2.9 Environmental Management

2.9.1 Environmental Protection Plan

An Environmental Protection Plan (EPP) will be developed for the construction phase of the Project in accordance with applicable federal and provincial regulatory, permitting and licensing requirements. In addition to incorporating environmental design features into Project design, an EPP will be developed separately for the construction, operations and decommissioning phases of the Project.

The EPP will outline all environmental protection measures to be implemented during each phase of the project. It will be used in the field and will contain the following information:

- Responsibilities of NLNG and all site personnel;
- Purpose, organization and maintenance of the EPP including contractors and subcontractors;
- Specific mitigation measures to be implemented during routine and non-routine construction, operations and decommissioning and abandonment activities;
- Contingency plans for accidental events;
- List of permits, approvals, authorizations and key personnel to be contacted in the case of an emergency.

2.9.1.1 Purpose

The EPP is the foundation for implementing environmental protection measures during the construction and subsequent phases of the Project. It will provide documentation of general and site-specific environmental protection procedures allowing performance to be readily assessed. If required, additional corrective measures will be implemented. The EPP is a working document for use in the field for project personnel and contractors, as well as at the corporate level. The EPP ensures that the Proponent's commitments are implemented and monitored. It is intended to provide a quick reference for project personnel and regulators to monitor compliance.

2.9.1.2 Implementation

An EPP will be implemented for each phase of the Project, including construction, operations and decommissioning and abandonment, 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. The EPP will be prepared to allow for updates and revisions as engineering design and work methods are further defined. The Proponent will review and approve each EPP and revision.

All Issued for Construction (IFC) drawings will contain environmental considerations and/or EPP notation boxes identifying 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 used on drawings to highlight important environmental protection measures relevant to given construction activity (e.g., buffer zones, stream crossings, etc.).

2.9.1.3 EPP Content

The EPP is designed for use in the field to provide an important support document 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 of the EPP provides an introduction, responsibilities of project personnel and implementation procedure.

Section 2 of the EPP provides an overview of environmental concerns and standard environmental protection measures associated with a variety of specific activities anticipated to occur in relation to each specific phase. Standard environmental protection procedures will be developed for:

- Clearing of vegetation;
- Grubbing and disposal of related debris;
- Excavations, embankment and grading;
- Installation of LNG pipeline from pier to storage tanks;
- Watercourse crossings;
- Blasting;
- Stringing, ditching, pipe installation and backfilling;
- Hydrostatic testing;
- Cleanup and re-vegetation;
- LNG facility operations;
- Access management;
- Fisheries protection;
- Erosion prevention;
- Waste management plan;
- Description of effects of wastes and hazardous materials;
- Handling, storage, use and disposal;
- Buffer zones;
- Dust control;
- Trenching;
- Dewatering – work areas;
- Marine vessels;
- Pumps and generators;
- Noise control;
- Groundwater development and use;
- Drilling – Geotechnical/Water well/marine;
- Concrete production;
- Linear developments;
- Vehicular traffic;
- Works in/around marine environment;
- Surveying;
- Equipment operations;
- Miscellaneous – Others.

Section 3 of the EPP references key sources of information for the purposes of HS&E performance including, for example, Department of Fisheries and Oceans (DFO) fact sheets and a list of Proponent's background technical data reports compiled during the environmental assessment.

Section 4 of the EPP provides contingency plans for:

- Spill prevention measures;
- Fire contingency plan;
- Spill contingency plan;
- Emergency response;
- Accidents and Malfunctions;
- Wildlife Encounters;
- Discovery of Historic Resources;
- Forest Fires; and
- Vessel Accidents.

Section 5 of the EPP provides the names and numbers of key contacts for the project.

Section 6 of the EPP contains the site-specific EPPs for the principal work areas for construction. These areas include:

- Marine Facilities;
- LNG Storage Tanks;
- Access and Service Roads;
- Site Utilities (water supply, firewater, power, etc.).

Site-specific EPPs will be updated as needed throughout the various phases of the Project as engineering design, work methods and overall schedule progress. The site-specific EPPs contain information on local environmental issues and concerns; potential effects and sensitive areas/periods; general environmental protection measures; relevant drawings and documents; and a listing of applicable permits, approvals and authorizations and associated compliance monitoring requirements.

2.9.2 Public Awareness & Communication

This section by Hawco Communications

2.9.3 Emergency Response Plan for Operations

The purpose of the Emergency Response Plan (ERP) is to document the procedures to be used in an emergency. The ERP will be developed with input from employees and local, provincial, and national authorities and finalized before start-up. The ERP will meet the requirements of Canadian Standards Association CSA-Z276-07 Liquefied Gas (LNG) – Production, Storage and Handling and will be consistent with the Environmental Emergency Regulations of the Canadian Environmental Protection Act. The ERP will include but not be limited to the following:

a) Procedures for responding to controllable emergencies
b) Procedures for recognizing non-controllable emergencies

c) Procedures for coordinating with appropriate local emergency and government agencies in preparation for emergency responses to protect the general public

Subject to discussions with the Arnold's Cove Fire Department, Provincial Department of Municipal Affairs Emergency Measures Organization (EMO) and the Provincial Office of the Fire Commissioner, the following ongoing activities will be proposed to ensure operational effectiveness of the ERP implementation:

a) Annual training with local agencies with regard to emergency response to LNG spill and/or fire. (This will include tour of plant facilities and familiarity of fire protection equipment.)
b) Emergency protocols regarding notification, communication, staging area, available resources, community evacuations, etc.
c) Coordination of command and control for first response
d) Annual orientation/ pre-planning training sessions for first responders at local fire stations and on-site emergency response personnel.

The ERP is a crucial planning and training tool for every LNG facility as it documents the procedures to be used in an emergency. The objective of the procedures is to protect human health, environment and the facility. The ERP will include a notification list, summary of reporting, and inventory and location of spill kits and safety equipment.

2.9.3.1 General Response to Emergencies

During an emergency, there is no replacement for the judgment of the first responder(s). In general, the priorities for the first responder(s) include:

- Evaluate the situation
- Notify others that may be in immediate danger
- Notify the control room/shift supervisor
- Take immediate mitigating steps if such steps can be performed safely
- Activate the appropriate emergency shutdown (ESD) if necessary
- Remove and attend to injured personnel
- Call for outside help/equipment if needed

2.9.3.2 Control Room Personnel Response

Control room operators are capable of monitoring large amounts of process information simultaneously due to the instrumentation and computer systems at their disposal. They also monitor hazard detection instruments and remote cameras. The operator, along with the shift supervisor if immediately available, will be required to quickly evaluate an abnormal or emergency condition and either shutdown the system or take other appropriate action. An emergency shutdown system, (ESD), which will quickly shutdown the process and set the systems to a safe state will be included among the facility's engineering controls. Control room personnel will also make notifications as appropriate to emergency and government agencies.

2.9.3.3 Responding to a Minor Spill or Leak

LNG as a cryogenic process fluid and the liquefaction system refrigerant must be contained by special metals that maintain their ductility at very low temperature. Cryogenic leaks must be stopped (closing valves) immediately or controlled to the extent possible (spraying water to vaporize liquid) to minimize the hazard. If a spill, even a small one, is impacting carbon steel structural supports, for example, brittle failure of the structural element is possible. Therefore, a first response to a small cryogenic spill might simply include deflecting (using wood, cardboard, sheet metal, etc.) a stream off a non-cryogenic-capable piece of equipment.

LNG in liquid form will not burn, but the vapor that emanates from a spilled pool of LNG will have a flammable region. The size of the flammable region will depend on the spill rate, pool surface area, underlying surface, and atmospheric conditions. If there is an ignition source downwind of a spill this adds urgency to and elevates the potential seriousness of an LNG spill. If time permits, portable flame detectors should be used to determine the extent of the flammable zone. All fired equipment in this facility will be equipped with ESD capability.

2.9.3.4 Responding to an Uncontrollable LNG Spill

If a very large spill occurs, the facility will activate the ESD system and evacuate. The ESD system will isolate and purge necessary equipment and systems in the facility. The LNG tanks will be surrounded by dike impoundments capable of holding the entire tank's contents. If an evacuation is necessary, the risk to the people near the facility will be mitigated by the automated and fail-safe systems.

High wind speeds help dissipate gas vapors in shorter distances than low wind speeds. However, if vapor within the flammability range reaches an ignition source, the gas will be ignited and will burn back to the source.

In the event of an uncontrollable LNG spill, plant personnel will activate the ESD, evacuate the plant, take head count, notify local emergency and government agencies, coordinate with local emergency agencies appropriate response for local community, and establish a command center outside of the hazardous area.

2.9.3.5 Relief Valves

Maintaining the operating pressure of the process fluid within the system's design limits is accomplished with the aid of operating procedures and engineered control systems. However, in case these systems fail, backup systems, pressure safety valves (PSV), pressure make-up system and vacuum breakers will be installed to safely relieve the pressure or vacuum as needed. PSV's and vacuum breakers will not activate during normal operation. These devices are carefully designed and tested. Redundancy or over-capacity is usually included in PSV/vacuum breaker design. If one of these devices operates, plant personnel will investigate to determine the cause of the process pressure excursion so that corrective action, if needed, can be implemented.

2.9.3.6 LNG Leaks

LNG leaks can be very small, fugitive emissions from a flange for example, to very large leaks as discussed in section 2.9.3.4. Generally, operations will be shutdown if a leak is large enough to create a flammable vapor zone near a potential ignition source. Also,

some hazard detection instruments will shut down the process upon detection of a leak. An example would be a Lower-Flammability Limit (LFL) detector on the air intake of the vaporizers.

If an ESD is initiated, preventive fire protection measures will be taken and the plant will not be re-started until the situation has been rectified and deemed safe for start-up.

2.9.3.7 Operator Error

There will be many automated systems and controls installed throughout the LNG transshipment facility. These systems will be designed to prevent operation outside the intended design limits of the plant. Operating procedures will be developed and operators will be trained on both the procedures and equipment. However, operator error is still possible and can occur in industrial facilities and possibly lead to an emergency situation. The systems just mentioned are designed to prevent such an occurrence. Other features of the facility, including dike impoundments, emergency shutdown system, hazard detection instruments, and the emergency response plan, are designed to mitigate events if the preventive measures fail.

If operator error occurs, there will be an incident investigation and follow-up program. Any incident (accident, spill, unintended process condition, or near-miss) will be investigated to identify its root cause. Appropriate corrective action will be implemented. Corrective action may include additional training, changes to procedures, changes or additions to engineering controls, and others.

2.9.3.8 Control System Malfunction

The LNG Terminal will be designed to shutdown in a failsafe manner due to upset conditions. The terminal will be designed to protect against high pressure, high and low temperatures and low flow conditions as necessary to ensure safe operations. Terminal siting and LNG impoundments will minimize impacts to adjacent properties in the event of major failures. The control system will provide for nearly automatic operation once the system is in a normal operating mode. Instrumentation that monitors process conditions (temperature, level, flow, pressure, etc.) will feed back information to the facility's computerized control system.

When process conditions vary from set-point or approach operating limits, the control system will make adjustments via process control elements (most often control valves, variable-speed motors, or start/stop motors) to correct the deviation or warn the operator via an alarm so that corrections can be made. It rarely occurs, but control system components can fail or be misused. If the control system malfunctions and conditions warrant, the terminal will be shutdown manually by activating the ESD system and control valves and motors will go to a fail-safe mode due to loss of control signal. The incident would then be investigated and corrective action taken before the system is re-started.

2.9.3.9 Forces of Nature

The design codes and standards applicable to an LNG facility are numerous. The structural, mechanical, and civil designs will incorporate seismic requirements based on the areas seismic and geologic history. The facility will be designed for an operating

basic earthquake (OBE) and a safe shutdown earthquake (SSE). The OBE is of lower magnitude than an SSE. The OBE is an earthquake for which the plant will sustain no significant damage and can be safely restarted after the event. The SSE is an earthquake for which all containment systems must maintain process containment. If an earthquake greater than the OBE occurs, the facility will have to be inspected and evaluated before restart.

Wind forces or snow loading on a large structure such as an LNG tank or ship can be significant. Codes and standards, such as the National Building Code of Canada, list design wind speeds specific to geographic area. The 100-year mean recurrence interval should be used to determine design wind speeds. The LNG tanks and other equipment, structures, and buildings will be designed according to the National Building Code of Canada, American Petroleum Institute (API) recommended practices, Canadian Standards Association (CSA) standards, American Society of Mechanical Engineers (ASME) codes, American Concrete Institute (ACI) standards, and others as applicable.

2.9.3.10 Activities Adjacent to the Facility

There is a petroleum terminal to the North of the proposed LNG transshipment terminal. The remaining property is surrounded by water. To the East-Northeast, there is a small community, Arnold's Cove. The impact of adjacent activities on the LNG transshipment facility operation will be negligible. Since ships will arrive and depart from both the petroleum terminal and the LNG transshipment facility, some traffic coordination by the pilot's association will be required.

The land areas immediately adjacent to the restricted access area of the LNG transshipment facility will be maintained to minimize the threat of a forest, grass or brush fire reaching the LNG storage or process area. The facility will also have a firewater system in place to provide fire protection and will be available for use by local fire departments for water supply.

2.9.3.11 General Fire Fighting Technique

Fire protection systems will be installed throughout the LNG transshipment facility. The extent and content of the systems will depend on an evaluation based on sound fire protection engineering principles. All operating, maintenance, and other personnel (as appropriate), will receive firefighting training with emphasis on the special requirements for LNG fires. The following are some of the topics likely to be covered in that training:

- Water – Water can be used to help disperse a vapor cloud or to cool adjacent equipment during an LNG fire. However, water should not be sprayed into a pool fire since this will only serve to increase the evaporation rate of LNG and increase the fire's intensity.
- Foam – Foam generators can be used on pool fires to reduce thermal radiation, or on large spills to inhibit vapor generation.
- Portable Extinguishers – Dry chemical extinguishers are effective on small LNG fires.
- Extinguish or let it burn – In some cases, if the source of the fuel to the fire can't be stopped, it is better to let the fire burn. If the fire is extinguished, care must be

exercised to avoid re-ignition of vapors. Where possible and appropriate, attempts to stop the fuel source will be made before the fire is extinguished.
- Personal Protective Equipment (PPE) – Clothing and other PPE appropriate for fire fighting will be available at the site and personnel will be trained in its use.

2.9.3.12 Reporting Safety Related Conditions

All employees will be trained in the recognition of unsafe conditions and incident recognition. Unsafe conditions may involve security vulnerabilities, tripping hazards, unsafe work practices, or mechanical integrity problems associated with the process equipment. Incidents include accidents, leaks, spills, near-misses, unsafe acts, missed or late calibration/inspection of safety devices, material failure or defects, operator errors, short-cut of procedures, housekeeping etc.

2.9.3.13 Offshore Safety Procedures

The LNG shipping industry has an excellent safety record. However, marine safety procedures adopted by Newfoundland LNG Ltd and Transport Canada will be developed to minimize the risks of an LNG tanker spill throughout the life of the facility.

Written by the International Maritime Organization (IMO), the International Ship and Port Facility Code was enacted in 2004 to improve shipping security and to prevent or suppress terrorist attacks. This code holds that ship and port security is basically a risk management process. Therefore, each situation requires a security assessment specific to the location and type of shipping activity. The requirements for ships include: ship security plans, ship security officers, specific on-board equipment. For ports, requirements include: port facility security plans, port facility security officers, and specific equipment. The Grassy Point LNG Transshipment facility will comply with the requirements of this code and national and provincial shipping-related laws and codes.

The final safety and security plan will be developed later in the design of this project. However, consideration for customs and immigration issues, tug operations, exclusion zones around the ship and dock area, escorts, weather, and appropriate authority notifications concerning ship arrivals/departures will be included in the safety/security plan for near-shore shipping.

Steps to ensure the safe operation of the dock and pier area will be enacted. An operating manual focused on safe marine operations will be developed and included in applicable operator training. Operators assigned to or responsible for marine-related transfer operations will also receive hands-on training for the equipment and electronic systems they will operate. The Coast Guard, Transport Canada, local pilot's association, tug operators, port authorities, and others, as applicable, will be asked for input for the operating manual. Examples of considerations and references include: SIGTTO manual Liquefied Gas Handling Principles on Ships and in Terminals, 3rd edition (2000), rapid phase transition (RPT) associated with LNG spills onto water, ship-to-shore grounding, mechanical hookup of articulated arms, ship-to-shore communication, pre-arrival checklists, electronic shutdown umbilical system, pilot and tug coordination, mooring, pre-cargo-transfer checklist, and post-transfer checklist and inspections. Procedures will include emergency response. Training on the hazard detection and other safety-related systems will be included in the operator training program.

2.9.4 Marine Terminal Manual

A marine terminal manual will be developed based on national and international regulations and codes of practice. The manual will outline the safety standards and operational procedures to be used by vessels utilizing the facility. The manual will be reviewed by the Canadian Coast Guard, Transport Canada and the regional Pilotage Association. Comments from the reviewing bodies will be incorporated into the manual. The manual will be distributed to vessel operators, masters and pilots.

The manual will provide information on the facility including:

- Description of facility including:
    - Contact numbers
    - Location coordinates
    - Bathymetry
- Environmental data including:
    - Wind directions and speed
    - Temperatures
    - Visibility
    - Waves
    - Tides and currents
- Support equipment and services available
- Communication protocol
- Navigation and mooring operations
- Berth Equipment
- Safety regulations
- Cargo and Ballast operations
- Emergency procedures