offers extensive recreational opportunities, including pleasure cruising, sea kayaking, cruising/remote island stay experiences, hunting, bird watching, historic sites, provincial parks and ecological reserves. Regional and provincial package tours that include key natural attractions and selected ecological reserves such as Cape St. Mary's Ecological Reserve, where the third largest nesting colony of gannets in North America is located. Big game hunting is a popular activity, with hunting taking place annually from September to December. Three Atlantic salmon rivers are located on or adjacent to Southern Head: Watson's Brook, Come By Chance River and North Harbour River.

During the operations phase, public and private owners/operators of tourism businesses and recreation facilities will experience an increase in use, but since operations personnel are more likely than construction workers to reside in area communities, they will also be contributing to the tax base from which public funds to maintain facilities will be drawn. There will likely be a more sustained, less intense use of privately owned/operated tourist and recreation facilities by workers, their families and visitors.

Residents use the surrounding area for moose, duck and goose hunting, berry picking, salmon fishing and hiking. A recreational boating club with a small craft wharf is located in Come By Chance.

The islands of Placentia Bay are home to more than 250 licensed cabins and many more unlicensed cabins. The western side of the Bay, which is only accessible by boat, also has many cabins. This generates significant small boat traffic during the summer months.

Arnold's Cove, Come By Chance, Southern Harbour, Clarenville, Marystow and Placentia have established municipal development plans covering land use. Sunnyside is currently preparing a municipal plan, while smaller communities such as Garden Cove, North Harbour and Little Harbour East are not incorporated as municipalities and have no centralized development planning. Many of the older municipal plans make specific reference to the availability of rural lands for temporary housing for the Hibernia labour force, which, may be also applicable to other oil and gas developments in the region. Some of the plans also designate areas for future industrial use.

The Trans Canada Highway and Highway 210 (Burin Peninsula Highway) are protected from adjacent development activity by government regulation.

7.8 Physical Infrastructure Effects and Mitigation Measures

7.8.1 *Transportation*

The Trans-Canada Highway is the main artery connecting feeder roads to the communities on the Isthmus. The Department of Transportation and Works maintain the feeder roads. Each municipality is responsible for maintenance of its local roads. A grade-separated interchange is recommended in the provincial long-range plans for the Trans-Canada and Come By Chance highway access intersection. It is anticipated that traffic volumes resulting from the Project may accelerate the development schedule for this interchange. The Project's plans to construct a new high volume interchange at the intersection of the new access road to the site to mitigate the impacts of increased traffic in the area.

The project will generate additional highway traffic on Highway 210 and the Trans-Canada Highway. This effect will be increased by a subsidy provided to commuters within 100 km of the site. The intersection between the Trans-Canada Highway and Come By Chance/Sunnyside will also receive additional traffic because of people commuting to the Project from these communities. Access to the Project site from the Trans-Canada Highway will be from a new access road built approximately $\frac{3}{4}$ km north of the current Come By Chance/Sunnyside interchange, so no additional effects on local roads within Come By Chance is anticipated. Access to the Project site from Highway 210 will be approximately $\frac{1}{2}$ km east of the access road to Goose Cove and North Harbour, eliminating additional site traffic from the Burin Peninsula over the Trans-Canada Highway.

In some Placentia Bay ports (i.e. Come By Chance and Whiffen Head), pilotage is required and all tankers or vessels must pay a fee for the service. The service is provided by the Atlantic Pilotage Authority (APA), and employs two pilot vessels and eight harbour pilots. A “Pilot Boarding Station” (PBS) is located at Red Island, where vessels carrying oil are boarded and accompanied into port. The CCG is responsible for vessel traffic management in Placentia Bay and has a Marine Communications and Traffic Services facility in Argentia that maintains a traffic management system. APA and CCG have increased their services in recent years to meet increased traffic demands. The project has the potential to increase marine passenger and freight traffic in Placentia Bay.

7.9 Water and Waste Management

Communities in the area use waste management sites located in North Harbour, Sunnyside, Southern Harbour, Chance Cove, Clarenville, Marystown and Placentia. There are no disposal sites for hazardous waste available in the province. There are three green depots located in Clarenville, Dunville and Marystown.

7.9.1 *Water and Wastewater Handling*

Most towns provide drinking water to residents. Homes and businesses in Come By Chance, Southern Harbour and Arnold's Cove are connected to their town's drinking water system, while Sunnyside is in the process of connecting all homes to its service, with about 75 per cent complete to date. Come By Chance is in the process of developing a water treatment plant. The development plan for this plant will include allocations for future developments and water needs and will be completed in the near future. All communities believe they have sufficient supply for present and future needs. The project will have no effect on existing municipal water supply systems.

The project requires potable water and water for various refining processes (cooling, process, boiler feed) and firefighting. Potable water needs will be met during construction by rainwater collection and supply from off site. A desalination plant will be built during construction to supply all freshwater requirements during operations and to minimize impact on the Watson's Brook Watershed.

There are no wastewater or waste treatment facilities in the area. Sewer pipe systems drain directly into the harbours and Placentia and Trinity Bays. All sewer systems in the area are aged and require upgrades.

The waste and run-off water produced at the site will be treated to required standards and discharged into Placentia Bay. The project will have no effect on existing municipal wastewater sewer systems.

7.9.2 *Solid Waste Handling*

Solid waste produced from the Project will be removed from the site using accredited contractors and transported to existing landfills at Southern Harbour and Sunnyside. The Project will implement a Waste Management Plan that will ensure waste segregation, reduction, reuse, and recycling. Overall solid waste production from the Project is not expected to be significant, although volumes will be increased compared to existing volumes produced in the region.

7.9.3 *Electricity Demand*

The project will require an uninterrupted supply of 170 MW of power for the first phase. Power will be supplied by Newfoundland Hydro through excess capacity on the inter-provincial grid or through construction of a new electrical generation supply. The Project will have the effect of using all additional electrical power capacity for the region and thereby drive the need for additional power generation.

7.9.4 Telecommunications

The Project will make use of existing telecommunications services in the area and will increase demands for high speed internet in the Come By Chance area since this level of service will be required for operations.

7.9.5 Residual Effects

The residual effect of the project on physical infrastructure is insignificant, given the mitigation measures to be put in place. Newfoundland Hydro will source the electrical power supply to the refinery from existing generation and planned new generation and a new transmission line will be built to the site.

The construction of new access roads will produce a positive residual effect, increasing road safety, shortening the commuting distance for workers and equipment from the Marystow area, and decreasing the volume of traffic on the TCH. The anticipated increase in traffic volumes may also provide the impetus for highway and intersection upgrades. Residual project effects to marine passenger and freight traffic will be minimal.

The project will have no residual effects on water and wastewater supply and infrastructure in the area. There will be some residual effects to solid waste management and to power supplies in the region.

NLRC will continue to monitor transportation effects and will monitor water in both marine and groundwater sources. NLRC will also monitor solid waste volumes and support the regional waste management system development process. It will monitor power demands and communicate peak periods to NL Hydro.

7.9.6 Emergency Services Effects and Mitigation Measures

The Study Area is policed by the RCMP, with regional detachments in Clarenville, Placentia and Burin. The area has 24 Search and Rescue (SAR) organizations with ground, marine or air capabilities. Ground search and rescue activities are usually coordinated by the RCMP. SAR volunteers are trained and certified by the RCMP. Within Placentia Bay, the Civil Air Search and Rescue Association (CASARA) and Canadian Coast Guard (CCG) also help with SAR activities. The CCG has three monitoring stations in Placentia Bay that also can be used to coordinate SAR activities.

In the case of a major emergency in the area, the Newfoundland and Labrador Emergency Measures Organization (NLEMO) would assist. NLEMO coordinates the use of provincial government resources in support of land, marine and air searches.

The area receives fire protection services through volunteer fire departments. An industrial fire department is located at the North Atlantic Refinery near Come By Chance. Fire services and

fire protection of natural areas are provided by the provincial Department of Natural Resources. A district office is located in Clarenville and a satellite office is located in Whitbourne.

There are twenty-one ambulances in the area, responding to three thousand six hundred and ninety-eight calls per year with eighty-three full-time and seven part-time personnel. Call volumes have increased over recent years with the elderly using this service more often than others. Air ambulance (MedEvac) services are also available.

Several communities in the area have emergency response plans that formalize the responsibilities of individuals and organizations. The plans for Arnold's Cove, Come By Chance, North Harbour, Clarenville, Placentia and Marystown identify the potential emergencies or hazards related to oil refining. While no formal mutual aid agreements are documented for the area, a general understanding is maintained that in the event of an emergency each municipality will assist.

The Canadian Coast Guard (CCG) is responsible for maritime search and rescue. The Maritime Rescue Sub-Centre in St. John's responds to approximately 500 incidents per year. Outside St. John's, the Canadian Coast Guard Auxiliary supports the SAR services. CCG operates a Marine Communications and Traffic Services Centre at Argentia, responsible for all traffic in Placentia Bay and approaches.

Eastern Canada Response Corporation (ECRC) provides marine oil spill response services as requested by contracted groups, CCG or any other government lead agency. ECRC has access to a 120-member team of dedicated spill responders, 540 additional spill responders, and dedicated response equipment. ECRC also has mutual aid agreements with the Atlantic Emergency Response Team (ALERT) in St. John, NB and with Point Tupper Marine Services (PTMS) in Point Tupper, NS.

Additional policing resources may be required during the project due increased vehicle traffic and the potential for acts of vandalism and terrorism. Emergency services will also be affected by additional commercial and recreational marine traffic. Emergency service providers are confident that oil spill and environmental response capabilities are adequate in Placentia Bay.

NLRC will enhance fire safety in the region by adding additional equipment and having a trained response team in place. Risk management systems associated with oil refinery related fires and potential for fires to spread to the surrounding environment. There may be some additional demands on volunteer fire departments, and those industries or organizations with which the NLRC establishes mutual aid agreements.

The Project may affect SAR organizations by increasing incidents caused by project-related activities and employee recreational activity.

While the potential for fire fighting demands are increased during the project, there is a corresponding increase in the population from which volunteer fire fighters can be recruited. The Project will also lead to an increase in mutual aid and resources.

Project effects on emergency services will be mitigated through a number of specific measures and investments by NLRC. Overall, the Project's residual effect on emergency services will be insignificant.

There are both positive and negative residual effects to emergency services, including policing. NLRC can help deter criminal activities through company policies, although a population increase will see a corresponding increase in the potential for criminal activity, traffic (marine and roadway) accidents, and situations requiring police services.

Positive residual effects to firefighting are greater regional capacity, increased levels of training, and NLRC's participation in regional safety initiatives and organizations.

Potential effects to air and ground ambulance services are mitigated through provision of dedicated ambulance and helipad services on site and at the work camp. There is no residual effect on these services.

The effect on the RCMP, SAR organizations, and marine safety organizations will be adverse but low in magnitude, since the effect will be temporary and most pronounced during construction.

NLRC will keep statistics on all project-related incidences that result in notifying the RCMP. Statistics will also be kept on any fire or search and rescue operations related to the project.

7.10 Historic Resources Effects and Mitigation Measures

Two archaeological sites are in close proximity to the project area, one of which contained some materials thought to be associated with a pre-contact Aboriginal presence (Gilbert and Reynolds 1990). The Provincial Archaeology Office (PAO) of the Department of Tourism, Culture and Recreation required that an Historic Resources Assessment be undertaken prior to commencement of any ground disturbing activities.

The purpose of this assessment was to determine, through archival research and a field study, if other cultural remains are present in the area, and to recommend mitigation measures that would reduce or eliminate the likelihood of impact. In October, 2006 the field component of the Stage 1 Assessment focused on a number of key locations identified by the PAO for investigation. Included were two sections of the access road to the refinery, a proposed bridge crossing on the Come by Chance River, the project area from Hollett's Cove to the proposed dock at Doughboy Cove, the refinery footprint and part of a transmission line corridor.

No sites of historic significance were found in the Project footprint. The remains of two gardens were investigated and determined to be of relatively recent origin. While not in the area affected by the Project, sites along the coast near North Harbour River were identified as the remains of a sawmill and some indications of early European settlers. The results of the historic resources assessment have been communicated to the Provincial Archaeology department.

One other location identified as significant during the 2007 Stage 1 Assessment is situated to the east of the Trans-Canada Highway, northwest of Sunnyside. The site, at one time consisting of two buildings constructed as a Trans-Atlantic cable station, was apparently used briefly during the 1850s. The PAO has concluded that the sites do not require further research or assessment and no mitigation is required, and construction in the areas may proceed. This can be considered as no effect.

The project's Environmental Protection Plan will clearly indicate that in the event of inadvertent discovery of a historic or pre-contact artifact or archaeological site during any phase of the Project, all work in the immediate area of the find will cease and only resume once approval has been received from the PAO.

7.11 Cumulative Effects

The assessment of cumulative effects was conducted individually for each VEC and VSEC, although the ability to describe cumulative effects is less certain than for direct effects. The assessment is largely qualitative in nature, based on knowledge of other projects and expert opinion, and more conservative in predictions. Cumulative effects are predicted to occur within the six major VECs: the Economy, Education and Training, Physical Infrastructure, Social Services Infrastructure, Emergency Services Infrastructure, and Land Use.

The assessment has also included major existing or planned projects within Placentia Bay that have either been registered or have a reasonable chance of occurring within the time frame of the project.

The overall cumulative effect of the Project with the other proposed projects is an increased demand on the skilled workforce, and enhanced opportunities for area businesses. Incomes will increase and there will be an unspecified expansion in the local and provincial economies.

7.12 Socio-Economic Management Plan

NLRC is committed to monitoring and managing to the degree possible the socio-economic impacts of the Project. The company will identify adverse effects early during project development and operations, enhancing positive effects and mitigating negative effects. Public and government consultation will play a major role throughout the project.

NLRC has developed a preliminary socio-economic management plan. During and after each project phase, the plan will be reviewed and updated as appropriate.

The Plan is based on six ongoing activities:

- Identification or forecast of impacts;
- Identification of mitigation measures;
- Integrating the mitigation measures with Project development;
- Monitoring, reporting and re-assessment;
- Ongoing involvement of the public and other stakeholders; and
- Establishing a refinery Project socio-economic impact assessment office.

The design and implementation of a socio-economic management plan does not have to be complex to be effective. The most important aspect is the manner in which it is communicated and involves the local community. In this case, NLRC believes that, by being transparent to the community during each step of the project, the potential for adverse impacts can be minimized and the maximum positive impact can be realized.

8.0 PUBLIC CONSULTATION

8.1 Rationale and Commitment

Public consultation has been, and will continue to be, an important component of the development. NLRC has maintained from the beginning of the project that the refinery must take into account the lives and livelihoods of those most affected: the public living in the many small communities that surround the site. Their understanding of the project, their concerns and their expectations have been an integral component of the planning effort. These people are a part of the environment, a Valued Ecosystem Component in their own right.

The beginning of this commitment to public involvement occurred when the NLRC Vice President of Community and Environmental Affairs personally introduced the project to the neighbouring communities before news of the project was released to the media.

Throughout the intervening period, NLRC has committed funding and resources to achieve the goal of meaningful and effective consultation, to the benefit of both the communities and the project itself. The Vice-President of Community and Environmental Affairs, a Public Consultation Facilitator, a Public Information Officer and other Public Information Centre staff were dedicated full-time to the consultation process.

8.2 Consultation Process

Public consultation began very early in the project planning phase, with the development of an understanding of the most affected and closest communities, their existing demographics, economies and services, and their concerns about a significant development in their “neighbourhood.” Consultation meetings were held at local venues, bringing information directly to those most affected and opening a dialogue. Design changes were suggested, and in many cases integrated in the project plan, when public input indicated alternatives that would reduce impact on the local community.

The participants included the nine communities adjacent to the site, the approximately thirty-five other communities bordering Placentia Bay, other regional communities, local organizations, project-specific advisory groups and educational institutions.

Approximately three thousand people live in the communities considered to be adjacent to the project. These communities will be most affected by the refinery, and continue to be the primary focus of consultations. Placentia Bay will be the transit route for all vessels involved in the construction and operational phases of the project, affecting community life in a variety of ways. The communities range from the southern tip of the Burin Peninsula (Point May) around the bay to the southern tip of the western Avalon (Point Lance). This area includes over eighteen thousand people.

Several communities which are not adjacent to the project site or Placentia Bay will be affected by the proposed refinery and have a keen interest in it. They are located in the area from west of Goobies to Clarenville and north to Lethbridge/Musgravetown area, and east of Little Harbour East to Whitbourne. The largest of these is Clarenville, a regional service centre with approximately five thousand residents.

Many established community organizations, with local, regional or provincial scope, are active in the project area, and have expressed an interest in the project through the consultation process. They have also brought the knowledge and experience of their respective memberships to bear on relevant questions of community and environmental impacts. These groups range from local Chambers of Commerce to the Newfoundland and Labrador Environmental Industries Association.

The proponent assisted in establishing two community groups to provide input on local concerns about air quality and the fishing industry. The Air Quality Study Community Input Group was formed, by public request, to ensure the community and industrial neighbours were able to share local knowledge and its potential impact on air quality modelling. The Provincial and Federal governments both participated in this group.

NLRC met with area fishers in seven dedicated sessions held in Southern Harbour, St. Bride's, Placentia, Marystown, Petit Forte, Garden Cove, and Southern Harbour. These meetings provided valuable insight into potential resource impacts, the location of traditional fishing areas, and the way that local communities view Placentia Bay: as a source of livelihood and a vital part of their way of life.

NLRC is also supportive of the initiative of the Salmonid Association of Eastern Newfoundland to form a local river stewardship group. This group could be instrumental in providing local input to No Net Loss Compensation Programs.

NLRC believes that consultation with regional educational institutions is critical in assuring an available, highly-trained workforce, both during the four-year construction phase and the operational phase. Discussions were held with representatives and students of three campuses of the College of the North Atlantic, Keyin College, and six local high schools.

8.3 Consultation Formats

The objective of the consultation process was to make the project information available to the widest swath of people concerned, and to give them as many opportunities as possible to meet, discuss and review the information. This included anticipating barriers to communication: what would deter people from attending open-house meetings, expressing their opinions and accessing information, when the project would have a significant effect on their communities. NLRC adopted an approach of bringing project personnel directly into the target communities, holding meetings in a familiar environment, and opening doors to all discussion.

NLRC has met face-to-face with over twenty-five hundred people who are directly affected by the project. Six open-house public meetings were held in North Harbour, Come By Chance, Southern Harbour, Placentia, Clarenville and Marystown. Project information was widely distributed at these meetings, and mailed to high schools, Chambers of Commerce, municipal governments, zoning boards, libraries, harbour authorities and all identifiable interested parties, with a request to review and circulate the material.

A Public Information Centre was opened at the Bull Arm Visitors Centre for public access to the project review documents and presentation posters, and to discuss the concerns and leave resumes. Access to information was emphasized throughout the process.

Media coverage, both news and advertising, complemented the consultation process, as did community updates sent to all 11,000 homes in the project area and Environmental Assessment Updates sent to key points. The NLRC website and email subscription list were well used: from January – June, 2007 over 6,600 unique visitors accessed www.nlrefining.com, and on average they used the site twice. The email list for regular updates had almost 300 individuals registered, and an accompanying fax list reached a wide range of organizations.

8.4 Response to Consultation

The primary issues arising from the consultation process focused on Placentia Bay vessel traffic, air quality, oil spill response, competitive and financial feasibility, and employment. Other concerns raised included environmental aspects, fisheries effects, benefits and other potential impacts.

There were six specific examples where residents' input resulted in changes in the project planning and design. These areas included:

1. The location of the marine terminal jetty was revised several times based on input from local residents, to better accommodate the local lobster fishery;
2. A site access road from the Burin Peninsula Highway was added, based on requests from businesspeople and residents in the communities on the west side of Placentia Bay. An access road directly from the Burin Peninsula Highway will bring more benefits to the surrounding area, and lessen impact on the Trans Canada Highway;
3. A request was made in a consultation session to create a community input group of residents and industrial neighbours to ensure local knowledge and experience on air quality was included in the Air Quality Study. The group also included federal and provincial participants;

4. Residents requested timely access to air quality monitoring information. NLRC has committed to providing this information available directly from the monitoring stations and available through a publicly accessible internet site;
5. Accurate information on fishing practices and locations was not easily accessible. Following consultation, NLRC contracted the fisheries unions to collect information on harvesting practices and locations, greatly adding to the local knowledge base and benefiting both NLRC and local residents.
6. A portion of the site access road from the Trans Canada Highway exit will pass across a river near the town of Come By Chance. Residents expressed concern that the sound from the truck traffic would be disturbing. NLRC has noted this concern, and will institute constant monitoring to determine the impact of noise in the area. If required, mitigative sound breaks between the road and the community will be considered. There will be no product trucks on this route during the operational phase as all product from the refinery will be transported by sea.

The NLRC public consultations have been extensive, and have reached virtually all residents in the project area. There have been multiple opportunities for information sharing, dialogue, and debate, and the project has adapted to residents' concerns wherever practical. Residents consistently rated the public meetings highly during exit surveys, and generally had positive comments on the openness and transparency of the process. The success of the process has lead the proponent to establish a long-term consultation plan, as the project evolves through the construction phase to an operational refinery.

9.0 CONCLUSIONS

The Biophysical Assessment has concluded that: only significant adverse impacts from the construction and operation of the proposed new Refinery, based on the assessment presented in the EIS/CSR, will be on the local population of the boreal felt lichen (*Erioderma pedicellatum*) and, only in the event of a marine oil spill, on coastal and pelagic seabirds in Placentia Bay. All other effects are determined to be negligible and not significant.

The Socio-economic Assessment has concluded that the Socio-economic impact of the proposed Refinery project can be a significant positive contribution to the Study Area and to the Province as a whole.

APPENDIX A
SUMMARY OF COMPONENT STUDIES

SOCIO-ECONOMIC ASSESSMENT COMPONENT STUDY

Prepared by: AMEC Earth & Environmental,
A Division of AMEC Americas Limited
133 Crosbie Road
P.O. Box 13216
St. John's, NL A1B 4A5

The study documents baseline socio-economic data for the area within a 100 km commuting distance of the proposed Project, and provides analysis of the baseline data as a means of categorizing, mitigating and measuring Project effects.

HISTORIC RESOURCES COMPONENT STUDY

Prepared by: Anvil Consulting
190 Western Gully Road
Portugal Cove/St. Philip's, NL A1M 2Y1

The study, requested by the Provincial Archaeology Office (PAO) of the Department of Tourism, Culture and Recreation, was prompted by the discovery of two archaeological sites in close proximity to the Project Area. The study reports on the findings of archival research and a field study.

MIGRATORY BIRDS COMPONENT STUDY

Prepared by: LGL Ltd.
 Environmental Research Associates
 388 Kenmount Rd.
 P.O. Box 13248, Stn A
 St. John's, NL A1B 4A5

The study presents results of “baseline” data collected during surveys of marine-associated birds (coastal and pelagic), landbirds, and waterfowl. Biologists conducted pelagic and coastal surveys in Placentia Bay from August 2006 to April 2007, breeding waterfowl surveys in September 2006 and June 2007, and landbird surveys at the proposed site of the oil refinery in June 2007.

AIR QUALITY COMPONENT STUDY

Prepared by: SNC-Lavalin Environmental
 1133 Topsail Road
 Mount Pearl, NL
 A1N 5G2

Air dispersion modeling was conducted for the normal operation of proposed refinery to evaluate the impacts of sulphur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), suspended particulates (PM10 and PM2.5) and benzene on ambient air quality. The predicted results were then compared with Newfoundland and Labrador ambient air quality standards.

MARINE FISH AND FISH HABITAT COMPONENT STUDY

Prepared by: AMEC Earth & Environmental,
A Division of AMEC Americas Limited
133 Crosbie Road
P.O. Box 13216
St. John's, NL A1B 4A5

The study provides a marine habitat characterization, including substrate distributions, depth profiles, macrofauna and macrofaunal distributions, and baseline sediment and water chemistry.

FRESHWATER FISH AND FISH HABITAT COMPONENT STUDY

Prepared by: AMEC Earth & Environmental,
A Division of AMEC Americas Limited
133 Crosbie Road
P.O. Box 13216
St. John's, NL A1B 4A5

Fish and fish habitat adjacent to, and within, the Project footprint were classified and quantified under the federal Department of Fisheries and Oceans quantification guidelines in order to characterize fish habitat near the facility and to determine the potential HADD (habitat alteration, disruption or destruction) from proposed activities.

APPENDIX B

TABLE OF CONCORDANCE

| 1.0 EIS GUIDELINE REQUIREMENTS | 2.0 | Volume | 2.1 Section |
|--|--|---------|--|
| 1.0 Executive Summary | Identification of the Proponent | 1 | 2.0 |
| | Project Overview | 1 | 4.0 |
| | | 2 | 1.2 |
| | Predicted Environmental Effects | 1 | 6 – end, 7.0 – end |
| | | 3 | 4.4.2, 4.5.1, 4.6.1, 4.7.1, 4.8.1, 4.9.1, 4.10.1, 5.0 - end |
| | | 4 | 3.3, 4.2, 5.5, 6.2.2, 7.2, 8.2, 9.2 10.2, 11.2, 12.2, 13.0 |
| | | 1 | 5.7, 6.0 - end |
| | Mitigative measures | 3 | 4.5.3, 4.6.3, 4.7.3, 4.8.3, 4.9.3 4.10.3, 5.5, 6.0 – end, 7.2.7, 8.1, 9.0 – end. 10.0 |
| | | 4 | 4.3, 5.4, 6.2.3, 7.3, 8.3, 9.3, 10.3, 11.3, 13 - end |
| | | 1 | 6.15, 7.9.5 |
| | Cumulative environmental effects | 1 | 6.14, 7.11 |
| | | 3 | Section 5 |
| | | 4 | Section 13 |
| | Outline of component studies | 1 | Appendix A |
| | Proposed monitoring programs | 1 | 5.15 |
| | Proposed response plans | 1 | 3.6 |
| | Fundamental conclusions of EIS | 1 | 8.0 |
| 2.1 Name of Undertaking | Name of Undertaking | Preface | --- |
| 2.2 Identification of Proponent | Name of corporate body and mailing address | Preface | --- |

| 1.0 | EIS GUIDELINE REQUIREMENTS | 2.0 | Volume | 2.1 | Section |
|--|---|---|---|-----|---------|
| | | Name of chief executive officer, official title, telephone number, fax number, e-mail address | 1 | 2.0 | |
| | | Principal contact person for EA, official title, telephone number, fax number, e-mail address | 1 | | |
| 2.3 Purpose of the EIS | Purpose of the EIS | Preface | --- | | |
| 3.1 Description of the Prospective Site and Study Area | Precise description of boundary and accompanying maps | 2 | 2.4 | | |
| | Principle structures and appurtenant works | 2 | 3.0 | | |
| | Shipping and marine traffic | 2 | 4.0, 5.7, 6.2 | | |
| | Types and quantities (ha) of habitat to be disturbed | 3 | 3.6.1 - 3.6.3, 4.7.1, 4.7.2, 4.8.1, 4.8.2 | | |
| 3.2 Rationale/Need/Purpose of the Project | Perceived benefits (local and provincial) | 2 | 2.1, 2.3.6, 2.6, 1.4.10 | | |
| | | 4 | 3.3.2, 3.3.3 | | |
| 3.3 Alternatives | Alternatives | 2 | 2.3 | | |
| | Null alternative | 2 | 2.3.7 | | |
| | Process to determine potential sites | 2 | 2.3.1 | | |
| | Alternative processing options and plant design | 2 | 2.3.2, 2.3.3 | | |
| | Waste management alternatives | 2 | 2.3.4 | | |
| | Environmental protection opportunities | 2 | 12.0 | | |
| | Results of public consultations in relation to project alternatives | 5 | 5.2 | | |
| | | 2 | 2.3.6 | | |
| | Discussion of technically and economically feasible alternatives | 2 | 2.3 | | |

| 1.0 | EIS GUIDELINE REQUIREMENTS | 2.0 | Volume | 2.1 | Section |
|-----|--|--|--------------------|--------------------------|--------------------------|
| | | Biophysical and socio-economic criteria for alternatives | 2 | 2.3 | 2.3 |
| | | Location of alternatives | 2 | | 2.3.1 |
| | | Design of alternatives | 2 | | 2.3 |
| | | Watercourse crossings | 2 | | 2.3.5 |
| | 3.4 Relationship to Legislation, Permitting, Regulatory Agencies and Policies | Provide comprehensive list of permits and regulatory approvals, including: activity requiring regulatory approval; name of permit and/or regulatory approval; legislation requiring compliance; regulatory agency. | 2 | 1.6, 11.10.2, Appendix A | 1.6, 11.10.2, Appendix A |
| | | | | | |
| | 3.5 General Project Description | Access road(s) | 2 | 3.4 | 3.4 |
| | Lighting | 2 | 3.1.1 | | |
| | Stream crossings, including culverts, bridges and fording sites | 2 | 5.9, 2.3.5 | | |
| | Temporary stream diversions | 2 | 5.8 | | |
| | Temporary construction camp(s), laydown areas | 2 | 5.3 | | |
| | Borrow pits and major excavations | 2 | 5.4 | | |
| | Temporary sewage and waste disposal facilities | 2 | 5.11, 5.12 | | |
| | Methods of handling waste and refuse at work and camp locations | 2 | 5.11, 11.6 | | |
| | Refinery infrastructure | 2 | 3.1, 3.2, 3.3, 3.4 | | |
| | Support buildings | 2 | 3.3.9 | | |
| | Marine infrastructure | 2 | 4.0 | | |

| 1.0 | EIS GUIDELINE REQUIREMENTS | 2.0 | Volume | 2.1 | Section |
|-------------------------|-----------------------------------|---|---------------|------------|-----------------------------------|
| | | Effluent treatment plant components, as well as effluent discharge locations and configuration and including anticipated effluent plume(s) | 2 | | 3.3.6, 6.1.3, 8.6, 11.4 |
| | | Shipping and marine traffic | 2 | | 4.0, 5.7, 6.2 |
| 3.6 Construction | | General | 2 | | 5.0 |
| | | General construction practices incorporating erosion and sedimentation control | 2 | | 3.3.3, 5.2, 7.1.2, 11.7.3, 5.14.1 |
| | | Construction schedule | 2 | | 5.1 |
| | | Construction camp operation, including solid waste disposal and disposal of construction waste, as well as identified opportunities for waste recycling | 2 | | 5.3 |
| | | Site preparation | 2 | | 5.0 |
| | | Water body alteration | 2 | | 5.8 |
| | | Stream crossing structures | 2 | | 5.9 |
| | | Electrical systems; locations of substations, transmission and method of providing external cable transport mechanisms | 2 | | 3.3.7 |
| | | Inventory of significant emissions during construction | 2 | | 8.2 |
| | | Excavations | 2 | | 5.4 |
| | | Blasting operations | 2 | | 5.5 |
| | | Vehicle types, truck routes, hours of operation of vehicles | 2 | | 5.6 |
| | | Type, size and frequency of support, carrier and dredging vessels involved in construction | 2 | | 5.7 |

| 1.0 | EIS GUIDELINE REQUIREMENTS | 2.0 | Volume | 2.1 | Section |
|-----|-------------------------------|--|--------|-------|----------------------------|
| | | Transport, storage and use of hazardous materials, fuels, lubricants and explosives | 2 | 5.10 | 5.10 |
| | | Establishment, operation and removal of construction camp and yard areas, including water, sewage and food handling provisions | 2 | | 5.3, 5.12, 5.13 |
| | | Measures to be employed to prevent project workers from setting up "residences" in roadside/gravel pit camping areas | 2 | | 5.3 |
| | | | 4 | | 7.3 |
| | | Sources of acceptable types of aggregate and pit-run material | 2 | | 5.44 |
| | | Disposal areas for excess/waste rock and overburden, including locations | 2 | | 2.3.2, 5.4 |
| | | Disposal areas for organic soil, slash, grubbing and wood fiber, including locations | 2 | | 5.2 |
| | | Removal of temporary operations | 2 | | 5.13 |
| | | Site rehabilitation and monitoring | 2 | | 5.14 |
| | | Construction job detail | 4 | | 4.2.1 |
| | | | 1 | | 7.2 |
| | 3.7 Operation and Maintenance | Product delivery | 2 | 4.2.3 | 4.2.3 |
| | | Product processing | 2 | | 6.1.1 |
| | | Product export | 2 | | 3.2.2, 4.2.3, 6.1.2, 6.1.6 |
| | | Waste handling | 2 | | 6.1.9 |
| | | Planned vessel traffic | 2 | | 6.2.1 |
| | | Anchorage plans and frequencies | 2 | | 2.3.6 |

| 1.0 | EIS GUIDELINE REQUIREMENTS | 2.0 | Volume | 2.1 | Section |
|-----|--|-----|--------|--------------|---------|
| | Vessel sizes and types | 2 | | 6.2.1 | |
| | Vetting systems | 2 | | 6.2.5 | |
| | Traffic by Cape St. Mary's Ecological reserve with map | 2 | | 6.2.5, | |
| | | 3 | | 2.7.2, 3.7.3 | |
| | Demonstration that pertinent authorities have been consulted | 3 | | 2.3 | |
| | | 5 | | Appendix A | |
| | Inventory all significant emissions during operation | 2 | | 8.3 | |
| | Greenhouse gases from all project components, BATEAs and BMPs, emission breakdown and comparison with alternative technologies | 2 | | 8.3, 8.4 | |
| | All sources of effluent; handling methods, flow rates, treatment efficiencies, details of effluent treatment plant maintenance planning and scheduling, cleaning methods and residue, proposed sampling parameters | 2 | | 8.6.2, 8.7 | |
| | Energy consumption profiles: annual and daily with peak and average requirements | 2 | | 6.1.5, 3.3.7 | |
| | Energy consumption profiles | 2 | | 3.3.7, 6.1.5 | |
| | Handling and storage for sulphur | 2 | | 3.3.7, 6.1.6 | |
| | Chemical storage facilities, identify chemicals by CASRN number | 2 | | 6.1.7 | |
| | Water-use, details on intake structure and proposed dams, details on any conservation or technology measures | 2 | | 6.1.4 | |
| | Food handling provisions | 2 | | 6.1.13 | |

| 1.0 | EIS GUIDELINE REQUIREMENTS | 2.0 | Volume | 2.1 | Section |
|--------------------------|----------------------------|---|--------|---|---------|
| | | Hiring initiatives | 4 | 1.4.2, 3.4, 4.3.1 | |
| | | Potentials for employee well-being | 4 | 1.4.2, 16.0 | |
| | | Assessment of off-site facilities and services (ie: recreational facilities, childcare, etc) | 4 | 8.1.1, 9.1.6 | |
| | | Operational emergency response, safety, and fire fighting facilities; preventative operating practices and support services | 2 | 6.3 | |
| | | Maintenance | 2 | 6.4 | |
| | | Consideration for the establishment of a community liaison committee | 2 | 13.0 | |
| | | | 5 | 4.2.3 | |
| 3.8 Abandonment | | Predicted lifespan of temporary facilities | 2 | 5.12 – 5.14 | |
| | | Predicted lifespan of the refinery | 2 | 7.0 | |
| 4.1 Existing Environment | | Discussion of existing knowledge (baseline) | 3 | 3.0 | |
| | | | 4 | 3.2, 4.1, 5.3, 6.2.1, 7.1, 8.1, 9.1, 10.1, 11.1, 12.1 | |
| | | Meteorological and atmospheric conditions | 3 | 3.1 | |
| | | Ambient air quality baseline | 3 | 3.1 | |
| | | Ambient water quality baseline | 3 | 3.4.3, 3.5.9 | |
| | | Hydrological conditions | 3 | 3.4.2 | |
| | | Wetland resources | 3 | 3.6.3 | |
| | | Flora | 3 | 3.6.2 | |
| | | Fauna | 3 | 3.6.4 | |
| | | Fish and fish habitat | 3 | 3.6.6, 3.7.2 | |

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| | Migratory birds | 3 | | 3.6.5, 3.7.3 | |
| | Species at risk | 3 | | 3.6.7, 3.7.5 | |
| | Water resources | 3 | | 3.4 | |
| | Historic resources | 4 | | 12.0 | |
| | Commercial fisheries and aquaculture | 4 | | 5.0 | |
| | Socio-economic | 4 | | 1.0 – 12.0 | |
| 4.2 Data Gaps | Data Gaps | 3 | | 2.6 | |
| 4.3 Future Environment | Future Environment | 2 | | 2.3.7 | |
| | | 3 | | 3.10 | |
| | | 4 | | 1.4 | |
| | Greenhouse gas emissions | 2 | | 1.4.6 | |
| 5.0 Environmental Effects | Scope of Assessment | 3 | | 1.4.2 | |
| | | 4 | | 1.2.1 | |
| | Effects of the environment on the Refinery | 3 | | 3.9 | |
| | Capacity of renewable resources | 2 | | 1.4, 4.7.5, 4.8.5 | |
| | Methodology to identify VECs | 3 | | 2.4 | |
| | | 4 | | 2.3 | |
| | Definition for spatial and temporal study boundaries (construction and operations) | 2 | | 5.1, 7.0 | |
| | | 3 | | 2.7 | |
| | | 4 | | 1.3 | |
| | Strategy for predicting and evaluating effects, determining mitigation, remediation and/or compensation, and residual effects | 3 | | 2.8, 4.1 | |
| | | 4 | | 2.6 | |

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| | Strategy for assessing project's contribution to cumulative effects | 3 | 5.0 | | |
| | | 4 | 13.2 | | |
| | Definition of impact criteria | 3 | 2.8.4 | | |
| | | 4 | 2.6.4 | | |
| | Description and analysis of potential interactions/effects and issues/concerns for each VEC | 3 | 4.1.1, 4.1.2, 4.11 4.3.1 - 4.10.1) 4.3.2 - 4.10.2 | | |
| | | 4 | 3.3, 4.2, 5.4, 6.2.2, 7.2, 8.2, 9.2, 10.2, 11.2, 12.2, 13.4 | | |
| | Effects of malfunctions or accidental events | 3 | 4.4.5, 7.0 4.5.4 - 4.10.4), | | |
| | | 4 | 5.4.6, 9.2.2 | | |
| | Safety of shipping route | 2 | 6.22 – 6.25 | | |
| | Sensitivity of environmental components to new shipping activity | 3 | 4.0 | | |
| | Accidents and malfunctions regarding shipping and processing activities | 2 | 12.0 | | |
| | | 3 | 7.0 | | |
| | Fate of any released hazardous materials | 2 | 12.0 | | |
| | Analysis of hydrographic, oceanographic and climatological features and conditions | 3 | 3.1, 3.4, 3.5 | | |
| | Maximum operating parameters (weather and sea state) for docking/undocking, cargo transfer, and vessel vacating berth | 2 | 6.2.10 | | |

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| | Reference to standards, codes and regulations | 2 | | Appendix B | |
| | Emissions estimates | 2 | | 8.2.1, 8.3.1 | |
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| | Stack emissions tests | --- | | Air Quality Component Study | |
| | | 3 | | 4.2 | |
| | Preliminary dispersion modeling | --- | | Air Quality Component Study | |
| | | 3 | | 4.2 | |
| | Potential effects on <i>Erioderma</i> populations | 3 | | 4.9 | |
| | Potential effects on training needs | 4 | | 8.2 | |
| | Potential effects on land and sea products | 3 | | 4.0 | |
| | | 4 | | 9.2.6 | |
| | Potential effects on marine and freshwater habitat quantity and quality | 3 | | 4.5, 4.7, 4.8 | |
| | Current adequacy and potential effects on public health services | 4 | | 6.2 | |
| | Potential effects on low income groups | 4 | | 3.3, 7.2 | |
| | Potential effects on housing costs | 4 | | 7.2 | |
| | Potential effects on existing municipal infrastructure, capacity, and services | 4 | | 4.4, 10.2 | |
| | Potential Effects on existing and emerging commercial fisheries | 4 | | 5.4 | |
| | Potential effects on existing and emerging aquaculture | 4 | | 5.4 | |

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| | Potential loss of traditional fishing grounds | 4 | | 5.4.3 | |
| | Potential effects on fishing vessels | 4 | | 5.4 | |
| | Evaluation of time for emergency response | 3 | | 7.0, 8.0 | |
| | Risk for introduction of alien species | 3 | | 5.5 | |
| | Cumulative environmental effects (existing and proposed projects) | 3 | | 5.0 | |
| | | 4 | | 13.0 | |
| | Mitigation measures for no-net-loss or no-net-gain | 3 | | 4.7.5, 4.8.5 | |
| | Predictions of changes in ambient air quality | 3 | | 3.2 (also see Air Quality Component Study) | |
| | Cumulative effects of disturbance and accidental events on seabirds | 3 | | 4.6, 5.0 | |
| 6.1 Mitigation | Air quality mitigation measures | 3 | | 4.4.4 | |
| | Dust emissions mitigation measures | 2 | | 11.5.2 | |
| | | 3 | | 4.4.4, 9.3 | |
| | Water quality and quantity | 3 | | 4.5.3, 4.7.3, 4.8.3 | |
| | Water desalination | 3 | | 4.3.3 | |
| | Process effluent and sewage | 2 | | 4.3.3, 4.3.5 | |
| | Vessel traffic safety, including Smart Bay initiative and PB traffic committee measures | 2 | | 6.2 | |
| | Flora species, landscaping, preservation, revegetation, prevent introduction of invasive species | 3 | | 4.8.3, 5.9, 6.0 | |

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| | | Fauna species mitigation measures | 3 | | 4.9.3 |
| | | Measures to ease burden on low/fixed-income individuals and families; | 4 | | 7.3 |
| | | Methods by which to mitigate gravel-pit residences | 4 | | 7.3 |
| | | Commercial fisheries and aquaculture, measures to minimize effects, compensation strategy, market perception of fish products | 4 | | 5.4 |
| | | Proposed mitigative strategies for different phases of the project | 4 | | 4.3 |
| | | Compensation for any losses | 3 | | 7.7, 4.8 |
| | | | 4 | | 5.4.2, 5.4.3, 5.4.4, 5.4.5 |
| | | Use of precautionary principle | 2 | | 1.4.4 |
| 6.2 Emergency Response/Contingency Planning | Emergency Response Plan | Emergency Response Plan | 2 | | 12.0 |
| | | | 3 | | 8.0 |
| | Partnering opportunities with area communities or industry | Partnering opportunities with area communities or industry | 2 | | 1.4.9 |
| | | | 3 | | 10.0 |
| | Marine and terrestrial spills | Marine and terrestrial spills | 2 | | 12.0 |
| | | | 3 | | 8.5 |
| | Environmental sensitivities | | 2 | | 12.0 |
| | Contamination or drainage to surface water or groundwater | | 2 | | 12.0 |
| | Remediation plans | Remediation plans | 2 | | 11.8 |
| | | | 3 | | 8.5, 9.3 |
| 6.3 Environmental Monitoring | Elements of the environment to | 3 | | | 10.0 |

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| and Follow-up Programs | be monitored | 4 | 10.5 |
| | Air quality monitoring program | 3 | 10.4.1 |
| | Effluent monitoring program | 3 | 10.4.2 |
| | Fish habitat monitoring program | 3 | 10.4.5 |
| | Eagle monitoring program | 3 | 10.4.10 |
| | Employment monitoring program | 4 | 4.3.1, 4.5 |
| | Cumulative environmental effects monitoring program | 3 | 5.0 |
| | | 4 | 13.2.7 |
| 6.4 Rehabilitation | Measures to reduce negative effects during construction, operation, maintenance and decommissioning | 2 | 7.2 |
| | Residual effects | 3 | 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10 |
| | | 4 | 4.4, 5.4.3, 6.2.4, 7.4, 8.4, 9.4, 10.4, 11.4, 12.4 |
| | Matrix of environmental effects, proposed mitigation and residual adverse effects | 3 | 4.0 |
| 7.2 Effects Evaluation and Selection of Preferred Alternative | Discussion/comparison of residual effects relative to preferred option and viable alternatives | 2 | 2.3 |
| 8.0 Public Participation | Outline of public participation program | 5 | Entire volume |
| 9.0 Environmental Protection Plan | Outline of EPP | 2 | 11.9.3 |
| | Statement of commitment to environmental protection planning, self-regulatory and compliance monitoring | Preface | 'Our Commitment' |

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| | Contingency planning for accidental and unplanned events | 2 | 12.0 |
| | Breakdown of major construction and operational activities and associated permits required | 2 | Appendix A |
| 10.0 References Cited | Bibliography of citations and project-related documents | 2 | 14.0 |
| | | 3 | 12.0 |
| | | 4 | 18.0 |
| | | Preface | Companies involved in preparation of the EIS/CSR are listed in the Preface. |
| 11.0 Personnel | Brief descriptions of expertise and qualifications of personnel involved | Component Studies | Personnel and qualifications for preparation of the component studies are listed in individual component studies. |
| 12.0 Copies of Reports | List of reports completed | Preface | |
