Sakhalin-2 Phase 2 Project
Environmental Audit of
LNG Plant

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Sakhalin-2 (Phase 2) Project Finance Parties

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List of Abbreviations

ALARP	As Low As Reasonably Practicable
AOC	Accidentally Oil Contaminated
COC	Continuously Oil Contaminated
EOF	Entirely Oil Free
ETP	Effluent Treatment Plant
HDPE	High-density polyethylene
HSEMS	Health, Safety and Environmental Management System
HSESAP	Health, Safety, Environment and Social Action Plan
IEC	Independent Environmental Consultant
LNG	Liquefied Natural Gas
LRQA	Lloyd's Register Quality Assurance
MDEA	Methyldiethanolamine
MEG	Monoethylene glycol
MR	Mixed Refrigerant
MSDS	Material Safety Data Sheet
ODP	Ozone Depleting Potential
OET	Oil Export Terminal
OPF	Onshore Processing Facility
OSR	Oil Spill Response
OSRP	Oil Spill Response Plan
OVID	Offshore Vessel Inspection Database
PCBs	Polychlorinated Biphenyls
PMR	Parallel Mixed Refrigerant
PPE	Personal Protective Equipment
PTW	Permit To Work
RF	Russian Federation
RoW	Right of Way
Sakhalin Energy	Sakhalin Energy Investment Company Ltd
SPZ	Sanitary Protection Zone
QMS	Quality Management System
WHO	World Health Organisation

Executive Summary

ENVIRON UK Limited, acting in the role as the Lenders' Independent Environmental Consultant (IEC) for the Sakhalin 2 oil and gas project (the 'Project'), visited the Project in September 2011 to audit certain Project facilities in accordance with the Lenders' loan agreement. This report presents the findings of an audit performed of the Liquefied Natural Gas (LNG) plant. The environmental audit assessed the Company's compliance with material environmental law and the Sakhalin Energy Health, Safety, Environment and Social Action Plan (HSESAP). The auditors would like to thank the auditees for their assistance with the audit.

Overall ENVIRON considers that environmental performance at the LNG plant is very good. There is a robust and well implemented HSE management system and there is evidence of a strong HSE culture at the facility. There was a good level of compliance with environmental law and the requirements of the HSESAP with the following exceptions:

- Water use
  - Sakhalin Energy is currently facing enforcement action from the Federal Service for Supervision of Natural Resources for breaches of its water use permit, relating to the abstraction of groundwater.
- Waste management and minimisation
  - There is inadequate secondary containment in the overflow waste storage area outside Building 10 (there is a hole in the bund wall). This issue was also highlighted in the last IEC monitoring visit report, dated April 2010.
  - Labelling was non-existent or poor on several waste containers holding solid and liquid wastes outside the site canteen.
  - Containment of general waste and waste cooking oil outside the canteen does not meet HSESAP requirements (a general waste bin had no cover, and concrete staining indicates leakage from the drums of waste oil).
  - Waste lube oil is sent to an off-site recycling facility rather than blended into the crude system.
  - Excessive packaging waste is generated (e.g. plastic water bottles) when the facility could use its potable water supply for drinking.
  - Some recyclable waste streams (e.g. paper and plastic) are currently disposed of via landfill, but efforts are ongoing to secure contracts with recycling companies.
- Storage of hazardous materials
  - Drip trays under diesel storage tanks in the wastewater treatment plant construction area were undersized and one drip tray had two holes in its base.
  - MSDS documents were absent or only available in one language in the chemical storage warehouse.
  - Labelling of some chemical containers was inadequate.
  - Some drums of chemicals were noted outside the chemical store with no secondary containment.

In addition, a number of recommendations to improve performance have been highlighted in this audit report, including:

- Provision of a low ramp would allow vehicle access to the waste storage area outside Building 10, whilst retaining adequate secondary containment. This would allow faster and easier access, minimising manual handling risks.
- Provision of a roof over the waste storage area outside Building 10 would minimise the volume of potentially contaminated runoff requiring treatment and disposal.
- Although the use of R22 in domestic-sized equipment is permitted by Sakhalin Energy it is recommended that alternatives are considered (R417A is a drop-in replacement for R22 and has an ODP of zero).

1 Introduction and Audit Scope

ENVIRON UK Ltd (ENVIRON) is the Independent Environmental Consultant (IEC) acting on behalf of the Lenders to the Sakhalin-2 Phase 2 project (the 'Project'). Under the Terms of Reference of our engagement, ENVIRON and Lender representatives undertake periodic monitoring visits and audits of the Project. This report details the findings of an audit of the LNG plant undertaken by Alan Fowler of ENVIRON and Helen Yip of AEA Technology from 29th September to 3rd October 2011.

More specifically, ENVIRON has conducted a Level 1 audit in accordance with paragraph 4.6.3 of the Common Terms Agreement which, amongst others, allows for bi-annual audits of the project facilities. In accordance with the Terms of Reference issued by Sakhalin Energy in September 2011 '*the audit shall review the Company's compliance with material Environmental Law, Environmental Consents, Project Expansion Environmental Consents and/or Interim Environmental Permissions and the HSESAP'.*

The audit covered the Liquefied Natural Gas (LNG) plant, which forms part of the Prigorodnoye Production Complex. It included the production process, storage of LNG, offloading to LNG tankers via a jetty, and all ancillary and service areas (e.g. water and wastewater treatment and electricity generation).

The audit was planned and executed in accordance with the requirements of the relevant international standard (Guidelines for Quality and/or Environmental Management Systems Auditing, ISO 19011:2002). Three days were spent at the LNG plant to complete the following tasks:

- Site Inspection: A brief orientation tour of the facility, followed by detailed inspections of areas of interest including:
  - the waste management area;
  - storage of chemicals, oils and fuel;
  - wastewater treatment facilities; and
  - the construction site (new wastewater treatment plant).
- Interviews: Meetings with senior management, HSE Department personnel and selected other staff and contractors.
- Document Review: Many documents were reviewed on-site and others were scrutinised after the site audit. These included HSE plans and procedures, monitoring data and various environmental records.

Specific attention was given to:

- the adequacy and implementation of EHS Management Systems;
- air emissions and air quality;
- water usage and wastewater management;
- waste management;
- hazardous materials;
- emergency response;

Elements of the HSESAP considered outside of the scope of this audit are summarised below:

- Road Transport HSE Management;
- Loss Prevention in Design and Construction Specification;
- Land Management; and
- Social Performance.

2 Overview of the LNG Plant

2.1 Description of the Facility

The LNG plant consists of two LNG trains that were designed to meet international best practice at the time of construction in 2004 to 2008.

The LNG plant comprises the following five distinct onshore areas:

1. Two liquefaction trains and their common facilities (with provision for a third liquefaction train).
2. Two LNG storage tanks located to the west of the liquefaction trains.
3. An LNG loading jetty extending 850 m into Aniva Bay, with two parallel loading lines.
4. Technical service and administration buildings, canteen and training centre, fire station, workshops, first aid facilities, laboratory and control room located to the north of the common facilities/utility area.
5. Flare area, located to the south of the liquefaction trains.

Feed gas supplied to the LNG plant consists of a mixture of associated gas from the Piltun-Astokhskoye (P-A) field and non-associated gas from the Lunskoye field. Gas from both fields is first processed in the Onshore Processing Facility (OPF), where the gas is dehydrated to meet the pipeline specification. From the OPF, the gas is routed via a 630km long 48" (1219 mm) diameter single pipeline to the LNG plant. The OPF and pipeline to the LNG plant were outside of the scope of this audit.

Feed gas arriving from the OPF is metered before being split into two parallel LNG trains. Each LNG train comprises:

- An acid gas removal unit (Sulfinol-D and Active MDEA processes) to remove acid gases (mainly carbon dioxide (CO_2) with trace amounts of hydrogen sulphide (H_2S)) from feed gas. The removed acid gas, containing some hydrocarbons co-absorbed by the solvent is routed to an incinerator.
- A molecular sieve unit to dehydrate the feed gas.
- A guard bed of sulphur-impregnated activated carbon to remove any mercury that may be present in the feed gas.
- A Double Mixed Refrigerant Liquefaction Unit to liquefy the gas using two separate mixed refrigerant cooling cycles. One cycle is for pre-cooling of the gas to approximately –50ºC (PMR cycle), and the other for final cooling and liquefaction of the gas (MR cycle) to below –160ºC.
- A fractionation unit to produce refrigerant grade ethane and stabilised condensate.

LNG produced by the two trains is transferred to two double-walled storage tanks of 100,000 m³ net capacity each and exported via a dedicated tanker loading facility. A collection and compression system is provided to recover boil-off gases generated during storage and loading for use as plant fuel. Condensate produced in the LNG trains is exported to the adjacent oil export terminal (OET).

LNG is stored and then exported by ship at atmospheric pressure and at its atmospheric boiling point of about -160 °C.

Jetty and mooring facilities receive ships for transport of LNG. Dedicated loading and unloading facilities are provided as well as recovery facilities for the displaced LNG vapours from the LNG ships. A LNG ship takes a consignment every two to three days.

Figure 1 shows the layout of the site and Figure 2 illustrates the overall process flow.

Figure 1 – Layout of LNG Plant

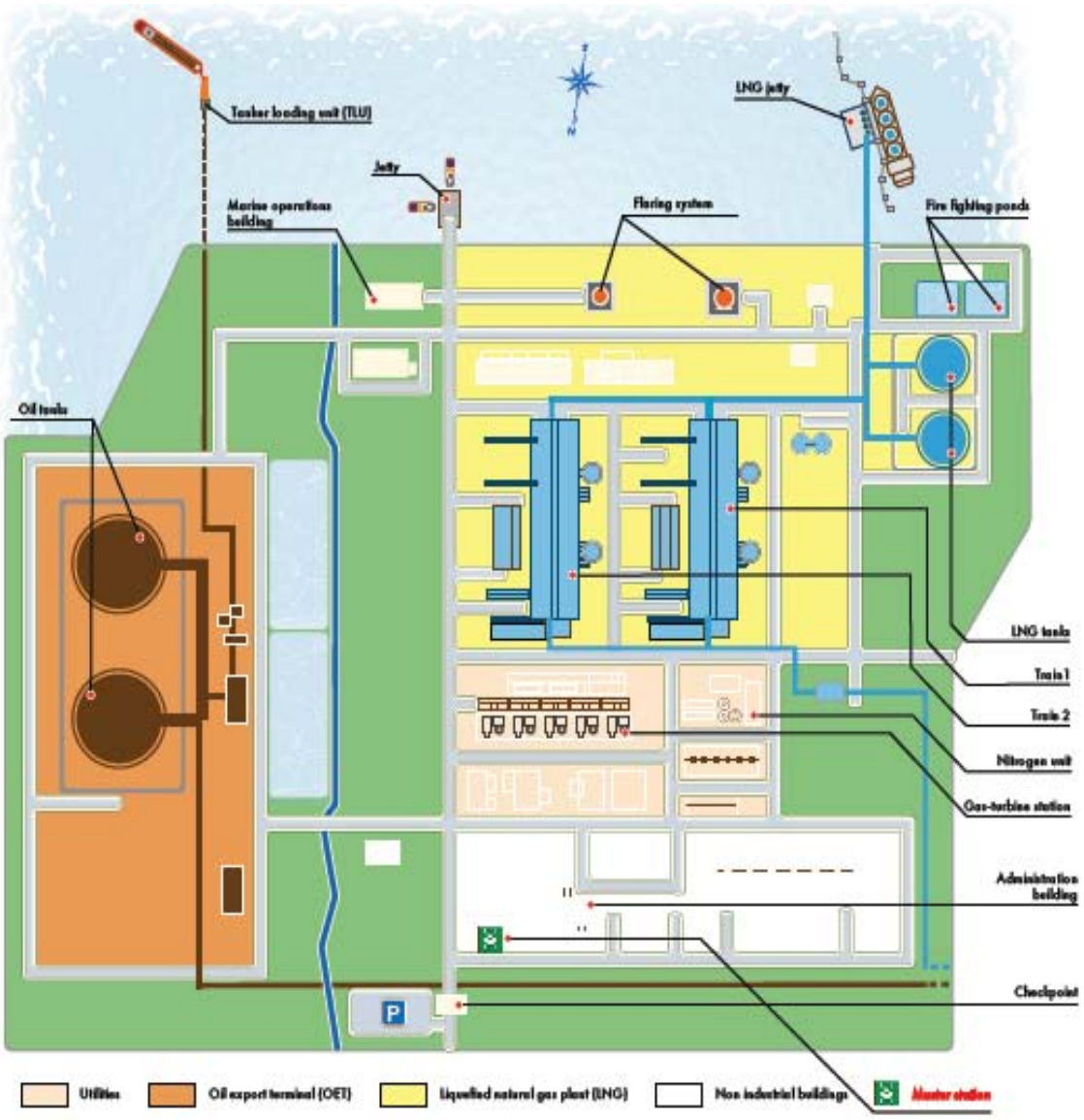
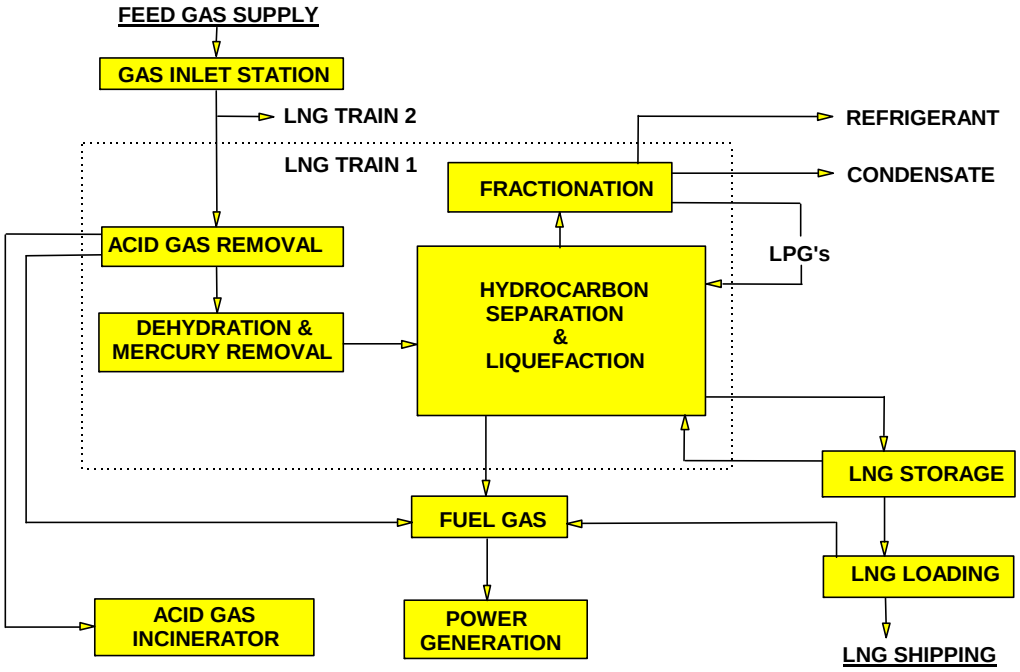


Figure 2 – LNG Plant Block Flow Diagram



2.2 Location

The LNG plant and oil export facilities (oil export terminal and tanker loading unit), together known as the Prigorodnoye production complex, are located at 46°38' N, 142°55' E on the shoreline of Aniva Bay. This is on the southern coast of Sakhalin Island, around 15 km east of the port of Korsakov and 53 km south of the capital city, Yuzhno-Sakhalinsk.

The total fenced area of the Prigorodnoye site is 112.6 hectares, and is divided by the Goluboy Stream (and surrounding undeveloped buffer zone); the LNG plant is located in the western part of the site, and the eastern part is occupied by the oil export terminal (OET).

2.3 Environmental Setting

The LNG production facility is situated on the southern outskirts of the Korsakovsk plateau, which rises to 10 to 25 metres above sea level. The LNG plant is situated on the lower onshore terrace of Aniva Bay.

Immediately to the east of the LNG plant are two surface watercourses discharging into Aniva Bay and a wetland area. Beyond the valley and to the north are low forested hills, 50 to 60 m high. The Goluboy stream bisects the Prigorodnoye production complex, between the LNG and OET areas.

There is a formal Sanitary Protection Zone (SPZ) around the plant. This zone extends 1,000 metres from the perimeter fence in all directions. A map showing the Sanitary Protection Zone around the site is shown in Figure 3.

Figure 3 – Sanitary Protection Zone Around LNG Plant

The LNG plant is located in a seismically active area. Studies have shown that the maximum credible earthquake in the area was 6.5 on the M_{LH} scale, and there is a potential seismic fault lying south-west to north-east just to the east of the Prigorodnoye site.

In the winter, from October to March/April, cold northerly winds prevail while in the summer relatively warm winds from southerly directions predominate. At the end of winter, substantial ice coverage may be on the surface of the sea in Aniva Bay. At the end of summer, tropical cyclones may occur; these originate near the Philippine Islands, and lose most of their intensity before reaching Sakhalin.

3 Audit Findings

The detailed audit findings presented below contain extracts form the HSESAP. These extracts are not intended to be exhaustive, but rather used as examples to demonstrate compliance or otherwise against HSESAP requirements.

3.1 EHS Management Systems

Sakhalin Energy has an integrated Health, Safety and Environmental Management System (HSEMS) that has been certified to the relevant international standards:

- ISO 14001:2004 (environmental); and
- OHSAS 18001:2007 (occupational health and safety).

The Prigorodnoye production complex is currently implementing a quality management system (QMS) and plans to achieve certification to ISO 9001:2008 early in 2012. This will be the first asset within Sakhalin Energy to implement a QMS.

It was reported that Sakhalin Energy has recently changed its certification body from LRQA to Russian Register.

The corporate system has been implemented at the Prigorodnoye Asset via the HSE Case (7000-S-90-04-T-7003-00-01) that was approved in December 2010. The HSE case details how the asset meets the requirements of ISO 14001 and OHSAS 18001, and provides a structured framework for managing HSE risks and delivering continual improvement in HSE performance. Key elements of the HSEMS, as applied to the LNG plant, are outlined below.

3.1.1 Leadership and Commitment

Interviews with the Asset Manager and other senior management representatives demonstrated an excellent level of commitment to good HSE performance.

3.1.2 HSE Policy and Strategic Objectives

The LNG plant is subject to the commitments defined in the Sakhalin Energy HSE policy. Strategic objectives for the management of HSE during the operation of the facility are established on an annual basis within the Asset HSE plan. These include:

- develop and maintain a risk-based HSEMS;
- integrate operation of Prigorodnoye into the HSE Cases for all associated Sakhalin Energy assets including Logistics, OPF, Pipelines and Booster Station 2;
- ensure that contractors implement HSE management systems that are consistent with Sakhalin Energy's HSEMS;
- manage operations to ensure that risks to the safety of people from major workplace hazards (and incidents) are ALARP and tolerable; and
- minimise adverse environmental impacts and implement effective waste management practices.

This audit concludes that these strategic objectives are fully integrated into the operation of the LNG plant.

3.1.3 Organisation, Responsibilities, Resources, Standards and Documentation

Key responsibilities for HSE management are clearly shown in an organization chart in the HSE case. The facility has an adequate number of well qualified HSE staff.

Systems have been established to ensure that personnel with HSE critical roles have the required level of competence to perform their tasks.

All new employees and visitors are provided with comprehensive HSE awareness training. Specialist training is provided to personnel where necessary. During this audit the training records of the waste management facility supervisor were inspected and found to be in order.

Contractor HSE requirements are established in accordance with the requirements of the Sakhalin Energy Contractor HSE Management Policy and Contracting and Procurement Procedure. These, in turn, meet the requirements of the HSE Management of Contracts Standard (0000-S-90-04-O-0013-00-E) which forms part of the HSESAP. Contractors working at Prigorodnoye are required to comply with Sakhalin Energy Corporate, Production Directorate and Facility Standards and Procedures relevant to their activity, together with any relevant technical and HSE standards required by their own employing company. Where differing standards apply between Sakhalin Energy and employing company standards, the most appropriate standard, which will normally be the higher, is applied. Contractor HSE performance is analysed, and details of contractor working hours and any incidents are recorded.

Based on the evaluation of HSE risks and performance contractors are classified as:

- Green Able to continue work for Sakhalin Energy;
- Amber Improvements needed; or
- Red Contractor cannot work for Sakhalin Energy.

The main forms of communication on HSE issues at the facility are:

- toolbox talks;
- team meetings;
- management coordination meetings;
- HSE Forum;
- HSE weekly townhalls;
- Incident Review Panel meetings;
- quarterly HSE departmental meetings; and
- ad hoc meetings called for specific issues.

In addition to the above, HSE information is also transferred by means of informal meetings such as presentations, workshops, posters and visual aids around the site.

HSE documentation is available to staff via the Livelink electronic document management system.

3.1.4 Hazards and Effects Management

Planned activities are reviewed to identify whether they have any significant HSE risks that cannot be adequately managed under normal operational controls. Activities identified as non-routine or higher risk are managed more intensively.

An Environmental Aspects Register is maintained for the asset (in part 4 of the HSE Case), listing the activities that may affect the environment, their potential consequences and an assessment of their significance. The most significant hazards to the environment have been identified as loss of containment and support vessel operations.

HSE risks associated with each hazard are assessed to determine the risk level. The corporate risk assessment matrix is used in this process. Risk management techniques are applied to ensure that risks are reduced to ALARP.

3.1.5 Planning

The following HSE objectives have been established for the Prigorodnoye Asset for the period 2011 to 2015:

- embed strong HSE culture in Sakhalin Energy;
- embed a simplified HSE Management System in Sakhalin Energy;
- develop and employ HSE competent staff;
- develop contractor relationships that support HSE improvement;
- meet external commitments and reporting requirements;
- align and gain appreciation of our HSE activities within society; and
- implement sustainable world class process safety management.

An Asset QHSE plan is developed each year to establish objectives and targets. The 2011 plan established the following HSE focus areas:

- visible HSE leadership and HSE culture – “you must be the change you want to see”;
- competence;
- contractor HSE management;
- health and hygiene management;
- safety in logistics; and
- environmental delivery & control.

Each of these focus areas has been broken down into discrete actions, with responsibilities and deadlines assigned to each item. It appears that adequate progress is being made against these objectives.

3.1.6 Implementation and Monitoring Performance

Activities are carried out in accordance with corporate and site policies and procedures, and non-routine or hazardous activities are controlled using a Permit To Work (PTW) system.

A number of procedures have been implemented to cover the site’s main environmental aspects such as the storage and use of chemicals and the storage and disposal of waste. In addition, procedures are used to ensure compliance with legal and other requirements, for example monitoring of releases to the environment.

The facility has a comprehensive and effective planned preventive maintenance system that is risk-based, thereby focusing resources on the most critical assets.

Systems have been established to ensure that HSE records are maintained, and that incidents and non-compliances are investigated and addressed.

3.1.7 Audit

Sakhalin Energy operates a Tiered HSE audit programme. The various levels of audit are described in the HSESAP and Sakhalin Energy's internal Compliance Assurance procedures (HSE Audit Procedure). In summary these include:

Level 1 – facility audits undertaken by 3rd parties e.g. lenders' IEC.

Level 2 – audit of a facility of activity performed by the Company e.g. Corporate HSE team.

Level 3 – self-assurance activities managed by the asset, often with a system or process focus.

Level 4 – self-assurance activity to identify specific non compliances. These are often referred to as inspections.

The audits are scheduled within a rolling HSE Assurance Five Year Plan.

An annual HSE audit programme for the LNG plant details internal audits (the frequency of audits reflects its risk rating) and external audits (e.g. Lenders and ISO 14001 certifiers). A sample of audit reports was reviewed and found to be completed to a good standard.

A pool of around ten internal auditors have been trained, with Lead Auditors receiving training by a specialist third party organization and assistant auditors receiving internal training.

3.1.8 Management Review

Senior management reviews of the performance of the facility against the HSE plan take place on a monthly basis, and the HSEMS is formally reviewed annually. These reviews aim to determine the effectiveness and suitability of the HSEMS and to ensure continual improvement in HSE performance.

3.1.9 Effectiveness of HSEMS

The auditors conclude that the LNG plant has implemented a robust and effective HSEMS that meets the requirements of relevant international standards i.e. ISO 14001 and OHSAS 18001. The system is well designed and has been implemented across the entire facility. Throughout the audit the strong HSE culture was very evident in all parts of the site and in staff at all levels.

3.2 Emissions to Atmosphere

3.2.1 Compressors

Four Frame 7 gas turbines are used to drive the LNG train refrigerant MR and PMR compressors (two turbines per train). These units have dry low-NOx burners, which ensure that NOx emissions are well under permitted levels. Analysis of monitoring data for 2011 also confirms that the emissions from the Frame 7 turbines are consistently well below the following limits prescribed in the Air Emissions Standards Comparison , which forms part of the Air Emissions and Energy Management Standard (0000-S-90-04-O-0257-00-E):

- *Particulate matter = 50 mg/Nm^3*
- *SO_x = 10 mg/Nm^3*
- *NO_x = 51.25 mg/Nm^3*
- *CO = 0.015 %vol (about 190 mg/Nm^3)*

- *H_2S = 15 mg/Nm^3 @ 15% O_2, dry flue gas between 80%-100% of base load.*

The turbines are maintained by GE and were reported to be very reliable.

3.2.2 Generators

Five Frame 5 generators are used to generate electricity for the site. These units have dry low-NOx burners, which ensure that NOx emissions are well under permitted levels.

Analysis of monitoring data for 2011 also confirms that the emissions from the Frame 5 turbines are consistently well below the following limits prescribed in the Air Emissions Standards Comparison , which forms part of the Air Emissions and Energy Management Standard (0000-S-90-04-O-0257-00-E):

- *Particulate matter = 50 mg/Nm^3*
- *SO_x = 10 mg/Nm^3*
- *NO_x (as NO_2) = 25 ppmvd (about 50 mg/Nm^3) CO = 0.015 %vol (about 190 mg/Nm^3)*
- *H_2S = 15 mg/Nm^3 @ 15% O_2, dry flue gas between 60%-100% of base load.*

The turbines are maintained by GE and were reported to be very reliable although they trip more frequently than the Frame 7 units.

Emergency power generation is provided by:

- two diesel engines for emergency power generation;
- two diesel engines for fire water pumps;
- one diesel engine for emergency instrument air compression; and
- one gas fired boiler for plant start-up.

3.2.3 Acid Gas Incineration

A thermal combustion unit burns Sulfinol and Active MDEA regenerator vent gas. The vent gas is supplied to the common vent gas knockout drum, from which it is fed to the combustor. The combustor is operated at 950 °C, so all combustible components are converted into oxidised products. Any additional heat required to achieve a flame temperature of 1000 °C is provided by an auxiliary burner, firing fuel gas or flash gas from the Sulfinol Unit. The maximum expected H_2S content in the flue gases is 5 ppm, but actual levels are extremely low or non-existent reflecting the lack of H_2S in the feed gas.

No spare unit is installed to back-up the thermal combustion unit. When this unit is out of service, the regenerator gas is vented to atmosphere. However, this is very infrequent and has limited impact due to the low or none existent levels of H_2S within the feed gas.

3.2.4 Flaring and Venting

The flare system is used to dispose of small amounts of hydrocarbons during normal operation, usually associated with equipment maintenance or a process upset. Four emergency flare stacks (cold flare, warm flare, storage/loading flare and spare flare) are supported by a common derrick structure with a height of 125 metres. Each flare stack is provided with pilot burners to ensure that combustion occurs under all wind conditions. The flare tips are provided with an assist gas ring to obtain smokeless combustion at low flow rates.

Site management have invested a considerable amount of time into minimizing flaring, largely via a Flaring Task Force, consisting of six people that meet regularly to discuss improvement measures. 25 process trips (leading to flaring) per year were predicted at the site but only four have occurred to date in 2011 (none in the first six months). So far in 2011 only around 0.13% of feed gas has been flared, compared to the target of 0.63%.

During the audit, the flare was small and the emissions were generally smokeless. However, on 30th September, a large flame with dark smoke was observed for several hours, which was reportedly a result of an unplanned process trip.

It was reported that no complaints have been received from the public in relation to flaring.

The Air Emissions Standards Comparison, forming part of the HSESAP, states the company's commitment to "no continuous venting" with respect to the disposal of gas from process units and other equipment. This audit verified that no continuous venting occurs.

3.2.5 Fugitive Emissions

Fugitive emissions from plant and equipment are minimized by the effective maintenance regime at the site.

During loading of LNG vessels at the jetty displaced vapours are collected and returned to the LNG storage.

3.2.6 Monitoring

Monitoring of emissions to atmosphere is conducted by a contractor, Sakhydromet. Data for 2010 and 2011 were reviewed and it appears that all emissions are below permitted levels. The auditors checked the monitoring frequency and the actual emissions for a sample of parameters against the requirements of the Air Emissions Standards Comparison (0000-S-90-04-O-0257-00-E) which forms part of the HSESAP and no non-compliances were identified.

3.3 Water and Wastewater Management

3.3.1 Water Abstraction and Usage

Water is supplied to the LNG plant and OET from four wells located approximately 6km north of the site. This system provides potable water, demineralized water, firewater and service water. The abstraction site has four wells, located approximately 100 m apart. Water from each well flows into one common underground pipeline to the Prigorodnoye Complex. The combined normal capacity is 50 m^3/h, but the maximum supply rate is 100 m^3/h. The water is filtered then disinfected with chlorine. Process water is also demineralized.

The potable water supplied to the site meets WHO drinking water quality standards (as required by Clause 10 of the Water Use Standards Comparison, forming part of the Water Use Standard (0000-S-90-04-O-0255-00-E) but it is not used for drinking (this water is used for cooking and cleaning only).

Finding: The Water Use Standard (Clause 1 of Standard Overview) (0000-S-90-04-O-0255-00-E Appendix 1) requires that water use "*shall meet Water Use Agreements*". However, in July 2011 the Federal Service for Supervision of Natural Resources wrote to Sakhalin Energy (Ruling No. ЯШ - 01 - 005/2011), informing the company that it will be fined RUR 300,000 for breaches of permit requirements (license ЮСХ 00338 ВЭ) including over abstraction, use of faulty water flow meters, and inadequate water quality sampling.

3.3.2 Wastewater Management

The Drainage System consists of four systems each designed to handle the drainage according to the level of contamination expected:

- Entirely Oil Free System (EOF);
- Accidentally Oil Contaminated (AOC) System;
- Continuously Oil Contaminated (COC) System;
- Domestic Sanitary Sewer System.

Entirely Oil Free (EOF) System

Entirely Oil Free (EOF) system consists of drainage from non-operational areas where there is no likelihood of contamination with oil or chemicals. Within the boundaries of the LNG plant rain water and snow melt from the EOF areas is collected in catch basins and open ditches. The ditches drain by gravity to the fire water pond where it is used to replenish the supply of fire water. Excess storm water overflows from the pond into Aniva Bay without receiving any treatment. An underflow weir is provided at the outlet of the fire water pond to prevent oil discharge to Aniva Bay in the unlikely event some oil is accidentally collected in the pond.

Gravelled areas, building roof runoff, landscaped areas and most paved areas (car parks excluded) are considered to be entirely oil free.

Accidentally Oil Contaminated (AOC) Drainage System

Water drainage from areas such as process area concrete pads, curbed and bunded areas around oil and chemical tanks, industrial building floor drains and parking lots is normally oil and chemical free but has the possibility of being contaminated with accidentally spilled oil or other substances harmful to the environment. To prevent the discharge of contaminated water into the sea this storm water is collected in the AOC underground storage tank and directed to the Effluent Treatment Plant (ETP).

This AOC system facilitates the collection of runoff by means of a network of surface drain channels, gutters and liquid filled underground headers interconnected by manholes which discharge effluents under gravity to the ETP.

Continuously Oil Contaminated (COC) Drainage

The Continuously Oil Contaminated system comprises localized catch basins and/or curbed areas for retaining continuously contaminated effluents. If water collected in COC drains is free of gross contamination it is directed to the AOC system. If it is known to have significant contamination (e.g. as a result of a spill) it is collected by a vacuum truck for off-site disposal at a licenced hazardous waste facility.

Domestic Sanitary Sewer System

Domestic sewage generated in the main administration building, guard house and other buildings is treated in an on-site sewage treatment plant. The Jetty Access Building is provided with an underground septic storage tank, which is periodically emptied by vacuum truck.

The ETP consists of the following sub-units:

- **Oily waste water treatment unit -** effluent from the OET and LNG AOC system is collected in an open tank. The oily wastewater is treated by electrolytic flotation, in

which an electrical current is used to generate hydrogen and oxygen bubbles, which carry oil to the surface before removal using a scraper. The water is then further clarified by sand and activated carbon filtration. The throughput capacity is 160 m^3/h.

- **Sewage treatment unit -** effluent from kitchens, lavatories, showers etc. in the LNG plant are pumped to the sewage treatment unit, consisting of two modular type units:
  - 50m^3/hour BR-50 plant; and
  - 200 m^3/hour BR-200 plant.

  Seven temporary sewage treatment units, used during construction phase, have now been removed. Sewage is treated by screening, aeration / biological treatment (activated sludge process), gravity solids separation, filtration for suspended solids removal and disinfection by chlorination or UV irradiation in order to kill bacteria.
- **Sludge dehydration unit** - collects, treats and dewaters, so that dewatered sludge can be containerized and removed for disposal. Water effluent from the sludge dewatering is returned to the oily waste water treatment unit.
- **Effluent transfer tank and pumps -** which collects treated water in a tank where it is pumped to the Effluent Outfall Tank on the eastern (OET) part of the Prigorodnoye site. If the outlet specification is met, treated water within the specified limits is discharged to Aniva Bay via the ocean outfall at a minimum water depth of 10m. If samples from the tank are unacceptable, the treated water is returned to the wastewater treatment process.

A major upgrade to the effluent treatment plant was underway at the time of the audit.

Monitoring Data

Treated wastewater discharged into Aniva Bay is monitored for a wide range of parameters in accordance with permit requirements. During the audit 2011 monitoring data were reviewed and a sample of parameters confirmed to be within compliance with the levels included in the HSESAP. In July 2011 elevated bacteria levels were detected but after cleaning the UV lamps in the domestic sewage treatment plant this issue was resolved.

3.4 Waste Management

3.4.1 Waste Storage

Central Waste Storage area

Hazardous waste is temporarily stored in a designated waste compound known as Building 10, before its off-site disposal.

A waste compactor was noted in Building 10 but it is not currently used as the electrical supply needs to be adapted to Russian standards. It is understood that this equipment will be used to compact waste plastic before it is sent for off-site recycling.

A bunded area adjacent to Building 10 provides additional storage capacity when required. At the time of the audit this area accommodated 32 empty oil drums (Photo 1). Runoff flows into a COC sump.

Finding: There is a hole in the bund wall around the external waste storage area (Photo 2). This issue was noted in the last Independent Environmental Consultant (IEC) monitoring visit report, dated April 2010, and no action has been taken. This is a non-compliance against Clause 3k of the Approved Waste Storage and Accumulation Facilities Specification, forming

part of the Waste Management Standard (0000-S-90-04-O-0258-00-E), which requires "*spill containment for liquid wastes such as oil and chemicals*".

Recommendations:

- There is no vehicle access to the external bunded area. It is recommended that consideration is given to installing a low ramp to allow easy access, whilst retaining the integrity of the bund.
- The outside area has no roof so large volumes of COC runoff can be generated. It is recommended that consideration is given to erecting a roof over this compound.

General Waste Storage on Site

In general, waste is stored on site to a very high standard. In most locations waste containers are in an excellent condition and are clearly labelled. Also, the segregation and containment of waste was generally very good. However, an exception was noted outside the main canteen area, where the following issues were identified by the auditors:

Findings:

- Clause 6 of the Waste Containers, Labelling and Transport Specification, forming part of the Waste Management Standard (0000-S-90-04-O-0258-00-E) requires that "*all waste containers are provided with clear, dual language (Russian and English) labels detailing the waste type, waste hazard-classification, and any material specific health and safety considerations*". Inadequate waste labelling was observed as detailed below:
  - labelling of four metal bins containing general waste was non-existent (Photo 3);
  - a metal bin labelled for oily rags actually contained only cardboard (Photo 4); and
  - waste cooking oil was stored in unlabelled drums (Photo 5).
- Clause 7 of the Waste Containers, Labelling and Transport Specification, forming part of the Waste Management Standard (0000-S-90-04-O-0258-00-E) requires that "*waste containers shall be used for the protection of wastes from vermin and scavenging animals". However, a* general waste bin had no cover, so there is a risk of wind-blown litter generation or vermin gaining access to the waste (Photo 3).
- Clause 3k of the Approved Waste Storage and Accumulation Facilities Specification, forming part of the Waste Management Standard (0000-S-90-04-O-0258-00-E), requires "*spill containment for liquid wastes such as oil and chemicals*". However, concrete staining indicates that leaks of cooking oil have occurred (Photo 5).

3.4.2 Waste Management Systems

The HSE department maintain excellent waste tracking systems, which are used to monitor the amount of waste generated and stored on site and its disposal. According to the Waste Tracking and Reporting Specification (0000-S-90-04-O-0258-00-E) the Asset should submit a monthly waste management report to the corporate HSE Waste Management Advisor. Such a report is not prepared but the corporate HSE department has access to the waste monitoring system used by the LNG plant.

It was reported that the logistics department checks the licenses of waste carriers and waste disposal companies to ensure that waste is handled by competent and approved organisations in accordance with the requirements of the HSESAP.

The waste management coordinator has received specialist training in waste management and copies of his training certificates are held on file.

Analysis of waste disposal data shows that in 2011 the amount of waste generated was within permitted limits for each of the five hazard classes. However, there were some minor exceedances for air filters and fat traps in the second quarter of 2011, but this is purely an administrative issue which requires Sakhalin Energy to pay a higher fee.

3.4.3 Waste Minimisation

Most waste streams generated by the LNG plant are sent for off-site disposal, mostly via landfill. However, some wastes are recycled or reused such as:

- waste lube oil (4.98 tonnes in 2010 and 10.8 tonnes so far in 2011 sent for off-site recycling);
- timber (given to local people); and
- food waste (given to a local farmer for animal feed).

Findings:

Several issues were noted related to waste minimisation, as detailed below:

- The Waste Management Standards Comparison, which is part of the Waste Management Standard (0000-S-90-04-O-0258-00-E) states that "*during the operation phase of the Project, lube oil shall be blended with crude oil in a controlled manner*". However, waste lube oil is actually sent for off-site recycling. It was reported that the Commercial Department will not allow waste lube oil to be blended into the crude system due to quality control concerns.
- Clause 2b of the Waste Minimisation, Diversion and Disposal Specification, which is part of the Waste Management Standard (0000-S-90-04-O-0258-00-E) requires the company to "*procure materials in bulk and in returnable containers*", and to "*procure materials in refillable and returnable packaging*" to minimise packaging waste. Room for improved performance was noted in the audit. For example, drinking water is currently supplied to staff in 500ml plastic (non-returnable) bottles. It is recommended that consideration is given to alternative water supplies to avoid generation of waste plastic. Options include:
  - potable water supply (which meets WHO drinking water standards); or
  - refillable water cooler systems.

  Waste avoidance is a better option in the waste management hierarchy than recycling or disposal.
- Clause 5c of the Waste Minimisation, Diversion and Disposal Specification, which is part of the Waste Management Standard (0000-S-90-04-O-0258-00-E) requires certain wastes, including plastic and paper, to be diverted to recycling where practicable. Waste paper and waste plastic is segregated at source for recycling. Sakhalin Energy has not yet signed contracts with recycling companies so this material is currently mixed with general waste before off-site disposal. However, it is understood that recycling companies have now been identified (two plastics recyclers on Sakhalin Island and a paper recycler on the mainland) and that arrangements will soon be in place to recycle this material.

3.5 Management of Hazardous Materials

3.5.1 Bulk Storage of Oils and Hazardous Materials

A central diesel aboveground storage tank with a capacity of 410m^3 (Photo 6) supplies diesel for emergency power generators, an emergency instrument air compressor, fire water pumps, space heating and mobile plant. Day tanks are located at each fixed location where diesel is used.

Adjacent to the diesel tank is an above ground tank containing heat transfer liquid (Photo 7). The diesel and heat transfer fluid bulk storage tanks have adequate bunding. The concrete bund walls and floor are in an excellent condition and there is no visible evidence of contamination from leaks or spills. Runoff generated within the bunded areas is collected in a COC sump.

LNG is stored in two double walled tanks of 100,000 m^3 each (Photo 8).

Refrigerants used in the LNG process are stored in two 14.6 m diameter spheres, one for ethane and the other for propane/PMR.

Finding: Two above ground diesel storage tanks of 0.5 m^3 capacity each are used in the effluent treatment plant construction site, serving two generators. Both had drip trays. However, the drips trays do not comply with Clause 1b of the Soil and Groundwater Industrial Controls Specification, forming part of the Soil and Groundwater Standard (0000-S-90-04-O-0018-00-E) which requires that "*where bunded areas are not practical, chemicals are stored over grated drip trays designed to hold and retain 150% stored volume*"). Also, two holes were noted in one of the drip trays, that appear to have been created to allow rainwater to drain away.

All bulk storage containers are inspected regularly by the maintenance department.

3.5.2 Chemical Store

A chemical store, comprising a number of separate locked rooms, contains drums and smaller containers of chemicals and oils used around the site. Each room had a concrete floor, a COC drain sump and a spill kit. Chemicals are stored in 205 litre metal drums and smaller metal and plastic containers. The general condition of each storage area was excellent but some deficiencies were identified, as outlined below. The auditors inspected the following areas:

C101 DIPA Sulfonate and Glycol Store

Despite the sign on the door, this area is used for storage of oils such as Tellus oil and Dowtherm SR-1 heat transfer fluid.

C102 Molsieve and Mercury Absorber Store

The following materials were noted in this storage area: Monoethylene glycol (MEG), polyaluminium chloride, isocyanate, antifoam, and aqueous film forming foam (AFFF).

C103 Chemical Store

This area contained lead acid batteries, lube oils (e.g. Rimula R3 and Albida EMS 2), corrosion inhibitor and smaller quantities of other chemicals.

C104 Alkaline Store

Plastic drums of sodium hyperchlorite are held on metal racking.

Concrete staining indicates that leaks have occurred in the C104 area (Photo 9). However, the risk to the environment from leaks in this location is minimal as any spillages are captured in the COC drainage system.

C105 Acid Store

A variety of acids are securely stored here.

C106 Chemical Store

This area contained sacks of sodium hydroxide granules for use in pH correction at the effluent treatment plant.

C107 Lube Oil Store

Drums of oil (e.g. Tellus 100 and Corena P) are stored upright on metal racking and seven drums were stored horizontally, above a drip tray. In addition, four 25 litre plastic drums of Zitrec L monopropylene glycol based heat transfer liquid, and silica gel were noted in this area.

Findings:

The following issues were noted in the chemical stores:

- Clause 6 of the Chemicals Management Specification, forming part of the Occupational Health and Hygiene Standard (0000-S-90-04-O-0270-00-E) requires that "*a full Material Safety Data Sheet (MSDS), in English and Russian shall be made available for all chemicals and oil products used at the site*". In general, a good level of compliance was noted. However, the following non-compliances were found in the chemical storage area:
  - No MSDS (in English or Russian) was available in the C103 store for the Hydranal Coulomat AD reagent. An electronic copy of the MSDS was later produced for inspection in the office but the MSDS file in C103 was incomplete.
  - In C104 and C106 the MSDS for chemicals stored were only available in Russian.
- Clause 6a of the Chemicals Management Specification, forming part of the Occupational Health and Hygiene Standard (0000-S-90-04-O-0270-00-E) requires that "*chemicals are appropriately labelled*". In most cases the labelling observed during the audit was adequate but the following exceptions were identified:
  - A drum of liquid in C104 is stored in a box with an incorrect stock code (the MSDS with the corresponding stock code - 1000941689 - was for High-density polyethylene (HDPE)) (Photo 10).
  - Two metal drums of liquid were noted in C107 that had labels in Japanese only (Photo 11). The stock codes (1000823468 and 1000823469) could not be tracked to MSDS in the chemical store. However, the auditors later confirmed, via the SAP system, that this material was delivered during the construction phase in 2007.
  - Five 205 litre drums and three smaller drums were noted outside C107 (Photo 12). The drums were full but the contents unknown as there were no labels. The drums were stored on hardstanding adjacent to gravel and no secondary containment was provided. The lack of secondary containment is also non-compliant with Clause 1b of the Soil and Groundwater Industrial Controls Specification, which forms part of the Soil and Groundwater Standard (0000-S-90-

04—O-0018-00-E), which requires that "*there shall be an appropriate use of bunded areas to provide spill containment of 110% of the largest stored vessel or double skinned tanks*" and "*where bunded areas are not practical, chemicals are stored over grated drip trays designed to hold and retain 150% stored volume*".

3.5.3 Acid Gas Removal Process

Acid gas is removed from feed gas using a solvent (Sulfinol was originally used but one LNG train has recently been converted to use Active MDEA, which is more efficient). When the solvent is regenerated it can "boil over", escaping the containment and entering the effluent system. It was reported that this problem had occurred in the Sulfinol process but that it is significantly less likely to occur in the Active MDEA process. However, should it occur in the future any solvent released should be captured by the Effluent Treatment Plant.

3.5.4 Asbestos

It was reported that no asbestos is used in the LNG plant, either in the fabric of buildings or in equipment. No suspected asbestos containing materials were identified in the audit.

3.5.5 PCBs

It was reported by an electrical engineer that no electrical equipment at the LNG plant contains polychlorinated biphenyls (PCBs).

3.5.6 Ozone Depleting Substances

An inventory is maintained of all equipment containing ozone depleting substances, as required by Clause 11 of the Air Emissions and Energy Management Standard Overview (0000-S-90-04-O-0257-00-E). The following refrigerants are used:

Table 1: Summary of Ozone Depleting Substances

Substance	Description	Total On-Site Quantity (kg)	Ozone Depleting Potential (ODP)
R22	Hydrochlorofluorocarbon (HCFC)	138	0.05
R134A	Hydrofluorocarbon (HFC)	337.5	0
R407C	Hydrofluorocarbon (HFC) blend	2,069	0
R410A	Hydrofluorocarbon (HFC) blend	61	0

The only refrigerant used at the site which is an ozone depleting substance is R22, which has a very low ODP of 0.05. R22 is being phased out in much of the world and in the EU it is scheduled for phase-out in December 2014. The Sakhalin Energy Air Emissions and Energy Management Standard, which requires the elimination of ozone depleting substances, does not apply to domestic-sized appliances. The inventory shows that R22 is only used in small equipment, typically in quantities of 2.5kg and with a maximum capacity of 8kg.

Recommendation: Although the use of R22 in domestic-sized equipment is permitted by Sakhalin Energy it is recommended that alternatives are considered (R417A is a drop-in replacement for R22 and has an ODP of zero).

3.6 Noise

No significant sources of environmental noise were identified during the audit. Hearing protection is provided to personnel working in areas with elevated noise levels.

2011 noise monitoring data for the site, the SPZ boundary and the closest dachas indicates that noise is below limits.

3.7 Soil and Groundwater Contamination

There are a number of potential sources of ground contamination at the LNG plant, including:

- loss of containment in bulk storage tanks (diesel and heat transfer fluid);
- loss of containment in chemical warehouse;
- loss of containment in waste storage area;
- leaks of hazardous substances from plant and equipment; and
- backfilling of site.

Issues associated with loss of containment and leaks are covered in other sections of this report. It was reported that no contaminated material was used during backfilling of the four temporary firefighting water ponds that were used during construction phase. During the audit it was noted that these ponds have all been backfilled with soil and that there was no evidence of contamination.

Groundwater monitoring is carried out at nine monitoring boreholes around the LNG plant. A tenth borehole (WPU-10) is no longer used as it has been damaged. Four wells were installed during the construction phase and six additional wells installed during site operation. The 2011 QHSE plan includes an objective to drill an additional eight wells by the end of 2011.

Boreholes are sampled by contractors and groundwater samples sent to a third party laboratory for analysis. Results are logged in a spreadsheet maintained by the HSE department. An inspection of the data indicated that there is no evidence of groundwater contamination from the LNG plant. Elevated chloride levels occur in WPU-8 but this is explained by its proximity to the coastline, which allows saline intrusion.

Three surface soil sampling points are also sampled periodically. No evidence of contamination has been detected.

3.8 Emergency Response Plans

Detailed emergency response plans have been developed for the site in accordance with the Oil Spill Preparedness and Response Specification (0000-S-90-04-O-0014-00_E) within the HSESAP.

Fire protection facilities are installed throughout the LNG plant for protection of all major equipment. Stationary fire-fighting equipment, e.g., hydrants, monitors, and automatic equipment, are installed on a firewater loop. Inherently safe design has been built into the facility wherever possible, for example:

- the Goluboi Brook provides a natural fire break 100m wide between the LNG and OET sites;

- LNG plant design is to the highest standards, e.g. the distance between equipment and a pipe rack structure is over 3 m to prevent the creation of a chimney effect in the case of fire; and
- the distance between LNG tanks is sufficient to avoid one tank igniting if the other catches fire.

The fire water system is sized for simultaneous fire at the OET (1512 m^3/h) and LNG (1080 m^3/h) i.e. 2592 m^3/h.

Details of firefighting plans and procedures are documented in the Prigorodnoye Asset Fire Fighting Plan.

3.9 Management of LNG Tankers

Sakhalin Energy uses effective procedures to ensure that all LNG carriers meet the standards specified in the Maritime HSE Specification, forming part of the Biodiversity Standard (0000-S-90-04-O-0259-00-E), including vessel design and compliance with MARPOL requirements on management of ballast water, waste and air emissions. Support vessels are inspected and approved by Prigorodnoye Marine Base personnel and LNG carriers are approved by the Sakhalin Energy Commercial Department. In addition to their inspections Sakhalin Energy uses the web-based Offshore Vessel Inspection Database (OVID) system to access vessel inspection reports.

A range of measures have been implemented to manage ballast water used by LNG carriers, including:

- requiring the changing of ballast water offshore;
- continual monitoring of the water quality in Aniva Bay;
- sampling from ballast tanks of LNG carriers; and
- surveys of the aquatic biota in the vessel berthing area.

3.10 Housekeeping

In general housekeeping is excellent around the site, including the wastewater treatment plant construction site.

Opportunities for improving housekeeping in chemical and waste storage areas were noted, as detailed in sections 3.4 and 3.5 of this report.

3.11 Energy Efficiency

It was reported that the LNG plant is the most energy efficient in the world (7.2 – 8.2 % of feed gas is used to produce LNG, compared to an industry average of 9%). This good performance is a result of its modern design and of initiatives to maximize process efficiency, for example the efforts to reduce flaring.

3.12 Health and Safety

Whilst health and safety is considered outside the scope of this audit, several examples of good practice were observed such as:

- use of appropriate PPE by all personnel;
- clear safety signage in Russian and English;
- excellent barriers around hazardous areas; and

- detailed and clear health and safety induction training for site visitors.

4 Conclusions and Recommendations

Overall ENVIRON considers that environmental performance at the LNG plant is very good. There is a robust and well implemented HSE management system and there is evidence of a strong environmental culture at the facility. There was a good level of compliance with environmental law and the requirements of the HSESAP with the following exceptions:

- Water use
  - Sakhalin Energy is currently facing enforcement action from the Federal Service for Supervision of Natural Resources for breaches of its water use permit, relating to the abstraction of groundwater.
- Waste management and minimisation
  - There is inadequate secondary containment in the overflow waste storage area outside Building 10 (there is a hole in the bund wall). This issue was also highlighted in the last IEC monitoring visit report, dated April 2010.
  - Labelling was non-existent or poor on several waste containers holding solid and liquid wastes outside the site canteen.
  - Containment of general waste and waste cooking oil outside the canteen does not meet HSESAP requirements (a general waste bin had no cover, and concrete staining indicates leakage from the drums of waste oil).
  - Waste lube oil is sent to an off-site recycling facility rather than blended into the crude system.
  - Excessive packaging waste is generated (e.g. plastic water bottles) when the facility could use its potable water supply for drinking.
  - Some recyclable waste streams (e.g. paper and plastic) are currently disposed of via landfill, but efforts are ongoing to secure contracts with recycling companies.
- Storage of hazardous materials
  - Drip trays under diesel storage tanks in the wastewater treatment plant construction area were undersized and one drip tray had two holes in its base.
  - MSDS documents were absent or only available in one language in the chemical storage warehouse.
  - Labelling of some chemical containers was inadequate.
  - Some drums of chemicals were noted outside the chemical store with no secondary containment.

In addition, a number of recommendations to improve performance have been highlighted in this audit report, including:

- Provision of a low ramp would allow vehicle access to the waste storage area outside Building 10, whilst retaining adequate secondary containment. This would allow faster and easier access, minimising manual handling risks.
- Provision of a roof over the waste storage area outside Building 10 would minimise the volume of potentially contaminated runoff requiring treatment and disposal.

- Although the use of R22 in domestic-sized equipment is permitted by Sakhalin Energy it is recommended that alternatives are considered (R417A is a drop-in replacement for R22 and has an ODP of zero).

Annex A: Photographic Log

Photo 1: Overflow waste storage area outside Building 10

Photo 2: Hole in bund wall around external waste compound

Title:	**Photographic Log**	**Client:**	**Sakhalin-2 (Phase 2) Project Finance Parties**
Site:	**LNG Plant**	**Date:**	**October 2011**

Photo 3: Unlabelled waste containers outside site canteen (the nearest bin has no lid)

Photo 4: Oily waste container full of cardboard

Title:	**Photographic Log**	**Client:**	**Sakhalin-2 (Phase 2) Project Finance Parties**
Site:	**LNG Plant**	**Date:**	**October 2011**

Photo 5: Concrete staining around unlabelled drums containing waste cooking oil

Photo 6: Diesel storage

Title:	**Photographic Log**	**Client:**	**Sakhalin-2 (Phase 2) Project Finance Parties**
Site:	**LNG Plant**	**Date:**	**October 2011**

Photo 7: Heat transfer fluid storage

Photo 8: LNG storage tank

Title:	**Photographic Log**	**Client:**	**Sakhalin-2 (Phase 2) Project Finance Parties**
Site:	**LNG Plant**	**Date:**	**October 2011**

Photo 9: Concrete staining in the alkaline store

Photo 10: Drum of unknown liquid with incorrect stock code in C104

Title:	**Photographic Log**	**Client:**	**Sakhalin-2 (Phase 2) Project Finance Parties**
Site:	**LNG Plant**	**Date:**	**October 2011**

Photo 11: Poorly labelled chemical containers in C107

Photo 12: Unbunded, unlabelled drums of unknown liquids outside C107

Title:	**Photographic Log**	**Client:**	**Sakhalin-2 (Phase 2) Project Finance Parties**
Site:	**LNG Plant**	**Date:**	**October 2011**

Annex B: Findings Log

Findings Log

Ref	Rank	Status	Date	Topic	HSESAP Ref:	Finding	Action Progress Review	Action
	Low Amber (E2)	New	20/10/2011	Water Use	0000-S-90-04-O-0255-00-E Appendix 1	In July 2011 the Federal Service for Supervision of Natural Resources wrote to Sakhalin Energy (Ruling No. ЯШ - 01 - 005/2011), informing the company that it will be fined RUR 300,000 for breaches of permit requirements (license ЮСХ 00338 ВЭ) including over abstraction, use of faulty water flow meters, and inadequate water quality sampling.	**Action**: Investigate the root cause of the non-compliance and implement appropriate corrective and preventative measures.	
	Red (E3)	Ongoing	20/10/2011	Waste Management	0000-S-90-04-O-0258-00-E Appendix 8	There is a hole in the bund wall around the external waste storage area. At the time of the audit this area only contained empty drums but the facility is used to accommodate liquid wastes when Building 10 is full. There is a risk of contamination of the ground immediately outside the breached bund wall. This issue was noted in the last Independent Environmental Consultant (IEC) monitoring visit report, dated April 2010, and no action has been taken. This issue has therefore been classified as E3 due to the "frequent exceedance of statutory or other prescribed limit".	**Action**: Immediately repair the bund wall.	
	Low Amber (E2)	New	20/10/2011	Waste Management	0000-S-90-04-O-0258-00-E Appendix 10	Inadequate waste labelling was observed outside the canteen: • labelling of four metal bins containing general waste was non-existent ; • a metal bin labelled for oily rags actually contained only cardboard; and • waste cooking oil was stored in unlabelled drums.	**Action**: Ensure that all waste bins are appropriately labelled. It is understood that a request has already been submitted to the maintenance department for refurbishment of waste containers (cleaning, repainting, repair and labelling).	

Findings Log

Ref	Rank	Status	Date	Topic	HSESAP Ref:	Finding	Action Progress Review	Action
	Blue (E1)	New	20/10/2011	Waste Management	0000-S-90-04-O-0258-00-E Appendix 10	Clause 7 of the Waste Containers, Labelling and Transport Specification, forming part of the Waste Management Standard requires that "waste containers shall be used for the protection of wastes from vermin and scavenging animals". However, a general waste bin had no cover, so there is a risk of wind-blown litter generation or vermin gaining access to the waste.	**Action**: Ensure that all general and food waste containers are protected from vermin.	
	Low Amber (E2)	New	20/10/2011	Waste Management	0000-S-90-04-O-0258-00-E Appendix 8	Clause 3k of the Approved Waste Storage and Accumulation Facilities Specification, forming part of the Waste Management Standard , requires "spill containment for liquid wastes such as oil and chemicals". However, concrete staining indicates that leaks of cooking oil have occurred.	**Action**: Provide secondary containment for waste cooking oil tanks.	
	Blue (E0)	New	20/10/2011	Waste Management	0000-S-90-04-O-0258-00-E Appendix 5	The Waste Management Standards Comparison, which is part of the Waste Management Standard states that "during the operation phase of the Project, lube oil shall be blended with crude oil in a controlled manner". However, waste lube oil is actually sent for off-site recycling. It was reported that the Commercial Department will not allow waste lube oil to be blended into the crude system due to quality control concerns.	**Action**: Work with Commercial Department to investigate the feasibility of blending waste lube oil into the crude system.	
	Blue (E1)	New	20/10/2011	Waste Management	0000-S-90-04-O-0258-00-E Appendix 7	Clause 2b of the Waste Minimisation, Diversion and Disposal Specification, which is part of the Waste Management Standard requires the	**Action**: Investigate opportunities to avoid the use of disposable drinking water bottles. Ideally this should be investigated as part of a	

Findings Log

Ref	Rank	Status	Date	Topic	HSESAP Ref:	Finding	Action Progress Review	Action
						company to "procure materials in bulk and in returnable containers", and to "procure materials in refillable and returnable packaging" to minimise packaging waste. Room for improved performance was noted in the audit. For example, drinking water is currently supplied to staff in 500ml plastic (non-returnable) bottles. It is recommended that consideration is given to alternative water supplies to avoid generation of waste plastic. Options include: • potable water supply (which meets WHO drinking water standards); or • refillable water cooler systems. Waste avoidance is a better option in the waste management hierarchy than recycling or disposal.	wider, systematic waste minimisation/resource efficiency initiative.	
	Blue (E1)	New	20/10/2011	Waste Management	0000-S-90-04-O-0258-00-E Appendix 7	Clause 5c of the Waste Minimisation, Diversion and Disposal Specification, which is part of the Waste Management Standard requires certain wastes, including plastic and paper, to be diverted to recycling where practicable. Waste paper and waste plastic is segregated at source for recycling. Sakhalin Energy has not yet signed contracts with recycling companies so this material is currently mixed with general waste before off-site disposal. However, it is understood that recycling companies have now been identified (two plastics recyclers on Sakhalin Island and a paper recycler on the mainland) and that arrangements will soon be in place to recycle this material.	**Action**: Conclude the contracts with waste plastic and paper recyclers as soon as possible and investigate opportunities to recycle, reuse, reduce or avoid other waste streams.	

Findings Log

Ref	Rank	Status	Date	Topic	HSESAP Ref:	Finding	Action Progress Review	Action
	Low Amber (E2)	New	20/10/2011	Storage of Hazardous Materials	0000-S-90-04-O-0018-00-E Appendix 5	Two above ground diesel storage tanks of 0.5 m^3 capacity each are used in the effluent treatment plant construction site, serving two generators. Both had drip trays. However, the drips trays do not meet Clause 1b of the Soil and Groundwater Industrial Controls Specification, forming part of the Soil and Groundwater Standard , which requires that "where bunded areas are not practical, chemicals are stored over grated drip trays designed to hold and retain 150% stored volume"). Also, two holes were noted in one of the drip trays that appear to have been created to allow rainwater to drain away.	**Action**: Ensure that effective secondary containment is provided at the two diesel tanks, and work with the contractor to ensure that the root cause of this non-compliance is identified, and corrective actions taken.	
	Blue (E0)	New	20/10/2011	Storage of Hazardous Materials	0000-S-90-04-O-0270-00-E Appendix 9	Clause 6 of the Chemicals Management Specification, forming part of the Occupational Health and Hygiene Standard requires that "a full Material Safety Data Sheet (MSDS), in English and Russian shall be made available for all chemicals and oil products used at the site". The following non-compliances were noted in the chemical storage area: • No MSDS (in English or Russian) was available in the C103 store for the Hydranal Coulomat AD reagent. An electronic copy of the MSDS was later produced for inspection in the office but the MSDS file in C103 was incomplete. • In C104 and C106 the MSDS for chemicals stored were only available	**Action**: Ensure that dual language MSDS documentation is provided in each chemical store. Periodically check the documentation, for example during audits and inspections.	

Findings Log

Ref	Rank	Status	Date	Topic	HSESAP Ref:	Finding	Action Progress Review	Action
						in Russian.		
	Blue (E0)	New	20/10/2011	Storage of Hazardous Materials	0000-S-90-04-O-0270-00-E Appendix 9	Clause 6a of the Chemicals Management Specification, forming part of the Occupational Health and Hygiene Standard requires that "chemicals are appropriately labelled". The following deficiencies were identified: • A drum of liquid in C104 is stored in a box with an incorrect stock code (the MSDS with the corresponding stock code - 1000941689 - was for High-density polyethylene (HDPE)). • Two metal drums of liquid were noted in C107 that had labels in Japanese only. • Five 205 litre drums and three smaller drums were noted outside C107. The drums were full but the contents unknown as there were no labels.	**Action**: Ensure that all chemical containers have adequate labelling.. Periodically check labels, for example during audits and inspections.	
	Low Amber (E2)	New	20/10/2011	Storage of Hazardous Materials	0000-S-90-04—O-0018-00-E	Five 205 litre drums and three smaller drums were noted outside C107 on hardstanding adjacent to gravel. No secondary containment was provided. The lack of secondary containment is non-compliant with Clause 1b of the Soil and Groundwater Industrial Controls Specification, forming part of the Soil and Groundwater Standard , which requires that "there shall be an appropriate use of bunded areas to provide spill containment of 110% of the largest stored vessel or double skinned tanks" and "where bunded areas are not	**Action**: Investigate the root cause of the non-compliance and implement appropriate corrective and preventative measures.	

Findings Log

Ref	Rank	Status	Date	Topic	HSESAP Ref:	Finding	Action Progress Review	Action
						practical, chemicals are stored over grated drip trays designed to hold and retain 150% stored volume".		

Annex C: Documentation Provided

List of Key Documentation Reviewed

1. Prigorodnoye Asset HSE Case (7000-S-90-04-T-7003-00-01)
2. Prigorodnoye Asset QHSE Plan 2011 (7000-S-90-04-P-0044-00-01)
3. Prigorodnoye Asset Groundwater Monitoring Procedure (7000-S-90-04-P-7135-00-E)
4. Prigorodnoye Asset Internal Audit Schedule 2011
5. Oil Spill Response Training Report (Drill Ref: LNG-OSR-CREO 26/11)
6. Q2,2011 Environmental Report to Senior Management
7. Prigorodnoye Asset 2011 HSE Scorecard
8. Waste Handling Procedure for LNG/OET Plant, Prigorodnoye Sakhalin Energy Complex (7000-S-90-04-P-7058-00-04)
9. Environmental Monitoring Programme 2011
10. Ruling No. ЯШ - 01 - 005/2011 on Imposition of Administrative Punishment, Department of the Federal Service for Supervision of Natural Resources (Rosprirodnadzor) for the Sakhalin Oblast.
11. List of materials in chemical warehouse
12. Ozone depleting substance inventory
13. Waste management database.

Annex D: Itinerary and Auditees

Itinerary

29th September	Site induction and kick-off meeting
	Meetings with senior management representatives
	Site orientation tour
30th September	Inspection of LNG plant and marine terminal
	Meetings with several auditees
3rd October	Inspection of waste storage area
	Meetings with HSE department

Auditees

Name	Role
Peter Norman	Asset Manager
Rene Verburg	Operation Manager
John Fraeijhoven	Head of Maintenance
Anikina Natalia	Head of Laboratory
Evgeny Kovalyov	QHSE Manager
Alexandr Brikov	Senior Environmental Engineer
Andrey Kashirov	Waste Management Advisor
Andrey Semenkov	Marine Base Supervisor
Capt. Viatcheslav Kivaev	Marine Superintendent