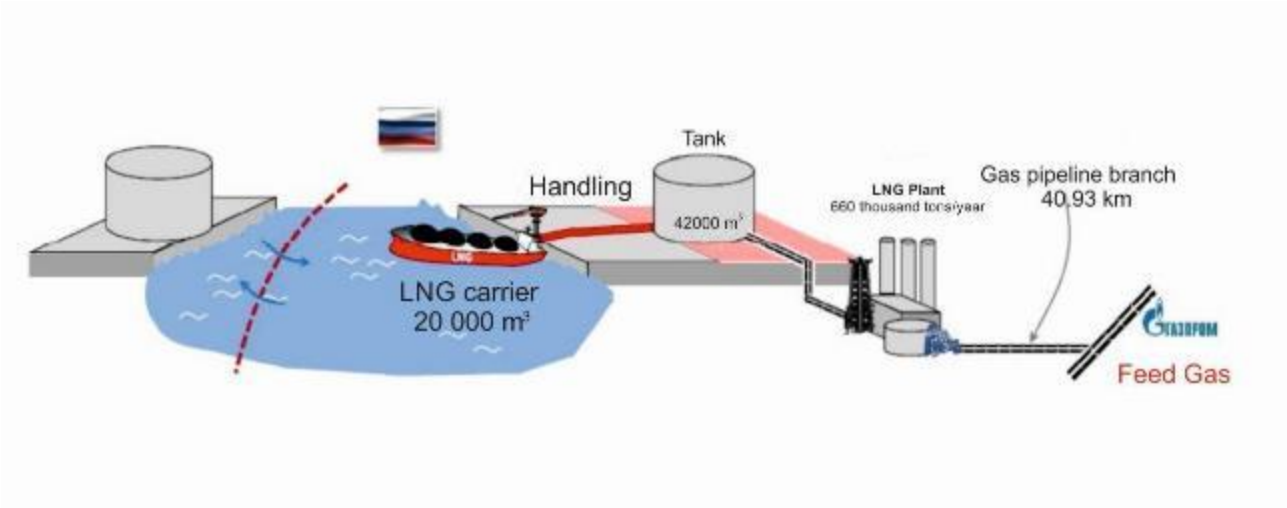

VYSOTSK LNG

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

NON-TECHNICAL SUMMARY

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1 INTRODUCTION TO VYSOTSK LNG PROJECT

The Project named «Terminal for production and transshipment of liquefied natural gas (LNG) in the port of Vysotsk in Leningrad Oblast» (the "Project") was launched at 20th St.-Petersburg International Economic Forum on June 17, 2016 by signing an agreement on Project implementation with Administration of Leningrad oblast.

Project facilities being constructed are located at the territory of Vysotsk and Sovetsk urban settlements and Goncharovsk rural settlement of Vyborg district, Leningrad region. The proposed construction site occupies the territory of the Ryuevyalinniemi Peninsula and the adjoining water area of Bolshaya Pikhtovaya Bay in the Baltic Sea. Vyborg district is located in the north-western part of the Leningrad region. The region borders with Finland to the west, Republic of Karelia to the north, Priozersk district to the north-east, Vsevolozhsk district of the Leningrad region to the east, and with Saint-Petersburg, City of federal importance, to the south-east (see Figure 1.1).

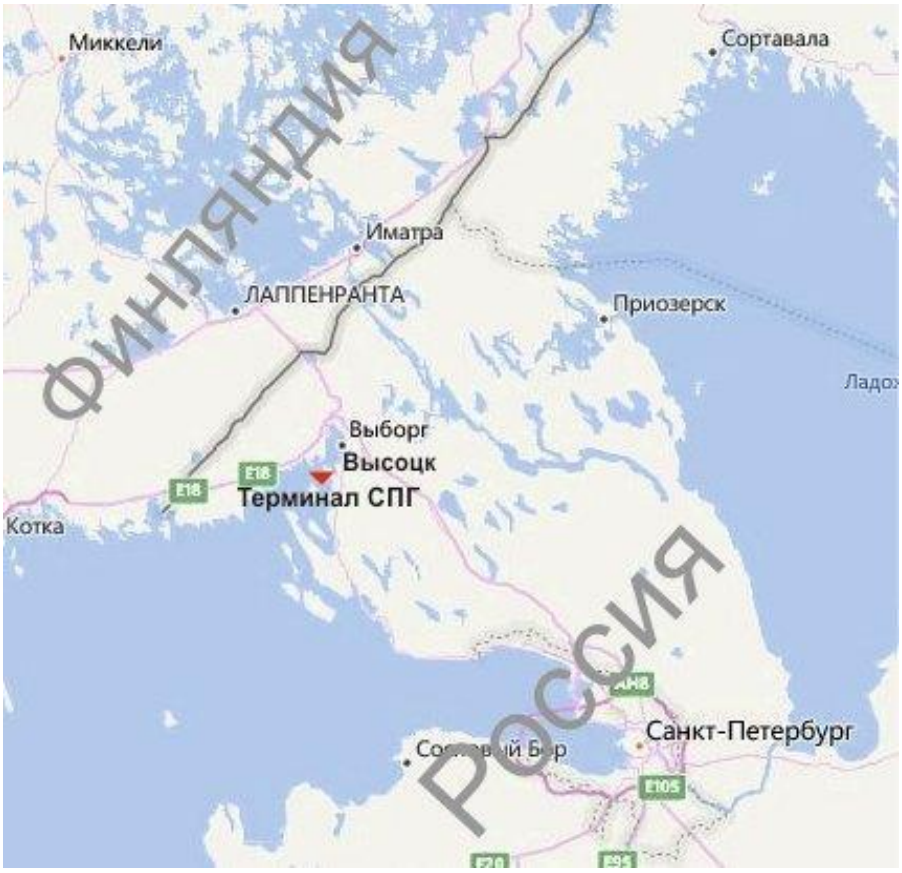

Figure 1.1: Location of Project

The production facilities and infrastructure required for the Project will comprise:

- a wharf for handling oversized cargoes and building materials with a temporary access road and a temporary storage zone for equipment and materials (hereinafter, the "Wharf") – Phase 1;

- a gas pipeline branch off of the Leningrad-Vyborg-State Border main gas pipeline leading to the LNG plant in Port Vysotsk in the Vyborg District, Leningrad Region (hereinafter, the "GPB") – Phase 2;
- a terminal for production and handling of LNG in Port Vysotsk, Leningrad Region, with the production capacity of 660,000 tons of LNG per year (hereinafter, the "Terminal") – Phase 3;
- supporting infrastructure in the form of local roads, aerial electrical transmission lines, workshops, fuel storage and refuelling area, water treatment facilities, waste management facilities and other workers' facilities.

Cryogas Vysotsk will operate as a project company for the purposes of implementing the Project, i.e. designing, developing, constructing, operating, managing and decommissioning the Project.

2 PROJECT DESCRIPTION

2.1 GENERAL INFORMATION

The proposed project is to construct a Terminal for the Production and Handling of Liquefied Natural Gas in Port Vysotsk, Leningrad Region, with the Production Capacity of 660,000 tons of LNG per year including a Gas Pipeline Branch Connected to Leningrad-Vyborg-State Border Main Gas Pipeline" (hereinafter, the "Project" or "Terminal Construction Project") being implemented by Cryogas Vysotsk (hereinafter, the "Company").

The project comprises the construction of a Terminal intended for reception and pre-treatment of natural gas with subsequent production, storage and offloading of LNG to consumers. To enable gas transportation by sea it is proposed to use gas carriers with design capacity of up to 20,000 m^3. The liquefied natural gas produced at the Terminal will be suppled both for domestic needs and for export to Scandinavian countries (particularly, to regasification terminals in the Gulf of Bothnia located in Pansio and Torino, Finland).

LNG is produced from natural gas supplied to the Terminal from Russia's Unified Gas Supply System.

This Environmental and Social Impact Assessment (ESIA) of the Project includes the first three Phases of Terminal construction. Phase 4, the gas pressure reduction station for supplying gas to third-party consumers in Vysotsk, relates to the prospective development of the Terminal and is outside the scope of this Project.

The Project's construction site is located in the Vyborg District of the Leningrad Region. The Project facilities are positioned as shown in Figures 2.1 and 2.2.

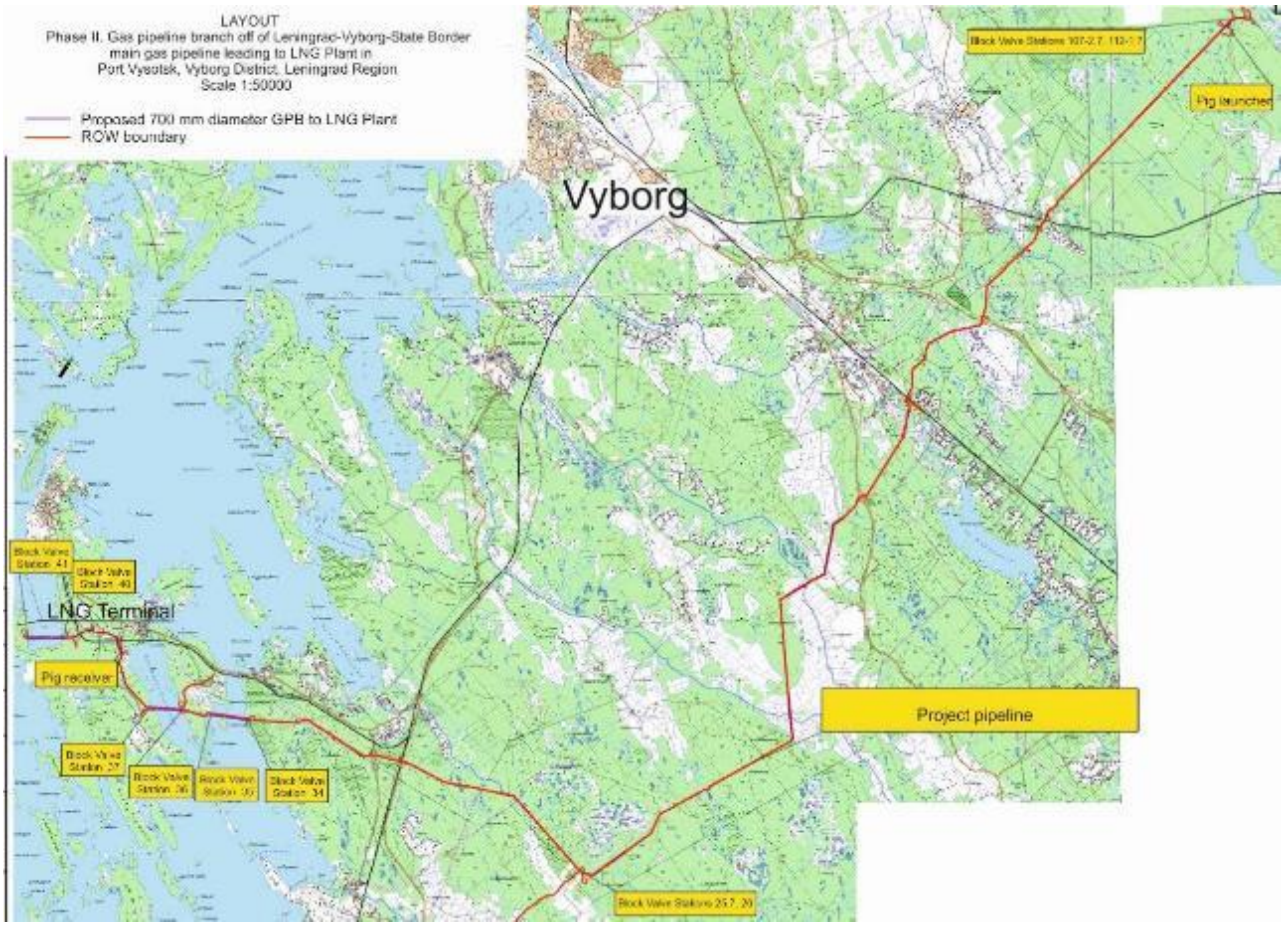

Figure 2.1: Project Facilities Location

The proposed construction site occupies the territory of the Ryuevyalinniemi Peninsula and the adjoining water area of Bolshaya Pikhtovaya bay. The location of these facilities is shown in Figure 2.1.

Figure 2.2: Jetty and Terminal locations

The oil-loading terminal RPK-Vysotsk LUKOIL II is located in close proximity to the Terminal facilities (800 m to the south) and is joined by a railway line and a road. The road connecting the Saint-Petersburg-Primorsk-Vyborg highway and the town of Vysotsk passes east of the construction site. The nearest railway station of Popovo (the Oktyabr Railway, Saint Petersburg Division, an OAO Russian Railways branch) is approximately 8 km east of the construction site.

The closest residential housing areas are located as follows:

- 2,502 m to the northeast – a residential area in the settlement of Pikhtovoe;
- 2,295 m to the north – a residential area in the town of Vysotsk;
- 1,379 m to the northeast – a residential area in the village of Suikkila;
- 2,262 m to the southeast – non-commercial gardening partnership Vysotskoye.

There are no residential housing areas (including individual homes), landscape and recreation zones, rest zones, resort, sanatorium or rest home areas, gardening partnership or cottage areas, collective or individual summer housing projects or gardening communities, or any other territories with regulated environmental parameters (sporting facilities, children's playgrounds, educational or children's establishments, public medical or health establishments) within a 300 m radius of the proposed construction site.

Phase I – Wharf for handling oversized cargoes and building materials

The wharf with an approach channel, shore stabilization structures, water intake and discharge structures, and a fire water pumping station is a hydraulic structure (HS).

The proposed HS is located on the northern shore of the Gulf of Finland on the way to the Inner Vysotsk roadstead of Vyborg bay near the northwestern part of South Transund Point in Vysotsky Island. Bolshaya Pikhtovaya bay creates a natural enclosure for anchored vessels. Bolshaya Pikhtovaya bay oriented in a southeast to northwest direction.

Navigation channel #6 is located 700 m from the shore and leads to Port Vysotsk.

Phase III – Liquefied Natural Gas Production and Handling Terminal

The proposed Terminal is located in the Vyborg District, Leningrad Region, on the northern shore of the Gulf of Finland near the northwestern part of South Transund Point in Vysotsky Island, on the Ryuevyalinniemi Peninsula, 90 km from Saint Petersburg and 50 km from the Russian-Finnish border. The Terminal will be constructed in close proximity to the entry zone of the Commercial Seaport (CSP) of Vysotsk and 800 m from the RPK-Vysotsk Lukoil II terminal.

The proposed construction site comprises a vacant, undeveloped plot of land.

The total area of the site (taking into account Phase III construction) is 57.18 ha. The selected site on the Ryuevyalinniemi Peninsula can fully accommodate the Terminal with the necessary infrastructure.

Phase II – Gas pipeline branch

The 41-km gas pipeline branch (GPB) will be built on the lands of the Goncharov rural settlement, the Soviet urban settlement and the Vysotsk urban settlement of the Vyborg District, Leningrad Region.

The approximate area of the land allotted:

- for long-term lease throughout the operation period: 9.84 ha;
- for short-term lease throughout the construction period: 149.19 ha.

The pipeline's starting point, the connection point, km 0 (Ch 0), is located on a section (km 112) of the Leningrad-Vyborg-State Border II main gas pipeline. The pipeline branch end point is located on the southwest shore of Bolshaya Pikhtovaya bay, south of Port Vysotsk near the proposed Terminal site.

The GPB is expected to pass through densely populated residential and recreation (gardening) land (the settlement of Cherkasovo, the non-commercial gardening partnership (NGP) Rechnoye , NGP Lesnoye, NGP Beliye Nochi, children's tuberculosis sanatorium Sosnovy Les). The gardening communities and population centers are situated close to each other. Some of the houses and dachas are located on the roadside. The surrounding area is actively used by residents for foraging.

The gas pipeline will cross numerous roads: the A-181 Scandinavia highway, the Primorskoye (Vyborg-Primorskoye) highway, the Saint-Petersburg – Vyborg railway, the Vyborg-Primorsk railway, the Popovo-Vysotsk railway (a branch off of the Vyborg-Primorsk railway line).

The gas pipeline will cross several major water bodies (Klyuchevskaya bay, Malaya Pikhtovaya bay, Bolshaya Pikhtovaya bay).

The gas pipeline will cross 11 watercourses (5 small rivers and 6 streams).

2.2 PROJECT TIMEFRAME

The total Project construction period is 36 months, including an 8-month preparatory period.

The construction work will be performed in 2016-2019.

The Project commissioning is scheduled for March 2019.

2.3 MAJOR FACILITIES' DESCRIPTION

In the course of the implementation of the Project it will be necessary to commission a large number of facilities intended for production, preparation, storage and transportation of liquefied gas (major facilities). These facilities are described below. The LNG production flow diagram is shown in Figure 2.3 below.

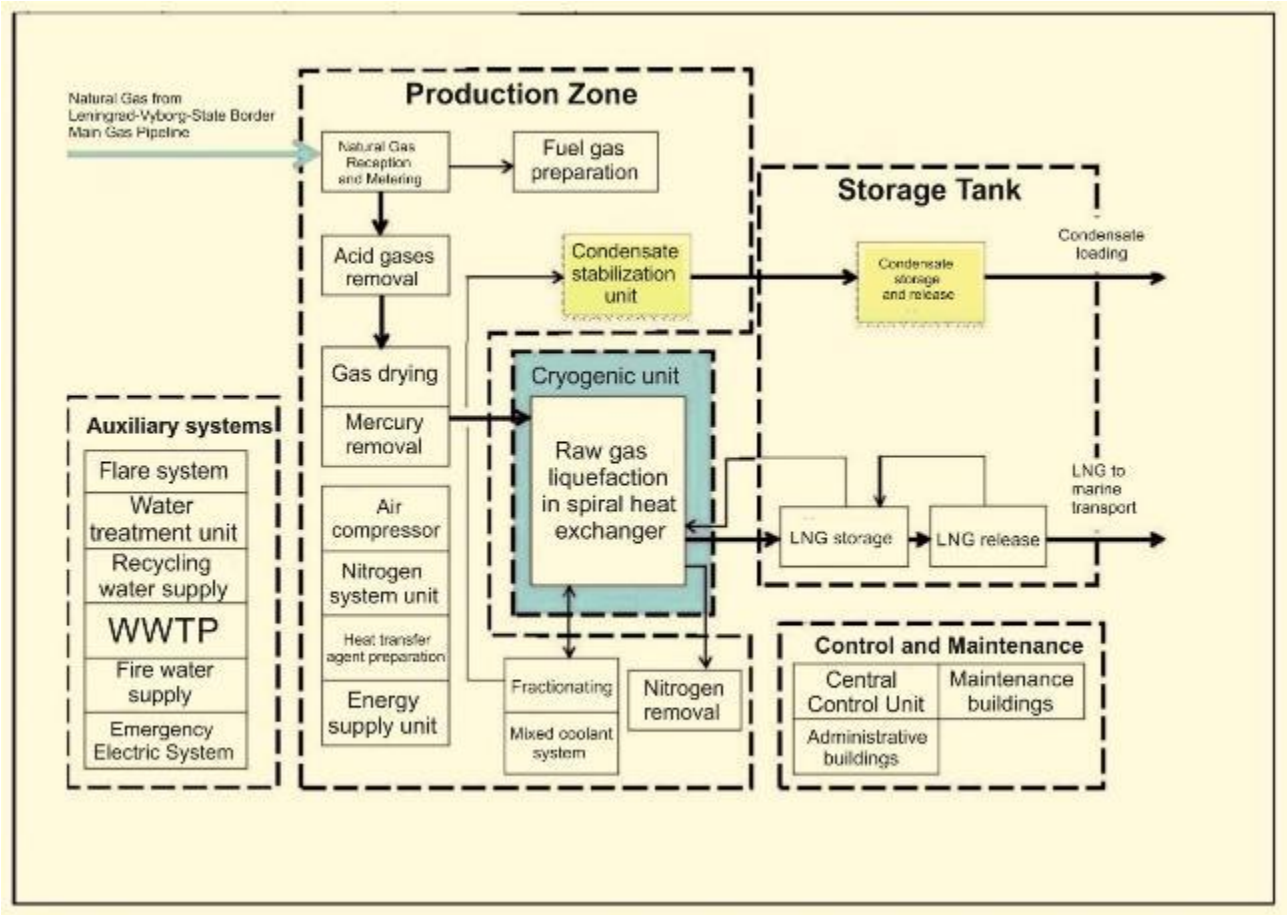

Figure 2.3: LNG Production Flow Diagram

2.3.1 PHASE I – FACILITIES AND TECHNOLOGICAL PROCESS DESCRIPTION

The wharf for handling oversized cargoes (including a temporary access road and a temporary storage zone) will be used for cargo intended for the Terminal construction before being transferred by tracks to a temporary storage yard within the Project site. During subsequent construction phases the wharf will be used for docking support vessels.

At its full capacity the facility will handle:

- 21 units of oversized heavy equipment (OHE) with the total gross weight of 3,343 t;
- accessory equipment with the total gross weight of 4,640 t;
- building materials with the total gross weight of 75,474 t, including general cargoes – 7,974 t; bulk cargoes – 67,500 t.

Working regime – navigation period, 7-8 months in duration, 24 hours in two shifts.

The wharf facility includes the following key (structural) process facilities:

- berthing face; Liebherr LR 1750 crawler crane installation site;
- parking zone for a modular transporter for oversize cargoes;
- yard for temporary storage of oversize cargoes;
- temporary storage zone for equipment and materials with the area of at least 5 ha;
- unheated warehouse with the floor space of 2,500 m²;
- key handling equipment.

In addition, the following items will be located on the wharf site:

- utility systems;
- modular buildings: a checkpoint and an office building

The Phase I area inside battery limits is 22.08 ha. The facilities and installation layouts were based on zoning requirements and in accordance with functional purpose; they are tentatively divided into the following zones:

A. Company owned facilities:

1. Offshore installations zone, including:

- 180-meter berthing face with the seabed depth of minus 8.50 m;
- designed offshore area;
- shore stabilization structures;
- loading quay;
- navigational aids.

2. Onshore facilities zone, including:

- office building with the floor space of 295 m^2;
- checkpoint;
- designed harbor facilities (fire water pump station, transformer substation, wastewater treatment facilities, sewage pump station);
- open storage yards for construction-related cargoes, with the storage area of 7.90 ha;
- sheltered cargo warehouse with the storage area of 2,593 m^2.

B. Facilities owned by the federal government:

- floating and stationary navigational aids for safe navigation.

Yards for storing and handling construction-related cargoes are located throughout the Terminal site and account for the majority of the Phase I facilities. The location of the yards is determined by technological solutions on handling and storage of construction cargoes and access ways will be built between yards to be used by special warehousing equipment and cargo transporters. The cargo warehousing facilities consist of open yards for short-term storage and stacking/de-stacking of batches for shipment.

The type of cargo intended for the Terminal facilities construction is varied in terms of both weight and size.

The equipment consists of various devices, including column devices, and process modules.

The following marine vessels will be used for cargo delivery:

- Cargo Vessel;
- m/v ESENIYA.

Liebherr LR 1750 (SDB) crawler cranes will be used at the wharf as the main loading equipment for handling oversize cargoes. Cranes like these will be used both for loading operations involving heavy loads and for installation work, including two-crane lifts.

The wharf will have two different load zones::

- zone 1– Liebherr LR 1750 (SDB) crane operation area, should withstand the load of 30 t/m^2;
- zone 2 – the area for parking or turning around a transporter, driving or parking a laden transporter, parking additional mobile for assembling Liebherr LR 1750 (SDB) cranes, should withstand the load 8 t/m^2.

A Liebherr LHM 320 mobile harbor crane with the lifting capacity of 104 t and the radius of up to 43 m is used for offloading accessory equipment and building materials, including bulk cargoes, from vessels.

The wide range of construction cargo to be handled at the wharf, including general cargo transported in individual crates or packages and bulk cargo, requires versatile handling equipment.

The following loading/offloading operations are performed at the wharf's storage area:

- stacking/unstacking general and bulk cargo;
- loading/offloading various types of general and bulk cargo into/from trucks.

Forklifts of various lifting capacity are used to handle general cargo, and front loaders with 2-6 m^3 buckets and bulldozers are used for handling bulk cargo.

An enclosed, unheated warehouse with the floor space of approximately 2,520 m^2 is provided for construction cargo which must be stored in a sheltered area. The warehouse covers an area of 30×84 m. Diesel loaders with the lifting capacity of 1.6-3.0 t are used for warehouse operations (staking/unstacking cargo), delivering and removing cargo from the warehouse.

If necessary, the warehouse structure can accommodate a manually operated overhead crane with the lifting capacity of up to 5 t.

Packaged construction cargo which are transported on pallets will be stored in stacks.

Scheurle modular transporters are used for transporting oversize cargo in the harbor area.

Platforms towed by articulated trucks are used as in-port transport for carrying long cargo from the wharf to the storage yards. A selection of highway trucks are used to carry combined general cargo, generally 12-15 m long.

Dump trucks are used for transporting bulk materials such as crushed rock.

A Liebherr LHM 320 mobile harbor crane, forklifts and front loaders are used for loading/offloading goods into/from highway trucks in the working areas within storage zones.

All the wharf's cargo handling equipment is leased as necessary.

All cargo handling equipment should be certified and cleared for operation in the Russian Federation by the relevant supervising agencies. All the repair and service operations that are required to be performed on the equipment (including loader washing) are carried out at the contractor's facilities outside the wharf area.

A refueling truck is used for refueling cargo handling machinery.

Handling of vessels loaded with oversize cargo at the wharf include the following operations:

- vessel mooring/unmooring (up to 3 h 35 min);
- unfastening cargo on board the vessel, preparing equipment units for hoisting using lifting slings attached to the equipment;
- transferring cargo with possible travel of Liebherr LR 1750 caterpillar cranes along the wharf;
- loading the equipment onto the modular transporter and securing the loaded equipment;
- technological breaks, including rest and lunch breaks.

The total time for handling one oversize cargo unit weighing 250 to 450 t may constitute 1 day.

Handling lighter cargo (18-250 t) usually takes between, 1 to 20 hours.

During unloading, vessels with oversize cargo enjoy priority over vessels with ordinary cargo.

Accessory equipment and construction materials are offloaded from vessels only in the absence of vessels with oversized cargo.

2.3.2 PHASE II – FACILITIES AND TECHNOLOGICAL PROCESS DESCRIPTION

LNG is produced from natural gas prepared in accordance with Gazprom's 089-2010 Organization Standard. Natural gas is fed into the LNG production line via a 530 mm diameter pipeline. Gas is taken from the Leningrad-Vyborg-State Border main gas pipeline. The tie-in point on the main

pipeline and the design criteria are determined by the technical specifications approved by Gazprom.

Along the entire gas pipeline branch (GPB) route pipes will be installed underground at the depth of at least 0.8 m from the crown of the pipe to the top of the ballast structures.

The gas pipeline branch consists of:

- main gas pipeline (530 mm in diameter, working pressure 5.4 MPa, length 41,277 m) from the tie-in points on the existing Leningrad-Vyborg-State Border 1 and 2 main pipelines to the proposed LNG Plant in the vicinity of the Ryuevyalinniemi peninsula, Port Vysotsk;
- pig launcher chamber - 60x90m;
- loop lines through the Gulf of Finland's water areas - 3;
- pig receiver chamber - 60x90m;
- block valve stations as part of the GPB's linear section;
- cathodic protection stations (CPS) - 3;
- electrochemical protection cabling with anode earthing devices (3).

The project documentation provides for a comprehensive protection against soil corrosion of the proposed GPB: insulating coating (passive protection) and electrochemical protection (active protection).

Based on the calculations, three cathodic protection stations will be installed along the entire GPB route. To ensure electrochemical protection of the pipelines from corrosion cathodic, sacrificial and drainage protection units will be used (CP, SP, DP, respectively), complete with appropriate equipment approved by Gazprom.

The following items are provided for the pig launcher, pig receiver and block valve station sites:

- electric power supply with commercial power metering;
- telematics equipment;
- lightning protection;
- protective grounding;
- fire alarm system;
- technical security equipment (TSE) with an access control system;
- technical vehicle access way and turnaround using the proposed access roads;
- site improvements.

The proposed gas pipeline branch is connected to the km zero block valve stations at km 112 of the Leningrad-Vyborg-State Border 1 main gas pipeline and km 107 Leningrad-Vyborg-State Border 2 main gas pipeline.

A pig launcher chamber will be installed at the beginning of the gas pipeline branch, and pig receiver chamber will be installed at the end of the gas pipeline branch, km 39. At km 26, a linear block valve station will be built with gas purging possible in both directions; the linear block valve station will be combined with a bridging section to the gas pipeline branch connected to the Vyborgskaya Tsellyuloza gas distribution network.

Pipeline looping will be used in places where the GPB will cross the Gulf of Finland; block valve stations will be built on both shores. On each side of the bays block valve stations will be built with gas purging possible in both directions.

A 700 mm diameter pig launcher chamber and a 700 mm diameter pig receiver chamber will be built to clean the pipes and conduct non-destructive inspection of the gas pipeline branch.

To secure the pipeline at the design elevation, ballasting structures will be installed at river, stream and wetland crossings and in waterlogged areas. Individual saddle-shaped reinforced concrete weights will be used for pipeline ballasting.

When crossing the rivers Perovka, Matrosovka and Medyanka the gas pipeline will be constructed using the method of horizontal directional drilling.

When crossing the Gulf of Finland bays 720x9 diameter K52 pipes will be used with ZUB concrete weight coating in sheet steel jacket.

At the sites where the gas pipeline crosses dirt roads crossings made of reinforced concrete slabs will be built.

When crossing railway lines and motorways of certain categories the gas pipeline will be installed in a protective encasement using trenchless technology (pipe ramming).

Once the pipeline installation is completed and the block vales are installed, the pipeline is subjected to strength testing prior to commissioning. Hydraulic tests at production sites, junction points and break valves are performed in accordance with Code of Practice (SP) 86.13330.2014 and Gazprom STO 2-3.5-354-2009.

All pipelines should be cleaned, subjected to hydraulic and pressure tests with subsequent drying.

To ensure the safety of the installations and pipes a set of technical security measures will be implemented; pipeline aboveground installations, block-containers and antenna equipment and masts will be fenced off and fitted with primary firefighting accessories.

To meet the civil defense and emergency requirements a provision is made for a civil defense and natural and human-caused emergency response action plan.

2.3.3 PHASE III – FACILITIES AND TECHNOLOGICAL PROCESS DESCRIPTION

The liquefied natural gas production and handling terminal is intended for raw gas reception, pre-treatment and subsequent production, storage and loading of LNG to consumers.

The Terminal's total production capacity is 660,000 tons of LNG per year. To produce the specified amount of LNG the LNG Plant will require delivery of 1 billion m^3 of natural gas per year.

The Terminal should be in operation at least 330 days a year.

The Terminal site is comprised of the following zones:

- Gas treatment and metering zone
- Production zone
- LNG storage zone
- LNG release zone
    - LNG release zone (marine vessels)
    - LNG release and reception zone (trucks)
- Flare system zone
- Auxiliary production zone
- Administrative zone
- LNG filling station zone
- Prospective development zone
- Free access zone
- Fire depot site
- Offshore zone.

The gas treatment and metering zones (located north of the gas pre-treatment unit) houses equipment for metering raw gas flow rate.

The production zone (located in the central part of the site) houses an LNG train consisting of a gas pre-treatment unit, two liquefaction units, and a high-temperature fluid unit. The zone also includes storage tanks for mixed refrigerant components, a fuel gas system, a technical and instrumentation air system, and a nitrogen supply system.

The LNG storage zone (located west of the production zone) has a 42,000 m^3 isothermal tank and a boil-off gas compressor unit. The working pressure inside the LNG storage system is below 0.024 MPa (gauge). The relief valves of the LNG storage system are set for pressure below 0.03 MPa (gauge).

Guaranteed annual volume of LNG transshipment is 660,000 tons per year. Guaranteed daily production capacity of one LNG train is 1,920 tons per day. Guaranteed hourly production capacity of one LNG train is 80 tons per hour.

The LNG Production and Handling Terminal should ensure the following key technological operations:

- Receiving feedstock (gas), analyzing its component structure, stabilizing its physical parameters (pressure, temperature, flow rate);

- Removing unwanted components from the row gas that may damage the equipment: carbon dioxide, mercury, methanol, heavy hydrocarbons, ensuring that the composition of the LNG meets the parameters prescribed by the relevant technical specifications;
- Drying the gas supplied for liquefaction;
- Preparing mixed refrigerant to ensure the required performance of the cooling cycle to produce the required amount of LNG of the required quality;
- Liquefying natural gas using the mixed refrigerant cycle;
- Storing LNG;
- Receiving LNG from third party producers delivered by trucks;
- Loading LNG onto carriers, bunker barges and into tank trucks ;
- Equipment heating system;
- Fluid control system;
- LNG quality control;
- Monitoring the amounts (by weight) of finished product intended for loading into trucks;
- Providing necessary energy products and auxiliary fluids for the production cycle.

The technological process of LNG production includes:

- adsorption of mercury from natural gas;
- absorption of CO_2 from natural gas;
- drying natural gas prior to liquefaction;
- separation of the C6+ fraction, refrigeration and liquefaction of natural gas;
- preparation and compression of mixed refrigerant by cycling compressors.

LNG reception and metering

The purpose of the gas reception and metering unit:

- monitoring pressure of raw gas supplied to process equipment, ensuring protection from pressure in excess of the permissible working pressure;
- separating liquids and mechanical impurities from gas;
- metering the flow rate of raw gas supplied to process equipment.

The gas reception and metering unit consists of parallel metering lines each of which includes a raw gas separator, a flow meter and a pressure regulator.

LNG Production

The LNG production process proposed by Air Liquide is based on using mixed refrigerant cooling cycle, drying natural gas and removing mercury, CO_2 and methanol prior to liquefaction. Mercury is removed using the non-recoverable PURASPEC adsorbent. The mercury content of natural gas reduces after the gas passes through the adsorbent.

The activated MDEA (methyl diethanolamine) process was chosen to remove carbon dioxide from natural gas. The amine absorbent also partially absorbs methanol from natural gas.

Acid gases are removed from raw natural gas by chemical absorption using MDAE solvent and an activator.

Raw natural gas contains oxygen which is partially absorbed by amine solvent and as a consequence heat stable salts (HSS) form during MDAE degradation. To reduce this negative effect created by oxygen a dissolved oxygen absorbent introduction system is used. This chemical substance also acts like a corrosion inhibitor. An anti-foaming agent is also added.

After removal of acid components (mainly CO_2) from the raw gas with the help of MDAE it is necessary to reduce the water content of the gas to 1 ppm (volume) with the help of adsorption on a molecular sieve. The adsorption/desorption process runs in drying adsorbers.

Cleaned and dried natural gas is liquefied in the “cold” unit. The liquefaction process offered by Air Liquide is based on refrigeration to minus 160°C using a coolant (mixed coolant). Natural gas liquefaction takes place in the “cold” unit consisting of a cryogenic heat exchanger, and pressure separators. These vessels are situated within the same module and are isolated from the other equipment. During the liquefaction of natural gas its C6+ fraction is separated.

A separator is used for separating lighter components (gaseous phase) from heavier components (liquid phase). After the separation of the liquid phase the mixture is supplied to the second compression stage where it is further compressed to a higher pressure.

Thereafter, the mixture of components is fed into an air cooler at high temperature where the second partial condensation takes place.

Gas/liquid separation takes place in the second separator.

High pressure gas after the compressor’s air cooler is called light mixture (LM), high pressure liquid is called heavy mixture (HM), and medium pressure liquid is called HHM as it contains components which are heavier than HM.

After expansion, the HM and the HHM are mixed with the evaporated LM supplied from the cold side of the heat exchanger. The resulting mixture combined at the same ratio as before is reintroduced in the two-phase state and evaporates from the hot side of the main heat exchanger.

After exiting from the hot side of the heat exchanger the recovered mixture is recycled back to the cycle compressor.

Each cycle compressor is driven by a gas turbine.

Heat exhausted by each gas turbine is recovered to be subsequently used in the technological process.

Hot flue gases from each gas turbine pass through a convection chamber where they transfer their heat to a heat-stable oil, heating it to the required temperature.

A provision is made for a flue gas bypass line with a control valve to prevent the oil from overheating and degrading.

LNG storage

The LNG storage zone is intended for storing liquefied natural gas prior to its transfer onto trucks and marine vessels. The LNG storage zone includes:

- A 42,000 m^3 LNG storage tank 160V01 with submerged pumps 160P601A/B/C, 160P602A/B;
- Boil-off gas compressor unit for compressing the liquid phase produced during LNG loading/offloading, including a boil off gas compressor 161C01A/B and the compressor's air coolers 161E01A/B and161E602A/B.

LNG loading (marine vessels)

The LNG loading zone is intended for loading LNG into gas carriers and bunker barges. The LNG loading zone includes special equipment (loading arms) for loading LNG into marine vessels - 162L01A/B and 162L01C/D.

LNG loading (trucks)

The LNG loading zone is intended for loading LNG into trucks. The LNG loading zone includes special equipment for loading LNG into trucks – a single rack for loading/offloading LNG into tank trucks, 162L03. To keep record of the LNG quantities weighing equipment is used.

Thermal decontamination plant

The thermal decontamination plant is intended for disposal of liquid and solid wastes generated at the Terminal.

Substandard products collection and disposal system (drainage)

The system is intended for collecting and disposing of, or recycling, various streams from the LNG unit. The LNG production unit includes closed drainage systems.

Flare system

The flare system is intended for emergency discharges and blowdown discharges of hydrocarbon fluids during operation (startup, shutdown, blowdown, equipment and pipeline draining, pressure stabilization and letdown) and their subsequent burning. It includes systems of "cold" and "warm" discharges. it also has a low-pressure flare system intended for discharging fluid from the regulators installed on the LNG storage tanks.

The main elements of the flare system are three flare stacks installed on a single foundation, and a support tower intended for keeping the stacks in vertical position.

The flare system zone also includes flare separators and drainage system equipment - drain tanks for "cold" and "warm" hydrocarbon discharges.

Fuel gas system

The fuel gas system is intended for production zone and auxiliary facilities zone consumers. The gas to be used in the system is taken from the raw gas pipeline and throttled. Before being pumped to consumers the gas is heated and fed through a separator and a mechanical filter.

No provision has been made for using fuel gas for the LNG plant's energy needs (fluid heating, including at startup).

Technical and instrumentation air system

The technical and instrumentation air system is intended for supplying the Terminal's consumers with instrumentation air (for instrumentation systems and devices) and technical air (for purges and repair operations). To produce instrumentation air an air compressor unit is to be installed (as part of the nitrogen supply system) sharing a common module with the apparatus for drying air to dew point temperature at or below minus 40°C. Technical air is taken from the compressor's discharge line upstream of the scrubbing and drying apparatus. Three 100 m^3 air receivers are provided for creating an emergency instrumentation air reserve.

Nitrogen supply system

The Terminal's operations require the availability of gaseous nitrogen with the dew point temperature at or below 70°C of various quality: with N_2 content of between 99% and 99.995%.

Gaseous nitrogen with N_2 content of at least 99% is mainly used for:

- creating a gaseous "cushion" in the absorbent tank, 112V21,
- creating a gaseous "cushion" in the hot oil tank, 192V91,
- creating a gaseous "cushion" in the amine drainage tank, 112V22,
- venting flare manifolds in the absence of fuel gas,
- venting pre-treatment vessels before shutting them down for repair,
- creating a gas seal on mixed refrigerant compressors.

A modular membrane air separation station manufactured by NPK Grasis is used for the production of 99% nitrogen. Nitrogen and instrumentation air are produced by an air compressor unit intended for compressing atmospheric air and supplying it to consumers (into the technical air system), to the drying apparatus (instrumentation air system), membrane air separation unit (99% gaseous nitrogen system). The air compressor unit is shared by the nitrogen supply system and the technical air and instrumentation system.

2.3.4 WATER SUPPLY

Phase I – Wharf for handling oversize cargoes and building materials

Potable water is used for domestic and drinking needs of workers and office staff and for showers. Potable water is delivered to the site. The estimated water consumption rate is 2.86 m^3/day (1,043.9 m^3/year).

Water will not be supplied to marine vessels.

The site will be sprayed with water brought in by water trucks, 204.0 m^3/day (24,480 m^3/year).

The source of water for fire water supply is the port's offshore area. The water is taken from the gulf through two water inlets located in the shoreline stabilization structure. The fire water pump station, sized 9.0x11.0 m, takes water from the gulf and is located on the wharf.

The area of water inlets is determined by the flow rate at full capacity (1,600 m3/h), each inlet opening has the area of 12.25 m^3. Inlets are fitted with bar screens filled with gravel and crushed stone sized 25-30 mm.

The required fire water flow rate is set based on the flow rate required to extinguish a fire at the warehouse, i.e. 51.4 l/s.

Phase II – Gas pipeline branch

Water supply during construction is intended for production, domestic, drinking and firefighting needs and for pipeline hydraulic testing.

Water for production needs is used to spray the site and replenish recirculated water systems for the car wash.

Water intended for domestic (0.681 m^3/day) and production needs is delivered by tank trucks. The construction staff is supplied with bottled drinking water that is delivered to the site.

Fire water is delivered to the site. Fire water consumption rate is 10 l/s.

Water for hydraulic tests is taken from Vyborg bay (2000 m^3/day, 28,000 m^3 per period). The water intake structure should be fitted with a fish protection device.

Phase III – LNG Production and Handling Terminal

Water is supplied to the Terminal from the following sources:

- water for production needs is delivered to the site by tank trucks (an additional source is used when there's a lot of precipitation – meltwater/rainwater);
- water for domestic needs is delivered to the site by tank trucks;
- water for firefighting needs is taken from the Gulf of Finland using fire pumps;
- water for drinking needs is delivered to the site in bottles by truck.

The consumption rate of domestic water for the Terminal's needs is 17.602 m^3/day, 5,455.97 m^3/year.

The consumption rate of production water for the Terminal's needs is 41.2 m^3/day, 8841,87 m3/year.

The total consumption rate of water for the Terminal's needs is 58.802 m3/day, 14,297.94 m^3/year.

2.3.5 WASTEWATER TREATMENT AND DISCHARGE

Phase I - Wharf for handling oversize cargoes and building materials

Domestic sewage system

The total volume of domestic wastewater is 2.86 m^3/day (1,043.9 m^3/year).

The domestic system is made of polyethylene pipes. Sewer manholes from precast concrete are installed to provide access to the sewers. Domestic effluent from the facility is directed to the underground local biological wastewater treatment plant and then discharged into the soil through a filtering trench. The wastewater treatment plant is manufactured by OOO Ecoline. An ECO-R modular water treatment unit is sued for biological wastewater treatment.

Bio-toilets will be placed at the wharf site in the vicinity of the rainwater treatment facilities.

Rainwater sewage system

During the first construction phase the Terminal's total catchment area will be 22.08 ha, including:

- lawns – 6.80 ha;
- crushed stone surfaces – 8.83 ha;
- hardtop surfaces – 6.45 ha.

Rainfall from the site is collected in rainwater gravity sewers; sewer pumps feed the rainwater into accumulation tanks and then to the treatment plant. Upstream of the accumulation tanks is a separation chamber through which passes the most polluted portion of the rainwater. The underground rainwater treatment plant located within the docking area discharge treated and decontaminated water into the bay. The wastewater treatment plant is manufactured by OOO Ecoline.

Industrial sewage system

Industrial wastewater gravity sewers are intended for removing accidental effluents from the 100 mm diameter floor drain located in the office building's water metering/boiler station into the external stormwater drain system.

Phase II – Gas pipeline branch

Domestic wastewater is transported from the construction site to a waterproof tank and the bio-toilets with subsequent removal by cesspool trucks and decontamination by specialist organizations.

There is no industrial effluent.

Wastewater from the hydraulic testing of the gas pipeline is collected in special sedimentation ponds which should be in operation during the entire period of work performance. After sedimentation the water is transported by tank trucks to the wastewater treatment plant to be built during Phase I construction.

Surface wastewater is collected in accumulation tanks and then removed from the site to the wastewater treatment plant to be built during Phase I construction.

Phase III – LNG Production and Handling Terminal

A domestic sewer system, K1, a rainwater sewer system, K2, and an industrial sewer system, K3, will be built to remove wastewater from the site.

Wastewater treatment facilities will receive and treat domestic and industrial water and rainwater from the Terminal site; the water will then be subjected to additional treatment and partly recycled with the surplus discharged into the Gulf of Finland. The domestic and industrial wastewater and the rainwater will be directed to the wastewater treatment facilities and subjected to mechanical and biological treatment. Domestic wastewater and rainwater will be treated in separate unrelated streams.

The wastewater treatment facilities receive domestic effluent from sanitary fixtures and industrial wastewater from the heating plant floor drains.

The rainwater treatment facilities receive rainwater and meltwater from storm drains.

Wastewater treatment facilities consist of the following:

- domestic effluent receiving tank;
- biological treatment plant;
- rainwater accumulation/sedimentation tank;
- biological treatment plant;
- grit dewatering bays;
- treated water tank.

After treatment at the biological treatment plant the treated and clarified effluent is disinfected by ultraviolet light in a disinfection unit.

The volume of treated wastewater to be discharged into the Gulf of Finland is 1,670 m^3/day. A 700 mm diameter discharge sewer was designed by OOO Morstroitekhnologiya, Saint-Petersburg. The designed throughput capacity of the discharge outlet is 323.5 l/s.

The following installations are located in the auxiliary production zone:

- industrial effluent and rainwater treatment plant;
- domestic wastewater aftertreatment plant.

The following installations are located in the administrative zone:

- domestic wastewater treatment plant;
- domestic wastewater aftertreatment plant.

2.3.6 WASTE MANAGEMENT

A thermal treatment plant intended for utilization of liquid and solid wastes generated at the Terminal will be built as part of the LNG Production and Handling Terminal facilities.

Other industrial and domestic wastes not subject to thermal treatment will be transported to waste utilization and disposal sites for wastes of hazard classes I-IV under contracts with the following companies: OOO RASEM (Vyborg municipal landfill), OAO Waste Management Company for the Leningrad Region, OOO Profspetstrans, OOO Merkuriy.

2.3.7 OTHER UTILITIES INFRASTRUCTURE

Other Project infrastructural assets include on-site and access roads, transport, fire depot, warehouses.

An **intrasite network of roads** with the following parameters will be built on the Terminal site:

- primary driveways 6 m wide;
- secondary driveways 4.5 m wide.
- the roadway width on the segment intended for dual-lane multi-axle low-bed platforms for oversize cargoes is 9.00 m.

The following types of surface will be used:

- warm mix asphalt concrete;
- road slabs;
- sand/cement leveling course;
- crushed stone foundation;
- coarse sand bed (GOST 8736-93).

Road posts should be installed along the roadway.

To connect the proposed sites with the existing road network a motor road about 1,473 m in length will be built to provide access to the Terminal. The main access will be from the southeast, from the existing motor road leading to Vysotsk, in accordance with the available approvals (a Phase I Project asset).

The road design parameters are set based on its intended purpose and traffic intensity: number of lanes: 2; roadway width: 6.0 m; shoulder with 2.0 m; roadbed width 10.0 m; surface type – permanent (single-layer asphalt concrete over reinforced concrete road slabs).

The roadbed is designed in accordance with the SNiP requirements taking into account the region’s geological, hydrogeological and weather conditions.

No roadside reserves are provided for, therefore the backfill for the roadbed will be taken from concentrated soil reserves (quarries). Water will be drained from the road and will be directed downhill via roadside ditches.

At watercourse crossings, both temporary and permanent, culverts constructed of precast concrete will be installed.

A second access to the site, 615 m in length, is provided for on the southern side of the Terminal site (a Phase I Project asset).

Besides, during Phase III of the Project construction a bypass will be built to ensure a back-up access to the Terminal site, an access to the LNG receipt and release zone (trucks) and block valve station #41, and to restore access to the navigational aids in the northern part of the peninsula. The road will pass of east of the site along the fence line.

Another 6 access roads will be built to access the gas pipeline's block valve stations, pig launcher, and pig receiver (150 m, 1,600 m, 3,000 m, 550 m, 150 m, 600 m in length, respectively). The pig launcher chamber and the zero-km block valve stations can be accessed from a local road in the Goncharovskoye rural settlement as well as from the proposed road leading to the block valve stations and telematics command center of the main gas pipeline.

A **fire depot** is located in the east, west of the administrative zone within the Terminal site. The fire depot site accommodates a fire depot for two fire engines, and the auxiliary structures ensuring fire depot operations and fire team training.

The warehouse which is to be built as part of the LNG Terminal facility is intended for storing such chemicals and accessories as may be necessary for the Terminal facility. The warehouse includes:

- amine storage area;
- lubricant oil storage area;
- accessories storage area.

2.4 SCOPE OF ACTIVITIES AND FACILITIES COVERED BY ESIA

2.4.1 ASSOCIATED FACILITIES

In accordance with IFC Performance Standard (IFC PS 1, item 8), Associated Facilities are those activities and facilities that are not part of the financed Project and would not be conducted, built or expanded if the Project was not carried out, but without which the Project would not be viable.

LNG will be transported by third-party carriers. LNG carrier operations and other offshore activities are not part of the financed Project and are not controlled by Cryogas-Vysotsk, they are, however, vital for the Project and are therefore considered as associated activities in the sense of the ESIA (transportation within RF territorial waters).

The Project provides for the following division of responsibility between Cryogas-Vysotsk and the federal authorities in the aquatic area in littoral zone:

(a) Cryogas-Vysotsk ensures design and construction of the following port facilities:

- a wharf for handling LNG;
- a wharf for receiving oversize cargoes and building materials;
- a warehousing zone;
- an administrative zone;

- utilities and services.

(b) The following facilities are within the scope of responsibility of the federal authorities (they are considered as Associated Facilities for the purpose of this ESIA):

- the maritime canal and the approach channel with the associated offshore area, including dredging operations in the approach channel, the turning basin and the maritime canal;
- repair dredging operation, if necessary;
- marine traffic control system and navigational aids;
- buildings housing marine services.

Other associated facilities include facilities used as sources of raw materials (e.g. quarries producing local building materials), including facilities which are created and developed solely for the Project as well as existing facilities and installations whose products/output will be, to a substantial degree, used for the Project's needs.

Existing motor roads of local and regional significance (e.g. the approach road to Vysotsk), RPK Vysotsk Lukoil II roads, and the Vyborg-Saint Petersburg railway line will be used during the construction and operation of the Project; when in Project use those roads are considered to be Associated Facilities.

2.4.2 OUT-OF-SCOPE FACILITIES

A description of activities that will not be addressed by the ESIA, typically because they fall outside of the Project's Area of Influence Cryogas-Vysotsk control, is provided below.

The transport of LNG during operational phase along shipping routes outside the territorial waters of the Russian Federation is considered to be outside of the scope of this ESIA.

Destination ports are also outside of the scope of this ESIA.

The operation of licensed waste utilization and disposal facilities currently receiving Project and non-Project related legacy waste is also considered to be outside of the scope of this ESIA.

The Leningrad-Vyborg-State Border main gas pipeline, from which natural gas is to be used for LNG production, is also considered to be outside of the scope of this ESIA.

2.5 AREA OF INFLUENCE

The area of influence will include areas within the Project sites and beyond, affected by the Project either directly or indirectly.

2.5.1 DIRECT IMPACT

The areas directly affected by the Project include those affected by the direct physical impacts from major Project facilities, infrastructure facilities (including Temporary Construction Camps) and auxiliary facilities located within land plots allocated to the Project (approximately 180,000 m^2 at the construction stage) and also include irreversible take of part of marine area (approximately

17,000 m^2) for construction of wharf and jetty, hydro-engineering facilities, LNG Plant, wastewater discharge outlet, water intake facility, coast protecting structures, etc.).

In addition to impacts within the Project land plots, the Project will have direct impacts beyond the Project battery limits (fence line of the Project facilities), and beyond the wider allocated land plots, including:

- air emissions and noise impacts (within sanitary protection zone of the facilities);
- light and visual impacts (also within SPZ);
- increased turbidity area during construction of wharf, port facilities and bay crossings;
- increased water turbidity caused by construction of river crossings;
- socio-economic impacts: in terms of direct impact on communities, the following urban and rural settlements:
    - Towns (Vyborg, Vysotsk, Sovetsky);
    - Rural settlements (Goncharovskoye, Medyanka, Cherkasovo, Perovo, Sokolinskoe, Roshino);
    - Household plots' entities: SNT – Non-commercial Communities of Gardeners (SNTs Vysotskoye, Solnechnoye, Sputnik 2, Berezovaya Dolina, Rechnoe, Lesnoe, Belye Nochi, Sosnovy Mys, Lada, Perovskoe);
    - Recreational centres (residential and recreational complex Pikhtovoye, Island).

2.5.2 ASSOCIATED FACILITIES

The area of direct impacts of associated facilities includes:

- shipping routes (within the RF territorial waters) as the major source of potential noise impacts (underwater noise affects definite marine biota and is likely to spread at a considerable distance);
- the approach channel (where maintenance dredging could be required);
- quarries for local construction materials such as sand, gravel, etc. (village Gavrilovo);
- existing transport infrastructure (automobile and rail roads):
    - Roads to deliver cargos from Vyborg;
    - Roads to deliver containers from Shushary station;
    - Roads to deliver sand etc. from Gavrilovo II;
    - Roads to deliver gravel from Gavrilovo;
    - Roads to transport construction and sanitary wastes and access ground etc.

2.5.3 INDIRECT IMPACT

In addition to direct impacts, the Project may impose indirect impacts beyond the zone of direct impact, such as:

- Potential impacts (including positive ones) on regional social infrastructure (health care facilities, educational institutions);
- Socio-economic benefits for local communities and residential areas within Vyborg region.

2.5.4 SUMMARY

Based on the above considerations, the area of Project direct impacts includes (see Figure 2.4):

- Land allocated directly for siting of Project facilities (Wharf, LNG Plant and Jetty, temporary construction camps) and areas of their sanitary-protection zones and gas pipeline buffer zones;
- Part of marine area of Bolshaya Pikhtovaya Bay and islands within this area ;
- LNG shipping routes within the RF territorial waters;
- Affected urban and rural settlements ;
- Quarries for local construction materials (Gavrilovo);
- Access roads.

The following should be also taken into consideration:

- Different types of impact will be applicable to different parts of the Project Area of Influence;
- Different parts of the Project Area of Influence will be imposed to impacts of different level of significance.

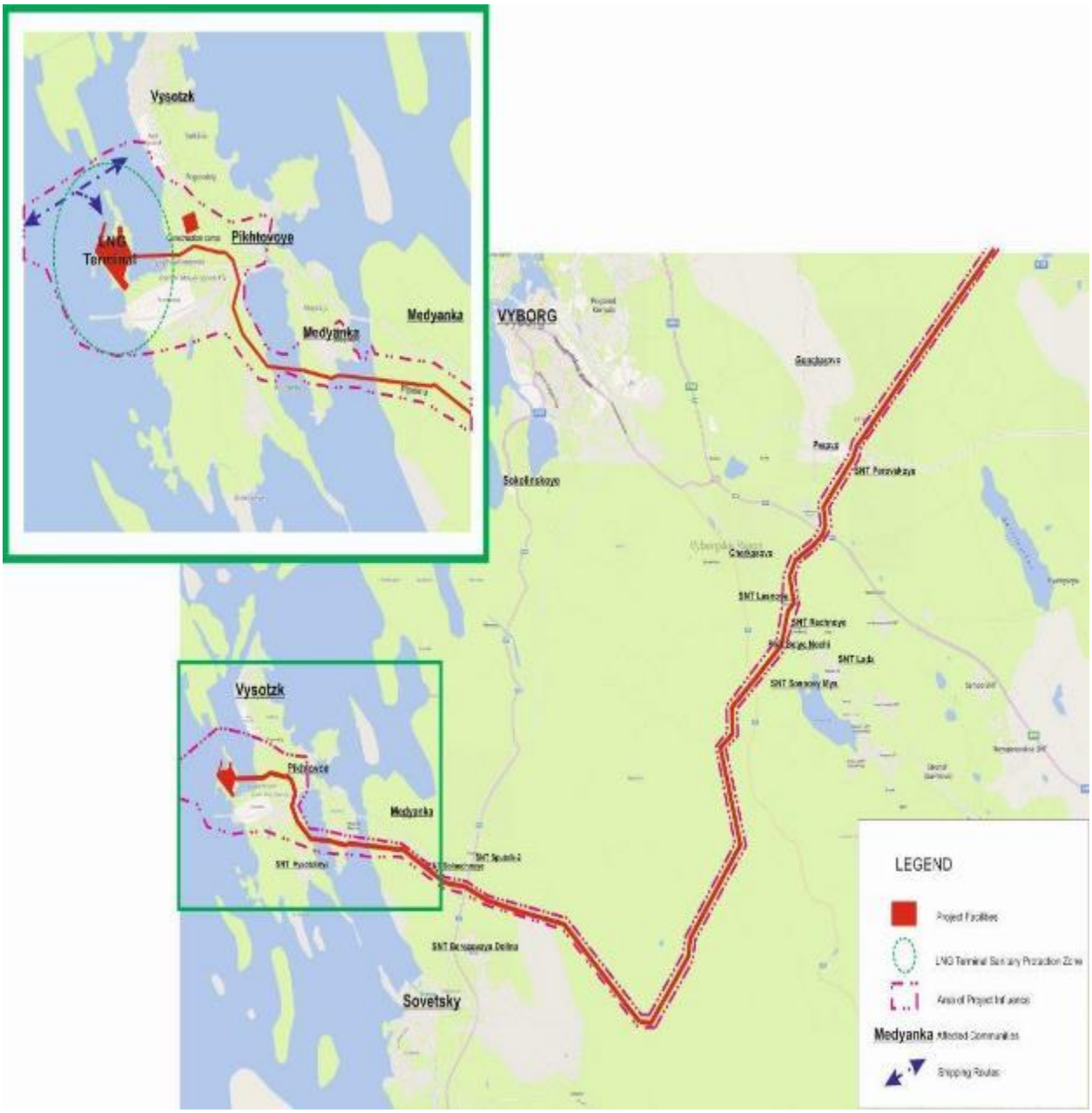

Figure 2.4: Project Area of Influence

2.6 ENVIRONMENTAL AND SOCIAL PROJECTION IN DESIGN

2.6.1 SOCIO-ECONOMIC RATIONAL

The Project is of exceptionally high socio-economic significance both for the region's economic potential and for the country as a whole.

The Project will engage as many Russian manufacturers of key process equipment and pipes and service providers as possible for constructing the proposed facilities.

The Project will bring the Leningrad Region a lot of socio-economic benefits, including:

1. New jobs. Contractors based in the Leningrad Region will be engaged in construction. At its peak (Phase III construction) the Project will employ nearly 2000 people. During the operational phase nearly 200 people will be permanently employed by the Project.

2. Tax payments to the Russian Federation and Leningrad Region budgets.

3. Solutions to infrastructural problems. After the launch of the Project it will be possible to gasify some of the district's remote areas by transporting LNG by special trucks. The construction of the 41-km gas pipeline branch leading to the Terminal will make it possible to supply gas to Port Vysotsk and the neighboring communities.

The construction project will need building materials and require transportation services which will certainly help:

- intensify the activity of related industries;
- increase the business activity of construction companies;
- upgrade the level of service;
- keep the previously created jobs and create new ones at companies involved in the construction.

2.6.2 MARKET RATIONAL

The implementation of the Project will allow the Russian gas industry and the Leningrad Region to develop a new technological segment and to increase the competitiveness of Russian energy products in the global marketplace.

The existing LNG demand on the part of the Baltic states can be satisfied by either the Project in question involving the construction of an LNG plant in Port Vysotsk or the existing LNG infrastructure (the LNG plant in Norway and the major LNG receiving terminals in Belgium and The Netherlands). However, the LNG Plant to be built in the Leningrad Region has a number of competitive advantages associated with its convenient geographical location and low feed gas prices.

The liquefied natural gas produced by the Terminal will be supplied for domestic needs and exported to Scandinavian countries.

At present, potential LNG exports to the Baltic states are estimated at 2.1 million tons of LNG per year.

The Scandinavian market can accommodate up to 400,000 tons per year of the produced LNG. The remaining LNG will be sold on Russia's domestic market as bunker fuel.

Potential demand for LNG at Russian Baltic Sea ports may exceed 800,000 tons per year by 2020.

2.6.3 PROJECT MANAGEMENT ORGANIZATIONAL STRUCTURE

Cryogas-Vysotsk is currently owned by 51% NOVATEK, 48 % - OAO "Gasprombank" and 1% - private Investor.

2.6.4 ENVIRONMENTAL AND SOCIAL POLICY

Environmental Policy

Cryogas-Vysotsk approved, introduced and disclosed Environmental Policy. Its key objective is to ensure environmental safety, environmental protection and sustainable use of natural resources. This policy is based on RF Constitution, Federal Law "On Environmental Protection", Helsinki Convention on the Baltic Sea Marine Environment Protection and other international and national regulatory documents.

Cryogas-Vysotsk declares the following major commitments in their policy:

- Adhere to the highest standards of national and international level in environmental protection
- Envision on all stages of their investment projects minimization of risks of adverse environmental impacts
- Perform regular monitoring and analysis of environmental impacts
- Increase environmental safety of their facilities and operations based on technological equipment safety and reliability
- Prevent emergencies which could lead to health and environmental damage
- Ensure decrease of negative environmental impacts, undertake all measures for climate and biodiversity conservation and for environmental damage compensation
- Introduce advanced and economically viable technologies and treatment methods, and thus move towards reduction of wastes, of polluting substances in wastewater and contaminants in air emissions from all sources
- Ensure sustainable use and reduce consumption of water and energy
- Motivate personnel for resources' saving and for performing their duties in environmentally sound manner
- Increase level of environmental awareness and knowledge of personnel

- Ensure wide access to environmental information associated with Company operations in routine and emergency mode and to information on relevant environmental protection measures.

The policy is applicable for all structural entities of the Company, all partners of Cryogas-Vysotsk and serves as a basis for planning and implementation of all Cryogas-Vysotsk operations and activities.

Social policy

Company manages social issues associated with their and contractors' personnel in accordance with RF Labour legislation and other relevant regulatory documents. As for public interaction (including but not limited to Project Affected Communities), in the nearest future the Company will develop Stakeholder Engagement Plan outlining key principles of such interaction and all required engagement activities.

3 REGULATORY STATUS

3.1 GENERAL

An extensive body of studies and reports has been prepared for Project design and to meet Russian Federation regulatory requirements. These include a number of 'OVOS' (environmental assessment) documents, covering different Project facilities, that have been prepared as a part of the Russian permitting process and submitted to the Ministry of Natural Resources and Ecology for approval.

The OVOS provide information on existing baseline data, impact assessment and mitigation measures. As such the OVOS materials provide valuable input to the development of the ESIA. OVOS materials have been submitted to "Expertisa" and approved by the Russian authorities (this is a formal expert review under the Russian planning approval process) for the following proposed project facilities/activities (see also Chapter 2 for a description of the facilities):

- Stage 1 - a wharf for handling oversized cargoes and building materials with a temporary access road and a temporary storage zone for equipment and materials;
- Stage 2 - a gas pipeline branch off of the Leningrad-Vyborg-State Border main gas pipeline leading to the LNG plant in Port Vysotsk in the Vyborg District, Leningrad Region;
- Stage 3 - a terminal for production and handling of LNG in Port Vysotsk, Leningrad Region, with the production capacity of 660,000 tons of LNG per year.

3.2 STATUTORY ENVIRONMENTAL REVIEW OF THE PROJECT

3.2.1 BACKGROUND TO THE DEVELOPMENT OF DESIGN DOCUMENTATION

All design documentation for the Vysotsk LNG Project has been prepared in full compliance with the Russian laws. Engineering surveys for the Project's capital facilities were performed by specialized companies engaged by Cryogas-Vysotsk in accordance with the Rules for the Engineering Surveys for Construction. General Provisions of SP 47.13330.2012 apply to the architectural design, construction, redesign, operations, demolition of buildings and structures, as well as landscape planning and grading activities.

The surveys were undertaken by the following companies:

- LLC «PromEcoSfera» //Saint-Petersburg, 2016, (Soil sample collection report №1473.16 dated May 27, 2016);
- LLC «PromEcoSfera» //Saint-Petersburg, 2016, (Soil sample collection report №1476.16 dated May 27, 2016);
- LLC «PromEcoSfera» //Saint-Petersburg, 2016, (Protocol of quantitative chemical soil analysis №1475.16 dated June 5, 2016);
- LLC «PromEcoSfera» //Saint-Petersburg, 2016, (Protocol of quantitative chemical soil analysis №1474.16 dated June 5, 2016);

- LLC «Centr Sanitarnoy Profilaktiki» //Saint-Petersburg, 2016, (Protocol of laboratory studies №182/E dated May 30, 2016);
- LLC «PromEcoSfera» //Saint-Petersburg, 2016, (Protocol of biotesting №1476.16.Г, dated June 2, 2016).

The engineering surveys included specific environmental surveys to assess the current status of the Project's forecast environmental footprint. The environmental surveys were based on:

- The review of high resolution satellite images (environmental interpretation);
- Field reconnaissance;
- Hydrogeological studies;
- Hydrological studies;
- Geocryological studies;
- Soil studies;
- Geo-environmental testing and pollution assessment of air, soil, dirt, surface and underground water;
- Lab chemical analysis;
- Radiological data analysis and assessment;
- Physical effect analysis and assessment;
- Biological (flora, geobotanics, fauna) studies;
- Socio-economic studies;
- Archaeological studies.

The above list fully meets the requirements defined in the Rules for the Engineering and Environmental Surveys for Construction (SP 11-102-97).

The engineering survey results served as the environmental basis of design solutions so as to ensure preservation of favourable life conditions for the local population, ensure safe operations of buildings, structures and sites, and prevent adverse environmental impacts.

3.2.2 PROJECT DESIGN DOCUMENTATION

All design documentation for the facilities under construction has been developed to fully comply with the scope and requirements of Russian Government Resolution 87, dated 16.02.2008, "*On the structure of sections of design documentation and requirements to their content*."

The following project documentation materials were prepared by LLC «Design Centre «Petrohim-Tehnologiya» by order of the Company to be submitted to the State Expert Review:

- Project Documentation for Stage 1: Jetty for handling oversized cargoes and building materials with a temporary access road and a temporary storage zone for equipment and materials, 2016;

- Project Documentation for Stage 2: Gas pipeline branch of the Leningrad-Vyborg-State Border main gas pipeline leading to the LNG plant in Port Vysotsk, 2016;
- Project Documentation for Stage 3: Terminal for production and handling of liquefied natural gas in Port Vysotsk, 2016

3.2.3 PROJECT DISCLOSURE

According to the *Provision on the Environmental Impact Assessment of the Activities Planned in the Russian Federation*, as approved by Order 372 of the State Committee for Environmental Protection, dated 16.05.2000, the Company performed the following consultation activities in the region of the Project implementation:

Type of Consultations	Date	Place	Brief Description
Public hearings on Vysotsk LNG Terminal Project including EIA (OVOS)	December 23, 2014	Leningrad region, Vyborgsky district, Vysotsk, Leninskaya street, 4, "Vysotsk Secondary School named after Rostotzky"	Public hearings were announced in federal, regional and local press in November 2014. 42 persons were present (among them 9 persons were representatives of Project Proponent and 5 persons were representatives of administration including environmental protection committee and 28 public representatives).
Disclosure of EIA report to the Public allowing free access along with the comments register	November 20, 2014 – December 23, 2014		EIA report was disclosed at two locations: Vyborg, Sovetskaya strett, 12 and Vysotsk, Kirovskaya street, 3 No comments were made
Consultations with Lukoil			Access roads, gas supply issues were discussed
Consultations with kolkhozes (agricultural enterprises)			Land lease issues were discussed
Consultations with neighboring dachas and gardening communities (SNT)			Access roads, informing about planned construction
Consultations with regulators			Regarding the issue of old wastes disposal excavated on site during site preparation
Consultations with stakeholders during the social survey	August 2016		Meeting with regulators and representatives of local municipalities

During the social survey undertaken during the ESIA process in August 2016 the following meetings/consultations were performed:

- Meeting with Vyborg Region Administration;

- Meeting with representatives of different administration departments;
- Meeting with representatives of local municipalities of the settlements in the Project area;

In due course the Company will develop a comprehensive SEP along with Grievance Mechanism and other relevant procedures. A detailed list of stakeholders, forms and timing for future engagement activities are to be outlined in this Plan.

3.3 SANITARY PROTECTION ZONES

Under Russian Federation regulatory requirements for the protection of human health, Sanitary Protection Zones (SPZ) are required around certain industrial facilities. The size of the SPZ is set such that the relevant standards for the protection of human health against impacts associated with air emissions, noise, vibration etc. are met at its boundary. Human land use restrictions are applied within the SPZ.

By sanitary classification in the new edition of SanPin 2.2.1/.2.1.1.1200-03, the Terminal falls under Hazard Class I, for which the sanitary protection zone size is defined as 1000 m. The tentative SPZ dimensions are established equally in all directions.

The SPZ boundary is marked in the scheme provided in the Appendix.

With regard to the current urban layout in the Project surrounding area and in terms of air pollution and physical (acoustic) impact levels it has been ascertained that:

- the tentative SPZ size for the projected Terminal – 1000 m – meets the standard set in the new version of SanPin 2.2.1/.2.1.1.1200-03. There are no residential properties, recreation areas, etc., categorized as inadmissible in a sanitary protection zone pursuant to p. 5.1 of SanPin 2.2.1/.2.1.1.1200-03, within the planned SPZ.
- a review of the calculation results of the dispersion of pollutants emitted to the atmospheric air has indicated that maximal concentrations of all analyzed pollutants on the boundary of the planned SPZ **do not exceed 1 MPC with account for the background**;
- a review of the calculation results of the cumulative noise exposure from all sources on the boundary of the tentative SPZ and in the residential area has indicated that the calculated acoustic levels **do not exceed** regulatory requirements of SN 2.2.4/2.1.8.562-96 for day and night hours.

The calculated values of pollution concentrations and physical (acoustic) impact levels on the boundary of the planned 1000-m SPZ evidence to the absence of above-standard impact of the Project on the environment and living conditions.

4 PROJECT ALTERNATIVES

4.1 THE 'NO PROJECT' ALTERNATIVE

The 'no project' alternative considers the outcomes should the Project not go ahead. In this case, not developing the Project would result in:

- The loss of opportunities for further regional development since the Project has an extremely high socio-economic significance for both the region's economic potential and the country as a whole;
- The loss of opportunities to engage many Russian suppliers of key process equipment, pipes and construction services;
- The loss of an opportunity to develop a brand new technological segment in the Leningrad Region and increase the competitiveness of Russian energy products in the global marketplace;
- The loss of socio-economic benefits, particularly: new jobs, additional tax payments to the RF budget and the Leningrad Region budget; solutions to infrastructural problems (possible gasification of Port Vysotsk, nearby population centers and the district's remote areas), development of new industry sectors within the district and a higher level of service.

The 'no project' option would avoid the potential adverse environmental and social impacts identified in Chapters 7 and 8 of this Non-Technical Summary. However, the economic, social and environmental benefits of the Project associated with the aspects identified above, coupled with international demand for LNG, are compelling.

4.2 ASSESSMENT OF DEVELOPMENT OPTIONS

Following a decision to proceed with the Project, the identification of preliminary high-level development options for the Project included consideration of:

1. Siting the Terminal in three different sea ports on the Baltic Sea, in particular in:
    a. Port Vyborg
    b. Port Primorsk
    c. Port Vysotsk
2. Two siting alternatives were considered for the Terminal in Port Vysotsk:
    a. South of the OAO RPK-Vysotsk Lukoil II terminal on the Ryuevyalinniemi peninsula;
    b. At the entrance to the port, north of the OAO RPK-Vysotsk Lukoil II terminal.
3. Routing the feeding gas pipeline.

The main siting criteria were as follows:

- whether it is possible to route a branch gas pipeline to the site;

- availability or proximity of an operating port infrastructure;
- whether it is technically possible to open a Russian state border checkpoint;
- adequate natural depths ensuring harbor approach for tankers;
- minimum damage to natural resources;
- conformity to the territorial planning schemes of various levels.

Port Vysotsk, the site north of the OAO RPK-Vysotsk Lukoil II terminal, was selected for the Terminal siting due to the following reasons:

- favourable natural and human-induced conditions;
- can accommodate an LNG terminal with the production capacity of 660,000 tons of LNG per year;
- no dredging operations required;
- the Terminal's operational offshore area borders on the existing approach channel and there is a turning basin which will allow tankers to turn around before docking;
- close proximity to the OAO RPK-Vysotsk Lukoil II (the terminal can be hooked up to the power grid which will lower the costs of opening a Russian state border checkpoint).

The following criteria were used in considering alternative gas pipeline routes:

- location of the tie-in point of the proposed gas pipeline branch (as designated by the Technical Substantiation document approved by PAO Gazprom);
- existence of specially protected natural territories;
- existence of cultural heritage sites;
- existence of mineral deposits;
- location of gas consumers;
- locations of existing engineering infrastructure facilities, population centers, buildings and installations with the purpose of minimizing the scope of construction and installation work, reducing human-caused environmental impact (minimizing logging operations) and observing minimum gaps around regulated facilities.

5 STAKEHOLDER ENGAGEMENT

Engagement with stakeholders is of key importance in ensuring that potential adverse impacts are identified and managed, and that benefits to the community stemming from the Project are enhanced. Initiating the engagement process at an early stage of the Project, together with the adoption of appropriate communication mechanisms, helps to ensure:

- the timely public access to all relevant information; and
- that stakeholders are provided with an opportunity to input into the Project design, the identification and assessment of impacts and measures for impact mitigation and enhancement (in the case of beneficial effects).

Project stakeholders have been categorized in the following key groups:

- Affected Parties – persons, groups and other entities within the Project Area of Influence that are directly affected (actually or potentially) by the Project and/or have been identified as being susceptible to change associated with the Project. Affected parties should be engaged in the identification of impacts and their significance, as well as during the decision-making process regarding mitigation and management measures;
- Other Interested Parties – individuals/groups/entities that may not experience direct impacts from the Project but who consider or perceive their interests as being affected and/or who could influence the Project and the process of its implementation; and
- Disadvantaged or Vulnerable Parties – persons who may be disproportionately impacted or further disadvantaged by the Project relative to other groups due to their vulnerable status[1], and for whom special engagement efforts may be required to ensure their equal representation in the consultation and decision-making process associated with the Project.

Preliminary list of stakeholders includes:

- Government federal, regional and local authorities:
  - RF authorities
  - Leningrad Oblast authorities
  - Vyborg region authorities
  - Vysotsk district authorities
  - Local settlements authorities
- Local communities such as:

[1] Vulnerable status may stem from an individual's or group's race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth, or other status. Other factors such as age, ethnicity, culture, literacy, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural environment and natural resources should also be considered.

- Towns:
  - Vyborg
  - Vysotsk
  - Sovetsky
- Rural settlements:
- Household plots' entities (SNT – Non-commercial Communities of Gardeners)
- Recreational centers:

1) Residential and recreational complex Pikhtovoye
2) Island;

- Community Service and Infrastructure organizations
- Children tuberculosis clinic
- General Public including residents and visitors of the nearby communities – coming for fishing, mushrooms and berries collection, recreation etc.
- Companies operating in the Project Area:
- Landowners
- Land users
- Marine area users
- Media
- Business associations
- NGOs
- Academic and Research Organizations

Comprehensive list of stakeholders at the local, regional, Federal and international levels has to be identified in the Stakeholder Engagement Plan (to be developed by the Company in due course).

Further details about the Company public grievance mechanism is provided in the SEP.

6 ESIA METHODOLOGY

6.1 DEFINITION OF TERMS

Some of the more important terms used in the ESIA are provided below.

- A project ***phase*** is a series of related activities, which together form a distinct stage in the life of the Project. Four phases are considered in the ESIA as follows (although for simplicity these may be combined in some sections of the ESIA where appropriate):
  - Construction
  - Commissioning
  - Operation
  - Decommissioning
- Environmental and social ***receptors*** are those elements of the environment and/or human society that may be affected by the Project.
- Environmental and social ***impacts*** are changes on environmental and/or social receptors that occur as a consequence of the Project. Impacts to individual receptors may be either ***adverse*** (having a detrimental/negative effect on a receptor) or ***beneficial*** (having an advantageous/positive effect on a receptor). Different types of environmental and social impacts are defined in terms of:
  - ***Duration.*** The 'duration' of impacts includes consideration of the period over which the source of impact occurs and also, for reversible impacts, the period over which recovery may occur (see also 'reversibility' below). The duration is classified as either ***Short***, ***Medium*** or ***Long*** term.
  - ***Extent.*** The 'extent' of impacts is dependent on the nature of the impact and the receptor of the impact, and are classified as either ***Local***, ***Regional***, ***National***, or ***International***.
  - ***Irreversible*** impacts are defined as those impacts that cause a permanent change in the affected receptor.
  - ***Reversible*** impacts are those impacts that can be reversed back to pre-existing conditions as a result of mitigation/reinstatement measures and/or natural recovery. The periods over which impacts may reverse/recover is a key link to the duration over which an impact is felt (see 'duration' above).
  - ***Residual impacts.*** These are the impacts on receptors that remain after mitigation measures have been put in place (see 'mitigation measures' below).
  - ***Cumulative impacts.*** Those impacts that result from the incremental impact of the Project when added to other existing, planned, and/or reasonably predictable future projects and developments that are not be directly associated with the Project.
- **Mitigation measures** are actions designed to reduce adverse impacts to acceptable levels. Mitigation measures may form part of the Project design, or may be additional actions that are put in place to reduce impacts that have been identified in the ESIA.

6.2 OVERVIEW OF THE ESIA PROCESS

The impact assessment process is carried using a number of steps. In summary, these are:

- Setting the scope of the ESIA ('Scoping') to identify aspects of the Project that are likely to give rise to key issues. This usually includes consultation with stakeholders to ensure that the concerns of all potentially affected parties are addressed in the ESIA.

- Collecting baseline data on the aspects identified during scoping, to provide the basis for the evaluation of potential or actual impacts. These data also serves as a baseline against which to compare/monitor subsequent changes due to the Project.
- Identify the impacts from the Project and assess their significance.
- Identify mitigation measures that could remove impacts or reduce their significance.
- Re-assess the impacts from the Project in the scenario that mitigation measures are in place.

Further details are given in Sections 6.3, 6.4 and 7 below.

6.3 SCOPING AND CONSULTATION

Scoping is the process of determining what should be covered in the ESIA and associated documentation. The scoping process aims to identify the types of environmental and social impacts that would be relevant to the Project, and to determine those aspects that are of potentially greatest significance. The process includes consultation with potentially affected communities, to identify their concerns and to ensure that they are appropriately addressed. Scoping also considers whether there are any issues that are not relevant to the Project, and hence do not need to be assessed in the ESIA.

6.4 SIGNIFICANCE CRITERIA OVERVIEW

This ESIA adopts an approach to impact categorization and significance that is commonly used in the preparation of large project ESIAs. This makes use of quantitative criteria where available, and where not available uses qualitative criteria and expert judgement.

6.4.1 KNOWN/CERTAIN IMPACTS

Where impacts are certain to occur and the extent of such impacts can be reasonably predicted (for example in relation to routine and/or planned events with reasonably predictable consequences), the significance is defined by the assessed severity of that impact. Table 6.1 below details generic severity criteria for negative impacts. Where appropriate, these qualitative generic criteria have been supplemented by more detailed and quantitative criteria that are presented on a topic-by-topic basis in the main ESIA.

Table 6.1: Severity Criteria

None/Negligible	No discernible impact – Effects are non-existent or the impact of a particular activity is deemed to be 'negligible' or 'imperceptible' and is essentially indistinguishable from natural background variations.
Low	Slight effects, well within Project Standards[2]. **Duration:** short term **Extent:** localised to immediate area **Reversibility:** reversible **Sensitivity of the receptor**: low sensitivity/value.

[2] The Project Standards are as defined in the Project Standards Document.

Moderate	Noticeable effect but still within Project Standards. **Duration:** short-term (moderate receptor sensitivity/value), medium term (low receptor sensitivity/value) **Extent:** local (moderate receptor sensitivity/value) or regional (low receptor sensitivity/value) **Reversibility:** reversible **Sensitivity of the receptor:** see duration and extent above.
High	Considerable effect and/or repeated breach of regulatory/project limits. **Duration:** medium to long term (moderate to low value receptors), short-term (high value receptors, protected habitats/species) **Extent:** local (high receptor sensitivity/value, protected habitats/species) or regional (moderate receptor sensitivity/value) **Reversibility:** reversible (moderate/high value receptors), or irreversible (low value receptors or localised moderate/high value receptors/habitats) **Sensitivity of the receptor**: see duration, extent and reversibility above.
Major	Major effect, continuous breach of Project Standards. **Duration:** Long term **Extent:** regional, national or international effect **Reversibility:** Limited reversibility/irreversible **Sensitivity of the receptor:** highly valued/sensitive receptors.

6.4.2 UNCERTAIN IMPACTS AND RISKS

Where an impact is not certain to occur (e.g. due to the inherent unpredictable nature of the potential impacts from routine/planned activities, or else where impacts are associated with unplanned/emergency events), the significance of the impact ***risk*** is a function of the ***likelihood*** that it occurs and the ***severity*** of the impact should it occur. Table 6.2 below provides a description of the likelihood categories applied in this ESIA. These are set and do not vary according to impact type.

Table 6.2: Likelihood Criteria

Probable	Events that are known to occur within the specific industry and likely to occur on multiple occasions during the design lifetime of the Project. Probability of occurrence – more than 50%.
Possible	Known to occur periodically within specific industry and reasonably foreseeable to occur once during the design lifetime of the Project. Probability of an occurrence – less than 50%.
Unlikely	Known to occur rarely in specific industry or periodically within wider industry. Realistically feasible but unlikely to occur during the design lifetime of Project. Probability of occurrence – less than 10%.
Improbable	Rarely heard of within wider industry and extremely unlikely to occur during the design lifetime of the Project. Probability of occurrence – less than 1%.

The significance of the overall impact risk is then determined using the following risk matrix (Table 6.3).

Table 6.3: Risk Matrix

Likelihood of impact	Severity of Impact				
	Negligible	**Low**	**Moderate**	**High**	**Major**
Probable	Negligible	Low	Moderate	High	Major
Possible	Negligible	Negligible	Low	Moderate	High
Unlikely	Negligible	Negligible	Negligible	Low	Moderate
Improbable	Negligible	Negligible	Negligible	Negligible	Low

7 ENVIRONMENTAL IMPACT ASSESSMENT

7.1 INTRODUCTION

The following sections summarise the key impacts that have been identified and assessed in the ESIA Report. This includes:

- A summary of the relevant baseline characteristics;
- Identification of key receptors and assessment of potential impacts;
- Identification of the design controls and mitigation measures that will be implemented in order to avoid or mitigate potential Project impacts; and
- A summary of the residual impacts and conclusions.

The impact assessment has been undertaken in line with the ESIA process described in Chapter 6.

7.2 AIR QUALITY

The air quality assessment examined potential impacts related to changes in air quality as a result of the Project, including the potential for adverse impacts on human health, the deterioration of habitats, and nuisances (such as increased dust) for neighbouring residents.

7.2.1 BASELINE CONDITIONS

Baseline conditions for air quality were established by using background data provided by the FGBU North-Western UGMS (Regional Centre for Hydrometeorology and Environmental Monitoring).

The largest contributions to air pollution and background pollution levels are made by motor and rail (diesel) transport and the LUKOIL oil terminal. The population centers nearest to work site are the settlements of Pikhtovoye, Medyanka, Popovo, Sveklovichnoye, Perovo, Cherkasovo, Veshchevo and the town of Vysotsk.

Air quality in the study area is generally good. The background concentrations of air pollutants such as of sulphur dioxide, carbon monoxide and nitrogen oxides measured in the town of Vysotsk and the settlement of Cherkasovo are generally low.

The background concentrations of the main air pollutants within the area under review are within the norm and do not exceed the MPC levels prescribed for residential areas.

7.2.2 IMPACTS AND RECEPTORS

Although the Project is being implemented in a relatively underpopulated area, the presence of a number of villages (Pikhtovoye, Medyanka, Cherkasovo, Veschevo) and a town (Vysotsk) located at a distance of 2.3 from the Site necessitate a fully responsible approach to this type of impact.

During the construction phase, the main sources of air emissions will be construction machinery and mechanisms, and physical construction works. In particular, air emissions from construction and assembly operations will come from operation of construction machinery, trucks, sea vessels and loaders, as well as from welding, painting, concrete works etc. In particular, a pad will be created to assemble pre-fabricated blocks and elements delivered mainly by vessels.

Emissions during the operation phase will be generated during berthing of vessels delivering oversized cargoes, equipment and construction materials and will mainly come from engines of vessels, handling machinery, and from the sanitary wastewater and storm water treatment facilities.

Pollution of air associated with operations of the pipeline will mainly be caused by necessary process operations on the pipeline:

- Internal non-destructive testing;
- Cleaning of pipeline sections.

The main type of air impact during operations of the terminal will be air emissions from sources within the plant site and adjacent territories.

Sources of air emissions will be as follows:

- Flare system;
- Gas-turbine generators of the Central Heating Plant (CHP);
- Diesel generators;
- Acid gas incineration unit;
- Acid gas removal unit;
- Liquid waste incinerator;
- Ventilation emissions from buildings with processing equipment;
- Diesel storage; individual diesel tanks;
- Fresh amine storage;
- Leaks on process and auxiliary equipment;

- Vehicle engines;
- Vessel engines.

As part of this assessment, air quality modelling was performed using Ecolog 3.0, a unified air pollution modelling software used for the Russian-format EIAs. The modelling included:

- An assessment of the air impact for the anticipated period of the highest utilisation of construction machinery and the highest number of emission sources during the construction phase;
- An assessment of the air impact during the operational phase to determine the size of the sanitary protection zone on the basis of the most unfavourable weather conditions.

The dispersion calculation results show that the highest ground-level concentrations (including the background levels) at the boundary of the nearest residential area will not exceed the MPC values for residential areas for any of the pollutants emitted to air during construction activities and operational phase.

Following the review of the dispersion modelling made for the operational phase, the following conclusions were made:

- The maximum concentrations (including the background levels) of all analysed pollutants at the boundary of the proposed sanitary protection zone and the residential area will not exceed respective MPCs;
- Modelling of ground-level dispersion shows that the facility will not have an adverse impact on the air quality at the boundary of the sanitary protection zone and the residential area;
- Based on the above and from the air quality impact perspective, it is recommended to establish a sanitary protection zone with a radius of 1000 metres.

7.2.3 MITIGATION

A series of good practice measures will be implemented to manage the impacts. These include measures to reduce emissions from construction equipment and vehicles, such as monitoring that adopted work methods are strictly followed and switching off machinery when not in use.

Measures to prevent dust emissions will include ensuring loose material loads entering and leaving the site are covered where practicable, and watering the ground to suppress dust during dry weather. Vessels used will comply with national and international legislation regarding type of fuel used.

The project provides for the following measures to be implemented during the period of construction works and the period of facility operations to reduce air emissions of pollutants:

- Maintain and service equipment and dredgers in line with schedules to developed by the customer’s technical services;
- Observe the established periods of construction and assembly works;
- Monitor that adopted work methods are strictly followed;

- Monitor the working time pattern of handling machines and equipment;
- Use foreign-made vessels, whose environmental performance matches necessary standards;
- Carry out preventive maintenance of propulsion units at the customer's premises;
- Use only operable vessels with properly calibrated fuel equipment to ensure that pollutants released with exhaust gases are within applicable limits;
- Store fuel and lubricants in airtight and lockable containers;
- Use only operable machines and mechanisms with properly calibrated fuel equipment to ensure that pollutants released with exhaust gases are within applicable limits;
- Equip all vessels with foreign-made diesel engines matching the MARPOL 73/78 requirements;
- Carry out preventive maintenance of shipboard installations in a timely manner;
- Avoid simultaneous use of after-burners for cold and warm liquids;
- Spread the use of machinery and equipment not involved in the same process across different time periods;
- Water soils during summertime earthworks to suppress dusting;
- Equip lorries transporting loose construction materials, soils and construction waste with a canopy to reduce dusting.
- Use of operable machinery, which passed exhaust gas toxicity tests, to reduce air emissions;
- Equip the emergency blowdown and flaring system with quick release valves;
- Use airtight equipment, valves, pipelines with a fully welded design where possible and with the minimum number of connections to minimise joint leaks;
- Always try to minimise the number of engineering tools and equipment used at the site to avoid sever contamination of the lower atmosphere during unfavourable weather conditions.

Following commissioning, the proposed Maximum Permissible Emissions (MPE) limits will have to be developed for the LNG Terminal (including the gas pipeline branch) and submitted to supervisory authorities in order to obtain a permit for air emissions. The MPE document has to specify maximum (in g/s) and annual (in tonnes) emissions of all pollutants from all sources.

Similarly, an industrial monitoring programme for air quality will have to be developed and approved by supervisory authorities. The programme should include a schedule of measurements at observation points (mainly at the boundary of the nearest residential area – in Vysotsk and Pikhtovoye – and at boundary of the site and its sanitary protection zone).

7.2.4 RESIDUAL IMPACTS AND CONCLUSIONS

The majority of the potential impacts on air quality are related to the Construction and Pre-Commissioning Phase, due to emissions associated with the increase in vessel movements, use of construction equipment and machinery, and traffic. However, these impacts will be short-term and temporary.

Given the results of the air pollution modelling described in ESIA Report and the emission reduction measures listed earlier in this section, it can be assumed that the air impact of the construction and the operation periods will be low.

7.3 LANDSCAPE AND SOILS

The landscape and visual assessment considered the potential impacts of the Project on the character and value of the landscape or seascape, as well as the views of the people who enjoy the area, including residents, tourists and recreational users. The soils and landscape assessment examined potential changes to the physical environment of the landfall section, including soils, geology, groundwater, and surface water.

7.3.1 BASELINE CONDITIONS

LNG Terminal is located within modern marine terrace landscape, and pipeline area crosses hilly moraine plain and hilly glacial lacustrine plane landscapes.

Modern marine terrace, lower level

Modern marine terrace, upper level

Figure 7.1: Modern marine terrace landscapes

Hilly moraine plain is presented with elongated moraine ridges (eskers), with slopes between 5 and 20°, with coarse sand composition, with gravel and boulders. The slopes of ridges and troughs are dissected with glacial plowing. Tracts of peaks and slopes of ridges and glacial shafts comprise coniferous park forests. Pine forests and spruce forests with bilberry-green moss and lichen ground cover grass-blueberry are underlain by a combination of podzols and sod-podzolic soils.

Figure 7.2: Hilly moraine plain landscape, with large boulders on surface

Natural-territorial complex of **hilly glacial lacustrine plain** is presented with two hypsometric levels of slowly undulating relief (up to 4-10°), of moraine and coarse sea sand with gravel composition, with pebbles and boulders.

Figure 7.3: Hilly glacial-lacustrine plain landscape

Project development area is located in the region where forestry and agriculture are developed. Major transformation agent of natural landscapes in the area is logging. Agricultural use of the territory has less impact. In general, landscape disturbance is moderate. It is caused by the presence of self-vegetating plots of reclaimed agricultural land, felling areas, electricity lines, poor-quality tree growth, and is mainly localized within hilly moraine plains and hilly glacial lacustrine plains natural and territorial complex.

7.3.2 IMPACTS AND RECEPTORS

Construction stage impacts are characterized by direct mechanical anthropogenic impact on the natural topography, soil and vegetation.

These impacts are associated with preparatory work (continuous cutting) of forest vegetation, uprooting stumps, trenches and foundation excavation, and actually the main construction works on pipelines laying, building construction, trenches back filling and compaction, construction of test and auxiliary equipment.

Construction works with use of resource-saving technologies should reduce the space of temporarily alienated land and degree of technogenic impacts on their main components – soil and vegetation.

The total area of land, disturbed for long-term placement of LNG plant facilities and Marine terminal, is 50 ha. Pipeline will occupy land strip of 23 m width and 41.2 km length. Compacted dirt mound of inert construction materials will cover and seal the top surface of the earth. Thus, construction soils buries natural soils and ground vegetation. Forest vegetation is also completely removed. Big boulders and rock faces, which give these landscapes additional visual value, are also removed. Vegetation and soils, as well as landscapes, completely stop their natural functioning and are subject to reclamation work at the end of the period of long-term lease of land.

Chemical impacts on soils during the construction period include potential leakages from transport, fuel and lubricant storage facilities, spills and wastewater releases. Potential impacts from these are considered to be of moderate significance.

There will be no sources of impacts on the soils of project area during operational stage. These land plots will be transferred from “forest land” to “industrial lands” category.

Operational stage for LNG plant, marine terminal and pipeline will have almost no adverse effects on adjacent land, as production processes will be taking place within its territories and will be carried in sealed pipelines and vessels. Possible impact on the environment and its components in these conditions will appear only in the form of sporadic and extremely small emissions of pollutants from motorized vechicles of engineering team, performing control equipment tests at underground part of the pipeline. Potential pollutants accumulation areas are located near flare system location, emergency diesel-electric and turbine power plants. Potential impacts from these are considered to be of moderate significance.

7.3.3 MITIGATION

Disturbed areas of temporary storage areas and construction camp should be subject to the forestry reclamation - maximum recovery of their initial natural state corresponding to the concept of "forest land".

The Project design provides concrete curbing around tanks or storage areas of fuel and lubricants. The site surface will be solidly sealed. Residual impacts would be of low significance following the adoption of mitigation.

Mitigation actions for Landscape impacts will be the following:

- Minimizing of footprint of construction area;
- Development and implementation of a post construction reinstatement plan.

Mitigation actions for Chemical impacts on soils during construction and operation could be a will be the following:

- Adherence to relevant regulatory standards;
- Adoption of protocols during the construction period to minimise spillages;
- Bunding of fuel storage tanks;
- Electrically driven shut-off valves to close pipeline in event of rupture;
- Earth bunding around tanks. Diesel storage tanks will have concrete bunding and impervious screen;
- Fired heaters will be installed on a concrete tray for collection of precipitation and accidental leakage;
- Concrete curbing will be provided around tanks for storage of lubricants and fuel. The site surface will be impermeable.

7.3.4 RESIDUAL IMPACTS AND CONCLUSIONS

Potential impacts on landscape during the operational period is considered to be **moderate** to **high** significance. Mitigation measures include minimization of footprint, which can bring potential impact to **moderate** level for long-term lease areas, and to **low** to **moderate** level – for short term lease areas.

Soil contamination as a result of pipeline break during maintenance or pre-operational checks could potentially incur impacts of a **moderate** to **high** significance. Mitigation would be provided by the provision of electrically driven shut-off valves. Stop valves would be equipped with remotely controlled automatic shutting devices. The residual significance of impact after mitigation is considered to be **low**.

Soil contamination as a result of explosion accidents at pipelines or LNG plant equipment could potentially incur impacts of a **moderate** to **high** significance. Mitigation would be provided by the provision of electrically driven shut-off valves. Stop valves would be equipped with remotely controlled automatic shutting devices. The residual significance of impact after mitigation is considered to be **low**.

7.4 GEOLOGY AND GEOHAZARDS

7.4.1 BASELINE CONDITIONS

The geological structure of the area comprises with modern sediments of technogenic origin (t IV) and Upper Quaternary glacial deposits (g III), underlain by Lower Proterozoic bedrock (PR1).

The site is located within the Karelian Isthmus, and confines to the Baltic Shield southern slope, Vyborg lowlands, where upper Proterozoic period formations outcrop, sometimes covered with quaternary glacial, glaciolacustrine, lacustrine and modern sediments. Typical glacial landforms are shipback rocks and boulder ridges.

Exogenous processes, which result in morphostructural transformation of the surface of the project area, comprising frost heave, water-logging and swamp formation and slope processes.

The Pipeline crosses multiple moraine hills and ridges, basins, wetlands, marshes, river valleys, numerous small streams and drainage ditches, sea bay, railways, a number of roads of different categories, engineering lines (cables, overhead lines) and farmland.

The southern part of the shoreline is formed by sand deposits and is subject to erosion.

The central part of the shoreline is characterized by less active sediment transfer. The north-eastern part is aggregated by heavier sand formations, which are transferred from the northern areas of the Gulf of Vyborg.

Seismicity

The territory is located on the southern slope of the Baltic Shield, located within the Vyborg granite massif of Late Proterozoic age. This granite massif is a batholite-type solid mass, up to 100 km in diameter, formed with porphyroblastic potassic granites (vyborgity, rapakivi).

The intensity of seismic impact for the construction area (Vyborg district Leningrad region), according to a set of cards A-B-C SRF-97 2000 is 5 points or less. Seismic data for the area of south-east slope of the Baltic Shield indicate a moderate microseismic background.

7.4.2 IMPACTS AND RECEPTORS

Mechanical impacts on geological environment are produced by practically all production or infrastructure facilities that have foundations. Mechanical impact includes static and dynamic loads, internal structural loosening and external destruction of a formation. Erosion by water is also included in this category (e.g. channel bank scour and gulley formation).

Chemical impact primarily refers to hydrocarbon contamination, as well as the pollution of rocks and ground water by residues of non-explosive demolition agents.

Biological impacts can be associated with unauthorized waste storage at construction base camp.

Another feature of the Project is the proposed seabed clean-up works, including disposal of excavated (dredged) waste to the landfill.

During the construction period, the primary causes of direct effects on the geological environment are likely to be related to mechanical impacts. These potentially include:

- Static load impacts - Caused by foundations, earthworks, boulders removal, and dirt stockpiling pads etc.;
- Dynamic load impacts – Caused by vehicle movements;
- Erosion impacts – Caused by surface water runoff forming linear erosion features (gullies) and the erosion of the banks of existing watercourses where they have been disturbed by road/pipeline crossings;
- Excavation impacts - External deterioration of a rock formation due to earthworks for foundation pits and quarries, etc.

Static load impacts

Static load impacts during earthworks includes:

- ROW preparation for construction works;
- Construction facilities and auxiliary facilities sites preparation (technological equipment sites, temporary roads and construction camp);
- Pipeline trench excavation, foundations excavation;
- Boulders and rock outcrops removal;
- Backfilling of pipeline trench and other pits.

Boulders and rock formation removal can cause unnecessary damage to nearby geological formations. Mitigation measures include replacement of explosion technique with non-explosive demolition agents use. This measure brings impact to **low**. If unmitigated, this impact could be graded as moderate.

Dynamic load impacts

Construction and use of roads have the potential to damage the soil cover because of the initial disturbance necessary for construction and the subsequent passage of vehicles. If unmitigated, this could cause a moderate impact.

The Project design incorporates mitigation measures to reduce the impact of dynamic load. These measures include restriction of unscheduled traffic and use of only local and temporary roads transport for construction purposes. The quantity of vehicles and equipment on roads and construction sites will be limited as far as is reasonable.

Corrugated 2.0-2.5m diameter culverts will be imbedded in road embankments where necessary to allow passage for smaller watercourses. Temporary bridges will be constructed at crossings over permanent watercourses.

Erosion impacts

Rainfall and snowmelt runoff could create linear erosion features in areas where vegetation have been removed and the ground disturbed. This could create gullies with potentially unstable sides and result in the transport of eroded soil into existing watercourses. In the absence of mitigation the potential impact is considered to be **moderate/high**.

Topsoil will be stored in piles, and will be used for reinstatement of disturbed areas after construction works.

Mitigation would comprise minimizing the area of disturbed land and the use of temporary surface water management systems in construction areas. These will include (where appropriate) surface runoff collection channels, retention ponds, silt fencing and silt traps. These measures would reduce potential impacts to a **low** significance.

During operation period there will be static loads on the geological environment from engineering construction foundations. This may accelerate erosion processes, form depressions and cause waterlogging. Mechanical impacts during project objects operations may take place after their

completion, especially if erosion of waterlogging processes have been intensified as a result of the operations.

LNG plant and marine terminal areas rainfall and snowmelt runoff could create linear erosion features in areas where vegetation has been removed and the ground disturbed. This could create gullies with potentially unstable sides and result in the transport of eroded soil into existing watercourses. In the absence of mitigation the potential impact is considered to be **moderate/high**.

Mitigation would comprise minimizing the area of disturbed land and the use of temporary surface water management systems in construction areas. These will include (where appropriate) surface runoff collection channels, retention ponds, silt fencing and silt traps. These measures would reduce potential impacts to a **low** significance.

7.4.3 MITIGATION

In general, adverse effects on the geological environment can be minimized by taking the following measures:

- Using non explosive techniques for boulders and rocks removal;
- Provision of appropriate construction material storage sites, maintaining construction sites free of litter and establishing spill prevention / clean-up protocols to prevent fuel and lube oil contamination;
- Surface drainage systems at construction sites to prevent production waste from spreading to adjacent areas, soils and ground water;
- Making sure no motor vehicle traffic occurs outside the production area and Project road network;
- Preventing industrial accidents, spills and leaks of corrosive liquids into the environment.

A reinstatement plan will be developed at the end of construction that will include the definition of reinstatement methods, timescales and success criteria. In general terms, reinstatement will involve two phases (mechanical and biological rehabilitation) as follows:

Mechanical rehabilitation:

- Removal of construction debris and unused materials;
- Grading of disturbed land areas;
- Reinforcement of slopes and banks with an appropriate ground/topsoil mixture.

Biological remediation:

- Reinforcement of un-built areas and passages with an appropriate ground/topsoil mixture;
- Planting and seeding in mechanically remediated areas.

The mitigation of impacts from static loads will be achieved by the actions described above for the construction phase. Potential impacts before mitigation would be of a low to moderate significance, and post mitigation residual impacts are predicted to be of a **low** significance.

Mitigation actions for Mechanical impacts on Geological environment during construction and operation stages:

- Use of piled foundations wherever practicable;
- Limit vehicular traffic to existing roads or temporary roads;
- Quantity of vehicles and equipment on roads and construction sites will be limited as far as is reasonable;
- Culverts will be inserted in road embankments where necessary to allow passage for smaller watercourses;
- Disturbed areas will be kept to a minimum during construction;
- Use of temporary surface water management / silt retention during construction;
- Development and implementation of a post construction reinstatement plan;
- Boulders removal with non-explosive demolition agents.

Mitigation actions for Chemical impacts on Geological environment during operation stage:

- Electrically driven shut-off valves to close pipeline in event of rupture;
- Earth bunding around tanks. Diesel storage tanks will have concrete bunding and impervious screen;
- Fired heaters will be installed on a concrete tray for collection of precipitation and accidental leakage;
- Concrete curbing will be provided around tanks for storage of lubricants and fuel. The site surface will be impermeable.

7.4.4 RESIDUAL IMPACTS AND CONCLUSIONS

Residual impacts from dynamic loads would be **low** with mitigating measures in place.

Residual impacts from static loads would be **low** with mitigating measures in place.

Residual Erosion impacts with mitigating measures in place would be a **low** significance

7.5 HYDROLOGY AND WATER QUALITY

The Project area comprises both land and water. The land area has a well-developed hydrographic network consisting of small and medium-sized rivers, streams, lakes and wetlands. The aquatic area consists of relatively shallow coves in Vyborg bay. The hydrographic conditions are characterized by the existence of an unconfined aquifer largely fed by rainfall.

The Wharf will be built on the coast of Vyborg bay on the side of the Greater Transund roadstead where the maximum depth reaches 10-11 m near the shore.

7.5.1 BASELINE CONDITIONS

Onshore water bodies consist of rivers/steams, reservoirs and special water areas (wetlands). The onshore water bodies directly connected with the Project area mostly comprise rivers and, to a lesser extent, lakes and wetlands. There are no water bodies on Vysotsky island where the LNG Terminal and the Wharf are to be built.

Vyborg bay is a part of the Gulf of Finland which is separated by a submerged shoal; it is an estuary-type water body. The bay's area is approximately 450 km². The upper part is shallow, below Vysotsk its depth increases to 30 m in its lower part.

The bay is characterized by a specific salinity regime determined by wind-induced currents and movements of water masses in the Gulf of Finland and the freshening role of the numerous rivers and streams falling into the bay. In the vicinity of the port of Vysotsk the water salinity ranges between 0.5 and 2.0 ‰. The transparency is reduced low and the water has a light brown color.

Ground water. The hydrogeological conditions within the Wharf and LNG Terminal construction site are characterized by the development of an unconfined aquifer associated with glacial sand deposits. The pressure head of water is zero. The catchment area coincides with the aquifer area. The aquifer is recharged by infiltration of rain water. The groundwater flow discharges into the Gulf of Finland. During heavy rains and spring snowmelt periods groundwater levels may rise to ground level (or higher).

7.5.2 IMPACTS AND RECEPTORS

This section provides a review of potential impacts on surface water, groundwater and offshore area during construction and operation of the Project facilities.

Potential receptors of impact from the Project facilities are:

- offshore area;
- surface water bodies; and
- groundwater.

Offshore impact

Potential impact of the temporary Wharf will be limited to the marine environment. The major effect will be changes to the physical and chemical properties of seawater due to increased turbidity within the construction area. The capacity of each operation to produce turbidity, and the composition of soil particles that will be suspended, will largely depend on the methods employed.

Construction of hydraulic engineering installations of the LNG Terminal will be carried out from water using floating rigs. Materials and constructions will be delivered from the onshore depot via the temporary Wharf or directly from the floating craft of suppliers.

Potential adverse effects of construction operations on water bodies will include:

- increased water turbidity;
- temporary and permanent/ continuous damage to benthos;

Adverse effects of roiling and increased water turbidity may include:

- reduced water transparency and consequent inhibition of normal development processes of bacterial plankton, phytoplankton, zooplankton and, under the worst scenarios, zoobenthos;
- adverse effect on the fish fauna resulting from the suppressed condition of bacterial plankton, phytoplankton, zooplankton and zoobenthos;
- lack of solar radiation which may hinder development and growth of spawned eggs and fish larvae;
- adverse respiratory effects on fish, molluscs and other aquatic organisms.

Operations/ functional zones of the LNG Terminal at the Port of Vysotsk will also include part of the offshore area.

During operation, Vyborg Bay will be a receptor of treated rainwater and industrial effluents that will be discharged to sea.

Gas Pipeline Branch is crossing 3 bays and 11 surface water bodies. Water for Pipeline testing will be taken from one of the bay and discharge back.

The modelling undertaken by Petrochem-Technology Design Institute indicates that construction operations (excavation and backfilling of trenches, soil dumping, etc.) will produce increased turbidity plumes which, due to the influence of currents and turbulent diffusion.

Surface water bodies impact

The Wharf, which will be located on the coast of Vyborg Bay (Baltic Sea), will encompass a part of the offshore area. This facility will not have any direct impact on onshore surface waters, but may indirectly affect groundwater.

Hydraulic engineering works for the GPB construction will be associated with the following potential impacts on suspect water bodies:

- increased water turbidity;
- temporary and permanent/ continuous damage to benthos;

The proposed section of the branch gas pipeline (GPB) will cross 14 water bodies.

This will result in disturbance of the aquatic organisms, including fish and the invertebrates that fish primarily feeds on. Damage to fish resources will be caused by destruction of spawning areas of phytophilous fish within the floodplains of watercourses during construction of access roads, process pads, embankments, etc.

Groundwater impact

Changes to the groundwater table may be caused by the changes of soil properties and structure. Groundwater drainage and recharge conditions may be affected by excavation of foundation pits and trenches as groundwater will be removed to prevent the flooding of pits and trenches and consequent erosion.

During construction of the facilities the impact on groundwater within the site may occur through uncontrolled disposal of polluted effluents generated by the operation of construction plant and equipment.

Impact on groundwater will occur indirectly due to infiltration of treated effluents discharged to land. Domestic effluents from the local wastewater treatment facilities will be discharged to land via a filter trench.

A direct impact on groundwater during operation may occur only in the event of an accident. The worst-case scenario that may result in significant geological and groundwater impact is an onshore oil spill resulting in pollution of soil with oil products.

Contamination of surface soils could potentially occur by the infiltration of products into the ground. This could be due to:

- Process liquid and lube oil leaks and spills;
- Accidental oil and petrochemical, wastewater and other waste spills as a result of violations of storage reservoir lining rules, fuel and lube oil spills; and
- Contamination with residues of non-explosive demolition agents, used for rock removal.

The most common effects on groundwater are:

- violations of the equation groundwater regime,
- groundwater contamination due to penetration of contaminants from the surface.

According to the results of geological surveys on the territory, the aquifer confines primarily to sand and sandy loam glacial lake sediments, as well as sandy and gravelly loam interlayers in glaciolacustrine and moraine deposits. Unloading of groundwater occurs in the local drainage network.

Changes in groundwater level regime can be caused by changes in the structure and properties of soil. Changes in aquifer properties can be a result of trenches excavation and backfilling.

The following conclusions can be drawn: geomechanical and geochemical impacts are rated as short-term and localized.

Water supply and waste water disposal are described in details in sections 2.3.4 and 2.3.5.

7.5.3 MITIGATION

This section provides a review of impact mitigation and monitoring activities provided for by the Project.

The character and level of impact on water bodies during the construction and operation phases will be different and will require different impact prevention and mitigation controls.

The construction design must provide for an action plan aimed at protection of groundwater and surface waters from depletion and pollution, such as:

- strict adherence to construction technology and timeframe;

- operations to be confined within allocated boundaries;
- provision of facilities with individual, passive and active fire protection;
- supply of construction sites with brought-in water;
- collection of domestic effluents in sealed tanks for subsequent removal by a specialised contractor; and
- collection and regular removal of construction waste and debris.

Potential groundwater impacts will be minimised by embedded controls which provide for collection and treatment of surface wastewater, collection and utilisation of construction waste, and construction of temporary hard surface driveways.

The facility and site design provides for a recycling water supply system for the construction site. The level of surface water and groundwater pollution within the subject area (i.e. the area of the proposed facility) will be largely determined by the quantity and quality of discharged wastewater, type and performance of treatment facilities, wastewater treatment and decontamination methods.

Wastewater generated during construction will consist of:

- domestic effluents;
- industrial wastewater; and
- rainwater runoff.

After treatment at the local wastewater treatment facilities, domestic effluents will be discharged to land via a filter trench. Treated industrial effluents and rainwater will be discharged to sea.

Wastewater treatment provisions will be based on the use of treatment facilities for the management of domestic and industrial effluents and rainwater. Biological treatment of ***domestic effluents*** will be provided by a module wastewater treatment system (EKO-R-10) with the capacity of 10 m³/day. The domestic sewage pumping station is designed for collection and automatic transfer of domestic effluents and will be delivered as a ready-to-operate package. The volume of domestic effluents will total 15.322 m³/day (4,623.77 m³/year).

***The stormwater sewe*r** will provide for collection of polluted rainwater and snowmelt from the operations area and rainwater from curbed pads. The total water collection area of the Terminal will be 12.44 ha. The rainwater runoff rate for the entire site area will be 3,888.5 m³/day (145,776.6 m³/year). The volume of rainwater that will be transferred for treatment is estimated at 2,514 m³/day (76,973 m³/year).

Protection of surface water

The subject facility will be partly located within the water protection area, which is subject to certain limitation of the economic activity established in Article 65 of the Water Code of the Russian Federation. The facility will also need to be equipped with structures which provide for protection of water bodies from pollution, littering or depletion.

Compliance with the requirements for water protection areas and riparian buffer zones of rivers and streams established by the national legislation will enable the operator to minimise an adverse impact of the project facilities during operation.

Protection of groundwater

The embedded controls aimed at reduction of the risk of potential accidents and minimisation of environmental effects on groundwater include:

- communication systems which provide for coordination of actions by structural units, information exchange, process monitoring, access to public communication networks;
- solutions preventing spills of hazardous liquids and providing for the removal of such liquids from risk areas;
- stop valves capable of cutting off and isolating any vessels with a hazardous liquid;
- stop valves on pipelines to enable the cutting-of of flow of a hazardous substance;
- locking systems on pumps for the shutdown of electrical equipment in case of critical deviations from specification parameters;
- system for remote shutdown of electrically driven equipment;
- alarm and locking systems activated in the event of critical deviations from standards process parameters (e.g. temperature, pressure, or level);
- accident protection system to enable shutdown of a process, disconnection of individual equipment units if an operating parameter reaches certain critical value, critical condition warning systems;
- bunding of the aboveground tanks.

Potential chemical contamination of shallow soil and ground water in areas adjacent to construction sites will be short-term and localized in scale. In the absence of mitigation the potential impacts are assessed to be of **moderate** significance. Mitigation will be achieved by adherence to relevant regulatory standards and the adoption of protocols during the construction period to minimize spillages. With these measures in place, the significance of residual impacts would be reduced to a **low** level.

Protection of Offshore area and Bays of Vyborg Bay (No. 1, No. 2, No. 3)

- Chemical environmental control during and after completion of the work
- Continuous process control
- Use of vessels in good condition
- Maintenance of dredging vessels at the home port
- Strict compliance with the requirements of the national legislation and MARPOL.

7.5.4 RESIDUAL IMPACTS AND CONCLUSION

The analysis of potential impacts of the proposed facilities indicates that all environmental impacts will not exceed the limit values established by the current regulations and guidelines for these impacts. In terms of the potential environmental impact, the construction and subsequent operation of the proposed facilities will be justified.

Implementation of embedded controls for the construction and operation period will enable minimisation of adverse impacts on water bodies.

If mitigation measures are implemented, the residual environmental impact for:

- Changes to water quality is **Low;**
- Contamination of groundwater due to infiltration of pollutants from the surface is **Moderate;**
- Pollution of groundwater due to land discharge of treated effluents is **Low;**
- Oil spill to land resulting in infiltration of pollutants and impact on aquifers is **Low;**
- The residual environmental impact of groundwaterter impact is considered to be **Low.**

7.6 WASTE MANAGEMENT

The waste assessment considered the types and quantities of waste products that will be generated by the Project, and identifies how these wastes will be managed and disposed of.

7.6.1 BACKGROUND

The construction and operation of the Project facilities will result in generation of multiple types of wastes. If the appropriate measures are not implemented, waste management may have potentially adverse impact on human health, groundwater, surface water and the environment.

The environmental protection section of the Project construction documentation describes the methods and techniques designed to ensure that each type of waste be handled, transported, temporarily stored, processed and disposed of in the appropriate manner.

7.6.2 IMPACTS AND RECEPTORS

The construction work will be performed in three stages, over the period of two years. Construction operations will involve preparing the construction site and cleaning it from trees and stones, building harbor facilities and temporary storage areas for materials and equipment, building the gas pipeline branch and installing the LNG plant and the loading terminal.

Potential impact associated with waste management includes the following aspects:

- Impact on waste management facilities operated by third parties (e.g. impact on existing facilities);
- Impact on community health resulting from waste management;
- Impact on surface water resulting from handling wastes and materials produced in water treatment facilities and in areas designated for collection of oily wastes and soil;

- Impact on soils and groundwater from handling wastes and materials produced in water treatment facilities and in areas designated for collection of oily wastes and soil;
- Environmental impact associated with the following factors:
    - Pollution of terrestrial, freshwater and marine ecosystems from liquid and solid waste disposal;
    - Attracting animal species which use waste disposal sites as their habitat or foraging grounds.
- Potential fire hazard of temporary waste accumulation areas.

A total of:

23 types of wastes will be generated during the Stage I construction period (5933.022 t/period, 9395.204 m^3/period);

12 types of wastes will be generated during the Stage II construction period (859.666 t/period, 1347.151 m^3/ period);

18 types of wastes will be generated during the Stage III construction period (1215.962 t/period, 1745.854 m^3/ period).

Technical maintenance of marine vessels is performed by the operators (vessel owners). Wastes from technical maintenance of vessels, including waste mercury and fluorescent lamps and bilge waters polluted by petrochemicals will be collected by vessel owners, kept in specially equipped areas on board the vessel and transferred for disposal at vessel maintenance locations (ports of registration); thus, such wastes are outside the scope of this project.

During operation wastes will be generated by the following sources:

- premises and construction site lighting;
- human activity, premises cleaning;
- process equipment servicing;
- operation of domestic wastewater treatment facilities;
- transshipment of cargoes;
- operation of rainwater treatment facilities;
- gas pipeline servicing;
- natural gas processing.

A total of:

12 types of wastes will be generated during the Stage I operation period (989.818 t/year, 1147.992 m^3/year);

4 types of wastes will be generated during the Stage II operation period (2,229 t/year, 16,716 m^3/year);

11 types of wastes will be generated during the Stage III operation period (1803.729 t/year, 2305.894 m^3/year).

7.6.3 MITIGATION

The general approach to managing solid waste will be described in an integrated Waste Management Plan. This will provide guidance on:

- Waste minimisation and prevention;
- Identification and segregation of waste materials at source;
- Recycling and reuse of suitable materials; and
- Treatment and disposal of specific waste streams.

In order to protect the environment from the adverse impact of hazardous wastes within the LNG Terminal site at all stages of construction the company should exercise control over:

- waste disposal operations in accordance with the requirements on waste disposal limits;
- the state of the temporary waste accumulation areas.

It was proposed that at the construction and operation stages all wastes will be handed over to licensed specialist third-party companies for processing/disposal.

A General Plan for Construction-Stage Waste Management will be developed for the Project as a key instrument of management providing for the relevant aspects of planning, projecting, personnel training, and waste management for the entire construction period. The Plan will be a dynamic document to be updated following the implementation of each construction stage. Each construction contractor will also be required to develop a waste management plan of its own based on the provisions of the General Plan.

Once the project is commissioned, the entity called “The LNG Production and Transshipment Terminal in the port of Vysotsk” will have to develop and approve with the appropriate supervising authorities a draft waste generation standards and disposal limits (DWGSDL) document in accordance with Russian law. The draft document will set out generation standards for all types of the entity’s wastes and their accumulation volumes as well as specific information on licensed companies engaged in collection, transportation and disposal of wastes.

7.6.4 RESIDUAL IMPACTS AND CONCLUSIONS

Subject to the implementation of the necessary measures, the environmental impact from waste management during the construction and operation stages will be minimized and can be considered acceptable.

If mitigation measures are implemented, the residual environmental impact of hazardous waste collection sites is considered to be **Low.**

7.7 NOISE AND VIBRATION

The noise and vibration assessment examined the potential sources of noise related to the Project, and how noise and vibration could affect the health and wellbeing of people living in the area.

7.7.1 BASELINE CONDITIONS

Baseline noise levels were measured at a number of locations.

The source of noise impact is due to motor transport. The noise levels were measured at reference points T1-T4: set Veshchevo, set. Cherkasovo, set Pikhtovoye and twn. Vysotsk.

The results have been made available for conducting project-related work. The measured noise levels are in accordance with SN 22.2.4/2.1.8.562-96 “Noise Levels in Work Areas, Residential and Public Premises, and in Residential Development Areas”.

7.7.2 IMPACT AND RECEPTORS

Recipients of the potential noise impact include:

- Project personnel engaged in construction and operation of the facilities as well as residents of the settlements located in close proximity to the Project. These impacts are:
    - Noise impact on the Project personnel (at construction and operation phases);
    - Noise impact on the residential areas near the LNG construction site, namely Vysotsk city and Pikhtovoye settlement (at construction and operation phases);
    - Noise impact on the settlements located along the gas pipeline bend route (at the construction phase).
- Fauna. Noise exposure can extend both to terrestrial fauna species (including sea birds) via air and to marine (underwater) fauna (viz. from submerged sources).

The only vibration sources to be potentially considered are associated with drilling and pile driving operations. As there are no buildings, including residential, owned by third parties in the Project’s vicinity, vibrational impact from automotive transport and construction machinery is assumed as negligible and, therefore, is not discussed in this ESIA report hereinafter.

Vibration-related exposure may be expressed as:

- causing nuisance for humans and terrestrial fauna as a result of noticeable soil vibration, and
- causing nuisance for marine fauna by underwater noise induced by vibration (see Noise Impact).

Of note is that sources capable of inducing soil vibration at the level sufficient for inflicting material damage are lacking and, therefore, are not discussed in this document hereinafter.

On the Project site, a concrete casting technology of well drilling will be used for pile driving.

Pursuant to Russian regulations (GOST 12.1.012-90 and SN 2.2.4/2.1.8.566-96), a safe vibration level at well drilling is achieved inside of the soil at depths from 40 m to 100 m from a surface vibration source. Thus, at a depth below 100 m, negative impact from vibration both on ecosystem components and on humans is considered small to negligible.

Therefore, vibration has been assumed to be limited to upper drilling zones and categorized as a medium intensity, temporary/short-term and local impact.

Over the construction period (Phases I and III), key noise sources will be offshore engineering facilities, construction equipment and machinery, and diesel and compressor plants.

According to the Plan of Construction Organization (PCO) operations will be performed on a 24-hour basis.

Noise levels at reference points were calculated using the ARM programme Akoustika 3D, version 3.1.6. The calculation of noise levels at reference points was performed for the boundary of the designed SPZ and the nearest residential property.

The calculation results have shown that:

- the calculated values of equivalent sound levels at reference points in living premises of the nearest residential houses do not exceed day-night standards set by SN 2.2.4/2.1.8.562-96 ($L_{eq.\ day}$ = 45 dBA and $L_{eq.\ night}$ = 35 dBA, respectively);
- the calculated values of maximal sound levels at reference points in living premises of the nearest residential houses do not exceed day-night standards set by SN 2.2.4/2.1.8.562-96 ($L_{max.\ day}$ = 60 dBA and $L_{max.\ night}$ = 50 dBA, respectively).

Over the operation period, potential onsite noise sources for the exposed residential area and surrounding territory will be: production equipment, transport vehicles, loading mechanisms and vehicles, and ventilation systems.

With account for the Project disposition, reference point locations were selected on the boundary of the designed SPZ and the nearest residential property:

- residential property at 16, Pikhtovoye, Leningrad Region – 2458 m;
- residential property at 7 Krasnoflotskaya st., Vysotsk, Leningrad Region – 2360 m;
- the designed SPZ boundary in the north-eastern direction;
- the designed SPZ boundary in the south-eastern direction.

Thus, no exceedance of regulatory sound levels in living premises of the nearest residential houses is anticipated over the period of construction of berthing facilities and the LNG production terminal.

Over the period of construction (Phase II), key noise sources will be construction machinery and equipment, diesel and compressor plants, and offshore engineering facilities.

To evaluate acoustic exposure on the areas subject to regulation calculations were performed at 9 reference points RP1 – RP9, which are less distanced from the construction site boundaries.

No sources of noise impact on the environment have been identified for the period of operation of the gas pipeline bend from the trunk gas pipeline Leningrad-Vyborg-State border to the natural gas liquefaction complex in port Vysotsk, Vyborg District of Leningrad Region.

7.7.3 MITIGATION

With a view to mitigate the anticipated levels of sound pressure from noise sources at 9 points located most closely to the construction site and along the access road from the side of SNT Rechnoe over the period of pipeline bend construction it is intended to set up temporary noise screens made from polymethylmethacrylate (PMMA) sheets along the land allotment boundary (totally 10 screens).

The measures that have been intended to minimize noise levels and mitigate anticipated acoustic exposure during construction include:

- construction of site fencing;
- operating high noise generating construction machinery at daytime;
- preventive maintenance of equipment;
- shutdown of engines during downtime or technical intervals;
- selecting rational operation modes for noise generating equipment and machinery, including limiting operations in proximity to residential zones;
- selecting equipment and machinery with noise characteristics consistent with regulatory noise requirements for workplaces and adjacent residential areas;
- fitting high noise equipment and machinery with noise-reducing devices (silencers, sound absorbing hoods, etc.);
- installing temporary noise barriers made of polymethylmethacrylate (PMMA) sheets along the land allotment boundary on 10 sections of pipeline bend construction.

During the Terminal operation it is necessary to undertake the following activities to reduce noise from operating machinery down to the permissible level established by sanitary regulations:

- providing personnel at workplaces with personal protective equipment against noise and vibration (ear sets, inserts, helmets) and organize systematic medical examinations to reveal occupational diseases;
- putting mechanisms to preventive maintenance;
- using silencers for engines to reduce noise from mechanisms for enhancing personnel and environment protection;
- shutdown of engines during downtime or technical intervals;
- delivery of feedstock and materials to the Terminal by trucks in the interval from 8.00 to 20.00;
- selecting mechanisms with better acoustic parameters;

- using low noise small size machinery.

The Project operation will be accompanied by integrated actions aimed at preventing the vibration transfer to building structures and ensuring permissible levels of noise generated by ventilation systems in operation, such as:

- placing ventilation equipment in soundproof enclosures;
- using flexible inserts or quick-release clamps with rubber packers to reduce vibration at fan connections with vent ducts;
- equipping ventilation units with silencer batteries;
- using resilient gaskets at vent ducts fastening to structures and where they pass through enclosing structures.

Noise protection activities planned under the Project are sufficient for ensuring permissible levels of noise from the facilities subject to regulation.

7.7.4 RESIDUAL IMPACT AND CONCLUSION

With the mitigation measures in place, the noise and vibration impacts caused by the Project are not expected to be significant at existing sensitive receptors neighbouring the Project.

A review of the acoustic exposure propagation associated with Project activities has shown that:

- noise from continuous noise sources at reference points on the boundary of the designed SPZ and inside of the nearest residential houses is within the permissible day-night level established by SN 2.4/2.1.8.562-96 “Noise at workplaces, in premises of residential and communal buildings, and in residential areas”;
- noise from non-continuous noise sources at reference points on the boundary of the designed SPZ and inside of the nearest residential houses is within the permissible day-night level established by SN 2.4/2.1.8.562-96 “Noise at workplaces, in premises of residential and communal buildings, and in residential areas”;
- cumulative value of noise from all sources at reference points on the boundary of the designed SPZ and inside of the nearest residential houses is within the permissible day-night level established by SN 2.4/2.1.8.562-96 “Noise at workplaces, in premises of residential and communal buildings, and in residential areas”.

All residual airborne noise impacts on humans are assessed as **Low**. Residual noise impacts on terrestrial animals are assessed as **Low.**

Residual vibration impacts on humans and terrestrial animals are assessed as **Low.**

Residual underwater noise impacts on marine fauna during construction Phase I (Construction of berthing facilities) are assessed as **Moderate**.

7.8 TERRESTRIAL FLORA AND FAUNA

7.8.1 BASELINE CONDITIONS

General

The terrestrial flora and fauna present within the Project area are typical of the taiga ecosystems formed under the influence of the latest Valdai glaciation. There are no specially protected natural areas within the Terminal site. The work area is not located within any federally or locally recognized specially protected natural areas or their protection zones.

Habitat Types

Forest of the southern taiga zone is the key habitat type in the Project area covering over 70% of the territory on Leningrad Region. 40% of forests belong to Group I forests which are essential for stabilizing the region's environment, preserving biodiversity, and performing soil protection and water regulation functions. They are also highly important for recreation (e.g. forests of Saint-Petersburg's green belt). Group II forests (60%) constitute multi-purpose resource potential and the main source of commercial timber. At present a part of the Vyborg district area is occupied by secondary small-leaved forests which grow in places of logging sites and coniferous forests destroyed by forest fires. Non-forest types of vegetation in the Vyborg district consist of dry meadows, which form on well-drained watersheds (dry valleys). Up to 30% of the territory (varying from 2 to 30% between the districts) belong to swamps.

The Project site is occupied by forest and non-forest communities, mostly modified by economic activity. Forest communities consist of coniferous and coniferous/small-leafed forests in various stages of regrowth. Non-forest communities consists of areas disturbed by human activity, fallows and lowland swamps.

Rare plants

The areas where the gas pipeline branch will be built and the aquatic area of Vyborg bay have already been under considerable human-caused strain. The flora and fauna species composition is typical for the region in question and, on the whole, is not unique.

None of the moss-like plants, algae, fungi, lichens or vascular plants listed in the Leningrad Region Red Data Book or the RF Red Data Book have been found within the Project area by the field survey performed in 2015. Only a single species listed in the Leningrad Region Red Data Book has been found in close proximity: *Lycopodiella inundata* – inundated club moss. It grown along the route of the existing gas pipeline (Figure 7.4). It is listed in the Leningrad Region Red Data Book (List of Plants and Mushrooms..., 2005) and has the status 3 (R) – rare species. A pioneer species, which as a rule eventually loses competition with other species.

Figure 7.4: Inundated club moss (Lycopodiella inundata) near the route of the existing gas pipeline east of the Saint-Petersburg-Vyborg railway

Herpetofauna

Seven species of amphibians (including the northern crested newt) have been recorded in the Leningrad region. In the Project area 2 widespread species have been recorded: the common frog (*Rana temporaria*) and the common toad (*Bufo bufo*). These species inhabit a variety of habitats, and easily adapt to new environments. Five species of reptiles are found in the Leningrad Region. 3 of them have been recorded within the Project area: the viviparous lizard (*Lacerta vivipara*), the common European viper and the grass snake. None of the species has protective / endangered status.

Birds

312 species of birds of 18 orders have been recorded in the Leningrad Region. 34 game bird species are known in the Vyborg District.

A section of the White Sea-Baltic Sea birds migration route passes over the territory of the Vyborg district of the Leningrad Region and over Vyborg bay. The main transitory migrants in the area under review are: sea and river ducks, swans, coots, grebes, black-backed gulls, diving ducks.

The following Baltic Sea bird species can be observed in spring and summer (nesting period) within and near the area under review: Eurasian oystercatchers, common eiders, Arctic terns, great black-backed gulls and lesser black-back gulls.

Within the Project site the diversity of bird species is minor: only 7 species have been identified. The scarcity of species diversity is due to a significant transformation of natural landscapes, the proximity of residential development areas and transport routes (both highways and railways). No aggregations of waterfowl, no stopover, molting or nesting sites have been noted within the Project site.

Mammals

Currently, the terrestrial fauna in the Leningrad region includes 61 species of mammals. Table below presents the information on the numbers of game species in the Vyborg district.

Table 7.1: Information on the numbers of game species in the Vyborg district

Description	Number of animals
Roe deer	12
Fallow deer	24
Moose	1884
Boar	1132
Brown bear	94
Red fox	726
Raccoon dog	643
Badger	391
Weasel	88
Otter	136
Stoat	179
Minks	633
European pine marten	580
European polecat	154
Eurasian lynx	34
Mountain hare	3101
European hare	52
Squirrel	2220
North American beaver	150
Eurasian beaver	675
Muskrat	785
European water vole	136
Moles	23942

The following rare species listed as Rare and Endangered Animal Species in the Leningrad Region Red Data Book have been found within the surveyed area: the European mink (*Mustela lutreola L.*) and the European roe deer (*Capreolus capreolus L.*). Conditions exist for the presence of the Eurasian least shrew (*Sorex minutissimus Zimmermann*) but due to its sporadic distribution and small numbers it is unlikely they would be encountered.

4 mammal species have been recorded in the Project area: European mole, squirrel, Field vole and Tundra vole. No species included in Red Data Books of various ranks were recorded during the field survey. Such species are not likely to exist within the Project area due to the lack of suitable biotopes and the degree of human-caused pressure to which the area is subjected.

Fish

The gas pipeline construction project provides for crossing a number of watercourses. Some of the widespread fish species, mainly roach (Rutilus rutilus), perch (Perca fluviatilis), ruffe (Gymnocephalus cernua), common bleak (Alburnus alburnus), white bream (Blicca bjoerkna), common dace (Leuciscus leuciscus), asp (Aspius aspius), gudgeon (Gobio gobio), pike (Esox lucius), European smelt (Osmerus eperlanus), etc. can be found throughout the entire lengths of those rivers.

European smelt, salmon and lamprey enter the Cherkasovka river from the Gulf of Finland. Atlantic salmon (Salmo salar) and brown trout (Salmo trutta) enter the Dryoma river. Brown trout spawns in the Matrosovka river, salmon migration routes and downward migrations of salmon juveniles follow its channel. The river's water area is also used as feeding grounds by juveniles and adult fish alike.

7.8.2 IMPACTS AND RECEPTORS

Project's impact on terrestrial flora and fauna both direct (loss of habitats) and indirect (disturbance and environmental pollution) will be considerable on the construction stage. The range of habitats that will be lost includes the areas occupied by the construction sites for the LNG Plant, the storage tank, the harbor facilities, the gas pipelines, and roads (with the total area of nearly 200 ha). This loss of habitat could potentially impact plant species including the marsh club moss, listed in the Leningrad Region Red Data Book.

No impacts on legally protected areas have been identified.

Potential impact on fish may be connected with the direct loss of habitats at watercourse crossings, abstraction of freshwater from rivers and lakes, pollution of watercourses from spills and generation of wastes. The main factors of adverse impact include irreversible or reversible takeover of water areas, destruction or disruption of biotopes inhabited by bottom invertebrates during dredging operations, higher water turbidity levels caused by hydro-engineering work. The partial loss of a water body's aquatic area may lead to a loss of the dwelling areas and spawning or feeding grounds of all types of aquatic animals, including fish.

As far as birds are concerned, the direct impact during the Project construction will consist in the full destruction of habitats within the Project area. Indirect impact will include acoustic impact and air pollution. Construction phase is normally accompanied by a decrease in birds population and species diversity. This is mainly caused by the disturbance factor. Human-caused noise alters bird behavior and, in particular, garbles their acoustic communication signals. Noise creates adverse conditions for bird habitation and breeding.

7.8.3 MITIGATION

The primary mitigation controls for the loss of terrestrial habitat include:

- Minimization of the project footprint and maximization of the use of historically disturbed lands (to minimise loss of undisturbed natural habitats);

Performing all construction and auxiliary work strictly within the boundary of the construction site;

Limiting construction machinery and motor vehicle traffic to designated roads;

- For the protection of rare plants:
  - Pre-construction surveys will identify any rare plants in the footprint of the development.
  - Any rare plants will be translocated to unaffected areas prior to construction.
  - Populations of rare plants within the Project License Area will be monitored.

For the protection of plant communities, mammals and birds:

Using mufflers for construction machinery and motor vehicle engines;

Strictly adhering to waste accumulation and storage rules, waste removal schedules and waste disposal destinations;

Localizing oil and lubricant warehouses with requisite waterproof foundations;

Scheduling hydro-engineering work in such a way as to minimize disturbance of bird populations, approving the schedule with environmental protection agencies;

Preventing poaching by placing a ban on bringing fishing and hunting gear to the construction site.

- For the protection of water habitats and fish:

Strictly adhering to the construction techniques and schedule;

Collecting domestic wastewater in hermetically sealed containers with their subsequent removal from the construction sites;

Providing for chemical-ecological monitoring during the performance and upon completion of hydro-engineering work as well as for continuous monitoring of work techniques;

Conducting industrial ecological monitoring of the state of water bodies

Ensuring compliance with the water protection zone regime;

Building installations ensuring protection of water bodies from pollution, contamination and depletion (treatment facilities);

Installing fish protection systems at water intakes to prevent injury and mortality of fish eggs and juveniles.

For more detail on the impact on surface water bodies and the impact mitigation measures see Section 7.5.

7.8.4 RESIDUAL IMPACTS AND CONCLUSIONS

With the implementation of the mitigation controls identified above, the residual impacts on terrestrial flora and fauna will be reduced from Moderate (without mitigation) to Low (with mitigation).

7.9 MARINE FLORA AND FAUNA

7.9.1 BASELINE CONDITIONS

Marine mammals

The species composition of marine mammals is scarce. In the eastern part of the Gulf of Finland the group of marine mammals includes two animal species listed in the RF Red Data Book:

- **the ringed seal** (sub-species *Phoca hispida botnica*) with the population of 300 animals, and

- **the grey seal** (*Halichoerus grypus*); the population of the grey seal has slightly increased and is currently 600 animals.

Grey seals are rare in the Russian part of the Gulf of Finland, they mostly appear in the southern portion.

Ringed seals also mostly keep to the southern part, bounded by Seskar island in the east. Four permanent haul-out sites that are reportedly used by ringed seals exist in Vyborg bay. Two haul-out sites have been identified near the Kiperort peninsula and two in the vicinity of the skerries. There are no ringed seal haul-out sites near the Project area.

Fish

Vyborg bay is a part of the Gulf of Finland and is a fishery water body of the highest category. It is an area of high commercial and fishery value.

As with other estuary bodies, Vyborg bay has a diverse fish community. Of the 69 fish species found in the Gulf of Finland, 28 were encountered in Vyborg bay. The dominant fish species (in terms of both density and mass) in Vyborg bay are Baltic herring, European smelt, bream, roach, perch, and, on much rarer occasions, whitefish, white bream, zander.

None of the species identified in the Project Area during the survey are listed on the regional (Leningrad Region), national (Russian Federation) or international (IUCN) Red Data Books.

7.9.2 IMPACTS AND RECEPTORS

The following types of activity may impact the marine environment:

- hydro-engineering work;
- building temporary installations;
- construction and operation of a sea port (harbor facilities).

The following are the key factors of an adverse impact:

- Dumping of soil into the water, excavation of soil from under the water and removal of piles or sheet piling represents the primary potential impact on the marine environment that can result in the following;
    - formation of a high turbidity zone (plume), which creates adverse living conditions for fish and organisms on which they feed;
    - changing the seabed soil structure, which may lead to destruction of existing benthic communities.
- Marine mammals may be impacted by underwater noise generated during construction of the offshore facilities.
- Oil spills may cause a considerable adverse effect on birds and juveniles of many fish and aquatic invertebrate species (including eggs and larvae). Many of them die in the first hours and days after the spill. Spills in spring, autumn and in the end of winter may cause high mortality rates and jeopardize the entire age groups and sub-populations of species.

- Discharges into sea (from vessels and onshore wastewater treatment facilities) may cause changes in water quality leading to impact on marine flora and fauna and entering of Invasive species through ballast waters.
- Abstraction of water from Vyborg Bay for hydraulic testing and for fire water supply needs may have impact on marine fauna causing mortality among aquatic organisms at water intakes.
- Collision of mammals with vessels may occur in the Project area, though it is most unlikely as the Project site is not a place of permanent or temporary dwelling (haul out, wintering) of mammals.

7.9.3 MITIGATION

Mitigation controls for impacts associated with discharges to the sea include the use of wastewater treatment facilities before discharging industrial wastewater and rainwater into Vyborg bay and monitoring over the effluents quality and water quality in the bay.

Mitigation controls for underwater noise include:

- choosing rational operation schedules for equipment and mechanisms;
- using equipment with noise specs ensuring compliance with regulations;
- using noise reduction devices (mufflers, soundproof casings, etc.);
- turning off engines during forced downtimes or technical breaks.

Installing fish protection systems at water intakes will minimize the adverse effect on marine fauna caused by water abstraction from the bay.

Mitigation controls for potential collision of marine mammals with vessels include:

- Using specific marine vessel routes;
- Monitoring marine mammals from nearby vessels.

The primary mitigation controls for the protection of the marine environment from hydro-engineering work will include:

- Keeping record of the pollutant content of seawater as part of environmental monitoring program;
- Observing the ban on work performance from late April till mid-June (to protect fish species that spawn in spring);
- Making up for the damage caused to marine bioresources and ensuring reproduction of fish resources
- Continuously monitoring compliance with technical requirements while performing hydro-engineering work.

7.9.4 RESIDUAL IMPACT AND CONCLUSION

With the adoption of the mitigation measures identified above, the residual impacts on the marine environment are assessed as:

- **Moderate** for underwater noise impacts
- **Low** for impacts associated with hydraulic construction
- **Low** for impacts associated with marine mammals collision with vessels
- **Low** for impacts associated with discharge of treated wastewater from shore
- **Low** for impacts associated with discharge of ballast water.

8 SOCIAL ASSESSMENT

8.1 BACKGROUND

8.1.1 POPULATION OVERVIEW

The Project Area is situated in the Vyborg district of the Leningrad Region. 204,000 people are living in the territory of the Vyborg district (more than 11% of the Leningrad region population). District population has reduced lately because of natural decline even under the conditions of positive migration balance. About 20,000 people are living in the territory of the settlements where the Project is realized. The permanent settlements nearest to the Project Area are:

- Vysotsk urban settlement (population 1,131)
- Sovetsk urban settlement (population 9,397)
- Goncharovsk rural settlement (population 9,881)

8.1.2 HUMAN RECEPTORS IN THE PROJECT AREA OF INFLUENCE

The human receptors that may be directly impacted by the Project (i.e. within the direct Project Area of Influence) are summarized below:

The Project will have direct socio-economic impacts beyond the Project battery limits (fence line of the Project facilities), and beyond the wider allocated land plots, including:

- Towns (Vyborg, Vysotsk, Sovetsky)
- Rural settlements (Goncharovskoye, Medyanka, Cherkasovo, Perovo, Sokolinskoe, Roshino);
- Household plots' entities: SNT – Non-commercial Communities of Gardeners (SNTs Vysotskoye, Solnechnoye, Sputnik 2, Berezovaya Dolina, Rechnoe, Lesnoe, Belye Nochi, Sosnovy Mys, Lada, Perovskoe);

- Recreational centres (residential and recreational complex Pikhtovoye, Island).

In addition to direct impacts, the Project may impose indirect impacts beyond the zone of direct impact, such as:

- Potential impacts (including positive ones) on regional social infrastructure (health care facilities, educational institutions);
- Socio-economic benefits for local communities and residential areas within Vyborg region.

8.1.3 RECREATIONAL LAND USE

The significant direction of the lands usage within the region is recreational and agricultural use (gardeners' non-commercial partnership - GNCP). In three settlements on the territory of which the facilities of the Project will be located there are 80 gardeners' non-commercial partnerships operate, and 10 of them are located in comparative proximity from the facilities of the Project. An important point is that all GNCP are actively used by summer residents. Among summer residents the inhabitants of St. Petersburg and Vyborgsky district prevail.

The residents of settlements of Vyborgsky district are actively using the surrounding territory. The traditional environmental use engages mostly the seacoasts within transport accessibility and woodlands located around the settlements and the Gardeners' Non-Commercial Partnership. Residents and, especially, seasonal (summer) residents actively gather mushrooms, berries, are engaged in amateur fishery, use bathing beaches.

The site of LNG terminal is located on the forested peninsula limited by water from three sides. The availability of an access road, a convenient access to the sea defined rather intensive recreational use of the coast.

8.2 OVERVIEW OF SOCIAL IMPACT ASSESSMENT

Social impacts are assessed in terms of the following aspects:

- Community health, safety and security;
- Population influx;
- Land use;
- Economy and employment;
- Cultural heritage.

Each of these aspects is discussed in turn in the sections below.

8.3 COMMUNITY HEALTH, SAFETY AND SECURITY

8.3.1 IMPACTS AND RECEPTORS

Potential impacts on community, health, safety and security during construction activities may occur through the following:

- Potential for health impacts related to air emissions, noise, generation of dust, ground contamination and pollutant run-off to the surface water resources used by the local population, which may exacerbate existing or cause new health conditions (e.g. greater predisposition to respiratory diseases);
- Heightened stress, potential for conflict, reduced feeling of personal and community safety, greater incidence of communicable disease, associated with the large numbers of non-local workforce present in the Project area (highly unlikely as most of the personnel are from Vyborg and St.-Petersburg);
- Risks associated with limitations of access to former recreational places and limited access to ecosystem services and hunting grounds;
- Risks associated with the presence of security personnel within the Project area.

8.3.2 MITIGATION

The risks identified in the preceding section will therefore be addressed through a number of preventive and control mechanisms to minimise the potential spread of communicable diseases between the workforce and off-site communities. These measures will be as follows:

- Health monitoring and disease prevention among workforce:
    - Health screening of all personnel engaged in the construction activities, undertaken upon commencement of their work assignment;
    - Implementation of the Health programme for Project personnel, including raising the awareness of potential health risks and methods of prevention;
    - Sanitary-hygienic control at the workplace and in the worker accommodation areas;
    - Regular liaison with the public healthcare and social protection authorities in Vyborg region;
    - Availability of medicines and first aid equipment at the site and in accommodation camps
- Workforce behaviour regulations:
    - Enforcement of the workforce regulations through the Accommodation Camp Policy (including sign-in/sign-out policies and guidance on visits to the local residential areas) and the overall Worker Code of Conduct, which is also applicable to the contractor personnel, particularly in relation to the worker movements outside of their working hours or in any areas beyond the designated worksites/Project area;

- Encouragement for workers to promptly report any cases of illness to the respective medical facility, particularly when an infection is suspected. Whenever possible, provision of cooperation for contact tracing will also be encouraged. Workers' privacy and confidentiality will be respected in all cases, along with assurance that the detection of an infectious disease will not lead to dismissal.

8.3.3 RESIDUAL IMPACTS

With the adoption of the above mitigation measures, and also taking into account the distances between the Project facilities (including the camps) and the nearest populated areas, all residual impacts on community health, safety and security are assessed as **Low**.

8.4 POPULATION INFLUX

8.4.1 IMPACTS AND RECEPTORS

At the peak of the construction phase (in 2017-2018), nearly 1200 construction workers will be present on site at one time. These will mainly consist of LNG's construction contractors. As there is lack of skilled construction workers in the Project region, it is envisioned that the Project will engage skilled personnel from St.-Petersburg working in rotation.

The potential adverse impacts induced by the influx of the construction workforce could be as follows:

- Risk of social conflicts, including possible tensions between the host community of Vysotsk district and the Project's non-resident personnel. However, there is low probability of this risk due to absence of significant cultural and income differences between host community and non-local force;
- Additional load to the municipal infrastructure of the settlements located in the Project area of influence (accommodation in the housing stock of the settlements, use of local hospitals, services, municipal roads);
- A potential for breakdown of law and order, including increased crime and illicit activities, e.g. unauthorised fishing and hunting, demonstration of inappropriate behaviour or spontaneous spread of violence/disorder on-site and off-site.

8.4.2 MITIGATION

The primary control methods are as follows:

- Minimising contact between the host population in the nearby settlements and the Project workforce by providing accommodation for construction personnel on-site and in Temporary Construction Camp for Stage III of the Project (when the number of construction workers will be about 1200). The camp facilities will be self-contained and will offer the catering, cleaning, sanitary and laundry services that are necessary for maintaining an appropriate standard of accommodation.
- For Stage 1 and II of the Project the risk of potential conflicts with local communities is low as the number of workers to be employed is not high (226 and 376 persons accordingly),

and these workers and host community have similar cultural background and level of incomes.

- Road transport infrastructure:
    - Establishing dedicated auxiliary infrastructure in the form of access roads will result in improved accessibility of the areas in the Project locality;
    - Advance notifications to the relevant authorities in cases when the road transportation of oversized heavy cargo loads is planned;
    - Import of construction equipment and materials, including oversized modules, via sea, thereby avoiding need for over-ground transport;
- All construction personnel, including contractors, will receive mandatory induction training regarding the norms of appropriate behaviour including familiarization with the Worker Code of Conduct.

The Worker Code of Conduct will specifically cover, inter alia, the following aspects:

- Prohibition of hunting, fishing and gathering practices by the workforce;
- Refraining from any activity that may be detrimental to the host community;
- Exercising neutral attitude of non-engagement and the prevention of disagreement in cases of potential conflict;
- Disciplinary measures to be applied in cases of infringement of the Code's requirements, proportionately to the gravity of the contravention.

8.4.3 RESIDUAL IMPACTS

Taking into account the mitigation measures described above, the residual adverse impact associated with the interaction between Project workforce and the host communities is assessed as **Low** to **Negligible**.

8.5 LAND USE AND FISHERY

8.5.1 IMPACTS AND RECEPTORS

The main existing land use in the Project's direct Area of Influence is recreational and agricultural activities as described in Section 8.1.3. Potential Project impacts include:

- Physical loss of agricultural lands or recreational, fishing gathering areas;
- Reduced access to recreational areas, fishing and gathering areas;
- Disturbance to residents of summer houses (dachas) by increased noise level, increased load to municipal roads, decrease of traffic safety,
- Physical loss of recreational areas, fishing and gathering areas;
- Damage to fish stock.

8.5.2 MITIGATION AND RESIDUAL IMPACTS

The primary measures to mitigate the impacts of factors of disturbance and decrease of traffic safety for the people using dachas for recreation are:

- Develop and implement Transport Management Plan (including safe driving training; safe journey management, requirements for vehicles, minimizing cargo transportation on public roads, route planning, etc.);
- Use noise screens where necessary;
- Develop and implement Construction Waste Management procedures as part of Construction Waste Management Plan for Solid Wastes.

With the adoption of the above mitigation controls, residual impact is assessed as **Low**.

The primary measures to mitigate the impacts of reduced access to or partial loss of recreation areas are:

- The foot print of the Project facilities will be minimised;
- Reclamation of lands on completion of construction works.

With the adoption of the above mitigation controls, residual impact is assessed as **Negligible to Low.**

Potential impacts to fish stocks and fishing activities from construction activities are mitigated through the application of good construction practices, which include:

- Use of filters on water abstraction pipes;
- Treatment of all discharge waters to meet discharge standards for fishery waterbodies;
- Erosion control practices to prevent sedimentation inflows into water bodies;
- Compensation of damage caused to marine bio-resources and ensuring reproduction of fish resources;
- Collection of domestic sewage and bilge water from vessels using sewage collecting vessels;
- Observing the ban on work performance from late April till mid-June (to protect fish species that spawn in spring);
- Collecting residual materials, structures and construction debris in special containers or on pre-approved sites upon completion of the construction and subsequent removal to existing landfills for neutralization and disposal;
- Disclose information on shipping routes and schedule to ensure safety of fishery companies and fishermen.

With the adoption of the above mitigation controls, residual impact is assessed as **Moderate.**

8.6 ECONOMY AND EMPLOYMENT

Vysotsk LNG Project will have a **beneficial** impact on direct employment primarily thanks to the high demand for construction manpower and the Company's special emphasis on recruiting local population where possible and without compromising the Project's rigorous quality standards. To reinforce this positive influence, the following enhancement measures will be implemented:

- Development and regular update of the 'Program for recruitment and professional training' covering all recruitment procedures, types of training offered by the Company, as well as the exact employment targets set for the short- and long-term prospects of the Project implementation;
- Preferential recruitment of employees from the local population, guaranteed by use of a local candidates' database before interviewing any non-local candidate;
- Provision of vocational/skills training and professional development opportunities for the local workforce (especially youth) to build and strengthen their capabilities and reinforce their competitive position;
- Interaction with Vyborg educational institutions for cooperation in professional training provision and engagement with recent graduates;
- Development of a mechanism to encourage contractors to recruit locally for semi-, low- and unqualified positions
- Annual employment of disabled – not less than 2% of the Company's total headcount.

8.7 CULTURAL HERITAGE

8.7.1 IMPACTS AND RECEPTORS

The following cultural heritage sites, which may be impacted during construction operations, are located in the Project area of influence:

- 4 communal graves of Soviet soldiers who died in 1941-44;
- Charcoal burning pits and piles.

8.7.2 MITIGATION

The mitigation controls for the protection of cultural heritage include:

- Close interaction with regional and local administration on the issues of preservation of the Great Patriotic War heritage;
- Development of Chance Find Procedure in accordance with PS 8 of IFC Performance Standards;
- Cooperation with archaeologists.

8.7.3 RESIDUAL IMPACTS

With the development and implementation of the above mitigation controls, residual impacts on cultural heritage are assessed as **Low**.

9 TRANSBOUNDARY IMPACTS

The Project Area of Influence is not expected to extend beyond international boundaries on the basis of:

- The scope of the Project is located entirely within the Russian Federation.
- The effects of nitrogen deposition from the Project's combustion of fossil fuel are assessed, but given the location of the Project, significant impacts are not anticipated to extend beyond national boundaries.

Significant transboundary impacts are therefore not anticipated. The one exception to this relates to emission of greenhouse gases (GHG) through the lifecycle of the Project and these impacts are addressed.

Project waste will generally be managed locally at the onsite waste facility. Selected wastes will also be sent to third party licenced facilities for recycling, including scrap metals, spent tires and luminescent lamps, etc. These will be facilities in the Russian Federation (only facilities with all relevant licences will be used), and therefore no significant impacts are anticipated.

10 CUMULATIVE IMPACTS

This Chapter presents a cumulative impact assessment (CIA) on the natural and social environment associated with the existing or planned activities within the Vysotsk LNG Project area, taking into account also other types of commercial activities carried out within the subject area and in adjacent territories.

The CIA methodology is based on the guidance described previously and in particular follows the six step approach outlined in the draft GPH and including six steps.

Step 1. Identification of VECs (Valued Environmental and Social Components) and Spatial and Temporal Boundaries of the Project;

Step 2. Defining historical, existing and planned activities and the presence of natural influences / stressors with the potential to affect the VECs identified in Step 1;

Step 3. Gathering available baseline data for the identified VECs;

Step 4. Assessment of Cumulative Impacts

Step 5. Assessing significance of Cumulative impacts

Step 6. Management of Cumulative Impacts

Based on the above approach, cumulative impacts were analysed for the following VECs identified in the cause of the ESIA study:

Atmospheric air

The most significant impact factors affecting the atmospheric air quality in the project area are currently:

- Coal terminal at Vysotsk Port (coal dust mostly)
- OAO “RPK-Vysotsk” Lukoil II (flaring, vessels)
- OAO “Vyborgskaya Tzellulosa” – PAO “Lesopromyshlennaya Korporatziya” – pulp and paper mill
- Roads – both motor roads and railways

Recipients of such an impact are residents of the nearby settlements who currently complain about high dust concentrations in the air especially near the Port.

Since humans (recipients) have a high level of sensitivity in relation to the atmospheric air quality, a cumulative impact can be assessed as **low** for operations’ stage and **moderate** for construction stage. The fourth stage of the Project will even lead to improvement of the situation as it is associated with gasification of Vysotsk which is currently using fuel oil for heating purposes.

Marine environment and hydrobionts habitats

During the construction phase of the Project it is expected that the water turbidity in watercourses directly influenced by the Project (especially by pipeline construction) will increase. Also noise impacts on marine fauna will be associated with underwater hydro-engineering works during construction.

There are other companies and port facilities operating in the same marine area (such as RPK Vysotsk Lukoil II and Port Vysotsk). Also there are other companies polluting marine environment in the Project area - such as PAO “Lesopromyshlennaya Korporatziya” (pulp and paper mill). There were major complaints about fish damage caused by discharges of this company and significant fines were imposed on the company.

The cumulative impact on marine environment has been assessed as **regional, temporary and moderate**, but it can be abated by implementing the mitigation measures foreseen in the individual project designs.

Surface waters and hydrobionts habitats

Considerable type of impact, mainly during the construction phase, is formation of zones with elevated water turbidity in water bodies as a result of an increase in solids discharge from the catchment areas disturbed as a result of construction activities and from construction sites.

In general, the cumulative impact on surface water and aquatic bioresources has been assessed as **temporary and moderate**.

Natural terrestrial habitats and landscapes

The main impact of the Project implementation on natural habitats will be associated with their long-term physical loss as a result of the land take for construction of Project facilities and infrastructure, clearing of forests and other vegetation, increase in the noise level caused by transport traffic (disturbance factor) and landscape type change in the Project area. Impact on natural terrestrial habitats will be mostly associated with construction stage and cumulative impacts could be assessed as short-term and low.

Cumulative impact on the landscape as a result of destruction of natural landscape can be assessed as **long-term and moderate**.

Ecosystem services and recreational activities of local communities

Implementation of the Project can impose adverse impact on ecosystem services and recreational activities of the regional and local population due to the following factors:

- Land take in the area of former recreational activities;
- Construction of new access roads and pipeline construction associated with logging and other disturbance factors leading to limitations in such activities as berries' and mushrooms' collection;
- Increase in the road traffic intensity affecting the safety on roads and higher risks of traffic accidents.

In general, cumulative impacts, taking into consideration implementation of other existing and planned projects relating to construction of new facilities in the same district, can be assessed as **low/moderate and of local character**.

Implementation of the Project can impose adverse impact on ecosystem services and recreational activities of the regional and local population due to the following factors:

- Land take in the area of former recreational activities;
- Construction of new access roads and pipeline construction associated with logging and other disturbance factors leading to limitations in such activities as berries' and mushrooms' collection;
- Increase in the road traffic intensity affecting the safety on roads and higher risks of traffic accidents.

In general, cumulative impacts, taking into consideration implementation of other existing and planned projects relating to construction of new facilities in the same district, can be assessed as **low/moderate and of local character**.

Local infrastructure

It is expected that the road traffic intensity (especially that of heavy vehicles) will increase significantly resulting in deterioration of the condition of local roads and requiring consequently additional financing for road maintenance and repair from the local budget. The Project implementation will also cause an increase in the intensity of traffic for transportation of local residents using their own cars or public transport means.

In case of lack of appropriate measures at the level of individual projects, the cumulative impacts on the regional infrastructure can be assessed as **moderate.**

Employment and economy

Creation of new jobs in connection with the Project implementation will contribute to the overall beneficial cumulative effects for the development of other commercial operations in the region.

Management of cumulative impacts requires adoption of adequate mitigation measures to abate impacts at their source at each particular Project phase.

The Company is committed to adopt a proactive approach to the cumulative impact management by complying strictly with the adopted mitigation measures in the course of the Project implementation, as well as continuous interaction and consultations with the local communities.

11 DECOMMISSIONING

The decommissioning phase of the Facility is not reviewed in detail in this document. A special project will have to be developed to cover decommissioning and dismantling of production facilities.

According to Decree 61-A of the Russian Federal Committee for Mining and Industrial Supervision, a hazardous production facility has to be liquidated in line with a plan describing how industrial safety will be ensured during dismantling.

An essential condition here is to protect local communities, the environment, and the property within the area of influence of the hazardous production facilities to be liquidated.

A hazardous facility liquidation plan should include the following design solutions**:**

- Preparation of equipment for dismantling and the actual dismantling process;
- Disconnection of utilities;
- Demolition of buildings and structures;
- Disposal of dismantling equipment and waste.

It should also provide for:

- Measures to prevent and response to potential emergencies;
- Consideration of geological, seismic and climatic factors;
- Environmental protection;
- Fire safety.

The design of the liquidation / mothballing plan for a hazardous production facilities are subject to mandatory industrial safety expert review.

Before the operational phase of the Facility is over, the demobilisation of facility staff has to be taken into account. In accordance with IFC Performance Standards, a demobilisation plan has to be prepared at least 3 months prior to the scheduled demobilization.

The purpose of the demobilisation plan is to assess impacts associated with a massive demobilisation of workers following the operational phase and to develop respective impact minimisation measures.

As the Facility was designed for a long operating life, a liquidation plan has not been developed.

12 ENVIRONMENTAL AND SOCIAL MANAGEMENT

Vysotsk LNG will establish management programmes that describe mitigation and performance improvement measures and actions that address the potential environmental and social risks and impacts identified through the ESIA process. These programmes will include procedures, practices and plans to ensure that all environmental and social aspects of the Project are managed in a comprehensive and systematic way. The programmes will apply across the Project, including both Vysotsk LNG and the contractors over which it has control.

In particular, Vysotsk LNG will produce the following document packages:

- Environmental and Social Management Plan (ESMP), and
- Environmental and Social Action Plan (ESAP)

An ESMP comprising a suite of individual environmental and social management plans (MPs) is being developed that defines the Project's environmental and social requirements and how these requirements are to be managed throughout the Project development. In particular, the MPs will describe:

- The organisational approach to environmental and social management, including definition of roles and responsibilities;
- The environmental and social standards to be applied;
- The specific management, mitigation and monitoring measures to be implemented to control all potentially significant environmental and social impacts under the control of Vysotsk LNG.

Recognizing the dynamic nature of the Project, the MPs will be responsive to changes in circumstances, unforeseen events, and the results of monitoring and review. At this stage the ESMP and associated Construction Management Plans (CMPs) will be developed that will address the construction phase of the Project. The operational phase ESMP will be developed at a later date prior to commencement of operations.

The ESAP has been prepared at this stage of the ESIA process that describes and prioritises any additional actions needed to enable the development and implementation of further relevant mitigation measures, corrective actions and/or monitoring measures necessary to manage the environmental and social impacts and risks identified in the ESIA. Additional actions captured in

the ESAP are typically those that require additional time for their full development after the finalisation of the ESIA.

Both the ESMP and ESAP will sit within the Project's overarching management systems, including Vysotsk LNG's Health, Safety & Environmental Management System (HSE MS) that is being developed to the international ISO14001 and OHSAS 18001 standards.