Debottlenecking Project

Environmental Assessment Registration

August 2010

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REGISTRATION PURSUANT TO

SECTION 40(1) AND 45 (1) OF THE ENVIRONMENTAL ASSESSMENT

REGULATIONS, 2003

UNDER THE

ENVIRONMENTAL PROTECTION ACT (SNL 2002 CE-14.2)

FOR THE PROPOSED

NORTH ATLANTIC REFINING LIMITED

DEBOTTLENECKING PROJECT

AUGUST 2010

Submitted to:

Minister of Environment and Conservation
P. O Box 8700
St. John's NF A1B 4J6
Attention: Director of Environmental Assessment

Submitted by:

North Atlantic Refining Ltd
P.O. Box 40
Come By Chance, NL
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DEBOTTLENECKING PROJECT

Executive Summary

This project, proposed by North Atlantic Refining Limited at its facility in Come By Chance, NL, is a major capital upgrade of its operation. It is known in the industry as a debottlenecking process, a standard industry practice of removing process constraints to permit improved production and efficiency. Process bottlenecks can relate to a number of factors such as: hydraulic capacity, cooling and heating constraints, technology obsolescence, and pumping capacity.

This project will improve the economics and sustainability of the refinery. It also provides the opportunity to make considerable improvements in the environmental impacts of the refinery by substantially reducing the Green House Gas (GHG) and Criteria Air Contaminant (CAC) emissions from refinery operations.

Highlights of the project include:

- $300 million investment
- 1.8 million person hours of work
- 15 to 20% reduction in Green House Gas and Criteria Air Contaminants
- 30% reduction in refinery fuel oil consumption
- Improved productivity, plant reliability and availability

For the most part, the work involves internal modifications to process units and heaters to increase their efficiency through improved heat recovery and heat balance with limited increase in footprint. In order to accomplish this, many existing pumps, heat exchangers, compressors and process vessels will require modification or replacement. There is a small requirement in footprint for a new crude blending tank which will be contained within the current area of the refinery. The project is to be executed in phases, beginning in the fall of 2010 and ending in the winter of 2011.

This registration addresses the upgrading work and attendant construction activities only. The refinery operation itself is addressed from the perspective of changes from existing conditions and operational parameters.

Consultation with government regulators determined that there is no need for project registration under the *Canadian Environmental Assessment Act*, but that project registration is required under provincial regulations mainly due to the increase in the physical footprint for the new crude blending tank.

North Atlantic has retained SNC-Lavalin Ltd for overall engineering and design responsibilities and Sikumiut Environmental Management Ltd. for environmental assessment and compliance activities. A more complete list of firms retained by North Atlantic for this project, and their functional responsibilities is given in Section 1.5.1 of this document. Health and Safety issues remain with North Atlantic as lead.

North Atlantic has an excellent reputation as a corporate citizen of Newfoundland and Labrador and is committed to executing this project in a manner consistent with all applicable Safety, Health and Environmental regulations and industry best practices.

NAME OF UNDERTAKING: DEBOTTLENECKING PROJECT

PROPONENT:

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1.0 THE UNDERTAKING

1.1 Introduction

North Atlantic Refinery Limited (North Atlantic) is proposing to undertake a major capital investment at its refinery at Come By Chance, Newfoundland. This environmental assessment registration has been prepared by Sikumiut Environmental Management Ltd. on behalf of North Atlantic.

1.2 North Atlantic Refinery Limited

North Atlantic operates an oil refinery at Come By Chance, Newfoundland approximately 130 km northwest of St. John's. The refinery is licensed to operate by the provincial Department of Environment and Conservation.

The refinery was originally established by Shaheen Resources Inc., in cooperation with the Government of Newfoundland and Labrador. Construction of the facility began in 1971, and the first shipment of crude oil arrived in May 1973. Shaheen Resources operated the refinery until February 1976, at which time it closed due to economic circumstances. Petro Canada purchased the refinery in July 1980 but did not operate it. In 1986 it was sold to Newfoundland Processing Limited which operated the facility until 1994. In August of that year, Vitol Refining S.A. (Vitol) purchased the refinery and it was renamed North Atlantic Refining. In October 2006, the refinery was purchased by its current owners, Harvest Energy Trust, a publicly traded trust. In December, 2009, the outstanding trust units of Harvest Energy Trust were purchased by the Korean National Oil Company.

Refinery operations consist of Atmospheric and Vacuum Crude Distillation, Platforming, Hydrotreating, Hydrocracking and associated downstream auxiliary units. Petroleum products produced at the refinery include: propane, conventional and reformulated gasoline, road and marine diesel fuels, jet fuels, furnace and stove heating oil, and bunker fuels. The refinery's crude oil storage capacity is 3.4 million barrels, with an additional 3.6 million barrels of storage for intermediate and finished products.

The refinery has a deep-water jetty for off-loading crude oil and for loading finished products for export. The refinery's petroleum products are sold locally, as well as in over 25 countries around the world. The primary markets for these products at present are the United States and Europe.

Over the years, substantial investment has been made in the refinery. These growing investments help ensure a safe, clean, reliable and efficient operation. As a consequence, North Atlantic is enjoying its strongest safety performance in its history, one that exceeds its peers in Canada. North Atlantic has also reduced sulphur dioxide emissions by 85%.

Much of North Atlantic's investments have been focused on improving the reliability of existing refinery equipment. However, North Atlantic has also invested in new technology and improvements.

Some of North Atlantic's most recent projects include:

- $23 million, 300,000 barrel butane storage facility.
- $6 million gasoline unit upgrade to produce low sulphur gasoline
- $40 million diesel unit upgrade to produce ultra low sulphur diesel
- $30 million visbreaker upgrade to improve the yield of ultra low sulphur diesel
- $20 million truck loading facility

North Atlantic is one of the province's largest employers. Over 500 people are employed at the refinery, and over 50 more work with the company's marketing division, North Atlantic Petroleum.

1.3 Nature of the Undertaking

For the most part, this project involves internal modifications to process units and heaters to increase their efficiency through improved heat recovery and heat balance with no increase in footprint. In order to accomplish this, many existing pumps, heat exchangers, compressors and process vessels will require modification or replacement. There is a small requirement for a new footprint for several project components which

will all be contained within the current area of the plant. The following facilities will require some limited new footprint:

- a new crude blending tank will be added to the existing crude tank farm;
- a new flare stack and a flare gas recovery unit which will reduce emissions and increase safety;
- a new sour water stripper which will increase the capacity of the facility to treat sour water that is generated in the process;
- a new oxygen supply unit to improve efficiency of the Sulfur Recovery Unit;
- new electrical substations to enable better process control; and
- a construction laydown area.

The new crude blending tank will have a capacity of 400 kbbls (6 million litres). The construction of a petroleum storage tank of capacity over 2 million litres requires registration under Section 45 (1) of the *Environmental Assessment Regulations,* (2003).

The project is budgeted at $300 million dollars and will require an estimated 1.8 million person hours of work. It is anticipated that construction on this project will begin in late 2010.

1.4 Rationale for the Undertaking

Bottlenecks are constraints on production which are imposed by equipment capacities and the availability of process resources (e.g. feed stock). A perfectly designed and running operation would have each unit running at optimum capacity and optimally synchronized with resource availability. With time, operating parameters change and bottlenecks start occurring within a process. Typical operating parameter changes include product definition (e.g., high to low sulphur gasoline); raw material change (e.g. light to heavy crudes); technology changes (e.g. material science and communications advances) and regulatory changes (e.g. new Green House Gas Regulations). Debottlenecking is the removal of these constraints through equipment and process upgrading, replacement, addition and re-organization.

The North Atlantic refinery was commissioned in the early 1970's, making it one of the newest refineries in North America. At the time of it's commissioning, there were

approximately 325 refineries operating in North America with a combined capacity of about 8.6M bpd (~51,500 bpd average). Today, there are approximately 170 refineries operating in North America, with a combined capacity of about 19.9M bpd (~118,500 bpd average). In addition to the increased average capacity, the complexity and overall value-added capabilities of the surviving refineries have likewise increased dramatically in the last 30-years. This increased capacity and complexity has been achieved through systematic incremental investment in the surviving refineries rather than green field construction of new refineries. The continual identification and alleviation of hydraulic, thermodynamic, catalytic, and other limitations of each process and utility unit has resulted in this overall increase in value-added capability. This "debottlenecking" has taken place during a timeframe in which, by Canadian, U.S., and European regulations, tetraethyl lead was removed from gasoline, sulfur was reduced in all grades of light fuels, and gasoline for sale in U.S. metropolitan areas was reformulated to address smog, ozone, and other contaminants (which required more sophisticated processing technologies). Additionally, average crude oils processed in North America have become increasingly heavy and sour by virtue of the reconfiguration of existing refineries to handle these more difficult to process feed stocks (i.e. heavy sour conversions and delayed coker additions).

During this same timeframe, the North Atlantic refinery has invested in technologies required to meet regulatory advances and it is one of very few North American refineries that has not seen meaningful debottlenecking activity in the last 35-years. Therefore, the refinery identified investment opportunities to effectively "catch up" with the rest of the North American refining industry.

Anticipated benefits include:

- increased competitiveness;
- reduced fuel consumption;
- reduced green house gas and other emissions; and
- improved throughput.

From a procurement perspective, the recent slow down in economic activity is favourable for this project since construction lead times and other cost factors for specialized equipment are less than they were two years ago.

1.5 Project Planning

This section will describe the planning process that has been undertaken to bring this project to fruition.

1.5.1 Consultant Reports

In 2008, SNC Lavalin Ltd. (SNC-L) was retained to develop process configurations which would improve the productivity and competitiveness of the North Atlantic refinery. North Atlantic, along with SNC-L, determined that the optimal solution was: the debottlenecking of existing process units.

Initial debottlenecking analysis concentrated on the process units, however a resource bottleneck existed at the crude storage facilities which would limit the benefits of a fully debottlenecked plant. Raw crude is variable in its properties and this has to be accounted for in the refining process. In order to accommodate this variability, a crude "day" tank is needed and will be added to the existing crude storage area to hold blended crude, thus providing stabilization of the refinery crude feed stock. This is one of the main elements of the project.

The pending regulatory criteria for Green House Gas (GHG) and Criteria Air Contaminants (CACs) reductions were also evaluated as an integral part of this study. Accordingly, objectives were set for the project team to evaluate the latest technological upgrades for heater firing systems as well as heater waste heat recovery with the overall objective of reducing emissions including SO_2 and CO_2.

Consultants have been retained for each major specialty area within the project, and under the general leadership of North Atlantic and SNC-L, are proceeding with detailed design and project planning. Table 1 lists the consultants and their area of responsibility.

Table 1 List of Consultants and Responsibilities

Company	Responsibility
SNC-Lavalin Ltd.	Engineering, Procurement & Construction Management
UOP	Technology Licensors and Engineering Specialists for Isomax, DHT, Kero Merox, Packinox and Benfield Units
Process Consulting Services (PCS)	Crude & Vacuum Process Engineering Specialists
CB&I	Technology Licensor for Sulphur Recovery Unit
Foster Wheeler	Hydrogen Steam Reforming Engineering Specialists
SENES Consultants Ltd.	Air Emissions Modeling
Axens	Distillate Hydrotreator Reactor Throughput Study
Shell Global Solutions	Isomax Reactor Throughput Study
Sikumiut Environmental Management Ltd.	Environmental Management

1.5.2 Location Options

Revamped units are primarily tied to existing layout and infrastructure. To minimize disturbance to the environment, even within the existing refinery footprint, the new and/or upgraded units will, where possible, be placed on existing concrete pads and within existing structures.

1.5.3 Regulatory and Public Consultations

North Atlantic maintains very close contact with all the pertinent levels of government during normal operations of the refinery and currently has Environmental Protection, Monitoring, Safety and Risk Plans in place. In addition, a Community Liaison Committee (CLC) with government, local community, and North Atlantic representatives hold monthly meetings on the operations and initiatives at the refinery. The CLC is mandated to be the primary link between North Atlantic and the community with regards to environmental impacts of refinery operations. The CLC membership includes representatives from the following:

- Town of Arnold's Cove
- Town of Come By Chance
- Town of Sunnyside
- Town of Southern Harbour
- Arnold's Cove Area Chamber of Commerce

- Department of Environment and Conservation
- Department of Health and Community Services
- Department of Natural Resources
- Environment Canada
- United Steel Workers of America, Local 9316
- North Atlantic

The CLC members have been kept informed of the project as it developed and on April 29th, 2010 were given a presentation on the project by the project manager.

North Atlantic has also discussed its debottlenecking plans at a monthly meeting of the Arnold's Cove and Area Chamber of Commerce in May 2010.

Consultation with government regulators determined that there is no need for project registration under the *Canadian Environmental Assessment Act;* however provincial regulators advised that project registration is required under provincial regulations. Correspondence between Sikumiut Environmental Management Ltd. and the Federal and Provincial Environmental regulators, to this effect, is appended as Appendix A.

On May 28th, 2010, a presentation and briefing session was given by senior North Atlantic personnel to provincial regulators. Representation at the meeting included the Departments of Environment and Conservation, Government Services, Natural Resources, Business, and the Department of Innovation, Trade and Rural Development.

1.5.4 Safety, Health, and Environment (SHE)

North Atlantic has a comprehensive Safety, Health and Environment Management Program. This program, based on the Industrial Accident Prevention Association (IMPA) model, has been developed with and through continuous consultations with North Atlantic's workers, the local public, regulatory communities, and national and international industry groups.

1.5.4.1 North Atlantic SHE Policies and Procedures

North Atlantic has a comprehensive SHE Manual and a supplementary pocket manual which contains its Vision, Mission, Principles and SHE Policies, as well as information regarding emergency equipment, potential hazards, key regulations and guidelines, security, incident reporting and investigation procedures, and required permits.

North Atlantic is committed to a program of integrating and continuously improving its SHE Management System. To achieve this, various training programs have been developed and provided to support the implementation of these standards and procedures.

A Safety Policy Statement and an Environmental Policy statement, both of which are given in the next two sections, ensure executive level support to SHE activities.

1.5.4.1.1 Safety Policy Statement

The management team of North Atlantic Refining Limited recognizes that safety is an integral part of operating our refinery. To meet this need North Atlantic Refining Limited will comply with, or exceed, regulations relevant to our industry, and to fully cooperate with the regulatory bodies. To that end, North Atlantic's management team will:

- *Pursue the continuous improvement in loss control and hazard management for the prevention of harm to our employees, our facilities, our neighbours and our customers.*
- *Do everything that is practical and reasonable to provide our employees, contractors, customers, and neighbours a safe place to conduct their day-to-day activities.*
- *Promote safety as part of North Atlantic's contracting process, to ensure the safety of contractors' employees on site.*
- *Provide employees and contractors an opportunity to participate and to enhance the safety and quality of work life.*
- *Train our employees to properly perform their tasks according to their job duties and responsibilities.*

- *Provide the proper level of job orientation to inform employees of workplace hazards and requirements for the transportation of dangerous goods.*

- *Promote and contribute to the safety within our industry.*

- *Utilize the positive forum provided by the Joint Occupational Safety, Health and Environment committee to obtain constructive recommendations to management in the development and/or revision of safety policies and procedures.*

- *Work in cooperation with the provincial Occupational Health and Safety Department, which contributes to the overall enhancement of our industry*

1.5.4.1.2 Environmental Protection Policy

The management team of North Atlantic Refining Limited recognizes that Environmental Management is an integral part of all aspects of our business. Senior management will lead in the implementation of this policy but every employee has a vital role to play. To improve environmental management North Atlantic will:

- *Pursue continuous improvement in environment management to minimize impact of our business on the environment.*

- *Do everything practical and reasonable to provide our employees and contractors with guidelines and directions to consider environment in day to day activities.*

- *Work with applicable government agencies to comply with regulations relevant to our industry concerning the protection of the environment and the public.*

- *Promote environment management as part of North Atlantic's contracting process.*

- *Train all employees and others engaged on our behalf of the need and requirements to protect the environment.*

- *Promote environmental management within our industry.*

- *Determine, evaluate and mitigate the environmental impacts of our business during project planning, implementation, operation and all other aspects of our business.*

- *Development and implement appropriate environment management programs, performance targets and goals.*

- *Respond to environment emergencies in a prompt and effective manner.*

- *Use energy and other resources efficiently in our operations.*

- *Communicate with the public on environmental matters and deal openly and fairly with members of the public regarding our activities.*

1.5.4.2 North Atlantic Environmental Protection Initiatives

Environmental Protection Measures, developed as part of regular refinery operations, will form part of the execution of this undertaking. North Atlantic has many Environmental Protection Initiatives. These initiatives flow from the North Atlantic SHE policies and result in the generation of Environmental Protection Standards, Plans, Procedures, Guidelines, Protocols, Documents, Training Manuals, and Best Practices for Environmental Protection, under the Environment Discipline at the refinery.

An environment group, consisting of two full time professionals is dedicated to Environmental Management issues at the refinery. Environmental Initiatives are a combination of in-house and contracted services.

The Environment Discipline has four elements:

- Environmental Management General Standard;
- Pollution Prevention Standard;
- Waste Management Standard; and
- Community Involvement Standard.

Each standard has a focused purpose and sets out processes for knowledgeable persons to assess and manage, as applicable, each of the following:

- Air Quality
- Land Impact
- Water Quality
- Process Equipment operation to minimize pollution
- Decommissioning and site restoration
- Contingency measures and emergency plans

- Chemical and hydro carbon spills
- Reporting, documentation, filing, recording keeping
- Sampling requirements, methodologies and competencies
- Benchmarking of Performance

These standards apply to all of the following activities:

- Normal Operations
- Routine Maintenance
- Upset Conditions
- Turnarounds
- New Projects
- Contractor Activities

Four major management plans flow from the standards. These are:

- Spill Prevention, Control and Countermeasures Plan (SPCC)
- Oil Handling Facility, Oil Pollution Emergency Plan (OPEP)
- Waste Management Plan
- Decommissioning Plan

An appreciation of the scope of each plan can be gleaned from the list of documentation contained within each. For example, the documentation contained in the Waste Management Plan includes:

- Environmental Protection Policy
- Waste Management Standard
- Solid Waste Management Guideline
- Liquid Waste Management Guideline
- Typical Waste Management Practices
- Waste Disposal/Recycling Permit Procedure
- Sampling of Waste Materials Procedure
- Transfer of Waste Materials Procedure
- Storage of Waste Materials Procedure
- Transportation of Waste Materials Procedure
- Waste Management Documentation Procedure
- Waste Documents Management Matrix
- Waste Records Management Matrix
- Scrap Materials Procedure
- Sample Contractor Environment Plan - Exchangers

- Sample Contractor Environment Plan - Heaters
- Waste Management/Recycling Permit
- Liquid Recycling and Drainage Permit
- Gate Pass
- Daily Waste Tracking Sheet
- Movement Document/Manifest
- Export Permit for Hazardous Recyclable Material
- Laboratory Chain of Custody Record

Not directly related to this project, but of interest from a safety and emergency perspective is North Atlantic's Environmental Emergencies (E2) Plan, which North Atlantic has developed and filed with Environment Canada, in accordance with the requirements of the *Canadian Environmental Protection Act*. Within the plan, modeling was completed for various toxic vapour cloud and explosion scenarios to determine potential off site effect. Public consultation with the neighbouring communities was held to disclose potential environmental emergency scenarios and plans. North Atlantic progressively conducts field and tabletop exercises of its plan and updates it as required.

1.5.4.3 North Atlantic SHE Standard Operating Procedures for Contractors

All of the work carried out for this undertaking will be performed by contractors. North Atlantic has extensive experience working with contractors, and has developed, as part of its overall Standard Operating Procedures package, three documents relevant to the SHE requirements for similar contracting activities. These documents address the purpose, scope and criteria, standard operating guidelines, communication, training, responsibilities and measurement, evaluation, recognition, improvement and correction of these Standard Operating Procedures. The purpose, scope, criteria, and standard operating guidelines are extensive and reflect the requirements for contractors to meet North Atlantic's and regulatory standards and are available for review.

2.0 DESCRIPTION OF THE UNDERTAKING

This section will describe the project being considered by North Atlantic

2.1 Geographical Location

2.1.1 General

North Atlantic's refinery operation is located in the town of Come By Chance in Placentia Bay. Figure 1 is a topographic map of the region showing the location of the refinery operations in relation to Placentia Bay and the Avalon Peninsula. Figure 2 is an Aerial Photograph of the refinery.

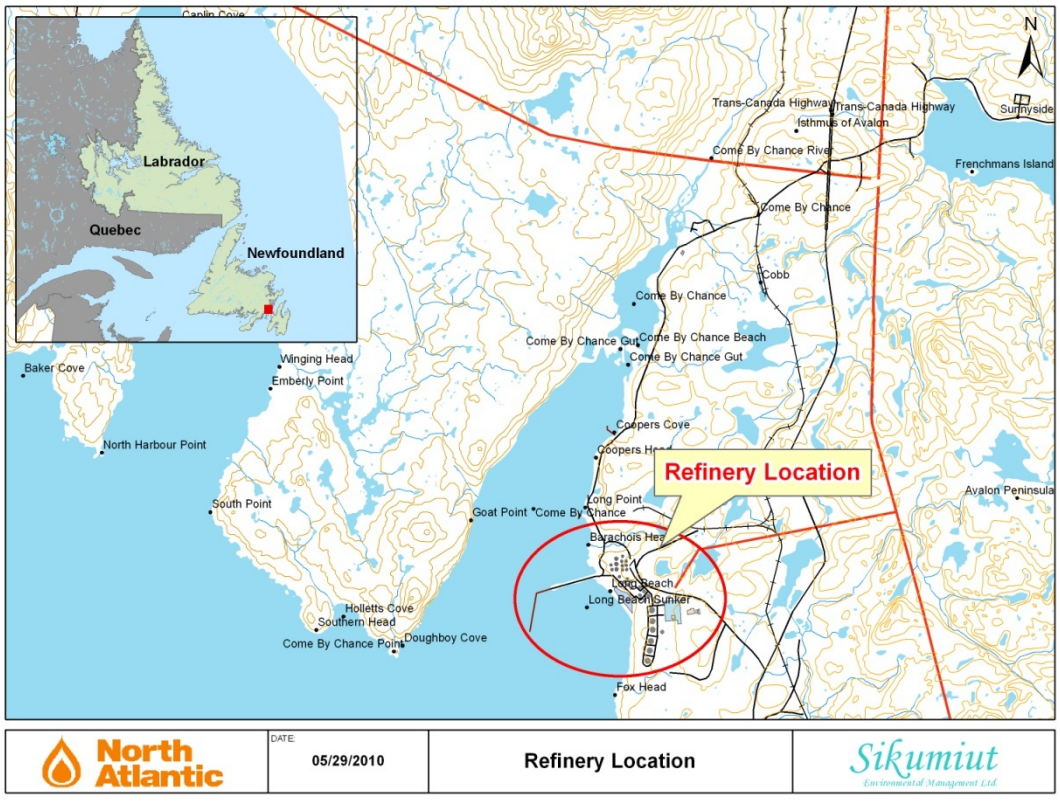

Figure 1 Refinery Location

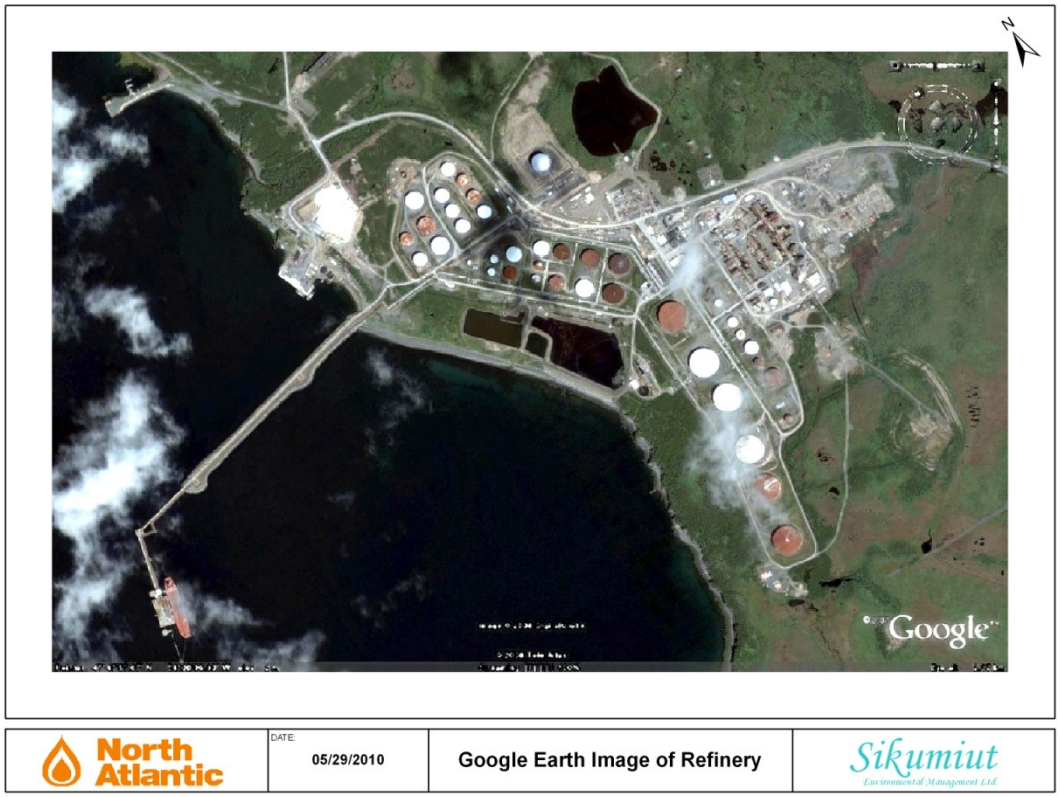

Figure 2 Aerial Photograph of Refinery

2.1.2 Unit Locations

Unit locations are tied primarily to the existing layout and infrastructure. With the exception of the new crude storage tank and some very minor additions and alterations, the site plot plan will not change. Figure 3 is a partial plot plan of the site showing the proposed location of this new tank.

A construction laydown area will also be developed. It will be located on refinery property inside the site fencing adjacent to existing laydown areas. It will measure approximately 160m by 180m. It will be prepared by grubbing and leveling the site. Material removed from the site during preparation will be disposed of on site in the general area of the existing flare stack.

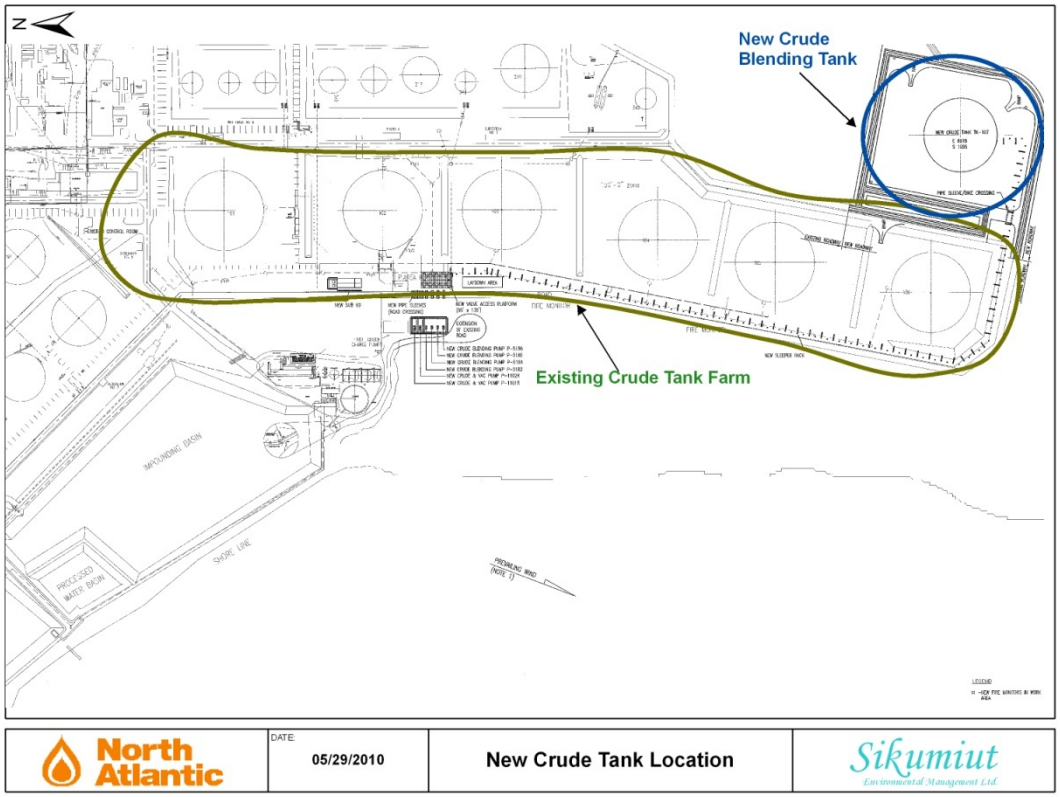

Figure 3 New Crude Tank Location

Appendix B is a plot plan of the process areas showing the affected areas as new, modified or existing.

2.2 Physical Features

2.2.1 Existing Environmental Features

The proposed project site is within the existing operating refinery and as such is a brown field site and there will be very little new land disturbance. Also, given that this project will result in greater energy efficiency and less fuel consumption, it is anticipated that emissions from the facility will be improved.

An overview of the surrounding environment including Climate and Geology, Aquatic Environment, Terrestrial Environment and Socioeconomic Environment is given in *Proposed Butane Storage Facility, Environmental Assessment Registration, North Atlantic Refinery Limited, May 21, 2002.* While there is no significant consideration of these environmental features for this project, they are extracted and repeated here for completeness. Some minor changes in the text are made to reflect the current project.

Climate and Geology

The project area is located on the northwestern portion of the Island of Newfoundland's Avalon Peninsula (Figure 1). The area is located within the South and Southeast Coasts and Immediate Hinterlands climatic zone, as defined by Banfield (1981). The area's climate exhibits a strong maritime influence with mild winters, cool summers, frequent fog, high precipitation and strong, predominantly southwest, winds (1995). Canadian climate normal data for the period 1951-1980 (AES 1982) are available for the Come By Chance area. Daily maximum and minimum temperatures at Come By Chance during that period averaged 0.2° C to –7.1°C in February and 18.5° C to 12.9°C in August. Annual rainfall averaged 968 mm, and the average snowfall was 160 cm. Wind data are available only from nearby Arnold's Cove, but are likely indicative of wind conditions in the general area (SGE 1995). The average annual wind speed during this period was 21.2 km/h, with the prevailing wind direction being southwest (AES 1982).

Bedrock geology in the Come By Chance area is comprised of late Precambrian sedimentary and volcanic rocks, and Cambrian-Ordovician quartzite and sedimentary rocks. Surficial deposits consist primarily of continuous and discontinuous ground moraine, with lesser amounts of bog, outwash and modern stream deposits (King 1989 and Henderson 1982, cited in SGE 1995).

Aquatic Environment

There are no major rivers adjacent to the proposed project site. The nearest water bodies are Barachois Pond and Inkster's Pond, both to the north of the refinery. These ponds are part of a small watershed comprised of several small ponds, wetlands and stream sections that enter Placentia Bay just north of the refinery site. Inkster's Pond is currently used to supply fire water and process water required for refinery operations. A pipeline extends from Inkster's Pond to the refinery. This water body is maintained by

pumping water from nearby Barachois Pond, as required. A small corridor of land between the two ponds is currently designated as refinery property. Both of these water bodies are exclusively for refinery use.

Past samplings of small ponds and streams in the general area have produced catches of brook trout (*Salvelinus fontinalis*) and three spine stickleback (*Gasterosteus aculeatus*). Deeper ponds such as Little Mosquito Pond (Bull Arm) contain landlocked Arctic char (*Salvelinus alpinus*) and larger streams in the broader region contain Atlantic salmon (*Salmo salar*) (i.e., Come By Chance Brook and Arnold's Cove Brook) (JWEL 1990). Other fish that may be present in the watershed include American eel (*Anguilla rostrata*).

Drainage from the refinery is away from these water bodies, and therefore, they will not be affected by this project.

Terrestrial Environment

The Come By Chance area is located within the Southeastern Barrens Sub region of the Island of Newfoundland's Maritime Barrens Ecoregion (Damman 1983). This ecoregion is characterized by extensive barren areas of heath, bog and fen with forested valleys. The main forest vegetation is balsam fir (*Abies balsamea*) associated with black spruce (*Picea mariana*) and lesser amounts of white spruce (*Picea glauca*), white birch (*Betula papyrifera*) and larch (*Larix laricina*). Scrub forest is common. Rock and soil barrens characterize heath areas. Rock barren vegetation is low and tundra-like. The dominant plant species are *Kalmia angustifolia*, *Ledum groenlandicum*, *Rododendron canadense* and *Chamaedaphne calyculata*.

In the Southeastern Barrens Subregion, the landscape is dominated by heath lands and the forest occurs only in small acreages which have escaped fire. The dominant heath shrub on uplands is *Empetrum nigrum*, with *Kalmia angustifolia* forming a dense cover only in protected valleys (Meades 1990). No rare or endangered plant species have been identified in this area by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2002).

Wildlife species using the general region are likely those which are typically found in predominantly barren ground habitats on the island of Newfoundland. This may include red fox (*Vulpes vulpes*), moose (*Alces alces*) and willow ptarmigan (*Lagopus lagopus*). Raptors such as bald eagle (*Haliaeetus leucocephalus*), sharp-shinned hawk (*Accipiter striatus)*, northern harrier (*Circus cyaneus*) and short eared owl (*Asio flammeus*) may also hunt in the general area. The short-eared owl is listed as a species of special concern by COSEWIC.

Socioeconomic Environment
The proposed project site is located within the existing refinery.

The Town of Come By Chance is located approximately 5 km north of the refinery. The project area is located within that community's municipal boundary. Other communities in the general area include Arnold's Cove (approximately 5 km to the south), Sunnyside (approximately 8 km to the northeast) and Southern Harbour (located approximately 10 km to the south).

There are no known archaeological sites within the project area (PAO 2002).

2.2.2 Project Features

2.2.2.1 General

All components of this project will occur within the boundaries of the refinery property. Most of the work items could be individually implemented as part of the refinery's routine and continuous maintenance and upgrading programs. However, because the combined scope of these work items is substantial, it is presented herein as a single project so that its significance, both environmentally and socio-economically can be evaluated.

The project team has selected the various technologies and process designs. For this project, only proven technologies have been selected. Detailed engineering design is ongoing, and in various stages of completion, depending on the units involved. Three dimensional (3-D) modeling software is being used for the design and layout. Inherent in

the software is the ability to perform various functions, such as simulated walk through and interference testing to ensure the project gets executed smoothly. The existing plant layout and components (as-builts) are incorporated into the modeling using advanced 3-D laser measuring technology. In parallel with the design phase, a Hazardous Operations Review is being undertaken to ensure the new components transition into the refinery operation without incident.

2.2.2.2 Project Components

Table 2 identifies and categorizes by function type, the major components of the project, along with the changes and benefits and attendant site changes expected for each.

Locations of units within a refinery are often referred to in terms of Inside Battery Limits (ISBL) and Outside Battery Limits (OSBL). These are logical boundaries separating the process units from the supporting infrastructure.

Table 2 Project Components

Project Component	Location	Function	Changes and Benefits	Physical Site Changes
Process Units				
1. Crude and Vacuum Unit	ISBL	This is the primary distillation for initial separation of crude oil into components such as propane, butane and other LPGs, naphtha, kerosene, diesel, vacuum gas oil and vacuum residue.	1. Processing capacity increased from 115,000 to 130,000 BPSD 2. Improved yield of diesel and vacuum gas/oil products 3. Elimination of waste gas burning 4. Improved heat recovery and heat integration 5. Improved Reliability and Availability	Installation of new 120 ft (36.6 m) high vacuum structure with new ejectors and condensers, new closed circuit cooling water system, pipe rack extension and new waste gas compression system. Towers, heaters and drums will be reworked with no changes to existing footprints. New exchangers, pumps and piping throughout unit, however most new installs will be on existing foundations (i.e. replace existing equipment with new, upgraded equipment)
2. Distillate Hydrotreater (DHT) Unit	ISBL	Removes most of the sulphur and nitrogen from crude unit diesel for the production of ultra low sulphur diesel (ULSD)	1. Increase capacity from 25,000 to 31,900 BPSD 2. Increase reactor inlet pressure and temperature and hydrogen circulation for extended run length 3. Increased heat exchanger surface area for improved heat recovery 4. Relieve hydraulic limitations and stripping to improve H_2S removal	Minimal site changes. Some new exchangers, pumps and piping throughout the unit however, most new installs will be on existing foundations (i.e. replace existing equipment with new, upgraded equipment), refurbishment of compressors, and replacement of existing steam stripper.
3. Isomax Unit	ISBL	Upgrades the vacuum gas oils (VGOs) through catalytic hydrogenation to produce, LPG, naphtha and ultra low sulphur kerosene and ultra low sulphur diesel products,	1. Increase capacity from 38,000 to 42,000 BPSD 2. Process heavier feed from crude/Vacuum unit 3. Optimize distillate and LPG production	For the reactor (high pressure circuit) there will be two new 300 ton pretreat reactors along with associated piping and supporting structures and a reconfigured Combined Feed Exchanger Circuit (two tier to three

Project Component	Location	Function	Changes and Benefits	Physical Site Changes
			4. Increased convective surface area in heaters to improve heater efficiency 5. Increased capacity of heat exchangers, air coolers and pumps to meet higher capacity requirements	tier exchanger structure). In general, towers, heaters and drums will be reworked with no changes to existing footprints. Some new exchangers, pumps and piping throughout unit, however, most new installs will be on existing foundations (i.e. replace existing equipment with new, upgraded equipment)
4. Sulphur Recovery Unit (SRU)	ISBL	Recovers sulphur as a by-product and thereby reducing SO_2 emissions.	1. Increase capacity from 180 to 270 LTPD (long tons per day) 2. Conversion from air to an oxygen enriched process using new on-site oxygen supply, so that higher sulphur recovery can be achieved.	Installation of a new O_2 generation facility adjacent to the existing facility. The existing facility will undergo minor piping changes and refractory upgrades with the minimal addition of new equipment. Furnace upgrades (refractory lining and combustion equipment to handle O_2) will be required; however there will not be any substantial changes to the existing footprint for this equipment.
5. Kerosene Merox Unit	ISBL	Produces desulphurized kerosene	1. Modified to match upgraded product runs from the crude unit that have higher impurity 2. Upgrade existing impurity removal system (< 20 ppmw) 3. Add spare post-treatment train to match crude unit availability 4. Change the current batch processes for catalyst and wash to continuous systems to meet new	In general, reactor and drum modifications will be required with no changes to existing footprints. New catalyst handling, continuous caustic/water wash facility, minor exchangers, pumps and piping however, most new installs will be on existing foundations (i.e. replace existing equipment with new, upgraded equipment). Notable

Project Component	Location	Function	Changes and Benefits	Physical Site Changes
			process conditions	exception will be the installation of a parallel salt and clay filter.
6. Light Ends Recovery (LER) Unit	ISBL	Removes hydrogen sulphide (H_2S) from refinery fuel gas and separate propane and butane product from LPG.	1. Increased efficiency of depropanizer column 2. Increased capacity of amine absorbers to match the increase in sour gas production from upstream units 3. Conversion to using methyl diethanolamine (MDEA) instead of diethanolamine (DEA) for amine solution for better removal of H_2S with minimum extra steam usage	Two new knock out drums and associated pumping/piping systems required. Tower/drum modifications required throughout unit (existing vessels), other new/replacement equipment to be made on existing foundations.
7. Hydrogen Plant & Hydrogen Distribution	ISBL	Produces hydrogen for use in various process units	1. Increased hydrogen production capacity from 73 to 91 MMSCFD. 2. Enhance Benfield carbon dioxide removal unit capacity and stability 3. Upgrades and modifications to gas compressors system to handle higher capacity through continuous operation as well as improving system reliability	Replace HP end of feed gas compressors, replace make up compressor intercooling system (piping and knock out drums). Benfield absorber and regenerator tower internals to be upgraded, fin fan cooling systems to be upsized (replace current equipment).
8. Fuel Feed System	OSBL	Provides fuel gas and fuel oils to the process heaters in the various units as well as to the boilers	1. Improve fuel gas vaporization control 2. Improve fuel measurement systems.	Changes require new equipment that will be installed on existing equipment foundations. Measuring/monitoring changes will result in little physical site changes (new flow meters and analyzers). Few new drums and filtration system under review.
9. Sour Water Stripper	OSBL	Removes hydrogen sulphide	Increase sour water processing	Install a new skid-mounted self-

Project Component	Location	Function	Changes and Benefits	Physical Site Changes
(SWS)		(H_2S) and ammonia (NH_3) from sour water received from various sources throughout the refining operation	capacity from 115 GPM to 170 GPM	contained processing unit south of the existing unit (in rack 2). Existing unit will be mothballed
10. Process Safety Relief Valves (PSV's) and Flare System	OSBL	1. Safe relief of fluids (gas and liquids) in case of extra pressure build up. 2. Burns small excess fuel gas, waste combustible gases and gas relief discharges from over-pressuring situations through the flare stack	Increase flare and relief capacity to handle incremental load from refinery debottlenecking Tie-in existing atmospheric hydrocarbon relieving devices to closed relief system.	PSV's will be upgraded and renewed as needed. New flare relief header through plant pipe rack system, piping from atmospheric relieving hydrocarbon PSV's to new flare header, new knock out drum, and new flare stack
11. Amine Regeneration Unit (ARU)	OSBL	Converts rich (sour gas laden) amine stream into lean (sour gases stripped out) amine stream and recycles it back to the amine absorber units.	1. Upgrade and streamline the existing amine regeneration and distribution system to accommodate new process loads 2. Convert from using diethanolamine (DEA) to methyl diethanolamine (MDEA) for amine solution. This improves overall energy and process efficiency.	Minimal site changes to this unit. New filters and pumps required however most new installations will be made on existing foundations. Some tower rework and exchanger rework required with no impact on existing footprint.
Heating Systems /Units				
1. Process Heaters	ISBL	Provides heat for the main refinery processes	1. Improved heat recovery resulting in lower fuel consumption and reductions in CO_2/GHG and other emissions. 2. Heater firing components will be upgraded for improved reliability and heater efficiency	Additional tubes will be added to the convection section of select heaters (CDU/Vacuum, Isomax & Platformer) with some changes to stack height (increase) to meet performance requirements. Burners will be replaced and reconfigured. There will be no change to the current footprint

Project Component	Location	Function	Changes and Benefits	Physical Site Changes
				for this equipment.
2. Naphtha Hydrotreator (NHT) Feed/Reactor Effluent Heat Exchanger	ISBL	Recovers heat from the reactor effluent stream for reuse in the process	Increase the preheat surface area of the existing NHT charge-reactor effluent heat exchangers to maximize heat recovery and reduce the amount of fuel oil firing in the downstream heater thereby reducing fuel consumption and emissions.	Relocate the current, three shell and tube type exchangers from the east end of the rack to an available plot on the west side of the rack and add additional three new (identical) exchangers (two tiers of three)
3. Platformer Feed-Effluent Heat Exchanger	ISBL	Recovers heat from the platformer effluent stream for reuse in the process	Replace most of the existing two vertical conventional shell and tube type preheat exchangers (preheat the feed to the Platformer changer heater) with a single, high efficiency, Plate Exchanger. This will reduce the firing in the charge heater resulting in fuel savings and reductions in emissions.	A new proprietary exchanger will be installed on an existing foundation. The redundant shell and tube exchangers will be left in place for back-up
4. Steam Boiler Economizers	ISBL	Recovers heat from the hot flue gases for reuse in the process	Improved heat recovery will contribute to a reduction in fuel firing in boilers. This will result in fuel savings and a reduction in emissions.	Minimal changes to existing equipment footprint. New economizers will be installed in the existing duct work system for both boilers
5. Steam Boiler Soot Blowers	ISBL	Keeps boiler plates/tubes clean and free of soot	Heat transfer within the boilers will be improved, resulting in fuel savings and a reduction in emissions.	Minimal site changes. Existing soot blowers will be upgraded and some relocated in the boilers for optimized soot blowing
6. Flare Gas Recovery Unit	OSBL	Recovers hydrocarbon gases from the flare system (previously flared) for use as	Recovered fuel from the flare gas will reduce refinery fuel requirement, resulting in lower fuel consumption,	A new 0.8 MMSCFD capacity, skid-mounted flare gas recovery unit will be installed to service both the

Project Component	Location	Function	Changes and Benefits	Physical Site Changes
		refinery fuel	and reduction in emissions.	existing and new (if required) Low Pressure flare systems.
Refinery Water Systems				
1. Raw, Fire and Treated Water Systems	OSBL	Water supply for various operational requirements	Increase the capacity to deliver and treat water for process usage.	A third ion exchange train will be required to meet increased boiler feed water demands. The balance of changes will be mostly upgrades to, or replacement of, existing equipment, specially in the clarifier to meet the higher demands as required
2. Steam, Condensate and Boiler Feed Water Systems	N/A	Supplies steam to operations and manage boiler feed water requirements and condensate recovery	Return steam systems to design conditions for optimal steam quality and process performance.	There will be minimal impact in terms of changes to the site condition with most work being performed on existing equipment. The let down stations, pumps, condensate recovery drums and piping will be replaced as necessary.
Others				
1. Crude Blending Tank System	OSBL	Provides a precisely controlled blended crude feed to the crude and vacuum unit for improved plant operational stability (i.e. reliability)	1. Provides for automated blending for more consistent and uniform blending of crude oils. 2. Provides the capability to perform inter-tank crude transfers	Installation of a new 400 kbbls crude day tank, east of the existing Tk-106, inside the refinery property. Four new pumps, control valves, ratio controllers and all associated piping to be installed adjacent to the existing crude charge pumps. The new tank will comply with the provincial Gasoline and Associated Products Regulations and CCME Guidelines for Controlling Emissions of Volatile Organic Compounds from Above

Project Component	Location	Function	Changes and Benefits	Physical Site Changes
				Ground Storage Tanks (PN 1180)
2. Electrical Substations	N/A	Supplies/distributes & controls electricity to refinery equipment	System upgrades to address the increased demand.	Three new electrical substations will be required (two in process area and one in off sites). Balance of work will be facilitated within existing substations. New cable and cable tray will be installed throughout the exiting process area and select areas in offsites.
3. Instrumentation	N/A	Process and safety control infrastructure	1. Increase the capacity of the existing control networks to accommodate the additional instrumentation and process controls requirements that will be introduced as a result of this project. 2. Install added fail safe control infrastructure as necessary for new safety instrumentation that will be added as a result of this project	There will be minimal physical site changes as a result of this work outside of the installation of new cabling and computer systems required for the following: extension to the existing distributed control system, local control network and fault-tolerant ethernet networks through new fibre optic cables.

2.2.3 Construction

Sections 2.2.3.1 through 2.2.3.3 describe how the project will be executed and includes any resources issues which can be expected during construction.

2.2.3.1 Project Activities and Work Breakdown Structures

Because of the nature of its operations, the refinery regularly undergoes large maintenance and capital projects (turnarounds). These can involve partial or complete shutdowns, be of varying length and involve increased employee and contractor work forces. The construction phases of this project will be managed the same as previous turnarounds.

This project, while large in capital value, will result in only minimal changes to the existing refinery footprint. Most project components are proprietary purchases to be delivered and assembled during the project. These components will be brought to site both by road and by sea transport.

Construction activities will include:

- Dismantle, removal and disposal of equipment removed from service
- Construct/extend new concrete foundations where needed
- Installation of replacement units and associated infrastructures of selected units
- Installation/modification of piping and cabling in support of selected units
- Building/connecting new electrical substations
- Clearing and grubbing for new crude blending tank
- Site grading
- Extend berm from the tank farm to new crude storage tank
- Provide surface drainage around the project area.
- Construct concrete foundations for new crude tank.
- Fabricate and integrate new blending tank
- Fabricate and integrate new flare stack
- Construct temporary facilities (e.g. canteen/washrooms)
- Prepare a laydown area

Major activities for the project will be executed in phases based around partial or complete normal turnarounds and synchronized with operational requirements such as

catalyst change out and recertification requirements. Construction activities not requiring a turnaround for execution will be completed outside turnaround periods currently scheduled.

Figure 4 shows the preliminary schedule and resource loading.

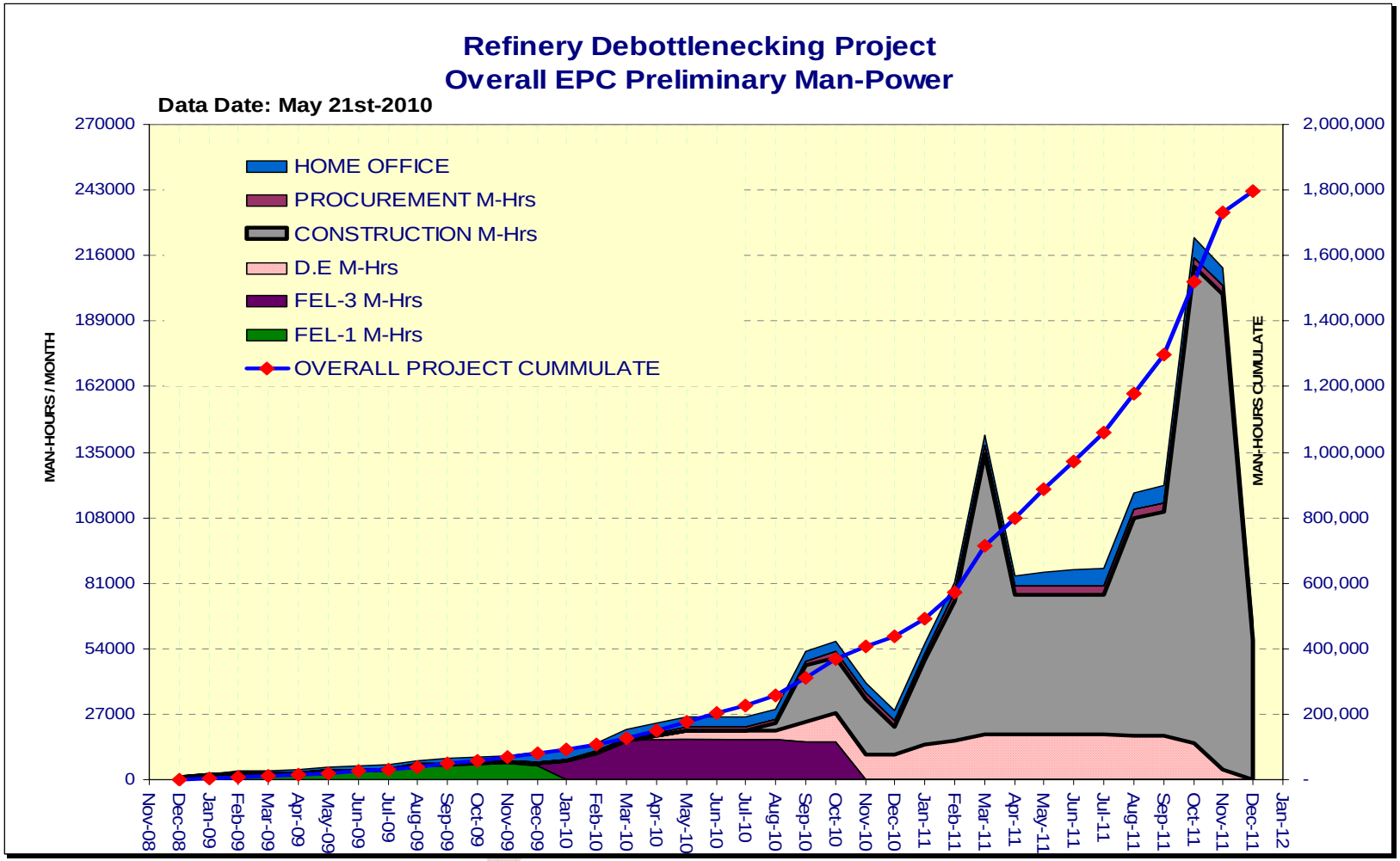

Figure 4 Preliminary Schedule and Resource Loading

2.2.3.2 Potential Sources of Pollution from Construction

The potential sources of pollution for this project are similar to those of the normal refinery operations. There may be some increases in the volumes of some waste streams. North Atlantic's standard operating procedures for waste management, as detailed in the Waste Management Plan, referenced in section 1.5.4 of this registration, will be used. The plan provides detailed procedures for the handling of all typical and non typical waste materials. As part of the plan, contractors are required to have their own Environment Plans for their work scope. In addition, North Atlantic Refining Limited has a contract in place with a waste management company to transport material requiring off-site disposal. This contract provides for a site representative who is available for consultation regarding waste matters in addition to the Environment Group.

Potential sources of pollution during the Construction stage may include:

Noise

The nearest communities to the site are Come By Chance and Arnold's Cove, both approximately 5 km away. Noise is not expected to be a concern for residents of these communities or wildlife in the area. Noise within the project area will be that of an industrial site and mitigated with personal protective and safety devices as required.

Air Emissions

All company and contractor vehicles and equipment are required to be in good and safe operating conditions.

Dust and Sediments

During excavation for the new crude blending tank, and other minor excavations, dust and fine material have the potential to escape and get into adjacent ponds and streams. Sediment trapping material such as approved filtration fabrics will be used to contain fines. Road access to the site is paved; however some parking lots are not. As necessary, dust will be controlled by the application of water to the road.

Fuel and Lubricants

Construction activity poses a risk for the release of fuel and lubricants from construction equipment. North Atlantic will require that all contractors and company equipment are properly maintained and inspected to avoid leaks of oil, fuel and hydraulic fluids.

Sewage
Sewage will be handled through existing sewage treatment facilities with portable facilities as required.

Waste and Garbage
All waste will be handled as required by the existing Waste Management Plan.

2.2.3.3 Potential Resource Conflicts

This project will occur completely within a well developed and operational industrial site. No resource conflicts are expected.

2.2.4 Operation

The refinery is nominally rated at 115,000 bbls of crude per day. After this project, the refinery will be capable of handling 130,000 bbls of crude per day, which is the design for the project.

2.2.4.1 The Operation

Refinery operations are addressed in this section, only to the extent that this project will change existing operating conditions and parameters. A Hazardous Operations Review ensures the new components transition into the refinery operation without incident.

The existing refinery operates under two operating documents from the Department of Environment and Conservation, Government of Newfoundland and Labrador; a Certificate of Approval and an Environmental Compliance Agreement, both of which expire December 31, 2010. This undertaking will likely be incorporated into the renewed Certificate of Approval.

The Certificate of Operating Approval requires the following.
All necessary measures shall be taken to ensure compliance with all applicable acts, regulations, policies and guidelines, including the following:

- *Environmental Protection Act;*
- *Water Resources Act;*
- *Air Pollution Control Regulations, 2004;*
- *Environmental Control Water and Sewage Regulations, 2003;*
- *Ozone Depleting Substances Regulations, 2003;*

- *Storage and Handling of Gasoline and Associated Products Regulations, 2003;*
- *Used Oil Control Regulations, 2002;*
- *Heating Oil Storage Tank Regulations, 2003;*
- *Storage of PCB Waste Regulations, 2003;*
- *Ambient Air Monitoring Policy Directive, (PPD 98-01);*
- *Accredited and Certified Laboratory Policy (PD: PP2001-01);*
- *Frequency of Stack Emission Testing Guidance Document (GD-PPD-009-1);*
- *Source Emission Testing Guidance Document (GD-PPD-016-1);*
- *Plume Dispersion Modeling Guidance Document (GD-PPD-019);and*
- *Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Above Ground Storage Tanks (CCME PN 1180).*

It is important to note that as a result of this undertaking, there are no new emission sources, as listed in the Certificate of Approval issued by the Department of Conservation and Environment. These sources are listed in Table 3. This means that there are no new product or waste stream types.

The only process change of significance is the conversion to the use of Methyl Diethanolamine (MDEA) instead of Diethanolamine (DEA) for the amine solution in the Light Ends Recovery (LER) Unit.

MDEA is the most widely used solvent for refinery fuel gas treating, and as such is considered the industry standard. It has many advantages over traditional amine solvents such as DEA.

These advantages are:

- substantially reduced corrosion compare to DEA;
- MDEA is more selective to H_2S removal in the presence of CO_2;
- reduced solution losses because of lower vapour pressure;
- lower heats of reaction;
- substantially higher resistance to degradation; and
- Reduced energy usage and capital cost.

Table 3 Emissions Sources

Source Type	Unit Reference	Effect
1. Crude/Vacuum Unit Process Heaters	1.1 H-1101	To be upgraded
	1.2 H-1102	To be upgraded
2. Visbreaker Process Heaters	2.1 H-1202	
	2.2 H-1202	
3. Isomax Process Heaters	3.1 H-1301	To be upgraded
	3.2 H-1302	To be upgraded
	3.3 H-1303	
	3.4 H-1304	
4. Naphtha Hydrobon Process Heaters	4.1 H-1401	
	4.2 H-1402	
5. Platformer Process Heaters	5.1 H-1501	To be upgraded
	5.2 H-1502	To be upgraded
	5.3 H-1503	To be upgraded
	5.4 H-1504	Previously decommissioned
	5.5 H-1505	
6. Distillate Hydrobon Process Heaters	6.1 H-1601	
	6.2 H-1603	
7. Hydrogen Steam Reformer Process Heater	7.1 H-1901	
8. Sulphur Recovery Unit Furnaces	8.1 H-2101	
	8.2 H-2102	
	8.3 H-2103	
	8.4 H-2104	
9. Black Oil Heater	9.1 H-3501	Previously decommissioned
10. Steam Plant Utility Boilers	10.1 S-3401	To be upgraded
	10.2 S-3402	To be upgraded
	10.3 S-3403	Previously decommissioned
11. Steam Assisted Smokeless Flare Stack	11.1 M-3601	
12. Butane Flare Stack	12.1 M-6601	
13. Low Pressure Flare Relief	New	Consolidation of Existing Sources

2.2.4.2 Potential Sources of Pollution

A new potential source of pollution as a result of this project is the new crude blending tank. This tank will be connected to the existing safety and pollution prevention infrastructure, and managed according to existing standard operating procedures and will comply with pertinent regulations.

2.2.4.2.1 Wastewater Treatment Plant

The existing wastewater treatment plant has consistently met and exceeded the requirements of the federal *Petroleum Refinery Liquid Effluent Regulations.* In addition, the Environmental Effects Monitoring (EEM) Program carried out under these regulations has not indicated any impact of the discharge from the plant on the marine environment.

While there may be a slight increase in the flow to the wastewater plant as a result of this project, the existing wastewater plant has sufficient hydraulic capacity to handle this increase.

The provincial *Water and Sewer Regulations* have recently been amended to be aligned with the requirements of the federal regulations. Therefore, the wastewater plant is able to meet the discharge requirements of both the federal and provincial regulations.

2.2.4.2.2 Stack Emissions

The Certificate of Approval for the refinery provides for stringent monitoring, sampling, testing and reporting of emissions data. Dispersion modeling, in accordance with the Plume Dispersion Modeling Guidance Document (GD-PPD-019), is regularly required by the refinery. Early in the Environmental Assessment process for the debottlenecking project, dispersion of emissions from the refinery stacks was identified by the Department of Environment and Conservation as an issue. To address this subject, North Atlantic engaged the firm SENES Consultants Limited (SENES) to undertake an air dispersion modeling exercise to estimate the effects that the debottlenecking project would have on the dispersion of emissions from the refinery. This study was undertaken in consultation with the Department of Environment and Conservation using the protocols established by that Department, i.e. the CALPUFF dispersion model.

For comparison purposes, two scenarios were addressed in the report:

1. 2007 daily emissions representing current typical operations; and
2. Future operations from the debottlenecking exercise.

In summary the report concluded the following:

1. Overall there is little difference in the two scenarios at the sensitive receptors and all sensitive receptors are modeled at below applicable air quality standards for both scenarios;

2. No exceedance of any applicable ambient air criteria for the following contaminants were predicted for either the current typical operations or the future debottlenecking exercise:
    - Carbon monoxide (CO);
    - Particulate Matter (total)(PM_{total});
    - Particulate Matter <10µm (PM_{10});
    - Particulate Matter <2.5µm ($PM_{2.5}$); and
    - Dioxins and Furans.

3. There will be a marked reduction in the extent of the area impacted by SO_2 once the debottlenecking project has been completed.

Note: the issue of SO_2 reduction is an ongoing discussion between North Atlantic and the Department of Environment and Conservation with progressive reductions being achieved.

4. Nitrogen dioxide modeled concentrations will meet time averaging period criteria at all times. There is however, one isolated area at the property line where hourly exceedances are predicted. This issue is being addressed through more detailed evaluation of the model inputs.

The report therefore indicates a general trend in improved emissions dispersion as a result of the debottlenecking project.

2.2.4.2.3 Green House Gas Emissions

One of the primary objectives of this project is to improve Green House Gas (GHG) performance.

North Atlantic's GHG emissions from non-fixed process sources are mainly generated from the consumption of fuel oil in the refining process. Our consumption of low sulphur fuel oil is expected to decrease by approximately 19% from normal operations1. See Table 4 below. (GHG projects refer to heat and steam generation upgrades.) Although there will be a small increase in GHGs from the consumption of fuel gas, project estimates indicate that there will be a 17% - 20% reduction in GHGs from normal operations.

Table 4 Change in Refinery Fuel Oil Consumption

Parameter	Reduction in Refinery Fuel Oil (BPD)	Total Reduction as a % of Total Fuel (FoE) from Normal Operations
Process Units	(-) 441	(-) 5%
GHG Projects	(-) 1101	(-) 14%
Total Refinery	(-) 1542	(-) 19%

[1] 2005 is the year proposed by the Federal government as the base year for GHG regulations. The refinery did not operate for a full year in 2005, and therefore its GHG emissions were lower than normal in that year. Current emissions are more representative of typical GHG emissions and project estimates indicate that there will be a 17% - 20% reduction in GHGs from normal operations.

2.2.4.2.4 Criteria Air Contaminants

This project is expected to have a positive effect on Criteria Air Contaminants (CACs). SO_2 is the CAC of most concern to the refinery's operation. Current estimates indicate that there will be a 17% to 20% reduction in SO_2 emissions from normal operations as a consequence of this project. Estimates of expected reductions in other CACs have not been calculated, however it is expected that the reductions in NOx and particulates will be similar to those for SO_2 since they share the same reduction at source.

2.2.4.3 Resource Issues

Sections 2.2.4.3.1 and 2.2.4.3.2 address the project effects on water and energy usage at the refinery.

2.2.4.3.1 Water Usage

Water usage is anticipated to increase from 3.63 m^3 per minute to 5.23 m^3 per minute, and will be within the water use authorization by the Department of Environment and Conservation, which allows for the annual usage of 6.4 m^3 per minute.

The Canadian Petroleum Products Institute (CPPI) conducts benchmarking exercises on water usage for its members, and the refinery's usage is consistently low compared to other refineries across Canada, and will continue to be so after this project.

2.2.4.3.2 Energy Usage

This project will substantially reduce overall energy consumption at the refinery. Overall there will be a decrease of approximately 9.4% in energy requirements for the refinery as a result of this project. See Table 5 below.

- Our consumption of low sulphur fuel will decrease by about 19% from normal operations; this will be partially offset with an increase in fuel gas consumption for a net reduction in energy from this source of approximately 11.5%
- Electrical power requirement is anticipated to increase from 32 MW to 44 MW.

To compare the change in energy consumption for the refinery oil and electricity, fuel consumption has been converted to mega watts of electricity.

Table 5 Change in Energy Requirements

Energy Type	Before Project MW	After Project MW	Change MW
Refinery Fuel (fuel oil + fuel gas)	597	526	-71
Electricity	32	44	12
Total	629	570	-59

2.2.4.4 Decommissioning

North Atlantic has an approved decommissioning plan which has been submitted to the Department of Environment and Conservation in accordance with Article 26 of the Certificate of Approval. The components of this project will be covered by this plan.

2.2.4.5 Potential Resource Conflicts

There are no anticipated resource conflicts resulting from the operation of this project. From a socio-economic perspective, there will be increased economic activity in the region in the short term, and this project will ensure the sustainability of the refinery well into the future.

2.2.5 Occupations

2.2.5.1 Construction

The peak workforce during construction will be approximately 750 people. Estimates of occupation breakdowns for the project, along with the number of personnel required for each category and the appropriate National Occupational Classification (NOC) codes are listed in Table 6 below. The number of workers is an estimate of the maximum of each type that can be expected at any time, that is for either turnaround or non-turnaround activities.

Table 6 Occupations Breakdown

Occupation	NOC Code	Number of Workers
Direct Field		
Laborer	7611	39
Millwright	7311	49
Rigger	7611	33
Light vehicle driver	7414	2
Heavy vehicle driver	7411	5

Occupation	NOC Code	Number of Workers
Oiler	7612	1
Mechanic	7321	1
Light equipment operator	7421	4
Medium equipment operator	7421	2
Heavy equipment operator	7421	23
Pipefitter	7252	106
Pipe welder	7265	48
Cement finisher	7282	5
Carpenter	7271	17
Ironworker – rebar	7264	6
Ironworker – structural	7264	7
Welder – structural	7265	1
Boilermaker	7262	3
Instrument fitter	7612	12
Electrician – line	7244	5
Electrician – wiring	7242	113
Sheet metal worker	7261	12
Insulator	7293	35
Painter	7294	14
Foreman	7212/7213	58
	7214/7215	
	7216/7217	
Project construction superintendent	0711	4
Area superintendents	7212/7213	17
	7214/7215	
	7216/7217	
Indirect Field		
Field Superintendents		
Piping	7213	26
Instrumentation	7212	7
Electrical	7212	10
Civil	7217	5
Mechanical	7214	31
QC&A, Inspection	2141	11
Subcontract Administration		
Cost engineering	2141	8
Field engineering	2131/2132	6
Planning & scheduling	2141	3
Safety & medical	2263	9
Timekeeping & accounting	1432	12
Material controls supervisor	1474	9
Drafting	2253	4
Support personnel	1411/1413	13
Total		774

2.2.5.2 Employment and Gender Equity

North Atlantic believes that all employees should be treated fairly. North Atlantic promotes employment equity in the workplace to ensure that women, aboriginal peoples, persons with disabilities and visible minorities are fully represented at all levels of the organization. North Atlantic's employment equity program ensures that hiring and promotion practices are based on qualifications and ability.

2.2.6 Project Related Documents

The following studies have been commissioned directly in support of this project or are related to project activities:

- Air Dispersion study by SENES
- Distillate Hydrotreator Reactor Throughput Study by Axens
- Isomax Reactor Throughput Study by Shell Global Solutions
- Waste Water Treatment Plant Evaluation by Siemens Water Technologies Corp.

3.0 APPROVAL OF THE UNDERTAKING

This proposed undertaking will require provincial, federal and municipal authorizations. To ensure permitting compliance, a permitting registry has been developed to record and track permitting activities.

Permits and authorizations which may be required in relation to this proposed undertaking are listed below in Table 7.

Table 7 Approvals and Authorizations

Activity	Approval/Certificate/ License/Permit/Inspection	Legislation	Regulating Agency
Government of Newfoundland and Labrador			
Project Construction/ Commencement	Release from the Newfoundland and Labrador *Environmental Protection Act*, Part X, Environmental Assessment	Newfoundland and Labrador *Environmental Protection Act*, SNL 2002 c.E-14.2, Part X, Environmental Assessment	Environmental Assessment Division, NLDEC
	Certificate of Approval to Operate a Refinery	Newfoundland and Labrador *Environmental Protection Act*, SNL 2002	Pollution Prevention Division, NLDEC
Site Construction	Statutory Declaration for Registration of Boiler and Pressure Vessels Fittings Fabricated in Newfoundland and Labrador	*Boiler Pressure Vessels and Compressed Gas Regulation* under the NL *Public Safety Act*	NLDGS
	Certificate of Plant Registration for Power, Heat, Refrigeration Compressed Gas or Combined Plant	*Boiler Pressure Vessels and Compressed Gas Regulation* under the NL *Public Safety Act*	NLDGS
	Contractor's Licence – Pressure Piping System	*Boiler Pressure Vessels and Compressed Gas Regulations* under the NL *Public Safety Act*	NLDGS
	Examination and Certification of Welders and	*Boiler Pressure Vessels and*	NLDGS

Activity	Approval/Certificate/ License/Permit/Inspection	Legislation	Regulating Agency
	Blazers	*Compressed Gas Regulations* under the NL *Public Safety Act*	
	Compliance Standard -	Fisheries Act, Sec. 36 (3) Deleterious Substances	Environment Canada
Waste Management Related to Construction Activities	Waste Oil – Handling and Disposal	Newfoundland and Labrador *Environmental Protection Act*, SNL 2002 c.E-14.2, *Used Oil Control Regulations*	NLDEC
Garbage Disposal/Waste Management	Waste Management System, Certificate of Approval	Newfoundland and Labrador *Environmental Protection Act*, SNL 2002 c.E-14.2, Waste Disposal and Litter	NLDEC
Access Roads	Culvert Installation, Certificate of Approval, Application for Environmental Permit to Alter a Body of Water	Newfoundland and Labrador *Water Resources Act*, SNL 2002, c.W-4.01, Section 48	NLDEC
	Certificate of Approval for Stream Fording, Application for Environmental Permit to Alter a Body of Water	Newfoundland and Labrador *Water Resources Act*, SNL 2002, c.W-4.01, Section 48	NLDEC
	Permit for Access off any Highway	Newfoundland and Labrador *Urban and Rural Planning Act*, SNL 2000, c.0-8, Highway Sign Regulations	NLDMA
	Construction (Site Drainage) Certificate of Approval	Newfoundland and Labrador *Water Resources Act*, SNL 2002, c.W-4.01, Section 48	NLDEC
Stream Crossings/ Fording	Water Resources – Water Course Crossings, Certificate of Environmental	Newfoundland and Labrador *Water Resources Act*, SNL	NLDEC

Activity	Approval/Certificate/ License/Permit/Inspection	Legislation	Regulating Agency
	Approval	2002, c.W-4.01, Section 48	
Fuel Storage	Fuel Storage & Handling – Temporary Storage Remote Locations	Newfoundland and Labrador *Environmental Protection Act*, SNL 2002, c.E-14.2, Storage and Handling of Gasoline and Associated Products Regulations, 2003	NLDEC
	Fuel Storage & Handling – A Permit Flammable & Liquid Storage & Dispensing (above or below ground) & for Bulk Storage (above ground only)	Newfoundland and Labrador *Environmental Protection Act*, SNL 2002, c.E-14.2, Storage and Handling of Gasoline and Associated Products Regulations, 2003, and *Fire Prevention Act*, SNL 1991, c.34	NLDEC and NLDMA (Office of the Fire Commissioner)
Borrow Pits and Rock Quarries	Quarry Development Permit – A permit is required to dig for, excavate, remove and dispose of any crown quarry material	Newfoundland and Labrador *Quarry Minerals Act*, SNL 1999, c.Q-1.1	NLDNR, Mines Division
Handling and Transportation of Dangerous Goods	Permit to Transport	*Transport of Dangerous Good Act*	Transport Canada
Accidental Hazardous Material Spill	Report Mechanism/Response	Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances, and/or Marine Pollutants. TP9834E. under the *Canada Shipping Act*	DFO – Canadian Coast Guard
Communications	Application for License to Install and Operate a Radio Station in Canada	*Radiocommunication Act*	Industry Canada Communications

Activity	Approval/Certificate/ License/Permit/Inspection	Legislation	Regulating Agency
In stream Activities	Fish Habitat Authorization for Works or Undertakings Affecting Fish Habitat	*Fisheries Act*	DFO
	Application for a Water Lease	*Fisheries Act*	Transport Canada
Municipal Government			
Project Approval	**Compliance Standard/ Development Plan**		**Town of Come By Chance**
Waste Disposal	Approval to dispose waste in municipal landfill		Relevant municipality
Guidelines			
In addition, the Project will also need to comply with or consider the following guidelines:			
• DFO's Guidelines for Protections of Freshwater Fish Habitat in Newfoundland and Labrador (Gosse et al 1998)			
• DFO's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998)			
• Newfoundland and Labrador Department of Natural Resources' Environmental Guidelines for Construction and Mineral Exploration Companies			
• Newfoundland and Labrador Department of Environment and Conservation's Environmental Guidelines for General Construction Practices			
• Newfoundland and Labrador Department of Environment and Conservation's Guidelines for Culverts			
• Newfoundland and Labrador Department of Environment and Conservation's Guidelines for Diversions, New Channels, Major Alterations (1992)			
• Newfoundland and Labrador Department of Environment and Conservation's Environmental Guidelines for Water Course Crossings (1992)			

4.0 SCHEDULE

Pending final approvals and completed engineering and design, work will commence as early as the fall of 2010. The work will be undertaken in conjunction with regularly scheduled refinery turnarounds as appropriate. Current planning suggests that the project will be completed by the end of 2011.

5.0 FUNDING

The project will be funded entirely by North Atlantic.

August 19, 2010
Date

Signature of Chief Executive Officer

6.0 REFERENCES

AES (Atmospheric Environment Service). 1982. Canadian Climate Normals, Volumes 1-5. Environment Canada, Ottawa, ON.

Banfield, C. C. 1981. The climatic environment of Newfoundland. In: The Natural Environment of Newfoundland – Past and Present. A.G. Macpherson and J.B. Macpherson (eds.). Department of Geography, Memorial University of Newfoundland, St. John's, NF.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2002. Species Database. http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm

Damman, A.W.H. 1983. An ecological subdivision of the Island of Newfoundland. In: Biogeography and Ecology of the Island of Newfoundland. G.R. South (ed.). Dr. W. Junk Publishers, The Hague.

JWEL (Jacques Whitford Environment Limited (LeDrew, Fudge and Associates Limited)). 1990. Hibernia Development Project Field Survey Freshwater Resources Habitat and Water Quality. Prepared for Mobil Oil Canada Properties, St. John's, NF.

Meades, S.J. 1990. Natural Regions of Newfoundland and Labrador. Report prepared for the Protected Areas Association, St. John's, NF.

PAO (Provincial Archaeology Office). 2002. Archaeological Site Inventory, Culture and Heritage Division, Department of Tourism, Culture and Recreation, St. John's, NF.

SGE (Sheppard Green Engineering and Associates Limited). 1995. North Atlantic Refining Limited Terrestrial Effects Monitoring Program. Report prepared in association with G.R. Ringius and Associates for North Atlantic Refining Limited, Come By Chance, NF.

Appendix A

Correspondence between Sikumiut Environmental Management Ltd. and Government Regulators

Sikumiut
Environmental
Management Ltd.

Sikumiut
Avatiligijingita
Kamajingit

March 5, 2010

Mr. Bas Cleary
Director
Environmental Assessment Division
Department of Environment and Conservation
4th Floor, West Block
Confederation Building
St. John's, NL
A1B 4J6

Re: North Atlantic Refining Ltd.-Debottlenecking Project

Dear Sir;

North Atlantic Refinery Limited (NARL) in Come By Chance is currently embarking on a project known as a "Debottlenecking Project" at its facility which will see significant improvements in energy efficiency and throughput . As the word "debottlenecking" would imply, the project is designed to ensure that any constraints in the process are eliminated and the systems work at maximum energy and hydraulic efficiency. It is anticipated that construction on this project could begin in late 2010 or early 2011. NARL is currently undertaking a detailed analysis on the project, one component of which is environmental planning. For that aspect of the work, NARL has engaged Sikumiut Environmental Management Ltd. to provide environmental and permitting support for them.

The details of the individual work components of the project are described in the attached document as prepared by the overall project managers, SNC Lavalin. For the most part, the work involves internal modifications to process units and heaters to increase their efficiency through improved heat recovery and balance with no increase in footprint. In order to accomplish this, many existing pumps, heat exchangers, compressors and process vessels will require modification or replacement. There is only

175 Hamlyn Rd. P.O.Box 39089, St. John's, NL, A1E 5Y7 T (709)-754-0499 F (709)-754-1445

a minor requirement for an increase in footprint for several project components which will all be contained within the current area of the plant. The following facilities will require a minor new footprint:

- A new crude blending tank in the vicinity of the existing crude tank farm.
- A new flare stack, new knock out drums and a flare gas recovery unit which will reduce emissions and increase safety.
- A new sour water stripper will be installed which will increase the capacity of the facility to treat sour water that is generated in the process.
- A new oxygen supply unit to improve efficiency of the Sulfur Recovery Unit.
- New electrical substations to enable better process control.

The project will have a focus on energy efficiency with resultant Greenhouse Gas and Criteria Air Contaminants (SO_x, NO_x, etc.) reduction. Overall it is anticipated that there could be a reduction of heavy fuel oil consumption of approximately 15 - 20% as a result of this project.

We are aware that the facility is currently operating under a Certificate of Approval (AA06-055480) and a Compliance Agreement dated May 11, 2006, both issued by the provincial Department of Environment and Conservation. Please be assured that the initiatives proposed under the Debottlenecking Project will comply with and indeed, surpass, in some instances, the requirements of these documents.

As can be seen from the above, the activities proposed are significant from an energy perspective and as a result will have a positive impact on the environment through emissions reduction. Given as well the minor requirements for new facilities there will be no disturbance of new land for their construction as they will all be contained generally within the existing area of the facility (see attached plot plan).

Can you please review this information and advise whether there is a requirement for registration of this project under the Environmental Assessment process. If you or

technical staff within the Department wish to have a briefing on this project, it can be arranged at your convenience.

Ken Dominie

Ken Dominie, P.Eng.
Environmental Policy Advisor

c.c. Roger Bennett

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Environment and Conservation
Environmental Assessment Division

March 17, 2010

File Ref No. 200.20.1709

Mr. Ken Dominie
Environmental Policy Advisor
Sikumiut Environmental Management Ltd.
175 Hamlyn Rd.
PO Box 39089
St. John's, NL A1E 5Y7

Project: **North Atlantic Refining Ltd. – Debottlenecking Project**
Location: **Come By Chance, NL**

Dear Mr. Dominie;

Your letter dated March 5, 2010 and associated documents were reviewed by this Department and it has been determined that registration is required under Section 45 (1) of the Environmental Assessment Regulations, 2003.

The construction of a petroleum storage tank with a capacity of more than 2 million litres requires registration. Not withstanding this requirement and the proposed significant improvements in energy efficiency and reduction in emissions, there is the potential of change to the air dispersion characteristics that may need to be examined. This information should be contained in your registration document.

The attached booklet entitled Environmental Assessment: A Guide to the Process provides the registration format and other information to assist you. Also enclosed for your guidance is a draft permit listing to be consulted when completing your registration document.

Please be aware that under provisions of the Environmental Protection Act, SNL 2002, ce-14.2, the undertaking may not proceed and other government agencies may not issue any required authorizations until a decision is rendered by the Minister. A decision by the Minister will be provided to you within 45 days following receipt of your registration.

If you have any questions regarding this matter please contact Brent Keeping at 709-729-4223, toll free at 1-800-563-6181 or email bkeeping@gov.nl.ca.

Sincerely,

Bas Cleary
Director
Environmental Assessment

cc: Derrick Maddocks, Pollution Prevention Division

Sikumiut
Environmental
Management Ltd.

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Avatiligiingita
Kamajingit

March 29, 2010

Mr. Mike Atkinson
Canadian Environmental Assessment Agency
1801 Hollis St.
Halifax, Nova Scotia
B3J 3N4

Re: North Atlantic Refining Limited-Debottlenecking Project

Dear Sir;

As per our brief telephone conversation this letter will serve as an introduction of a project currently being planned by North Atlantic Refining Limited (North Atlantic) and to inquire as to whether it triggers the Canadian Environmental Assessment Act.

North Atlantic is embarking on a Sustainability project known as a "Debottlenecking Project" at its facility which will see significant improvements in energy efficiency and throughput. As the word "debottlenecking" would imply, the project is designed to improve energy and hydraulic efficiency by removing process constraints with the existing facility configuration. It is anticipated that construction on this project could begin in late 2010 or early 2011.

North Atlantic is currently undertaking a detailed analysis on the project, one component of which is environmental planning. For that aspect of the work, North Atlantic has engaged Sikumiut Environmental Management Ltd. to provide environmental and permitting support for them.

The details of the individual work components of the project are described in the attached document as prepared by the overall project managers, SNC Lavalin. For the most part, the work involves internal modifications to process units and heaters to

increase their efficiency through improved heat recovery and balance with no increase in footprint. In order to accomplish this, many existing pumps, heat exchangers, compressors and process vessels will require modification or replacement. There is only a minor requirement for an increase in footprint for several project components which will all be contained within the current area of the plant. The following facilities will require a minor new footprint:

- A new crude blending tank in the vicinity of the existing crude tank farm.
- A new flare stack, new knock out drums and a flare gas recovery unit which will reduce emissions and increase safety.
- A new sour water stripper will be installed which will increase the capacity of the facility to treat sour water that is generated in the process.
- A new oxygen supply unit to improve efficiency of the Sulfur Recovery Unit.
- New electrical substations to enable better process control.

The project will have a focus on energy efficiency with resultant Greenhouse Gas and Criteria Air Contaminant (SO_x, NO_x, etc.) reduction. Overall it is anticipated that there could be a reduction of heavy fuel oil consumption of approximately 15 - 20% as a result of this project.

The activities proposed are significant from an energy perspective and will have a positive impact on the environment through emissions reductions. As well there are only minimal requirements for new facilities and, to the extent that some land is required for their construction they will all be contained generally within the existing area of the facility (see attached plot plan).

We met with local Environment Canada officials (Kevin Power and Charles Maclean) a short while ago to discuss this project with them. They were not aware of any aspect of this project that would trigger CEAA but they advised us to contact you directly, hence this communication.

Can you please review this information and advise whether there is a requirement for registration of this project under the Canadian Environmental Assessment Act. If you or technical staff within CEAA need ay further information on this project, please do not hesitate to contact me at your convenience at ken.dominie@sikumiut.ca or at phone number (709) 754-0499.

Ken Dominie

Ken Dominie, P.Eng.
Environmental Policy Advisor

c.c. Roger Bennett

Canadian Environmental Assessment Agency
Halifax, Nova Scotia
B3J 3N4

Agence canadienne d'évaluation environnementale
Halifax (Nouvelle-Écosse)
B3J 3N4

16 April, 2010

Ken Dominie, P. Eng.
Environmental Policy Advisor
Sikumiut Environmental Management Ltd.
P.O. Box 39089
St. John's, NL A1E 5Y7

CEAA File : 2010-0123

Dear ~~Mr. Dominie~~ Ken:

Re : North Atlantic Refining Limited – Debottlenecking Project

Mike Atkinson has requested that I reply to your letter of March 29, 2010 inquiring whether the proposed Debottlenecking Project is subject to environmental assessment pursuant to the *Canadian Environmental Assessment Act*.

I have reviewed the material you provided and have concluded there are no required federal powers, duties or functions in relation to the project that would trigger the federal environmental assessment process.

Thank you for bringing this project to the Agency's attention.

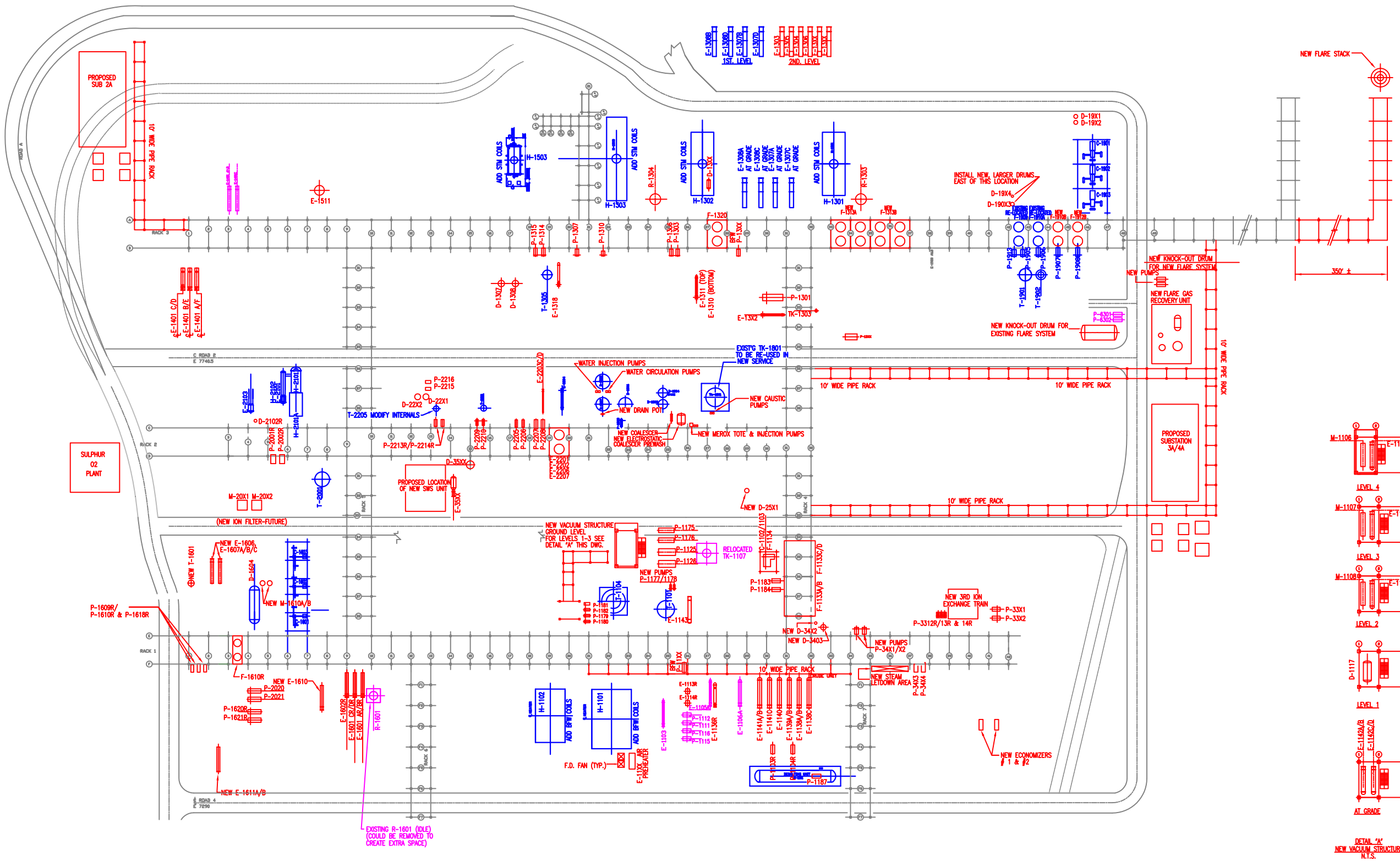
Yours truly,

William A. Coulter, P. Eng.

cc: Mike Atkinson

Appendix B

Process Area Plot Plan showing affected areas



General Notes

1. NOMINAL GRADE ELEVATION IS 99'-6" (EQUALS SITE EL 115'-0").
2. HIGH POINT OF FINISHED PAVING EQUALS 99'-6".
3. UNDERSIDE OF ALL PUMPS AND EQUIPMENT BASE PLATES EQUALS 100'-0" UNLESS STATED OTHERWISE.
4. STRAINERS N-1101,02,03,04,05,06,07,08,09,10,11,12,13 & 14 ARE NOT SHOWN FOR CLARITY.

PRELIMINARY
UNCHECKED
FOR INFORMATION

LEGEND:

RED - NEW

BLUE - MODIFY

MAGENTA - EXISTING EQUIPMENT RELOCATED

PROFESSIONAL SEAL:

WELD STAMP INFORMATION:
CODE / WELD SPEC:
ROOT: FILLER:
PREHEAT: PWHT:
NDE:

DOCUMENT CONTROL:

Q.C. INSPECTOR / ENGINEER:

REV	DATE	BY	CHK'D	APP'D	W.O.# PROJ#	REVISION DESCRIPTION
PB					P-3219/347378	ISSUED FOR INFORMATION

NORTH ATLANTIC REFINING LIMITED
P.O. BOX 40, COMEBY CHANCE, NL
CANADA A0B 1N0 (709) 463 8811

DRAWING TITLE:

PROCESS AREA EQUIPMENT LAYOUT

PROJECT NUMBER	
347378	
SNC-LAVALIN DRAWING NUMBER	
347378- 0000 - 46D2 - 0001	
ELECTRONIC FILE NAME	REV
347378-0000-46D2-0001	PB

W.O. / PROJ No:	DRAWING No:	SCALE:	REV:
7370/2135	347378-0000-46D2-0001	NTS	PB

FNAME
REVDATE
USER

Appendix C

List of Acronyms

List of Acronyms

Acronym	Meaning
ARU	Amine Regeneration Unit
BFW	Boiler Feed Water
bpd	Barrels per day
BPSD	Barrels per stream day
CAC	Criteria Air Contaminant
CCCW	Closed Circuit Cooling Water
CDU	Crude distillate unit
CEAA	Canadian Environmental Assessment Act
CLC	Community Liaison Committee
DCS	Distributed control system
DEA	Diethanolamine
DFO	Department of Fisheries and Ocean
DHT	Distillate Hydrotreater
EEM	Environmental Effects Monitoring
FG	Fuel gas
FTE	Fault-tolerant ethernet
GHG	Green House Gas
GPM	Gallons per minute
HP	High pressure
SHE	Safety, Health and Environment
ISBL	Inside Battery Limits
k/o	Knock out
Kbbls	Thousand barrels
LCN	Local control network
LER	Light Ends Recovery
LP	Low Pressure
LPG	Liquefied petroleum gas
LTPD	Long tons per day
MDEA	Methyl diethanolamine
MMSCFD	Million standard cubic feet per day
N/A	Not Applicable
NA	North Atlantic
NHT	Naphtha Hydrotreator
NLDEC	Newfoundland and Labrador Department of Environment and Conservation
NLDGS	Newfoundland and Labrador Department of Government Services
NLDMA	Newfoundland and Labrador Department of Municipal Affairs
NLDNR	Newfoundland and Labrador Department of Natural Resources
NOC	National Occupational Classification
OSBL	Outside Battery Limits
ppmw	Parts per million by weight

PSV	Process Safety Valve
RFO	Refinery Fuel Oil
SRU	Sulphur Recovery Unit
SWS	Sour Water Stripper
TW	Tempered Water
ULSD	Ultra low sulphur diesel
VGO	Vacuum gas oil
WWTP	Waste Water Treatment Plant