South Stream
Offshore Pipeline
ENERGISING EUROPE

Appendix 20.1: Environmental and Social Impacts of Associated Facilities: Russkaya Compressor Station (CS)

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1 Introduction

1.1 Approach and Objectives

As indicated in **Chapter 1 Introduction**, the landfall facilities will be connected to the Russkaya Compressor Station (CS) via four 3.2 kilometre (km) long onshore pipelines. The Russkaya CS and the four connecting pipelines are being developed by Gazprom Invest, and are not part of the South Stream Offshore Pipeline – Russian Sector (the Project). However, as indicated in Section 1.2.2 in Chapter 1, the Russkaya CS and connecting pipelines are defined as *associated facilities*[1] and thus there is a need to consider the potential environmental and social implications associated with the compressor station development, given that such impacts will be additional to the impacts as associated with the Project (and as reported within the ESIA technical assessment chapters – Chapters 8 to 18).

In preparing this appendix, guidance has been sought from the Organisation for Economic Co-operation and Development (OECD) Common Approaches (the "Common Approaches", Ref. 1) which provides guidance for "officially supported Export Credits".

The Common Approaches paper defines associated facilities as "*those facilities that are not a component of the project but that would not be constructed or expanded if the project did not exist and on whose existence the viability of the project depends; such facilities may be funded, owned, managed, constructed and operated by the buyer and/or project sponsor or separately from the project.*" This definition is consistent with the definition included in the International Finance Corporation (IFC) Performance Standards.

Article 15 of the Common Approaches states that "*members should, where appropriate: assess the potential environmental and/or social impacts of any associated facilities, taking into account the timing and location of their construction, including making reasonable efforts to benchmark against relevant international standards using the available information.*"

The Common Approaches also states that an environmental and social review of associated facilities involves:

- Benchmarking of the project's environmental and social performance against the relevant aspects of the international standards applied to the project; and
- Consideration of measures that can be taken to prevent, minimise, mitigate or remedy adverse impacts and / or to improve environmental and social performance, as appropriate to the size of the relevant parties involved in the project, the context of their operations, the nature and extent of potential adverse impacts, the international standards applied to the project, and the significance of the Members' share in the overall project.

[1] IFC Performance Standards (PS) 1 defines associated facilities as being "*facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable*".

Given the above, this appendix summarises the potential environmental and social impacts of the construction and operation of the Russkaya CS and the four connecting pipelines. The information presented in this appendix is drawn from available information, namely the Russkaya CS Environmental Impact Assessments (EIAs) (Ref. 2 and Ref. 3) and associated documentation. In summarising the available information, this appendix also compares the approach and content of the Russkaya CS EIAs and associated documentation against applicable international standards (e.g. the 2012 IFC Performance Standards) that are being applied to the South Stream Offshore Pipeline.

Then, this appendix considers the potential combined environmental and social impacts that may result from the development of the Russkaya CS and the Project. This combined assessment has a different focus to the cumulative impact assessment (CIA) as presented in Chapter 20 – namely the CIA focuses on the risks of concurrent Project and Russkaya CS activities generating cumulative impacts upon sensitive receptors that are common to both developments, whereas this combined assessment considers the potential impacts of the Project and the Russkaya CS development as though this were one development upon sensitive receptors (during construction and operational phases). To facilitate a combined assessment, an attempt is made where relevant and possible, to represent assessment information from the Russkaya CS EIA and associated documentation with reference to the impact assessment framework used in this ESIA for the Project, as detailed in Section 3.3, **Chapter 3 Impact Assessment Methodology**. Where relevant / possible, opportunities for the alignment of environmental and social mitigation approaches between the Russkaya CS and the Project have been considered. However, it is recognised that the mitigations approaches may differ and that additional impact analysis as related to the Russkaya CS may have been conducted independently from the documents reviewed for this Appendix.

1.2 Assumptions and Limitations

The Russkaya CS development is being built in two stages (refer to Section 2 below). The EIAs were prepared for each stage with the aim of satisfying applicable Russian EIA legislative requirements (see Section 3 herein). The Russkaya CS EIAs were thus not prepared with reference to IFC Performance Standards requirements.

The Russkaya CS EIA and associated documents comprise a series of technical and environmental reports. The primary EIA documents covering the assessment of potential environmental and social impacts have been translated into English, together with targeted appendices and associated reports. The sections below define which parts of the Russkaya CS EIA documentation have formed the basis of the gap analysis against IFC PS (see Section 3.2) and the combined impact assessment (see Section 4).

2 Russkaya CS Description

The Russkaya CS is part of a gas transportation system being developed by Gazprom Invest called the "Expansion of United Gas Supply System for gas supply to the pipeline 'South Stream'". This gas transportation system is located onshore on the territory of the Russian Federation and consists of two main gas pipelines (Western and Eastern Corridors) and associated compressor stations. Infrastructure facilities upstream of the Russkaya CS (i.e. the Western and Eastern Corridors, and their associated compressor stations) are not described herein and are only discussed to provide context to the Russkaya CS as necessary.

The Russkaya CS will be developed in two stages as follows:

- Stage 1 involves construction of the Russkaya CS and its connection to the Western Corridor gas pipelines. During this stage, the Russkaya CS will be connected to the Project landfall facilities via four 3.2 km long onshore pipelines (see Figure A2.1). Stage 1 is expected to be fully operational in 2016 (Ref. 2); and
- Stage 2 involves increasing the capacity of the Russkaya CS due to the supply of further gas supplies via the Eastern Corridor gas pipelines. A storage area for material and equipment (the Materials and Equipment Depot (MED)) will also be established at the Russkaya CS during Stage 2. Stage 2 is expected to be operational in 2018 (Ref. 3).

The Russkaya CS will compress and transport 31.5 billion m^3/year to the Project in 2016 (Stage 1), gradually increasing to 63.0 billion m^3/year from 2018 through to 2025 (Stage 2; Ref. 3).

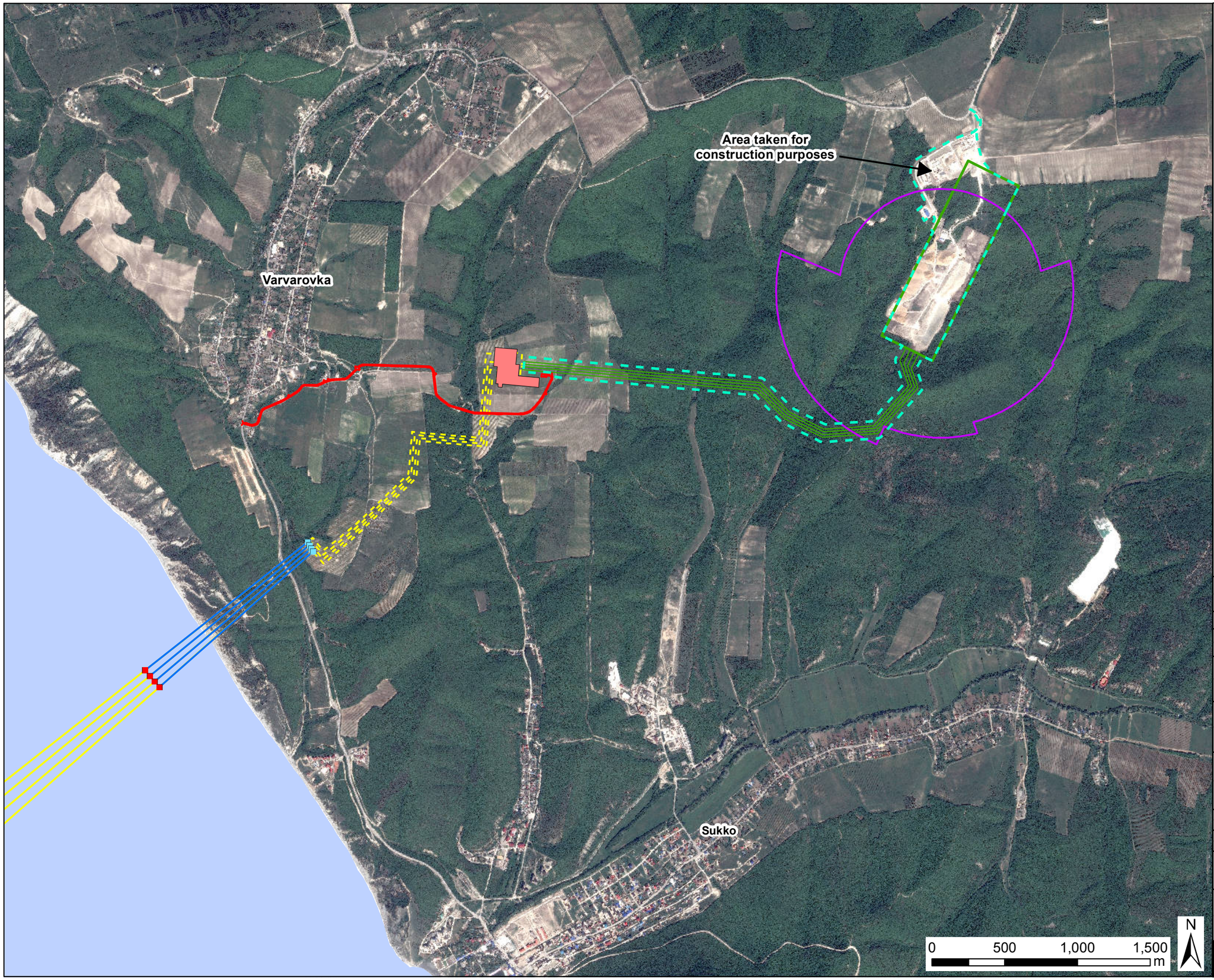
2.1 Russkaya CS Project Area

The Russkaya CS will be located in the Anapa administrative district of the Krasnodar Region on a greenfield site and in a relatively isolated location (see Figure A2.1). The village of Gai-Kodzor is located approximately 1.2 km north east of the Russkaya CS site, whilst Sukko is located approximately 2.9 km to the south, with Varvarovka located approximately 4.3 km to the west of the Russkaya CS site (Ref. 2).

The Russkaya CS development footprint (see Figure A2.1) has been estimated based upon data as presented in the Russkaya CS EIA documentation (Ref. 2 and Ref. 3) as follows:

- The compressor station construction footprint is estimated to be approximately 52 hectares (ha);
- The construction footprint of the 3.2 km long pipelines to the Project landfall facilities is approximately 38.7 ha, assuming a 120 m wide construction corridor; and
- The construction footprint for the permanent access road (i.e. the road extending from Varvarovka eastward, across the Graphova Gap, past the Project's landfall facilities to Gazprom Invest's safety valve station) is estimated to be approximately 4.5 ha.

In addition to the above, an area of approximately 16.1 ha has been estimated to be required for a temporary construction works area (located to the north west of the Russkaya CS construction footprint).



LEGEND

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Microtunnel exit pit

United Gas Supply System

- Russkaya compressor station
- United Gas Supply System pipelines
- Permanent access road to be constructed by Gazprom Invest
- Russkaya compressor station landtake area
- Estimated Sanitary Protection Zone*

* Estimated Sanitary Protection Zone dimensions are taken from the center of the gas compressor works.

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — South Stream ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: LOCATION OF THE RUSSKAYA COMPRESSOR STATION

Drawn	Checked	Approved	Date
AH	RW	MW	06 Mar 2014

URS Internal Project No.	Scale @ A3
46369082	1:25,000

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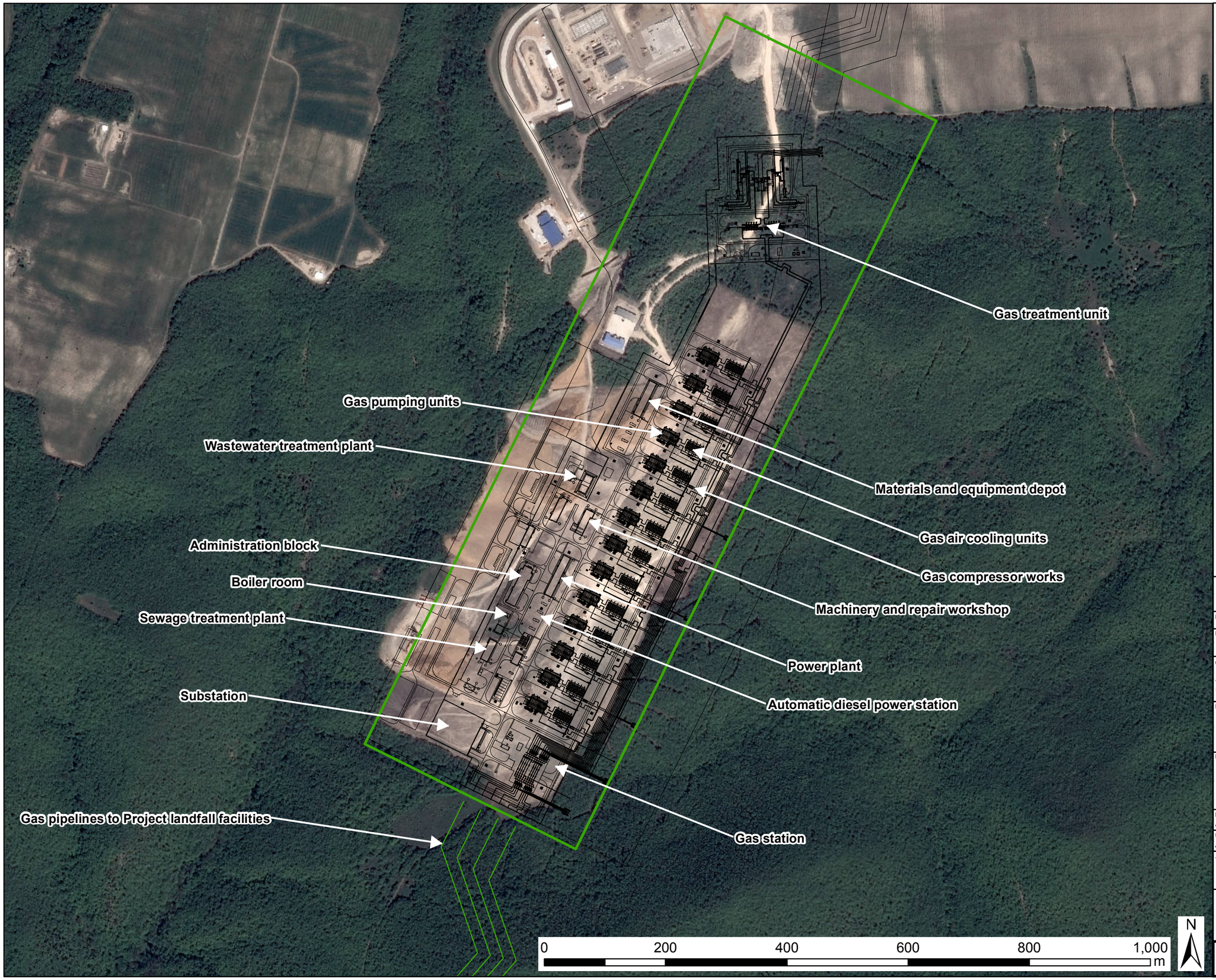
Drawing Number: Figure A2.1

Rev:

Plot Date: 06 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Appendix - Russkaya Project Description\Figure A2-1 Location of the Russkaya Compressor Station.mxd



LEGEND

United Gas Supply System

- Russkaya compressor station
- Russkaya CS Layout
- United Gas Supply System pipelines

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: RUSSKAYA COMPRESSOR STATION KEY COMPONENTS

Drawn	Checked	Approved	Date
AH	RW	MW	06 Mar 2014

URS Internal Project No.	Scale @ A3
46369082	1:6,000

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Drawing Number: Figure A2.2

Rev:

Plot Date: 06 Mar 2014
File Name:I:\15004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Appendix - Russkaya Project Description\Figure A2-2 Russkaya Compressor Station Layout.mxd

Given the above, the total construction footprint of the Russkaya CS development is estimated to be approximately 111.3 ha.

A sanitary protection zone (SPZ) will be applied to the Russkaya CS in accordance with Russian regulations (see Figure A2.2). This buffer zone aims to protect human receptors from impacts due to compressor station emissions and potential unplanned events (e.g. fire). The Russkaya CS SPZ is defined in the EIA documentation for Stage 1 (not Stage 2) and has been based on calculations of expected air pollution and acoustic levels.

2.2 Russkaya CS Design

The Russkaya CS will comprise a module assembly system with a set of automated gas processing units (GPUs) supplied in separate turnkey modules in easily assembled hangar shelter units. This design provides for minimum construction, assembly and commissioning works.

During Stage 1, the CS will comprise seven (six duty and one reserve) Ladoga GCU-32 GPUs, each with a unit rating of 32 MW (Ref. 2), providing a maximum total capacity of 224 MW (Ref. 7) and a processing capacity of 31.5 billion m^3/year (Ref. 2).

During Stage 2, the CS will be expanded to comprise 14 GPUs (Ref. 3), with a total capacity of 448 MW (see Figure A2.2) (Ref. 7). When working to maximum capacity (2025), the Russkaya CS will have a processing capacity of 63 billion m^3/year (Ref. 3).

The Russkaya CS will have two mechanical design pressures: 11.8 MPa (American National Standards Institute [ANSI] 900) to the security unit and 30.0 MPa (ANSI 2,500) after the security unit (Ref. 2).

The Russkaya CS gas discharge pressure will be 28.45 MPa, which is sufficient for conveying gas over a distance of 900 km with no additional technical means required (Ref. 7).

2.3 Russkaya CS Components

The Russkaya CS development will comprise the following main elements:

- Input pipelines with gas inlet piping machinery stations, which will connect the main gas pipeline to the gas treatment unit;
- Gas treatment unit, which will treat gas by removing contaminants, such as solids, water and hydrocarbon condensate;
- A monoethylene glycol (MEG) injection unit;
- Compressor works, comprising the GPUs with individual gas air cooling units;
- Gas flow rate metering unit, which will provide commercial gas flow rate metering and determine the chemical composition of the transported gas;
- Supporting facilities and utilities, such as access roads, a gas processing unit for internal needs, power stations, a boiler unit for heat supply, water supply and treatment facilities, wastewater drainage and treatment facilities, a machinery and repair shop with reserve

motor storage, fuel and oil storage tanks, a road vehicle car park and washing area and a fire station;

- The materials and equipment depot (MED; Stage 2) that will provide for the storage of materials and equipment. The MED will include an entry area with changing rooms, heated warehouse, cooled warehouse, open storage area, automatic diesel power station, diesel storage tank and local treatment facilities for rainwater; and
- Four 3.2 km long pipelines that will connect the Russkaya CS and the Project landfall facilities (see Figure A2.1).

Details of these facilities is provided below using information as presented in the Russkaya CS EIA documentation (Ref. 2 and Ref. 3).

2.3.1 Inlet Unit

The inlet unit will connect the Russkaya CS to the main upstream gas pipelines. A safety unit will provide for safe operation of the compressor station inlet unit and pipelines, protecting them from pressure fluctuations. The security unit will consist of pressure safety valves, no-return valves and cut-off valves.

The inlet unit will incorporate a shut-off valve and pig (pipeline inspection gauge) receiver unit. The pig receiver unit will receive the pig device from the upstream pipeline section and consist of receiver chambers with end gates, a device to take the pig launcher from the chamber, a condensate collector, pipeline drainage system for the transfer of condensate and gas vents.

2.3.2 Gas Treatment Unit

The gas treatment unit will treat gas by removing solids, water and hydrocarbon condensate in order to prevent contamination and erosion of the compressor station equipment and pipelines.

The gas treatment unit will consist of parallel gas filters. Products separated from the gas by the filters will be collected at the bottom of the dust trap and flow by gravity in a closed circuit to the drainage collector. The drainage collection system will collect and discharge the products of gas treatment (condensate and sludge) and will consist of a drainage collector, a 10 m^3 capacity condensate collection drum, and draining piping. Before the treatment products are removed, gas will be vented from the gas section in the condensate collector. Products of treatment will be transported for recycling / disposal.

2.3.3 Monoethylene Glycol Injection Unit

Monoethylene glycol (MEG) will be injected into the pipeline at the compressor station to prevent the formation of hydrates in the pipeline and in case of an emergency situation at the facility. An estimated 15 m^3 MEG/day will be supplied at a daily gas flow rate of 195,000,000 m^3/day. The MEG storage capacity is designed to hold 21 day's continuous supply of MEG.

2.3.4 Gas Compressor Works

Gas will be compressed at the compressor station for 24 hours a day, 7 days a week. The compressor works will comprise 32 MW unit capacity GPUs equipped with full pressure turbo-compressors (Ref. 2). During Stage 1, the works will consist of seven GPUs (six operational + one reserve; Ref. 2), equating to a maximum total capacity of 224 MW and a processing capacity of 31.5 billion m^3/year (Ref. 7). During Stage 2, the works will be expanded to consist of 14 GPUs (Ref. 3), which increases the maximum total capacity to 448 MW, and the maximum processing capacity to 63 billion m^3/year (Ref. 7).

The GPUs will be supplied in separate turnkey modules with automated control systems. All machinery will be connected in parallel to the suction manifold and discharge header by pipes equipped with cut-off valves. A re-circulation line will connect the outlet pipe of the gas air cooling unit with the GPU inlet pipe (along the gas flow). The re-circulation pipe will be equipped with an anti-surge control valve.

After compression, the gas will be cooled to a temperature not exceeding 50°C in the gas air cooling units installed at each GPU. These units will be equipped with fan drives and frequency control systems. Gas cooling unit functions will be controlled by the GPU automated system. The cooling units will be arranged as groups of interconnected modular assemblies, five units each, fitted in parallel and installed as close as possible to the GPUs.

2.3.5 Gas Flow Rate Metering Unit

The gas flow rate metering unit will perform commercial metering of the gas flow rate and condition (Ref. 2).

2.3.6 Access Roads

A permanent access road will be constructed to the Russkaya CS site (running from Varvarovka eastward across the Graphova Gap to a safety valve station of the Russkaya CS development) (see Figure A2.1). It is understood that access road will have a permanent width of 25 m (including shoulders) and total construction width of approximately 41 m.

Temporary access roads will be constructed to the construction site and site accommodation with temporary surfacing made of precast concrete slabs. Temporary roads will range from 4.3 m to 21.5 m wide, depending on location and intended use (Ref. 2).

2.3.7 Gas Processing Unit (GPU)

The GPU will treat and maintain gas condition, temperature and pressure parameters for the compressor station internal needs. The unit will operate all year round, supplying coolant to the heat exchanger and heating the unit during the winter. The GPU will consist of compact block units, installed in a heated box supplied by the manufacturer.

The GPU will receive gas from the main gas treatment unit. The gas will be passed through a filter-separator, condensate drum and manifold pipelines. Impurities will be collected in the filter-separator and discharged to a condensate holding tank.

After treatment, gas will be heated in a gas-to-water heat exchanger to prevent formation of crystal hydrates. Hot water will be supplied to the heat exchanger from the coolant treatment section where two UTM-4 (Kva-0.5 Gn) boilers (two duty + one reserve; Ref. 2) will be installed.

Treated and heated gas will be supplied to the pressure reduction unit, which will have two lines; duty and reserve. From here, the gas will be supplied to a gas metering unit, consisting of two metering devices.

2.3.8 Power Supply

The main power supply to the Russkaya CS will be a natural gas power plant, consisting of seven 1.5 MW fuel gas units (five in duty, one reserve, one repair; Ref. 2). Automated control systems will control the start, shut-down, and protection and control functions of the power plant. The power plant will include a sub-system of performance controls which will ensure stable operation of assemblies during individual and parallel operation modes. Exhaust fumes will be emitted through vent pipes.

An emergency automatic diesel power station will be used as a reserve source of power in case of a power cut. Four units will be installed with a total capacity of approximately 1 MW and one 280 kW capacity unit will be installed for internal needs (Ref. 2). The emergency diesel power station will not operate during normal compressor station operation; however test start-ups will be performed once a month.

2.3.9 Heat Supply

A prefabricated block of four Vitoplex-200 SX2 (three duty and one reserve) boilers will be installed in a boiler room and operated to meet the demand for heat, ventilation, air conditioning and hot water supply for the compressor station (Ref. 2). The boiler unit will be a pre-manufactured turnkey block, supplied in modules pre-assembled by the manufacturer. The set will also include a smoke-stack and external flues. The boiler unit is anticipated to be rated as II category. The heat supply system will be closed, operating in a dual-pipe circulation mode.

Water supplied to the heating system will be treated chemically using (automated) sodium-cation exchange process and a unit that removes dissolved oxygen and carbon dioxide.

Membrane expansion vessels will be installed to compensate for temperature change in the volume of the heating medium in the heat supply system.

An automated system will control the boiler unit operation and compressor station operational staff will carry out regular equipment servicing.

Gas will be supplied to the boiler unit from the GPU as fuel. The boiler unit will temporarily be supplied with diesel prior to gas supply to the compressor station, hence interim diesel reservoirs will be installed at the boiler unit.

2.3.10 Water Demand and Supply

2.3.10.1 Construction

During construction, 7 m^3/day water will be required for production and engineering needs (e.g. cement and concrete slurries, soil moistening for the construction of embankments of roads and sites, sprinkling of the permanent and temporary roads; Ref. 2). Water will be delivered from the existing water supply systems of nearby settlements and stored in a tanker.

Bottled water will be used for worker potable needs. The total volume of potable water for consumption during the construction phase is estimated to be approximately 1,658 m^3 (Ref. 2).

Temporary 200 m^3 capacity tanks will be installed for fire-fighting purposes during the construction phase (Ref. 2).

2.3.10.2 Commissioning

The total demand for water for hydro-testing is estimated to be 3,000 m^3 (Ref. 2). To accumulate this volume, a temporary earthen insulated settling pit will be constructed near the Russkaya CS site. Water will be delivered 8.5 km to the pit in trucks (capacity 12,000 litres per tank; Ref. 2).

2.3.10.3 Operation

During the Operational Phase, the Russkaya CS is estimated to require 151.9 m^3 water / day, for domestic and potable needs, and for watering the area (Ref. 2). Water is not used in the main technical processes at the compressor station.

During the operational phase, the following will be required to supply and treat water for the Russkaya CS:

- Wells for water supply;
- Two water supply systems (household / potable and fire water supply);
- Pumping stations for household / potable water supply, including module-block water purification equipment that treats water to regulatory requirements outlined in the standards SanPiN 2.1.4.1074-01 (Ref. 2); and
- A pumping station for fire-fighting water supply.

The process of purification of water includes the following process steps:

- Prefiltering using a coarse filter;
- Aeration to precipitate ferric minerals (which are deposited on the filters with a catalyst loading);
- Filtering using a fine filter;
- Treated water collected in a clean water tank; and
- Treated water passage through an ultraviolet sterilizer prior to water being used.

2.3.11 Wastewater Drainage and Treatment

To prevent the accumulation of surface water and groundwater at the Russkaya CS site during construction and operation, a water drawdown and drainage system will be constructed at the area adjacent to the compressor station, consisting of a system of drainage canals and a drain well.

2.3.11.1 Construction

During construction, runoff containing suspended solids and possibly petroleum products from the Russkaya CS construction site will be delivered to a ring canal via temporary treatment facilities. The modular treatment plant, OZON LLC, has been selected with a runoff capacity of 30 litres/second to treat runoff prior to its discharge (Ref. 2).

During construction, sealed containers will collect household wastewater. After the containers are filled, household wastewater will be taken away by sewage disposal trucks to the nearest treatment plants (under contract).

At the end of the construction period, local treatment facilities will be dismantled.

2.3.11.2 Commissioning

Following hydrotesting, wastewater will be discharged into the ring canal of the drawdown system.

2.3.11.3 Operation

During operation, the following will be required to treat and discharge wastewater from the compressor station:

- Domestic, industrial and stormwater sewer systems;
- Wastewater treatment plants. The treatment of wastewater will be performed in two separate flow systems as follows:
    - Treatment of domestic wastewater and industrial wastewater of similar composition; the treatment system includes an effluent inlet reservoir, settling reservoir for rain runoff, two treatment units and grit dewatering bays; sewage discharges into a reservoir before being pumped to a biological treatment unit for treatment. The units consist of a quadrilateral metal reservoir-monoblock, with a multiple-stage nitri-denitrifying treatment unit and settling reservoir; and
    - Treatment of surface runoff (total capacity of 2,400 m^3/day; Ref. 2). Runoff will discharge to the sewage treatment units.
- Sewage pumping station for the pumping of treated household wastewater and runoff; and
- Outfall sewer to divert treated wastewater into the water intake and then into a nameless stream.

The effluent treatment system will be designed to comply with the requirements of Russian Federation norms and standards for discharge of effluents into fishing bodies of water, in accordance with the SanPiN 2.1.5.980-00 (Ref. 2).

Treated effluent reservoirs will be used for replenishing fire water reservoirs and for general watering. Treated effluents that are surplus to requirement will be discharged into the nearest water body.

2.3.12 Mechanical Repair Workshop

The mechanical repair shop will provide maintenance services for the main and auxiliary equipment at the compressor station, and for storage. The building will consist of a one-storey and a two-storey section; the one-storey section will be used for the storage of reserve compressor engines, whilst the two-storey section will contain a fitting and repair site housing tools and equipment, a workshop, storage, and living quarters.

2.3.13 The Materials and Equipment Depot (MED)

The MED is intended for compressor station operational needs during Stage 2. The MED will be located approximately 290 m to the north north west of the compressor station and will incorporate the following facilities:

- Entry area with changing rooms;
- Heated warehouse;
- Cooled warehouse;
- Open storage area;
- Automatic diesel power station;
- Diesel storage tank; and
- Local treatment facilities for runoff.

2.3.14 Diesel Fuel Storage Tanks

Diesel for the emergency power station will be stored in nine steel, above-ground, horizontal tanks. The tanks will have a total capacity for three days of operation of all units (i.e. approximately 25 m^3 (Ref. 2)). Diesel will be supplied to the storage tanks by tankers.

2.3.15 Oil Storage

Makeup oil will be required for the oil dosing system of the gas pumping assemblies at the heated storage facility. Clean oil will be stored in containers.

2.3.16 Vehicle Wash

An open vehicle wash will be provided at the Russkaya CS which will operate only during 'warm' months (i.e. 9 months a year). The wash will operate for approximately 2 hours a day.

2.3.17 Fire Station

A fire station will provide a fire protection service 24 hours a day, 7 days a week. The fire station will comprise a bay for a fire engine, premises for the duty driver, a fire station manager room, a utilities room and a power supply room. One fire engine will be located in the bay.

2.3.18 Landfill and Waste Facilities

Contracts will be signed with licensed organisations for waste recycling, burial, and reprocessing prior to the commencement of construction and operation of the Russkaya CS.

2.3.18.1 Construction

Construction waste will comprise solid refuse, vegetation and mineral soil surplus, stumps and cutting debris. Waste will be transported to approved disposal sites.

The total amount of construction waste generated is predicted to be approximately 502,484.5 tonnes (Ref. 2), of which (also refer to Section 4.12 of this Appendix):

- 27,734.1 tonnes will be re-used or recycled at third-party facilities; and
- 474,750.4 tonnes will be transferred to a specialized waste disposal facilities.

2.3.18.2 Operation

Industrial and domestic wastes produced during Russkaya CS operation will be incinerated at the station site or transferred to licensed facilities for processing / recycling.

The annual amount of waste generated at the site is predicted to be approximately 164.6 tonnes (Ref. 2), including (also refer to Section 4.11 of this Appendix):

- 0.12 tonnes to be processed or recycled at third-party facilities;
- 82.1 tonnes to be incinerated at site; and
- 82.4 tonnes to be disposed as landfill at licenced facilities.

2.4 Construction Phase

2.4.1 Indicative Construction Schedule

The main construction period for Stage 1 of the Russkaya CS is estimated to be 34 months. Early works and site preparation activities commenced in early 2013, and the first phase of the main construction period commencing in January 2014 and last 22 months until October 2015.

The second phase of Stage 1 construction is proposed to start in May 2015 and last 18 months until October 2016 (Ref. 2).

Stage 2 construction is estimated to last for 34 months, with completion predicted in 2018.

The construction schedule is based on a six-day working week and a 10-hour working day.

2.4.2 Construction Works

The construction phase of the Russkaya CS will consist of both offsite and on-site preparatory work. Offsite preparatory work will include (Ref. 2):

- Construction of the access road to the Russkaya CS site to be used for construction needs, with temporary surfacing made of precast concrete slabs;
- Preparation of a temporary construction base site and contractor site accommodation, which includes drainage of areas, digging drainage ditches, backfilling soil;
- Construction of a temporary access road to the construction base and site accommodation;
- Delivery and placement of packaged-unit buildings and facilities for the production, storage, auxiliary and household needs;
- Laying of temporary utility lines from the connection points to the switchgear at the construction base, providing fire-fighting water supplies and equipment; and
- Repair and restoration of departmental roads used during construction.

The on-site preparatory work will include (Ref. 2):

- Construction of intra-site driveways and temporary parking areas for erecting cranes;
- Protection of underground utilities with reinforced concrete slabs in areas of transportation of heavy equipment;
- Construction of storage and assembly areas;
- Arrangement of temporary utilities and installation of connecting devices for power, water and steam supply;
- Supply of building materials, products, structures and equipment;
- Equipping with switchboards and wiring to connect the machine tools and perform gas welding;
- Relocation of construction machinery and mechanisms;
- Delivery and placement of mobile, packaged-unit buildings and facilities for administrative and household, production and storage needs;
- Construction of temporary pedestrian paths;
- Fire-prevention measures and lighting of the construction site; and
- Preparation for the main period of construction e.g. assembly of structures, process equipment and pipelines.

Preliminary earthworks (e.g. site clearance and preparation, construction of approach roads) will be undertaken using bulldozers, vehicles, other machinery and assemblies.

After construction is completed, all temporary structures and lines will be dismantled and removed together with mobile buildings, whilst construction sites will be subject to revegetation.

Construction work at the compressor station will include (Ref. 2):

- Excavation works;
- Piling;
- Laying of utilities;
- Installation of above-ground parts of buildings, installation of shelters, block-boxes, metal structures;
- Installation of process piping and equipment;
- Internal plumbing work;
- Electrical work, Electrical Control and Instrument (EC&I) work; and
- Finishing work.

2.4.2.1 Construction Plant, Vehicles and Equipment

The main construction plant for Stage 1 and 2 are estimated to include the following (Ref. 2 and Ref. 3):

- Auto-crane KS-3577;
- Vehicle-mounted crane KS-3577;
- Vehicle-mounted crane KS-45717;
- Pipe laying machinery TG-301;
- Crane MKG-25.01 - 2 units;
- Tractor T-150;
- Welding unit UST-22; and
- Diesel power station DES-100.

The majority of these transportation and construction machinery use diesel fuel.

2.4.2.2 Construction Materials

During the preparatory period, quarry soil will be used to install temporary platforms and roads, and to maintain roads used during the construction phase. This soil will be delivered from quarries and off-loaded at the construction site. The amount of quarry soil used for repair and maintenance of roads and erection of temporary buildings and structures is estimated to be (Ref. 2):

- Sand and gravel mixture – 191,230 m^3;
- Crushed marl – 57,210 m^3; and
- Sand – 1,845 m^3.

Quarry soil needed for the main construction period comprises (Ref. 2):

- Gravel – 16,509.6 m^3;

- Sand – 16,777.8 m^3; and
- Crushed marl – 404,569 m^3.

An estimated 23,294 m^3 of cement will be required for the main construction period (Ref. 2). This will be supplied by a mobile cement batching plant.

Bitumen will be used for the insulation of structural elements. Bitumen will be poured from a 6.2-tonne-capacity machine (DS-41A; Ref. 2).

An estimated 12.5 tonnes of paints and varnishes (enamels, lacquers, are used for internal and external finish of the premises, covering pipelines, structures, primer covering) will be required during the main construction period for construction purposes (Ref. 2).

Industrial equipment, pipes, soil, construction cargo, and labourers will be transported to site by vehicles.

2.5 Pre-Commissioning Phase

The pre-commissioning phase will involve testing the pipelines for durability and checking for leaks using hydrotest methods. This involves:

- Cleaning the pipeline cavity with compressed air (blow down) and with cleaning pistons (pre-treatment by pulling mechanical cleaning devices through in the process of assembling and welding of individual pipes or sections into the gas pipeline);
- After blow down, temporary plugs will be installed at the ends of the cleaned section to prevent re-contamination of flow lines;
- Preliminary filling of the pipeline with 15% of the total amount of water required for hydraulic testing;
- Filling the pipeline with the total amount of water required for testing;
- Displacement of water from the pipeline; and
- Drying the pipeline with dry compressed air and a pass-through of foam pistons.

A 70 m^3/h capacity mobile pumping station (ANO-201 type; Ref. 2) will be used for water off take. Water for hydrotesting will be drawn from the Maskaga River and is not anticipated to require additives prior to its use. The inlet pipe of the pumping station's suction pipeline will be equipped with a fish protection system.

2.6 Commissioning Phase

Process discharge of gas will be performed during the commissioning stage. During this stage natural gas discharges of 1.5 m^3 are anticipated to be vented from drives (Ref. 2).

2.7 Operational Phase

During operations, gas will be transported through the Russkaya CS via the following sequence: supply, treatment, compression, cooling and metering. Operational procedures centre on monitoring and maintenance of the compressor station facilities as detailed below.

2.7.1 Monitoring and Maintenance

2.7.1.1 Pipeline

The compressor station gas pipe fittings will be under constant pressure of the transported gas. In order to clean the pipelines while maintaining the design gas flow rate, the pipelines will be equipped with chambers for pig launchers and receivers. Pipeline cleaning will normally be performed once a year, though cleaning is planned twice during the first year of operation.

If pipeline maintenance or repair work is required, gas will be vented from the compressor station piping, including the inlet and outlet gas pipes.

2.7.1.2 Gas Treatment Unit

An internal inspection and stripping of the gas treatment unit draining collector will be undertaken once a year. This will involve disconnecting the dust traps from the gas treatment unit and inspecting it (one dust trap at a time). Gas will be vented into the atmosphere when the dust traps are shut down. After maintenance and repair, and before the dust trap is started, the equipment will be purged by natural gas, which will then be vented.

2.7.1.3 Gas Compressor Works

Gas will be discharged at the GPU supercharger loops during startup and shutdown. The injection line of the GPUs will be equipped with gas air-cooling units and so when gas is vented from the GPUs, gas will also be vented from the gas air-cooling unit.

GPU shutdown and venting will take place on average every 500 hours of operation (i.e. approximately every 20 days).

2.7.1.4 Gas Metering Station

Gas emissions from the gas metering station may take place during inspection of metering equipment and through a special vent located outside the compressor station enclosure. If complete shutdown of the gas metering station is required, the gas will be discharged from the entire piping through this vent.

2.7.1.5 Gas Processing for Internal Needs

The gas processing units will be inspected once a year, and if necessary, repaired. This requires the equipment to be shut down and gas vented into the atmosphere. The fuel gas collector will be regularly inspected (not more than once a year), and if necessary, repaired. Prior to servicing, the remaining gas will be bled from the collector.

2.7.1.6 Supporting Facilities

The workshop fuel gas collector will be subject to regular inspection and maintenance, involving shut down and venting of gas (not more than once a year). Process piping injection collectors and outlet collectors will be inspected not more than once a year and repaired when required.

2.8 Assessment of Alternatives

2.8.1 Introduction

The Russkaya CS site location was specified as part of a feasibility study (Ref. 6) taking into account engineering, safety and environmental considerations. Because of the characteristics of the compressor station, the primary consideration for the site selection process was the availability of land with suitable morphology, the site's distance from sensitive land uses such as residential areas, and the feasibility of connecting the compressor station site to upstream and downstream pipeline systems. Details regarding the site selection process are reported in the feasibility study (Ref. 6) from which the details as presented below are taken.

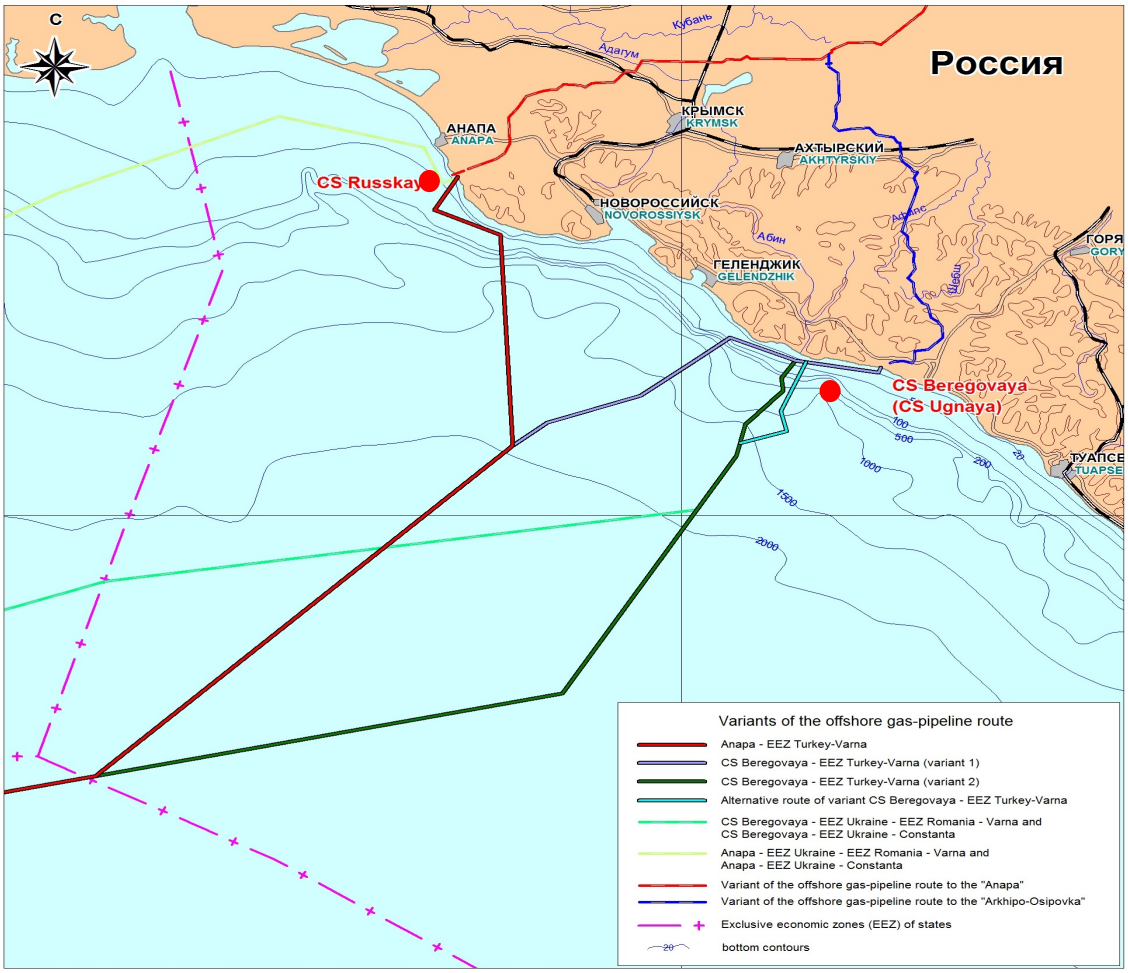
The Black Sea coastal region of Russia is characterised by flat marshy land in the north bordering the Sea of Azov which transitions to increasing undulated terrain towards the south, where the foothills of the Caucasus mountain chain dominate the landscape. The northern part of the region offers less challenging conditions for the construction of a compressor station (and upstream pipelines), because of the relatively flat terrain, although the density of populated areas and isolated residential units is higher than in the southern part of the region.

Environmental constraints increase from north to south because of the natural characteristics of the landscape and the presence of extensive forests. Because of the natural undulation of the terrain, it also gets increasingly difficult to find unpopulated flat areas that can accommodate the compressor station without the need to substantially modify the landscape.

In view of such constraints, Gazprom Invest carried out extensive siting studies in the whole Black Sea coastal region (refer to Ref. 6), the result of which identified two possible locations for the compressor station (see Figure A2.3):

- Arkhipo-Osipovka located approximately 5 km east of the town of Arkhipo-Osipovka (compressor station would be called Beregovaya CS); and
- Russkaya located approximately 10 km south-east of the town of Anapa.

Figure A2.3 Alternative Gas Pipeline Routes Considered During the Various Project Designs Stage - Shows Locations of Russkaya CS and Beregovaya CS (Figure taken from Ref. 6)



The Beregovaya location is adjacent to an existing compressor station of the Blue Stream Pipeline Project[2]. The choice of this potential location was driven by the principle of "bundling" infrastructure and impacts.

The Russkaya location is a green field site in a relative isolated location and was identified on the basis of the feasibility of routing pipelines (avoiding the Caucasus mountains) and siting the compressor station in compliance with safety regulations.

Both locations were also identified to be potentially suitable on the basis of available land of suitable morphology, existing land uses, presence of existing transport infrastructure, distance from existing residential areas and the absence of other environmental, socio-economic and cultural heritage constraints.

[2] The Blue Stream gas pipeline crosses the Black Sea delivering Russian natural gas to Turkey.

The feasibility study (Ref. 6) included a comparative assessment of the two selected locations which considered the following factors:

- Specially protected areas;
- Natural habitats and protected species; and
- Geohazards.

The findings of the feasibility study (Ref. 6) comparative assessment are summarised in the sections below.

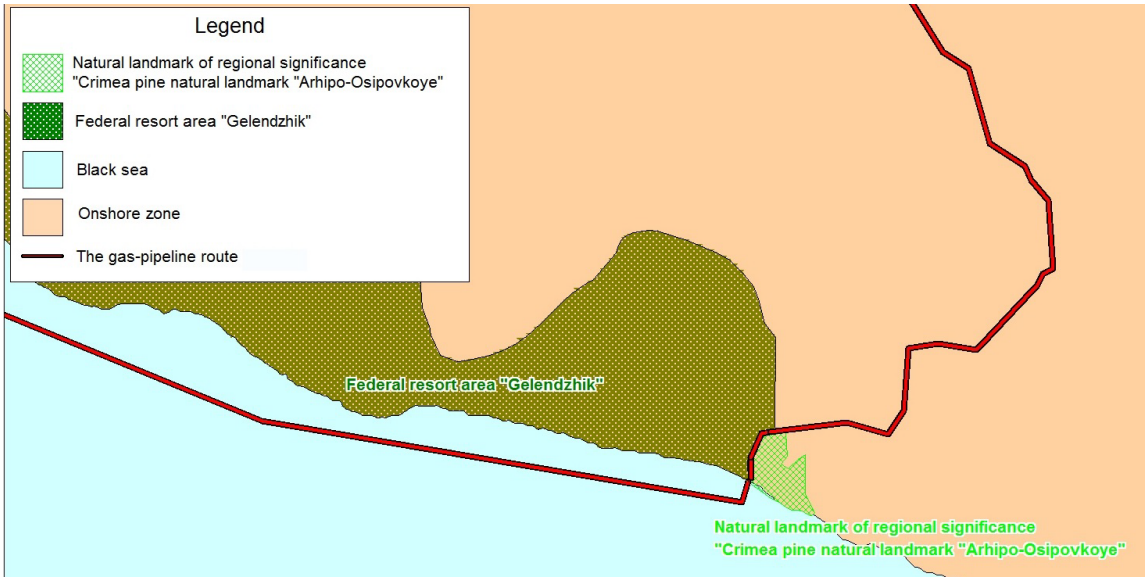
2.8.2 Specially Protected Areas

2.8.2.1 Arkhipo-Osipovka Alternative

The route of the upstream pipeline system to the Arkhipo-Osipovka site and the location of the site itself would cross two specially protected areas, namely (see Figure A2.4):

- The Federal resort area "Gelendzhik"; and
- The natural landmark of regional significance "Crimea pine natural landmark Arhipo-Osipovskoye".

Figure A2.4 Location of Gelendzhik and Crimea Pine Natural Landmark Arhipo-Osipovskoye (Figure taken from Ref. 6)



The federal resort area of Gelendzhik is a tourist resort extending over an area of approximately 120,000 ha. The area's protection status is based on the need to preserve the characteristics of the area to encourage tourist related activities. The natural landmark of regional significance "Crimea pine natural landmark Arkhipo-Osipovskoe" was established to protect natural forests of Crimean pine-tree and Pitzunda pine trees. The territory is renowned for its unique natural and climatic characteristics, whilst it is also a native habitat for many protected faunal species.

2.8.2.2 Russkaya Alternative

The Russkaya alternative would lie within the Anapa Resort Town (ART) municipal district (see Section 14.5.1, **Chapter 14 Socio-economics**). Similar to the Gelendzhik resort area, the Anapa resort area was established to promote the tourist industry of the area and to ensure the preservation of natural amenities.

2.8.3 Rare and Protected Species

The assessment of alternatives carried out by the feasibility study (Ref. 6) identifies natural habitats that host protected species in both alternative locations. This included the migration pathways of protected bird species as associated with the ornithological reserve of Kiziltashsky which is included in the list of "Key ornithology Russian areas of international importance". Constraints as related to protected species and habitats as identified in the assessment of alternative site were considered to occur equally at both sites.

2.8.4 Geohazards

No significant differences between the two alternative locations were identified with regard to geohazards (Ref. 6). However, it is apparent that the pipeline route to the Russkaya site would avoid the need to traverse the Caucasus mountain range.

2.8.5 Other Considerations

The comparative environmental assessment included in the feasibility study (Ref. 6) also considered other environmental factors, including the following:

- Compressor station air emissions were considered to have comparable impacts for both alternative sites (although air emissions from a new compressor station at the Beregovaya site would have the potential to generate a potential cumulative air quality impact when considering air emissions from the existing Blue Stream Pipeline compressor station). In addition, during the construction phase, the gross emissions associated with the onshore pipeline construction were assessed as being greater for the Arkhipo-Osipovka alternative due to the longer length of onshore pipeline required to connect the compressor station to the upstream pipeline system;
- Impacts on water quality were considered for the two alternative sites with the Russkaya alternative being assessed as having a smaller impact because of the reduced volumes of suspended sediment generated by microtunnelling methods as compared with the open cut method which was anticipated for the Arkhipo-Osipovka alternative;
- Impacts to marine ecology were considered to be lower for the Russkaya alternative as a result of the adoption of the microtunnelling technique;
- Damage to fish (calculated in accordance to Russian Federation standards) were considered to be almost equivalent, although slightly larger for the Arkhipo-Osipovka alternative; and
- Waste generation was expected to be higher for the Russkaya alternative as a result of the large volume of spoil that would be generated through the microtunnelling operations.

2.8.6 Conclusions

The comparative assessment of the two potential compressor locations carried out by Giprospetzgaz (Ref. 6), concluded that the location of the Russkaya CS had fewer environmental impacts compared to the Beregovaya site. This included lower impacts on air quality and noise, lower suspended solids in runoff, lower usage of petroleum products, lower impacts on marine biological resources, and greater distances from protected areas. In addition, bundling impacts at the Beregovaya site was considered to be unacceptable because of the potential cumulative impacts associated with the contemporaneous operation of the new compressor station and the existing Blue Stream Pipeline compressor station. On this basis, the Russkaya CS site was selected and the decision was subsequently approved by Russian environmental agencies at both the Federal and Regional level during meetings held on the 22 to 29 September 2011 (see Section 4.5.1, **Chapter 4 Analysis of Alternatives**). As a result of the selection of the Russkaya CS site, the Anapa landfall was considered for further technical evaluation.

3 Russkaya CS EIA Standards and IFC Gap Analysis

3.1 Russian EIA Standards

The potential environmental and social impacts associated with the Russkaya CS development (including the four connecting pipelines) are reported in EIAs produced to satisfy Russian EIA legislative requirements (Ref. 2 and Ref. 3). As detailed in **Chapter 2 Policy, Regulatory and Administrative Framework**, the EIA process in the Russian Federation is controlled at the national level by the following laws:

- Article 32 of the Federal Law 'On Environmental Protection', No. 7-FZ, 10 January 2002 (Ref. 4); and
- 'Regulations on Environmental Impact Assessment' sanctioned by the Goskomekologii (the former State Committee for Environment Protection which was responsible for environmental regulation and protection in Russia until it was dissolved in 2000) (Ref 2.28) of the Russian Federation in Order No. 372 dated 16 May 2000, and registered in the Russian Federation Ministry of Justice, No. 2302, 04 July 2000 (Ref. 5).

The Russkaya CS EIAs for Stages 1 and 2 (Ref. 2 and Ref. 3) were prepared to accord with Russian Federation EIA legislation and were submitted to the regulatory authorities in early 2012. The EIAs were subsequently approved, with United Gas Supply System (UGSS) (including the Russkaya CS) construction activities being started in early 2013.

3.2 Russkaya CS EIA and IFC Performance Standard Benchmarking

The Russkaya CS facility and associated pipelines have been designed to meet the requirements of relevant standards in use within the Russian Federation. As explained above, the Russkaya CS EIAs were prepared to meet the requirements of EIA legislation in use at the time within the

Russian Federation. Both the design standards and EIA requirements were met as the EIAs were approved by the relevant authorities and the facility is under construction.

Given that the Russkaya CS EIAs were prepared to meet Russian Federation legal requirements, it is understandable that some IFC Performance Standard requirements might not be addressed in the reports. However, this does not necessarily mean that such issues are not being appropriately managed by Gazprom Invest outside of the EIA process (e.g. emergency preparedness and responses). Examples of where the main Russkaya EIA documentation (Ref. 2 and Ref. 3) does not include information at a level of detail required by the IFC Performance Standards include the following:

- Performance Standard 1 Assessment and Management of Environmental and Social Risks and Impacts: e.g. details regarding the project's overarching environmental and social policy; the establishment and maintenance of an Environmental and Social Management System (ESMS); stakeholder engagement; external communications and grievance mechanism procedures;
- Performance Standard 2 Labour and Working Conditions: e.g. details of working conditions and management of worker relations; protecting the workforce; measures relating to workers engaged by third parties;
- Performance Standard 3 Resource Efficiency and Pollution Prevention: e.g. details regarding greenhouse gas emissions (GHG); cumulative impacts;
- Performance Standard 4 Community Health, Safety, and Security: e.g. details such as emergency preparedness and response activities; monitoring of security personnel; grievance mechanism relating to security arrangements and acts of security personnel;
- Performance Standard 5 Land Acquisition and Involuntary Resettlement: e.g. details of the need for any physical and / or economic displacement (if any); compensation measures; replacement land and transitional support;
- Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources: e.g. details regarding the identification of critical habitat (if any); identification of priority ecosystems services and potential threats; impacts on landscape; views of stakeholders including Affected Communities;
- Performance Standard 7 Indigenous Peoples: Performance Standard 7 is not considered to be applicable to the Russkaya CS development; and
- Performance Standard 8 Cultural Heritage: e.g. details about tangible heritage with paleontological and religious values; intangible cultural heritage; consultation relating to cultural heritage.

Further benchmarking of the Russkaya CS EIAs and associated documentation with applicable IFC Performance Standards is presented within Section 4.

4 Summary of Russkaya CS Environmental and Social Impacts, Benchmarking and Consideration of Combined Impacts with the Project

4.1 Introduction

The sections below provide a summary of the Construction and Operational Phase environmental and social impacts as reported in the Russkaya CS EIAs and associated documentation. These sections consider the following technical disciplines:

- Soil, Surface Water and Groundwater;
- Air Quality;
- Greenhouse Gases;
- Noise and Vibration;
- Terrestrial Ecology;
- Marine Ecology;
- Landscape and Visual Impacts;
- Socio-economics;
- Ecosystem Services;
- Cultural Heritage;
- Waste Management; and
- Traffic and Transportation.

Residual impacts are presented, together with details of mitigation measures and management actions as detailed in the Russkaya CS EIA documentation. It is noted that in some instances impact significance levels were not fully defined in the Russkaya CS documentation reviewed for this Appendix.

Each section below also provides a qualitative comparison of the Russkaya CS EIA documentation against IFC Performance Standard requirements / good international impact assessment practices building upon the appraisal as presented in Section 3.2 of this Appendix.

The potential combined environmental and social impacts of the Russkaya CS and the Project have then been considered. In some cases this evaluation of potential combined environmental and social impacts has entailed additional qualitative and / or quantitative assessments.

On the basis of this evaluation, commentary has then been made with regard to potential opportunities for the alignment of environmental and social mitigation approaches which aim to reduce and / or manage potential combined impacts.

4.2 Soil, Surface Water and Groundwater

4.2.1 Summary of Russkaya CS Impacts - Construction and Operation

The sections below provide a summary of the construction and operational phase impacts upon soils, surface water and groundwater as presented in the Russkaya CS EIA documents (principally from the review of Chapters 4, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3).

4.2.1.1 Construction and Pre-Commissioning Phase

The Russkaya CS EIA documentation identifies the following activities as having the potential to impact upon soils, surface water and groundwater (although it is noted that the EIAs do not define the significance of residual impacts):

- Runoff from construction sites / hydrotesting activities impacting upon surface water;
- Construction activities causing a change to natural surface water flows;
- Impacts on water resources from water use;
- Increase in flooding due to earthworks and vegetation clearance;
- Vegetation clearance and earthworks resulting in loss of top soil and soil erosion; and
- Inappropriate storage of waste as necessary to prevent soil / water contamination.

The EIA documentation highlights that surface water runoff from the compressor station construction site has the potential to pollute. As such a surface water drainage system will be implemented in order to intercept runoff. Treatment facilities (design flow rate of 30 l/sec) will be used to remove suspended solids and hydrocarbons prior to runoff discharge. At the end of the construction period, the treatment systems will be removed. The impact of runoff from the construction of the pipeline trench / stockpiling of soil is not specifically mentioned in the EIAs.

The EIA documentation indicates that during construction there is the potential for natural drainage to be disrupted. Culverts or other drainage structures are planned during the works to preserve the natural runoff. Such proposals are not specific with regard to whether this covers the compressor station site and the associated pipeline. The impacts of any surface water crossing points by the pipeline trench are not specifically mentioned in the EIA documentation.

The EIA documentation summarises water use and sources of water during the construction phase. Sources include a water supply from a nearby settlement for industrial needs and bottled water for potable water. The hydrotest water will be sourced from the Maskaga River and tankered to the site. Prior to use water will be stored in a lined settling pit, which will be located away from surface water and runoff from the construction site. Hydrotest water is not anticipated to require the use of additives prior to its use. Following hydrotesting, water will be discharged to the site's drainage system and treatment facilities prior to discharge to surface water. The EIA considers that the small volume of water drawn for hydrotesting, and the short duration of this process, will not significantly affect the flow of the Maskaga River.

The EIA documentation recognises the potential for flooding to occur as a result of earthworks and vegetation clearance, although no levels of significance are assigned.

With regard to soils, the EIAs indicate that prior to the main excavation work, topsoil will be removed from the construction zone and relocated to a temporary store for later use in landscaping and restoration of land. In addition, the temporary storage of construction wastes will be undertaken in a manner that avoids contamination of soil, surface and groundwater.

4.2.1.2 Operational Phase

The EIA documentation highlights that during Russkaya CS facility operation, impacts on water quality and water resources may occur due to water use and the discharge of treated wastewater.

An on-site borehole water supply will be used to provide domestic, potable, industrial and fire-protection needs, during Russkaya CS operation (abstraction volume not specified although as indicated in Section 2.3.10.3 of this Appendix the total estimated water consumption at the Russkaya CS is estimated to be 151.9 m^3/day for household and potable needs, and for watering the area (Ref. 2)).

Separate sewer systems for domestic, industrial and rain water will be provided. Wastewater will be collected and treated. Collected rain water will be recycled as irrigation water or directed to fire protection water storage tanks, whilst any excess will be discharged to surface water. Treated domestic and industrial water will be discharged to surface water courses.

Monitoring of waste water quality at the point of surface water discharges will be undertaken to demonstrate regulatory compliance.

4.2.2 Russkaya CS Design Controls and Mitigation

A large number of mitigation measures are highlighted in the EIAs that relate to soils, surface water and groundwater, including the following:

- Vehicle movements will be restricted to the construction area and permanent access roads;
- Prohibition on siting construction equipment, storage facilities or other facilities within source protection zones;
- Use of tanks for storing spent lubricants;
- Vehicle washing / maintenance will be undertaken in dedicated sites located outside source protection zones and coastal conservation strips of water bodies;
- Use of serviceable equipment with no oil or fuel leaks;
- Storage of fuels, lubricants, domestic and construction waste, and regular removal of waste to locations specially allocated for this purpose;
- Reinstate temporary construction sites to a condition suitable for their end use;
- The fuelling of excavation equipment permitted only using mobile refuelling vehicles equipped with fuel stop valves on hose nozzles;

- It is recommended that the road vehicles should be filled up at the petrol station;
- Fuelling vehicles using buckets or other open containers will be strictly prohibited;
- All measures associated with the fuelling / repair of construction equipment will be detailed in a contractor work execution plan, which will be approved by the Ministry for Natural Resources, and will take place in designated locations;
- Removal, storage and subsequent laying of top soil, and seeding to avoid weathering of the top soil during storage;
- Mixing of the topsoil with other soil is not permitted;
- Protection measures to stabilise unstable ground will be undertaken. The protection measures will aim to maintain natural drainage;
- If the topsoil is removed during winter, any frozen layers should be worked by bulldozers to loosen the soil, with loosening to a depth not exceeding the thickness of the fertile layer of soil;
- Bioremediation of soils in locations of contamination with petroleum products;
- Refuelling, lubricant storage facilities, storage and placement of chemical and other hazardous substances used during construction will be carried out in strict compliance with the relevant norms and standards prohibiting any leaks of fuels or lubricants on soils and surface water. Temporary lubricant storage areas will be bunded. All warehouses will have reserve containers for the collection of fuel and lubricants in case of emergency;
- Parking areas will be designed to exclude any pollution of groundwater and surface water;
- Restoration of the landscape profile after the completion of excavation works, covering the trenches, followed by recultivation of disturbed soil;
- Laying a productive soil layer on top of area of mineral soil;
- Restoration of landscapes after the completion of construction of water body crossings, formation of strips and recultivation of land to prevent linear erosion and pipe exposure;
- Stabilisation of slopes;
- Recultivation (fertilizing soil and sowing grass) to prevent planar and linear erosion, in particular of steep slopes and water crossings;
- Installation of water-permeable structures (under roads etc.) to facilitate natural drainage;
- Installation of drainage trenches for excess drainage and reduction in saturated soil;
- Control of surface runoff and preservation and restoration of the natural drainage system;
- Environmental monitoring at construction sites; and
- Restoration of the vegetation cover, prevention of erosion and preservation of natural landscapes.

4.2.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

The Russkaya CS EIAs refer to Russian Federation water discharge standards in accordance with Russian Federation EIA procedures; the EIAs do not refer to the IFC EHS Guidelines, or to IFC Performance Standard 3 ("Pollution Prevention and Abatement"). Comparison of Russian standards with international standards / guidelines for water quality shows that Russian standards are more stringent than international standards for some parameters, and less stringent for others, whilst for some parameters no limits are set.

In terms of design details, the Russkaya CS EIA documentation herein reviewed did not include details of:

- The location of the outfall from the wastewater treatment works; or
- The location of the two wells (duty and standby) to be used to supply water to the Russkaya CS facility, their associated source protection zones, abstraction volumes, and the potential impacts of water abstraction on groundwater resources.

Consequently, the review herein could not establish how these details might have influenced the impact assessment. Nevertheless, this does not mean that the details are not available elsewhere, or that impacts are not effectively mitigated.

4.2.4 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

4.2.4.1 Combined Impacts

Chapter 8 Soil, Groundwater and Surface Water reports that the Project's residual impacts upon soils, surface water and groundwater are predicted to be either Not Significant or Low Adverse during all Project phases, with impacts being local to the Project site.

The construction activities for the Russkaya CS facility and pipeline are similar to those associated with the Project. However, the Russkaya CS development impacts upon a larger area than the Project construction activities (approximately 111.3 ha as compared to approximately 65 ha as impacted by the Project). The mitigation measures identified in the Russkaya CS EIAs (Section 4.2.2 of this Appendix) broadly align with those identified by the Project (as defined in **Chapter 8 Soil, Groundwater and Surface Water**). The implementation of such measures have the potential to reduce the Russkaya CS development impacts upon soil, groundwater and surface water resources. It is assumed that the Russkaya CS development use of water supply wells will be undertaken in compliance with local regulatory authority requirements in a manner that does not adversely impact upon groundwater resources.

Given the details as presented above, it is considered that the mitigation measures defined for the Project (see **Chapter 8 Soil, Groundwater and Surface Water**) and for the Russkaya CS development (Section 4.2.2 of this Appendix) are largely complimentary and appropriate for managing potential adverse impacts upon soils, surface waters and groundwater.

4.2.4.2 Mitigation and Management - Combined

The mitigation measures identified in the Russkaya CS EIAs with regard to soils, surface waters and groundwater (Section 4.2.2 of this Appendix**)** broadly align with those identified by the Project (see **Chapter 8 Soil, Groundwater and Surface Water**). No further mitigation measures are considered to be necessary to control potential combined impacts upon soils, surface waters and groundwater. However, South Stream Transport will investigate whether the alignment of the soils, surface water and groundwater mitigation measures being adopted by the Russkaya CS development with those to be applied by the Project offers benefits in terms of mitigation consistency / working efficiencies. South Stream Transport will engage with Gazprom Invest to clarify operational phase water supply well abstraction quantities and associated monitoring proposals.

4.3 Air Quality

4.3.1 Summary of Russkaya CS Impacts - Construction and Operation

The sections below provide a summary of the construction and operation phase air quality impacts as presented in the Russkaya CS EIA documents (principally from the review of Chapters 4, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3).

4.3.1.1 Construction and Pre-Commissioning Phase

The Russkaya CS EIA documentation identified the following sensitive receptors in the vicinity of the Russkaya CS:

- Gai-Kodzor residential area (1.3 km to the north);
- Buzhor residential area (2.1 km to the north);
- Varvarovka residential area (3.7 km to the west); and
- Zelenaya Roshcha residential area (3.2 km to the south west).

The Russkaya CS EIAs do not specifically quantify dust emissions from construction equipment and vehicles. The Russkaya CS EIAs consider that the greatest air quality impact during both Russkaya CS Stage 1 and Stage 2 construction phases is on nitrogen dioxide (NO_2) concentrations. The Russkaya CS EIAs assess the impact of construction phase activities against 20 minute Maximum Permissible Concentration (MPC) NO_2 concentrations. Maximum concentrations are predicted to increase at the most affected receptor Gai-Kodzor from the current level, which is approximately 25% of the national regulatory limit, to 33% of the regulatory limit.

Overall, the Russkaya CS EIAs conclude that construction of the Russkaya CS facility would not result in a significant negative impact on air quality at the nearest residential receptors.

4.3.1.2 Operational Phase

During operation, the primary source of air pollution from the Russkaya CS will arise from the combustion of natural gas within the gas turbine compressor units. Exhaust gases will contain primarily NO_2 and carbon monoxide (CO). As indicated in Section 2.2 of this Appendix, during Stage 2, the Russkaya CS will be expanded to comprise 14 GPUs, with a total capacity of 448 MW.

The Russkaya CS EIAs consider the impact of the operation of the compressor station on 20 minute MPC values for 17 pollutants. In addition to normal operation, two abnormal operating scenarios are considered, consisting of an emergency shutdown and a cut in electricity supply.

During normal operation, the Russkaya CS EIAs report that the primary impact on peak short term (MPC) concentrations is due to emissions of NO_2. Of the four residential areas considered, the biggest impact would be on Gai-Kodzor where peak NO_2 concentrations would rise to approximately 59% of the Russian standard from a baseline of 25% of the standard. Concentrations of the other 16 pollutants would not approach or exceed permissible standards at Gai Kodzor or other residential settlements.

The Russkaya CS EIAs report predicted exceedances of the short-term NO_2 standard at ground level elsewhere close to the compressor station site, but this would not occur at locations where there is residential exposure. Short term concentrations of CO would also rise above background concentrations, but would not exceed 54% of the regulatory standard.

During an emergency shutdown or power shut-off, the Russkaya CS EIAs conclude that concentrations of natural gas, hydrogen sulphide, nitrogen dioxide and other pollutants do not exceed permissible concentrations.

The Russkaya CS EIAs focus on assessing impacts against Russian Federation regulatory requirements, and do not consider the long term impact of compressor station emissions. As the CS turbines would burn natural gas, the operation would potentially impact on annual mean NO_2 concentrations. This is the only pollutant of concern emitted in relatively large quantities from the main compressor stacks of the operational CS (emissions of sulphur containing compounds and particulate would be virtually nil). Because the Russkaya CS EIA did not consider long term NO_2, as Russian national regulations focus on short term peaks, a further assessment of the effects associated with the operation of the CS turbine units against the annual mean project standard for NO_2 has been undertaken within this appendix.

4.3.2 Russkaya CS Design Controls and Mitigation

The Russkaya CS EIAs provide details of a number of best practice and air quality control measures that will be applied during construction and operation of the compressor station, in accordance with Russian Federation regulations. These are summarised in the sections below.

Construction

- Use of hermetic sealable tanks for the storage of fuels and lubricants;
- Plant and equipment to be in good repair and having passed mandatory periodic emissions tests;

- Periodic monitoring of ambient air at defined control points to determine that breaches of air quality standards are not occurring;
- The use of fuel on site of a specification which meets Russian Federation GOST requirements;
- The postponement of works with significant potential to affect air quality during adverse meteorological conditions.

Operation

- The use of the latest generation of GPU, meeting the Russian Federation GOST requirements for newly developed gas pumping units (it is understood that domestically produced high efficiency and low emission Ladoga GCUs are being installed[3]);
- Maximising the use of natural gas fuel;
- Use of stack and vent heights suitable to achieve acceptable dispersion;
- Measures to minimise fugitive emissions of gas from the pipeline system;
- The use of technical monitoring and safety systems for key equipment; and
- The availability of measures to reduce emissions to atmosphere during periods of adverse meteorological conditions, including the postponement of test runs or planned repair work, increased monitoring of operational parameters and automated control systems, and the prohibition of gas venting from the compressor station equipment.

4.3.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

The air quality impacts of the compressor station as reported in the Russkaya CS EIAs have been quantified through the use of Russian Federation assessment methodologies and against national air quality standards. Although IFC guidance states that national standards take priority, the Russkaya CS EIAs focus on "Maximum One-Time" (MPC) peak concentrations. Therefore, the EIAs do not specifically assess the impact of emissions from the compressor station main stacks against the long term NO_2 Project standard of 40 µg/m^3 as adopted by South Stream Transport for the Project ESIA air quality assessment (compliance with the long term NO_2 Project standard of 40 µg/m^3 also indicates compliance with the applicable IFC EHS Guideline NO_2 standard – see Table 4.1). Table 4.1 sets out the Russian Federation air quality limits and the air quality Project standards adopted by South Stream Transport for carbon monoxide (CO) and NO_2 (which are the main pollutants emitted from the compressor station main stacks).

[3] http://www.gazprom.com/press/news/2013/december/article179871/

Table 4.1 Relevant Air Quality Standards (µg/m^3)

Pollutant	Averaging Period	Russian Federation Limits	IFC/World Bank/WHO Guidelines	Adopted Project Standard
Nitrogen dioxide (NO2)	1 hour/MPC	200	200	**200**
	Annual/APC	40	40	**40**
Carbon monoxide (CO) (mg/m3)	MPC	5	n/a	**5**
	APC	3	n/a	**3**

APC - Average (annual) permissible concentration
MPC - Maximum (20 minute) permissible concentration

In addition to the above, the Russkaya CS EIAs do not contain information on the emission standards to be achieved by the proposed waste incineration unit to be used on the site, and whether the incinerator will conform with the IFC EHS Guidelines for Waste Management Facilities. It is understood that the unit is of a type commonly used throughout Russia.

4.3.4 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

4.3.4.1 Combined Impacts

Construction and Pre-commissioning Phase Impacts

Whilst the Russkaya CS EIAs do not quantify dust emissions from construction equipment and vehicles, it is considered that most dust (including finer particulates) is anticipated to be deposited within approximately 1 km of an emission source. As such, dust from the Russkaya CS construction works are unlikely to affect Gai-Kodzor which is the nearest populated area to the Russkaya CS construction site (located approximately 1.6 km north of the Russkaya CS construction site).

As illustrated in **Chapter 9 Air Quality** in this ESIA, mitigation measures that accord with normal Good International Industry Practice (GIIP) will be applied during the Construction Phase of the Project such that dust impacts are predicted to be Not Significant.

Given the above, concurrent Project and Russkaya CS construction activities are not anticipated to elevate dust impacts beyond those as indicated above. For example, Project construction activities would not result in any dust related impacts upon Gai-Kodzor and thus combined impacts would be avoided. Similarly, no other receptors are anticipated to experience a combined dust related impact.

The greatest air quality impact from the construction of the Russkaya CS and associated pipeline would be on NO_2 concentrations. Project emissions of the other pollutants considered in the ESIA would result in a negligible or low impact on concentrations at Gai Kodzor, giving an impact that is Not Significant. The Russkaya CS EIAs assessed the impact of construction phase

activities on 20 minute MPC NO_2 concentrations. As illustrated in Section 4.3.1 of this Appendix, maximum concentrations are predicted to increase at Gai-Kodzor from the current level, which is approximately 25% of the national regulatory limit, to 33% of the regulatory limit. As illustrated in **Chapter 9 Air Quality**, NO_2 emissions from Project construction phase plant are predicted to result in impacts that are of Low significance at nearby communities and dwellings. Concurrent Project and Russkaya CS construction activities are not anticipated to elevate NO_2 impacts beyond those as indicated above, other than at receptors that are located closest to both Project and Russkaya CS construction activities (e.g. Lesnaya Polyana and Gai-Kodzor). The potential for concurrent Project and Russkaya CS construction activities to generate a NO_2 impact upon these receptors was considered in the cumulative impact assessment as presented in **Chapter 20 Cumulative Impact Assessment** (see Section 20.7.2.1). This analysis indicated that concurrent construction of the Russkaya CS and the Project would not result in a significant cumulative NO_2 MPC impact. Furthermore, the assessment was based on unfavourable meteorological conditions, and thus the analysis represented an improbable very worst case. Similarly, receptors located further from the two developments are not predicted to experience a concurrent NO_2 impact during the construction and pre-commissioning phases.

Operational Phase Impacts

As detailed in **Chapter 9 Air Quality**, due to the very limited emissions, there would be minimal impacts on air quality during the operation of the Project, with all air quality impacts being Not Significant.

As indicated in Section 4.3.1.2 of this Appendix, the Russkaya CS EIAs do not assess the impact of the compressor station operation against the long term air quality standards. However, using information as provided in the Russkaya CS EIAs, it has been possible to undertake supplementary dispersion modelling of NO_2 emissions from the main compressor station stacks in order to evaluate the potential impact of compressor station operation on long term pollutant concentrations at nearby sensitive receptors. Long term NO_2 was modelled for the purposes of this combined assessment because it is the only pollutant of concern emitted in relatively large quantities by the by the main compressor stacks of the operational CS. This modelling has been carried out using the Atmospheric Dispersion Modelling System (ADMS) dispersion model employed in the assessment of air quality impacts as detailed in **Chapter 9 Air Quality**. Insufficient emissions data were available regarding the Russkaya CS power plant and heating plant to include these in the supplementary model. However, as these are relatively small emission sources in comparison to the compressor units, it is considered that the modelling results are able to largely characterise the NO_2 impacts of Russkaya CS operation.

The ADMS modelling of the Russkaya CS main stacks predicts that the maximum change in ground level annual mean concentrations of NO_2 would be 7% of the annual mean Project standard / IFC standard of 40 $\mu g/m^3$ (refer to Table 4.1), with 10 of the 14 GPUs in operation. The location of the maximum predicted impact is a short distance to the south west of the Russkaya CS boundary. According to the impact assessment criteria presented in **Chapter 9 Air Quality**, an impact of this magnitude on receptors of negligible sensitivity, in an area with background concentrations that are well within the Project standard / IFC standard would be Not Significant. A contour plot of predicted annual mean impacts is provided in Figure A4.1 which shows that the change in NO_2 concentrations would be typically less than 1% of the Project standard / IFC standard at the nearest residential communities to the Russkaya CS site.

LEGEND

Emission receptors

Emission sources

Impact on ground level annual mean (µg/m³)

- 0 - 0.3
- >0.3 - 0.6
- >0.6 - 0.9
- >0.9 - 1.2
- >1.2 - 1.5
- >1.5 - 1.8
- >1.8 - 2.1
- >2.1 - 2.4
- >2.4 - 2.7
- >2.7 - 3

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Anode ground bed for cathodic protection of pipelines
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Anode ground bed connection to landfall facilities
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Temporary Varvarovka bypass road to be constructed by SSTTBV

United Gas Supply System

- Russkaya compressor station
- United Gas Supply System pipelines
- Permanent access road to be constructed by Gazprom Invest

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: RUSSKAYA CS – IMPACT ON GROUND LEVEL ANNUAL MEAN NO_2 CONCENTRATIONS DURING OPERATION

Drawn	Checked	Approved	Date
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Drawing Number: Figure A4.1

Rev:

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Plot Date: 18 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Chapter 9 Air Quality\Figure A4-1 Russkaya CS – Impact on ground level annual mean NO2 concentrations during operation.mxd

The findings of the Russkaya CS EIAs and the supplementary dispersion modelling as detailed above indicates that the operation of the Russkaya CS is likely to have an impact on air quality of Low significance at worst at residential settlements, including the closest residential receptors located in the town of Gai Kodzor. In other residential areas, impacts would be of a lesser magnitude. For this reason, it is considered that the combined impact of Project and Russkaya CS operation would also be of Low significance at worst (given that the Project's emissions during the operational phase will be negligible such that impacts would be Not Significant) and thus that a significant combined operational phase impact on air quality is unlikely.

4.3.4.2 Mitigation and Management - Combined

The combined impact assessment as presented above has not indicated the need for mitigation measures beyond those already specified for the Project (as detailed in **Chapter 9 Air Quality**) and in the Russkaya CS EIAs (Section 4.3.2 of this Appendix). Provided these mitigation measures are implemented in full, the impacts would be no more significant than as set out in the EIA, Chapter 9 of the ESIA and within this appendix.

South Stream Transport will investigate whether the alignment of air quality mitigation measures being adopted by the Russkaya CS development with those to be applied by the Project offers benefits in terms of mitigation consistency / working efficiencies (especially during concurrent construction phases). In addition, South Stream Transport will investigate whether the Russkaya CS incinerator will be designed and operated in accordance with GIIP.

4.4 Greenhouse Gases

4.4.1 Summary of Russkaya CS Impacts - Construction and Operation

The Russkaya CS EIA documentation reviewed (principally Chapters 4, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3) do not specifically consider issues associated with greenhouse gas (GHG) emissions, although they do provide some details with regard to operational phase carbon dioxide emissions. The Russkaya CS EIAs detail fugitive emissions for all equipment and ancillary buildings other than the gas pumping assemblies, whilst the EIAs also provide technical details for the compressor units.

4.4.2 Russkaya CS Design Controls and Mitigation

No mitigation measures are detailed in the Russkaya CS EIAs that relate specifically to the reduction of GHG emissions. However, system design features and operational procedures that reduce gas emissions from the pipeline and compressor station facilities will reduce the potential for emissions of GHGs.

4.4.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance

IFC Performance Standard 3 states that *"for projects that are expected to or currently produce more than 25,000 tonnes of CO_2-equivalent annually, the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary."*

As detailed above, the Russkaya CS EIA documentation does not specifically quantify GHG emissions. However, given the nature of the development, it is anticipated that the compressor station will result in GHG emissions greater than 25,000 tonnes of CO_2-equivalent annually which as indicated above is a requirement of IFC Performance Standard 3. The section below provides an estimate of compressor station operational phase GHG emissions using operational source data as presented in the Russkaya CS EIAs.

4.4.4 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

4.4.4.1 Combined Impacts

As illustrated in **Chapter 9 Air Quality** (Section 9.6.6), Project construction activities are estimated to result in the emission of 341,922 tonnes CO_2 (with approximately 90% of emissions being associated with the use of marine vessels and the remainder being associated with the use of onshore construction plant). The Russkaya CS EIAs do not quantify construction phase GHG emissions, nor is there sufficient data within the EIA documentation to enable such GHG emissions to be calculated. Regardless, it is considered that construction phase GHG emissions from the Russkaya CS development will be small in comparison to long term operational phase GHG emissions (see text below).

The Project is not anticipated to result in significant GHG emissions during the Operational Phase (see **Chapter 9 Air Quality**) given the absence of any major GHG emission sources. As indicated in **Chapter 19 Unplanned Events**, the only potential source of a large scale release of gas into the atmosphere would be the result of a pipeline rupture or a planned release of gas from the landfall facilities or pipelines to allow maintenance or repairs to take place. Pipeline ruptures could be caused by factors such as external interference, internal or external corrosion, material and construction defects or ground movement / geohazards. Statistically, a pipeline rupture is a very rare event and the probability of such an extreme situation is very low. An estimated 600 - 700 tonnes of gas would be emitted during such an unplanned venting event (equivalent global warming potential to 12,600 – 14,700 tonnes CO_2).

As the Russkaya CS EIAs do not specifically quantify potential operational phase GHG emissions, an additional assessment has been undertaken to estimate total compressor station operational phase GHG emissions (using operational source data as presented in the Russkaya CS EIAs).

Total GHG emissions have been estimated in tonnes of carbon dioxide equivalent (CO_2e) as based upon defined data sources and assumptions[4]. Total annual GHG emissions from the Russkaya CS operation is estimated to be 477,257 tonnes CO_2e during Stage 1 (to service the eastern pipeline corridor), whilst following completion of Stage 2 (including the eastern and western pipeline corridors), total annual GHG emissions are estimated to be 891,194 tonnes CO_2e. A breakdown of these figures is provided in Table 4.2.

Table 4.2 indicates that fuel use for the Russkaya CS compressor units is the primary source of GHG emissions (in this case CO_2), accounting for approximately 51% of the total GHG emissions from Russkaya CS operation (Stage 2). The second largest contributor is nitrous oxides which accounts for approximately 40% of the total, with nitrous oxides emissions coming from combustion activities to drive the compressors and from operational venting.

When both stages have been completed, annual GHG emissions from Russkaya CS operation will equate to approximately 0.3% of the Russian Federation's annual GHG emissions.

Table 4.2 Estimated Greenhouse Gas Emissions from the Russkaya CS Operation

	Russkaya Compressor Station (CS) GHG Emissions Stage 1
GHG Emissions	**CO_2e (tonnes per annum)**
CO_2	232,652
Nitrous Oxide	198,652
HFCs (Gaseous Flourides)	36
Methane	45,917
Perfluorocarbons (PFCs)	-
Sulphur hexafluoride (SF6)	-
TOTAL	**477,257**

Continued…

[4] Data sources and assumptions:
- Equipment and operational details: Ref. 2 and Ref. 3;
- Non heating season capacity factor: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Russia-EU_-_basic_statistical_indicators 11/02/14;
- Conversion factors: Department of Environment, Food and Rural Affairs (DEFRA) (UK) 'Government Conversion factors for Company Reporting' 2012; and
- Global Warming Potential (GWP) Factors: DEFRA's (UK) 2012 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting Russia's Annual GHG Emissions: United Nations (UN) Climate Change Secretariat http://unfccc.int/files/ghg_emissions_data/application/pdf/rus_ghg_profile.pdf for 2011 accessed 12/02/14.
- The CS will be fully operational for an entire year - assumed that summer load will be 48% of winter (heating season) based upon the proportion of industrial energy use in Russia;
- The HFCs is R404A as this would be the worst case scenario in terms of GWP factor (the GWP factor for R404A) was used in the calculation); and
- Total GHG emissions for Stage 2 include the emission figures detailed in Extract 0-323 CS Russkaya 2nd stage of the construction ENG Operational Phase.

Russkaya Compressor Station (CS) GHG Emissions Stage 1	
Russkaya Compressor Station (CS) GHG Emissions Stage 2 (inclusive of Stage 1 Emissions)	
GHG Emissions	**CO_2e (tonnes per annum)**
CO_2	452,084
Nitrous Oxide	354,704
HFCs (Gaseous Flourides)	132
Methane	84,274
Perfluorocarbons (PFCs)	-
Sulphur hexafluoride (SF6)	-
TOTAL	**891,194**

Complete..

4.4.4.2 Mitigation and Management - Combined

South Stream Transport will request data from Gazprom Invest to track and report annual GHG emissions from Russkaya CS (including actual plant or fuel usage in order to calculate tonnes GHG emissions per year).

4.5 Noise and Vibration

4.5.1 Summary of Russkaya CS Impacts - Construction and Operation

The sections below provide a summary of the construction and operation phase noise impacts as presented in the Russkaya CS EIA documents (principally from the review of Chapters 4, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3). The Stage 1 EIA considered the impact of noise that will be generated by the construction and operation of the Russkaya CS (Western corridor) (Ref. 2). The Stage 2 EIA considered the cumulative impact of noise that will be generated by the simultaneous operation of the Russkaya CS eastern and western corridors (construction noise impacts were not assessed). The vibration that will be generated by the construction and operation of the Russkaya CS was not considered in either of the EIAs.

The Russkaya CS EIA documentation identified the following sensitive receptors in the vicinity of the compressor station:

- Gai-Kodzor residential area (1.3 km to the north);
- Buzhor residential area (2.1 km to the north);
- Varvarovka residential area (3.7 km to the west); and

- Zelenaya Roshcha residential area (3.2 km to the south west).

The Russkaya CS EIAs apply criteria taken from the Russian Federation document Sanitary norms (CH 2.2.4/2.1.8.562-96) – Noise at the working places in rooms of residential and public buildings and in residential areas (specifically the maximum noise levels for residential dwellings). These are the same criteria used in the Project ESIA (as shown in Table 10.7 of **Chapter 10 Noise and Vibration**).

4.5.1.1 Construction Phase

Table 4.3 reports the sources of noise that will be present during the construction of the Russkaya CS as identified in the Stage 1 EIA (Ref. 2).

Table 4.3 Noise Sources Associated with Construction of the Russkaya CS

Plant Type	Quantity	Equivalent sound level, (L_{Aeqv}), dB
Bull-Dozer	3	105
Excavator	4	96
Vehicle mounted crane	1	83
Loader	2	81
Motor grader	1	91
Compressor	3	94

The Russkaya CS EIA documentation states that construction activities will only occur during the daytime, and hence the noise levels have only been compared against the Russian Federation daytime criteria of 55 dB(A).

The noise levels due to construction phase activities were not predicted at the defined sensitive receptors. Instead, the Russkaya CS EIA states that at a distance of 200 m from the construction site boundary, the daytime noise limit will not be exceeded. As the nearest residential receptor is identified to be the town of Gai-Kodzor at a distance of 1.3 km from the construction site, indicates that noise requirements will be comfortably met.

4.5.1.2 Operational Phase

The Russkaya CS EIA documentation identifies noise sources during the operation of the compressor station. These are separated into constant sources of noise (i.e. operational 24 hours a day), and noise sources that will be intermittent. The constant noise sources identified are as follows (Ref. 3):

- 10 GPUs;
- 10 air cooling units; and
- 5 auxiliary power supply stations.

One source of intermittent noise was identified, namely gas discharges which would only occur during the daytime.

The Russkaya CS EIA documentation reports:

1. An assessment of constant noise only, which was compared against the night-time noise criteria for constant noise sources applying the L_{Aeq} parameter; and
2. An assessment of constant and intermittent noise, compared against the daytime criteria applying the L_{Aeq} and L_{Amax} parameters respectively.

The intermittent noise sources were identified as potential sources, occurring during the daytime only, of high maximum noise levels, and hence the assessment of daytime noise incorporated an assessment of L_{Amax} levels against the Russian Federation noise criteria.

In addition to the four sensitive receptors in the vicinity of the Russkaya CS as listed above (i.e. Gai-Kodzor, Buzhor, Varvarovka and Zelenaya Roshcha), the Russkaya CS EIA documentation also identified eight reference points located on the boundary of the minimum sanitary interval of the compressor station (also referred to in the Russkaya CS EIAs as the "sanitary protection zone"). The minimum sanitary interval is the minimum distance from the compressor station that any residential development can be constructed (established by SanPiN 2.2.1/2.1.1.1200-03 and located 700 m from the compressor station). The locations of the receptors and reference points are detailed in Table 4.4.

Table 4.4 Locations at which Russkaya CS Operational Noise Levels were Calculated (Ref. 3)

Reference Point Number	Description	Co-ordinates	
		X (m)	Y (m)
1	Edge of minimum interval	1,205.00	876.00
2	Edge of minimum interval	1,713.00	162.00
3	Edge of minimum interval	1,283.00	-557.00
4	Edge of minimum interval	442.00	-657.00
5	Edge of minimum interval	-301.00	-560.00
6	Edge of minimum interval	-662.00	112.00
7	Edge of minimum interval	-300.00	784.00
8	Edge of minimum interval	442.00	871.00
9	Edge of residential zone (Gai-Kodzor)	2,342.00	615.00

Continued…

Reference Point Number	Description	Co-ordinates	
		X (m)	Y (m)
10	Edge of residential zone (Buzhor)	2,534.00	1,796.00
11	Edge of residential zone (Zelenaya Roshcha rural area)	-2,836.00	1,820.00
12	Edge of residential zone (Varvarovka)	-1,962.00	3,521.00
13	Edge of mining and sanitary protection zone	-744.00	2,124.00
14	Edge of mining and sanitary protection zone	-2,263.00	724.00

Complete..

As mentioned previously, the Stage 2 EIA considered the combined impact of the operational noise generated by the Russkaya CS eastern and western corridors (e.g. operation of 10 GPUs). The results of this assessment are reported below.

The noise levels emitted by the operation of the Russkaya CS facility during the night, when only the constant sources of noise will be in operation, were predicted and are presented in Table 4.5 (Ref. 3).

Table 4.5 Night-time Russkaya CS Operational Noise Levels (Ref. 3)

Reference Point Number	Predicted Noise Level (dB)									
	Octave Band Centre Frequency/Hz									
	31.5	63	125	250	500	1k	2k	4k	8k	L_{Aeq}
1	41	42	40	36	39	35	28	21	0	39
2	40	41	38	35	37	33	26	16	0	38
3	41	42	40	36	39	36	29	21	0	40
4	44	45	43	39	42	40	35	29	12	44
5	43	44	42	39	41	38	32	26	9	42
6	44	44	43	39	40	37	32	26	11	42
7	44	44	43	39	41	38	32	26	11	42

Continued...

Reference Point Number	Predicted Noise Level (dB)									
	Octave Band Centre Frequency/Hz									
	31.5	63	125	250	500	1k	2k	4k	8k	L_{Aeq}
8	45	45	44	40	42	40	34	29	15	44
9	36	37	34	30	31	25	11	0	0	31
10	34	34	31	26	26	17	0	0	0	25
11	31	32	28	23	21	5	0	0	0	20
12	30	31	27	21	18	0	0	0	0	18
13	35	36	33	29	29	21	0	0	0	28
14	34	35	32	27	26	18	0	0	0	26

Complete..

The Russkaya CS EIA documentation thus predict that night-time operational noise levels at the identified reference points will not exceed the Russian Federation night-time L_{Aeq} criteria of 45 dB(A).

The noise levels emitted by the operation of the Russkaya CS during the day, when both constant and intermittent sources of noise may be present, are presented in Table 4.6.

Table 4.6 Daytime Russkaya CS Operational Noise Levels (Ref. 3)

Reference Point Number	Predicted Noise Level (dB)	
	L_{Aeq}	L_{Amax}
1	39	44
2	38	44
3	40	45
4	44	46
5	42	43
6	42	42

Continued…

Reference Point Number	Predicted Noise Level (dB)	
	L_{Aeq}	L_{Amax}
7	42	43
8	44	45
9	31	36
10	25	30
11	20	22
12	18	20
13	28	30
14	26	27

Complete.

The predicted daytime Russkaya CS operational noise levels at the identified reference points do not exceed the Russian Federation daytime L_{Aeq} criteria of 55 dB(A). The Russian Federation daytime L_{Amax} criteria of 70 dB will also not be exceeded.

4.5.2 Russkaya CS Design Controls and Mitigation

The Russkaya CS EIA (Ref. 2) does not recommend any measures specifically to mitigate noise generated by construction activities, although it does state that working hours will be limited to 10 hours per day. This ensures that working hours will occur only during the daytime and hence only daytime noise limits need to be applied to the noise emitted by the Russkaya CS construction activities.

The Russkaya CS EIA documentation also includes the following design controls which are for the purpose of reducing the noise levels generated by the compressor station:

- "All emissions are to be in compliance with the rules on maintenance and do not coincide in time. Since the emissions are planned, they take place only during the day. No scheduled shutdowns of equipment at night or on weekends are carried out at the CS."
- "When gas is discharged into the atmosphere, all vents with high venting capacity and the longest duration of the venting process, and vents frequently used for discharging gas are equipped with the noise suppressors. Such vents are:
    - Vents to discharge gas from the superchargers with gas air-cooling unit group;
    - Vents to discharge gas from the fuel gas supply line;
    - Vent to discharge gas from the drainage collector;
    - Vent to discharge gas from blind collectors;

- Vents to discharge gas from the injector collectors and outlet collectors; and
- Vents to discharge gas with connection unit connected with the unit of the pig receiver unit.

- As follows from the specifications for noise suppressors, the permissible level of noise should not exceed 80 dBA."

No mitigation measures are recommended in the Russkaya EIAs for the attenuation of operational noise, as the predicted levels at defined sensitive receptors are within the noise limits in the applicable Russian regulations.

4.5.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

The Russkaya CS EIA documentation have used the Russian regulations to assess noise impacts during the construction and operation of the Russkaya CS. Compared to the IFC General EHS Guidelines, the Russian noise regulations provide a more stringent approach to noise limits, as there is no allowance for elevated noise levels where the prevailing ambient noise climate is already over the prescribed threshold. The Russian noise regulations also incorporate limits within each octave band level, in addition to a limit value on the maximum noise level L_{Amax}. As the Russian regulations provide the most stringent criteria, demonstration of compliance with the Russian noise regulations also indicates compliance with the IFC guidelines.

While the Russkaya CS EIAs focus their noise impact assessments on onsite construction and operations, they do not specifically consider noise generated by offsite traffic associated with Russkaya CS construction activities. The EIAs did not assess vibration impacts as this is not usually required.

4.5.4 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

4.5.4.1 Combined Impacts – Construction Phase

The assessment of noise impacts associated with construction of the Russkaya CS (summarised in Section 4.5.1.1 of this Appendix) concluded that noise levels would not exceed Russian noise limits at a distance of 200 m from construction activities. As the nearest identified sensitive receptor is 1.3 km from the Russkaya CS construction activities, significant construction noise impacts are not anticipated.

Chapter 10 Noise and Vibration assesses the noise impacts associated with Project construction, concluding that residual impact significance ranges from Not Significant to Low Adverse.

Construction of the Russkaya CS is likely to occur concurrently with some construction activities of the Project. It is considered that the worst-case scenario for combined noise impacts might arise during construction of the connecting pipelines from the Project landfall facilities to the Russkaya CS. Under this scenario, the closest noise-sensitive residential receptors are (please refer to Figure 10.2 in **Chapter 10 Noise and Vibration** for receptor locations):

- Receptor 3 - A residential dwelling situated in the north eastern part of Varvarovka, approximately 1.4 km north of the landfall facilities;
- Receptor 4 - A residential dwelling situated in the north eastern part of Varvarovka, approximately 1.5 km north of the landfall facilities; and
- Receptor 8 - Two log cabins that have recently been built on cleared land, approximately 1.3 km south of the landfall facilities.

For the purpose of this assessment of combined impacts, the noise levels of Russkaya CS pipeline construction activities were modelled using the same noise model described in **Chapter 10 Noise and Vibration**. Inputs were based on the maximum sound power level for each of the items of machinery listed in the Russkaya CS EIA documentation that will be involved in the construction activities, averaged out over a 10-hour working day (Ref. 2). No octave band data were provided in the Russkaya CS EIAs for the noise sources - these have, therefore, been sourced from British Standard 5228-1.

An assessment of the worst case construction noise impacts during concurrent Russkaya CS and Project construction activities is summarised in Table 4.7, taking the highest predicted residual construction noise at identified receptor locations.

Table 4.7 Assessment of Construction Impacts During Concurrent Russkaya CS and Project Construction Activities

Receptor	Project Construction Noise Level (dB(A))	Russkaya CS Construction Noise Level (dB(A))	Cumulative Noise Level (dB(A))	Russian Noise Limit (dB(A))	Impact Significance
Receptor 3	40	19	40	55	Not Significant
Receptor 4	50	21	50	55	Low Adverse
Receptor 8	40	22	40	55	Not Significant

Table 4.7 indicates that the combined impact of the noise generated by concurrent construction of the Project and the Russkaya CS will have an impact of Low Adverse significance at the most exposed receptor (Receptor 4). This impact significance is the same as for the Project-only scenario as detailed in **Chapter 10 Noise and Vibration,** and thus the Russkaya CS construction works are not causing an additional noise impact at Receptor 4. At receptors 3 and 8, the significance of the impact is Not Significant. As the daytime noise limit of 55 dB(A) as given in the Russian regulations will not be exceeded at any of these receptors (as well as being below the applicable IFC noise limit), it is considered that these noise impacts are acceptable.

The analysis above indicates that concurrent construction of the Project and the Russkaya CS facilities will not result in significant increases in noise at locations exposed to both developments. In other areas, the construction phase noise impacts will be as reported for the Project in **Chapter 10 Noise and Vibration** of this ESIA Report and as reported for the Russkaya CS in the Russkaya CS EIA documentation (see Section 4.5.1 of this Appendix).

As mentioned previously, the vibration that may be generated by the construction of the Russkaya CS facilities has not been assessed in the Russkaya CS EIA documentation. The assumption has been made that the vibration generated during the Russkaya CS construction phase will be of a similar magnitude to that generated by the construction of the Project. This is reasonable as similar equipment will be used for anticipated construction activities. As the significance of the impact of the vibration that will be generated by the Project is Not Significant, it is also considered that the significance of the combined impact of the vibration generated by the construction of the Project and Russkaya CS will also be Not Significant.

4.5.4.2 Combined Impacts – Operational Phase

The noise impacts associated with Russkaya CS operation are summarised in Section 4.5.1.2. The significance of operational phase noise impacts can be assessed using the assessment criteria as set out in **Chapter 3 Impact Assessment Methodology** and Table 10.8 of **Chapter 10 Noise and Vibration**. Using this methodology, the impact magnitude of predicted operational phase night-time noise at all reference points (see Table 4.5) is assessed as being negligible. Receptor points 9 to 12 (as identified in the Russkaya CS EIAs which are also identified in **Chapter 10 Noise and Vibration**) have a high sensitivity. A negligible noise impact upon these high sensitivity receptors is considered to generate an impact that is Not Significant. There are no sensitive receptors at the remaining reference points (receptors 1 to 8 as detailed in Table 4.4) – thus these reference points are considered to have a negligible sensitivity. Hence the significance of the night-time noise impacts at these reference points is considered to be Not Significant.

Using the same methodology as per the above, with regard to the operational phase daytime noise levels (see Table 4.6), the magnitude of predicted daytime operational noise impacts at reference points 9 to 12 is assessed as being negligible. A negligible noise impact upon these high sensitivity receptors results in an impact significance that is Not Significant. As there are no sensitive receptors at reference points 1 to 8, 13 and 14, the significance of predicted daytime operational noise impacts are considered to be Not Significant.

Chapter 10 Noise and Vibration details the noise impacts as associated with Project operation, indicating that impacts would be Not Significant.

The identified sensitive receptors in the Russkaya CS EIAs (reference points 9 to 12) are considered appropriate for the assessment of the combined impact of the operational noise of the Project and the Russkaya CS. As detailed above, the significance of the impact due to operational noise as emitted by the Russkaya CS is considered to be Not Significant. The predicted noise levels at defined sensitive receptors are substantially below the criteria at which the magnitude of the impact of the noise changes from negligible to low. The Operational Phase of the Project is predicted to emit very low levels of noise, which will have a significance of impact of Not Significant. Therefore, it is considered that the significance of the combined impact of Project and Russkaya CS operational noise will be Not Significant.

The analysis above indicates that concurrent operation of the Project and the Russkaya CS facilities will not result in significant increases in noise at locations exposed to both developments. In other areas, the operational noise impacts will be as reported for the Project

(**Chapter 10 Noise and Vibration**) and as reported for the Russkaya CS in the Russkaya CS EIA documentation (see Section 4.5.1.2 of this Appendix).

The Project will not generate any vibration during its operation (**Chapter 10 Noise and Vibration**). Therefore, the Project will not alter the impact of the vibration as generated by the operation of the Russkaya CS (although noting that vibration impacts are not specifically assessed within the Russkaya CS EIA documentation).

4.5.4.3 Mitigation and Management - Combined

As the significance of the combined residual noise impact associated with the concurrent construction and operation of the Project and the Russkaya CS facilities are assessed to be Not Significant to Low, and that the applied Russian Federation noise criteria will not be exceeded, no additional mitigation measures are required (noise mitigation and monitoring measures as associated with the Project are detailed in **Chapter 10 Noise and Vibration**).

Regardless of the above, South Stream Transport will investigate whether the alignment of noise mitigation measures being adopted by the Russkaya CS development with those to be applied by the Project offers benefits in terms of mitigation consistency / working efficiencies**.** South Stream Transport will clarify noise monitoring proposals with Gazprom Invest and determine whether there are benefits in terms of integrating / aligning monitoring proposals.

4.6 Terrestrial Ecology

4.6.1 Russkaya CS EIA Baseline Summary

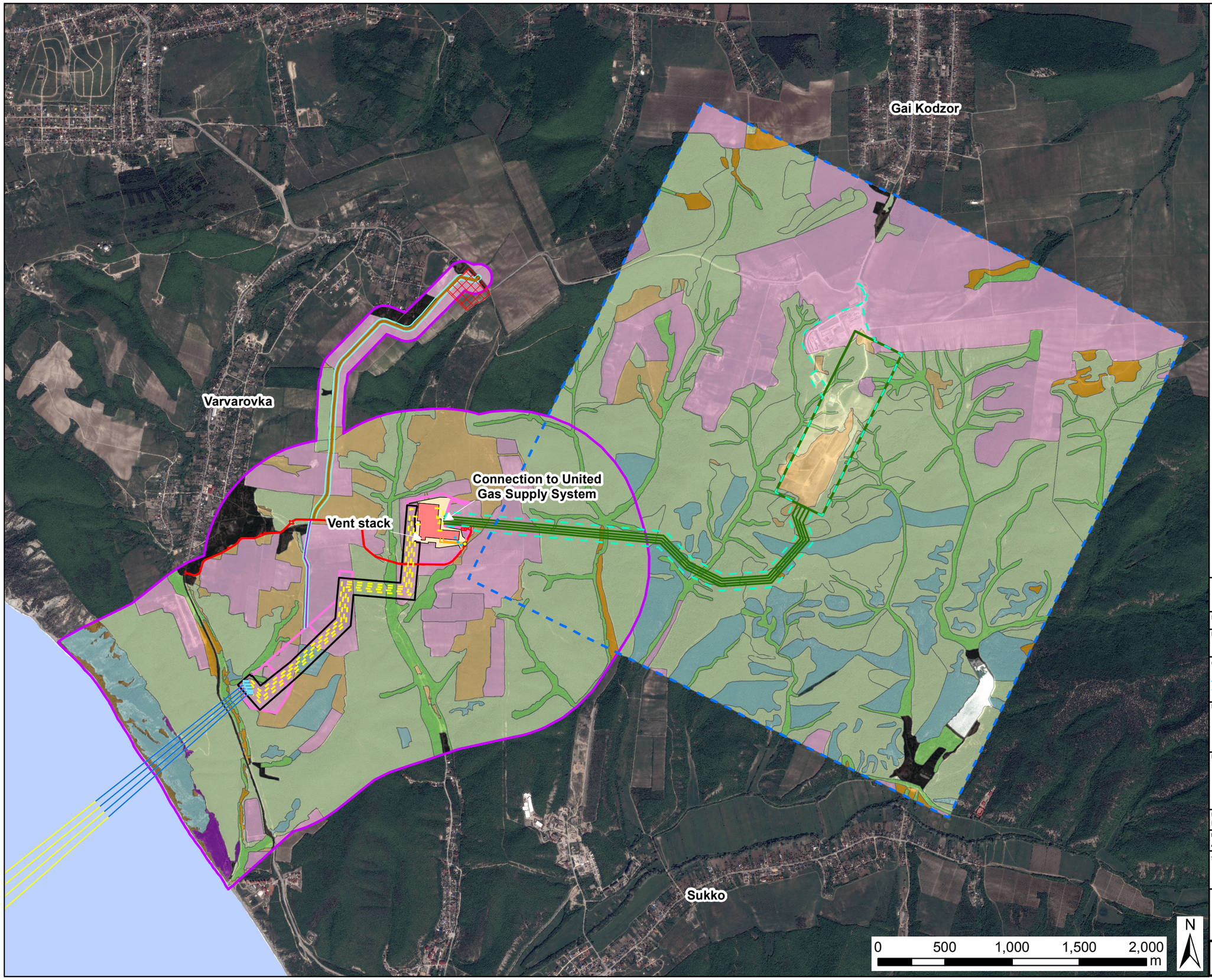
This section provides a summary of the terrestrial ecology baseline as it has been presented in the Russkaya CS EIA documents (principally from the review of Chapters 4, 6 and 7 in Ref. 2 and of Chapters 6 and 7 in Ref. 3).

4.6.1.1 Habitats and Flora

Baseline surveys undertaken to inform the Russkaya CS EIAs recorded a total of 10 habitat types within the Russkaya CS construction footprint (see Section 2.1 of this Appendix). These ten habitats are broadly similar in character to those which have been recorded within the Project's Study Area and are listed in Table 4.8. It is important to note that the nomenclature used to define habitats in the Russkaya CS EIAs are not consistent with those used in the Project's ESIA. Therefore, an effort has been made to standardise the name of each habitat type. Each habitat type described in the Russkaya CS EIAs are listed in Table 4.8 against the equivalent habitat type as described in **Chapter 11 Terrestrial Ecology** of this ESIA Report for the Project. The location and extent of each habitat is illustrated on Figure A4.2.

Table 4.8 Habitats Recorded within the Russkaya CS EIA Construction Footprint

Russkaya CS EIA Habitat Type	Corresponding Project Habitat Type
Hornbeam-oriental hornbeam-oak sometimes with forest linden tree	Shiblyak
Oriental hornbeam-oak forests mixed with maple growing on the slopes	Shiblyak
Oak-hornbeam forests, sometimes mixed with maple that grows on slopes and along the bottom of narrow valleys	Shiblyak
Juniper-oak forests and woodland	Juniper woodland
Hornbeam-oak-ash forests sometimes mixed with maple that grow along the bottom of narrow valleys	Mesophilic forest
Maple and linden scrub	Not Recorded within the Project Study Area
Willow with ash-aspen forest	Not recorded within the Project Study Area
Meadow communities in places overgrown with oriental hornbeam and juniper	Secondary Steppefied Meadow
Vineyards, orchards, and other cultivated land	Agricultural habitats
Roads, other utility, and disturbed land	Urban habitats



LEGEND

- Juniper Woodlands
- Mesophilic Forest
- Mesophilic Meadow
- Vineyards And Orchards
- Residential Area And Ruderal Habitats
- Rocky Outcrops
- Seaside Gravel
- Shiblyak (Undersized Xerophilous Forest)
- Steppefied Secondary Meadow
- Tomillyar

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Anode ground bed for cathodic protection of pipelines
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Anode ground bed connection to landfall facilities
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Temporary Varvarovka bypass road to be constructed by SSTTBV
- Landfall study area
- Russkaya CS study area
- Transfer site
- Right-of-Way
- Cut and fill side slopes
- Temporary construction area for road construction
- Construction sites

United Gas Supply System

- United Gas Supply System pipelines
- Russkaya compressor station
- Proposed offshore pipelines
- Permanent access road to be constructed by Gazprom Invest
- Russkaya RoW and compressor station

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: HABITATS IN THE VICINITY OF THE RUSSKAYA CS

Drawn	Checked	Approved	Date
DH	RW	MW	18 Mar 2014

URS Internal Project No.	Scale @ A3
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Drawing Number: Figure A4.2

Rev:

Plot Date: 18 Mar 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA v2\Appendix - Russkaya Project Description\Figure A4-2 Habitats in the Vicinity of the Russkaya CS.mxd

The Russkaya CS EIAs report that 37 vascular plants listed on either the Red Data Book (RDB) of the Krasnodar Krai (KK) or the RDB of the Russian Federation (RF) (hereafter collectively referred to as RDB species) are potentially present within the Russkaya CS construction footprint. During surveys undertaken for the Russkaya CS EIAs, surveyors recorded the following RDB listed plants including:

- Red helleborine *Cephalanthera rubra*;
- Small dotted orchid *Orchis punctuate*;
- Bladdernut *Staphylea pinnata*; and
- Greek junipers *Juniperus excelsa*.

All these species, with the exception of small dotted orchid, were also recorded within the Project's Study Area.

4.6.1.2 Fauna

The Russkaya CS EIAs report that the wider Anapa district, within which the Russkaya CS sits, supports a notable faunal assemblage, in terms of both species diversity and number. It goes on to state that the habitats within the immediate vicinity of the Russkaya CS, however, exhibit a narrower range of environmental conditions when compared to the entire Anapa district, and that they consequently support a lower diversity of fauna. Table 4.9 presents the number of species, per species group, which are present within the wider Anapa district, and the proportion of species which are likely to be supported by the habitats contained within the area to be affected by the Russkaya CS.

Table 4.9 Russkaya CS EIA Fauna Results Summary

Class	Number of Species within the Anapa District	Number of RDB Species within the Anapa District	Number of Species potentially present within Russkaya CS Construction Footprint	Number of RDB Species recorded within Russkaya CS Construction Footprint
Amphibians	4	1	3	-
Reptiles	12	10	3	1
Birds	231	9	32	-
Mammals	59	13	10	-

Nikolski's tortoise, *Testudo graeca nikolskii,* was the only RDB listed animal species recorded during field surveys for the Russkaya CS[5]. The Russkaya CS EIAs identify a number of other

[5] Precise details with regard to the survey effort (e.g. number of days, number of surveyors used) employed to record and count fauna are not available within the Russkaya CS EIA documentation. A comparison between the survey effort employed for the SSOP Project ESIA and the Russkaya CS EIAs could not, therefore, be made.

RDB species which, although not recorded during survey, are considered to be potentially present within the Russkaya CS construction footprint. Table 4.10 presents these species, as well as their status on the relevant RDB.

Table 4.10 RBD Fauna Potentially Present within the Russkaya CS Construction Footprint

Species	RDB RF	RDB KK
Reptiles		
Nikolski's tortoise	1	1B
Steppe runner *Eremias arguta*	3	3
Medium lizard *Lacerta media*	3	3
Scherbak's lizard *Darevskia brauneri szczerbaki*	Not listed	3
Caspian whipsnake *Heirophis caspius*	Not listed	3
Aesculapian snake *Elaphe longissima*	3	3
Pallas whipsnake *Elaphe sauromates*	Not listed	3
Steppe viper *Pelias renardi*	Not listed	3
Birds		
Lesser spotted eagle *Aquila pomarina*	3	3
Great grey shrike *Lanius excubitor*	3	3
Wood lark *Lullula arborea*	Not listed	1B
Mammal		
Greater horseshoe bat *Rhinolophus ferrumequinum*	3	1B
Lesser Horseshoe bat *Rhinolophus hipposideros*	3	3
		Continued…
Barbastelle Bat *Barbastella barbastellus*	Not listed	2
Lesser noctule *Nyctalus leisleri*	Not listed	2
Geoffroy's bat *Myotis emarginatus*	2	1B

Species	RDB RF	RDB KK
Bechstein's bat *Myotis bechsteinii*	Not listed	2
Natterer's bat *Myotis nattereri*	Not listed	3
Steppe whiskered bat *Myotis aurascens*	Not listed	5

Complete.

4.6.2 Summary of Russkaya CS Impacts - Construction and Operation

The paragraphs below present a summary of the Russkaya CS impact assessment in respect of terrestrial ecology receptors (principally from the review of Chapters 4, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3).

4.6.2.1 Construction Phase

Habitats and Flora

Impacts of the Russkaya CS development on habitats and flora can be grouped into the following broad effects:

- Direct impacts resulting in loss or damage to habitats and flora; and
- Indirect effects which lead to the damage or degradation of habitats and flora.

Direct Habitat Loss or Damage

The Russkaya CS EIA documentation reports that the direct loss of habitat will be the most significant adverse impact associated with construction of the Russkaya CS. It states that construction activities (vegetation clearance, earth-works, trenching etc.) will require the felling of forests and removal of vegetation and soil within the Russkaya CS construction footprint. Direct habitat loss is not quantified in terms of area of habitat loss per habitat type. However, based on the habitats which were recorded during the baseline surveys, it is inferred that the majority of direct loss will be shiblyak habitat, with additional, although smaller losses of juniper woodland, mesophilic woodland, secondary steppe meadow and vineyard.

Indirect Habitat Damage or Degradation

The Russkaya CS EIA documentation reports that there is a risk of degradation to habitats and flora through the potential introduction of pollutants at the Russkaya CS construction site. Potential pollutants are identified as including by-products of construction activities (oil or scrap metal), and domestic waste and litter arising from site workers and their accommodation.

The Russkaya CS EIAs also report that the emission of dust during construction has the potential to adversely affect vegetation within the vicinity of the construction area. The EIAs state that vehicle emissions during construction are likely to have an adverse impact on local air

quality. This, it states, will affect natural vegetation adjacent to access roads and tracks used during construction.

The Russkaya CS EIAs further identify the following indirect impacts which are anticipated to affect habitats within the vicinity of the Russkaya CS construction works:

- Increased likelihood of fire due to construction activities and the associated increase in human presence during construction;
- Increased potential for the introduction of invasive species and other pests (such as rats or stray dogs);
- Greater potential for storm damage within the woodland habitats due to an increase in the extent of the forest edge which is exposed to the elements; and
- Increased risk of flooding due to changes in the hydrological regime within the vicinity of the Russkaya CS and Right of Way (RoW).

The Russkaya CS EIAs do not specifically quantify these impacts in terms of either habitat type or proportion of habitat affected, or in terms of metrics for quantifying impact magnitudes (e.g. in terms of nitrogen oxides (NO_x) deposition concentrations for air quality impacts).

Fauna

The Russkaya CS EIAs state that construction activities, including vegetation clearance, earth-works, trenching and vehicle movement (amongst others), have the potential to kill or injure small mammals, amphibians, and reptiles, which are known to occur within habitats that will be affected by construction of the Russkaya CS. The proportion of each species' population that may be affected is not quantified in the EIAs.

The Russkaya CS EIAs also describe the potential for species to be disturbed through noise and visual disturbance associated with the presence of workers and the operation of plant and machinery during construction of the Russkaya CS. The Russkaya CS EIAs state that this is likely to affect small mammals, reptiles, amphibians, and birds, which are potentially supported by habitats within and in the vicinity of the construction area.

The Russkaya CS EIAs state that construction activities are also likely to result in a loss of and degradation to habitats which are of importance to fauna at various stages in their lifecycle, including habitat for foraging, sheltering, breeding, and hibernation. The impact of habitat loss / degradation is reported as likely to affect a number of mammals, reptile, amphibian and bird species which are present within the construction area.

The impact of habitat severance was also considered, and the Russkaya CS EIAs recognise that construction activities are likely to restrict the movement of both mammals and herpetiles within the local area.

The Russkaya CS EIAs report that a number of indirect impacts associated with the construction phase could affect mammals and reptiles. These include:

- Introduction of invasive species and diseases which could affect local populations of native fauna; and

- Increased persecution of fauna through hunting or poaching due to an increase in human presence and accessibility to previously wooded and difficult to access natural areas.

The above described impacts are assessed in the Russkaya CS EIAs in relation to mammal and herpetiles species groups. The impact of the Russkaya CS development on individual species receptors (such as Nikolski's tortoise) is not discussed in detail, whilst the magnitude of construction impacts are not specifically quantified (such as number of individuals or proportion of population likely to be affected).

4.6.2.2 Operational Phase

Habitats and Flora

Operation of the Russkaya CS will result in emissions of combustion gases; of relevance to the sensitivity of habitats and flora are the oxides of nitrogen, sulphur and carbon. The Russkaya CS EIAs report that the deposition of these chemicals may alter the acidity of soils and affect the composition and health of the vegetation within the vicinity of the compressor station. It is not reported within the Russkaya CS EIAs the distance to which these pollutants are likely to disperse, or their deposition concentrations. The significance of this impact on habitats and flora is also not presented.

The Russkaya CS EIAs identify a number of additional impacts during the operational phase that have the potential to impact upon habitats and flora, including:

- Increased access to natural habitats, potentially resulting in illegal cutting of woody vegetation and / or trampling of habitats;
- Increased risk of fire to the vegetation surrounding the compressor station facility; and
- Pollution and contamination due to littering and plant and vehicle emissions, including fuel and lubricants, products of combustion of petrol and diesel fuel.

The above mentioned impacts are reported as being relatively minor and easily avoidable if suitable avoidance measures are enacted. The long term impact of gaseous emissions may be more significant, although the significance of this impact is not specifically reported.

Fauna

The Russkaya CS EIAs report that the key impacts associated with operation of the development include the following:

- Anthropogenic disturbance (both noise and visual) due to operation of the facility and increased human presence; and
- Potential increased killing or injury to species due to hunting.

The Russkaya CS EIAs anticipate that the majority of species will adapt to these changes.

4.6.3 Russkaya CS Design Controls and Mitigation

General Measures

The Russkaya CS EIAs propose mitigation measures to minimise and to avoid ecological impacts associated with the construction and operation of the compressor station. These include a suite of measures, not all of which are specific to terrestrial ecology, but which will nonetheless reduce the likelihood of terrestrial ecology receptors receiving significant adverse impacts. These include the following:

- Measures to reduce adverse effects related to air quality during construction and operation (see Section 4.3 Air Quality of this Appendix);
- Measures to reduce the impact on the natural environment, including restriction of the development's construction area, soil management, and protection of the hydrological regime and terrestrial freshwater bodies (see Section 4.2 Soil, Surface and Groundwater of this Appendix); and
- Measures to control waste produced during both construction and operation (see Section 4.12 Waste Management of this Appendix).

Measures proposed to specifically mitigate for construction and operation impacts on terrestrial ecology receptors are discussed further below.

Construction Phase Mitigation

Habitats and Flora

- Maximising the use of the existing infrastructure in order to minimise the area of disturbance of natural habitats;
- Maximising the construction area supervision to ensure that all vegetation clearance is undertaken strictly within the borders of the approved land allotment;
- Prohibition of littering or polluting of the construction site and adjacent habitats by industrial waste, solid and liquid waste;
- Prohibition of unauthorised timber felling;
- Compliance with the Rules on Sanitary Safety in Forests (2007) in respect of clearance of material felled in the course of construction;
- Compliance with the fire protection requirements stipulated by the Decree of the Government of RF dated 30.06.2007 No. 417 "On Adoption of Rules on Fire Safety in Forests". In addition, contractors should be trained in using fire-fighting equipment;
- Restoration and re-cultivation of land on construction sites and linear facilities for the fastest restoration of the natural vegetation cover and reduction in risk of erosion processes;
- Implementation of measures to prevent erosion; and
- Clearance of vegetation during the autumn and winter months to reduce the negative effects on flora.

Fauna

- Banning of technologies and machinery which may kill or injure large numbers of animals;
- Banning of construction during the reproduction and migration of terrestrial vertebrate animals[6];
- Banning solid fencing and structures which do not have special passages on the paths of migration of animals;
- Pits and trenches will be covered when not in use to avoid reptiles, amphibian and small mammals being trapped in them;
- Restricting use of bright light sources and open fires during the night, particularly during migrations of birds in spring and autumn;
- Storage of petroleum products in sealed containers;
- Banning the placement of builders' cabins, assembly and fuelling sites, and the use of construction equipment within water protection areas;
- Regular extermination of pests such as rodents;
- Banning of hunting devices (weapons, steel traps etc.) in order to reduce poaching;
- Banning of keeping of unleashed dogs within the construction area;
- Strict compliance with the fire protection and sanitary rules; and
- Training of construction workers on environmental protection and the requirements of the study of the "Forest Code".

Operational Phase Mitigation

Habitats and Flora

- Minimisation of the operational corridor;
- Banning of felling (except where required and in accordance with appropriate licencing) in protective forest areas during vegetation clearance activities;
- Reducing the mechanical load on soil and vegetation (i.e. limiting plant or equipment within semi-natural areas); and
- Banning vehicles, particularly tracked vehicles, within semi-natural areas (or off roads).

Fauna

- Banning of vegetation clearance during reproduction and migration of animals;
- Banning of the use of herbicides and pesticides within the operational corridor; and
- Increased hunting inspection services and other nature protection authorities in order to prevent poaching by personnel involved with the Russkaya CS development and the public.

[6] Noting that it is unclear when this period is perceived to be by the Russkaya EIA documentation

In addition to the measures presented above, a number of mitigation measures specific to the protection of RDB species are proposed. These include the following:

- RDB Habitats and Flora:
  - Demarcating and limiting entry by construction personnel into areas known to support RDB plant species;
  - Harvesting of seeds of RDB species for growth in specialised nurseries and replanting of these species in areas of similar habitats (if possible); and
  - Monitoring of RDB on sites adjacent to the construction areas to ensure their wellbeing.
- RDB Fauna:

  The Russkaya CS EIAs state that the primary means by which significant adverse impacts on RDB fauna will be avoided, will be through protection and preservation of their habitats. During construction and operation, toolbox talks will be given to personnel to ensure that they are aware of RDB fauna and understand what is required to ensure compliance with the established mitigation measures. In particular:

  - Spring burns of vegetation which could directly affect RDB fauna will be prohibited;
  - Banning the chasing of animals, destroying of nests and shelters, and illegal hunting;
  - Banning of tame animals in residential settlements and control on keeping guard dogs on the construction sites; and
  - Minimisation of disturbance in areas adjacent to the construction area.

4.6.4 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

Environmental and social standards applied to the Russkaya CS EIAs for terrestrial ecology show compliance with host country standards. The text below provides an indication of benchmarking the Russkaya CS EIA documentation against the IFC Performance Standard No. 6 for Biodiversity:

- The EIA documents present the results of desk study and field survey work which was undertaken to inform the Russkaya CS impact assessment. This section is comprehensive and lists RDB species such as Nikolski's tortoise;
- The methods used to determine the baseline appear to be broadly appropriate, and there is, with the exception of invertebrates for which no assessment appears to have been undertaken, sufficient information to be able to determine which habitats / species are present and likely to be impacted. The manner in which the information is presented within the EIA documentation makes it somewhat difficult to determine impact significance for the various receptors;
- The EIA documents consider levels of significance and selection of ecological receptors. It describes a 'matrix method' for determining if impacts are of ecological significance. This 'matrix method' is systematic in assessing magnitude - duration (short-term to perennial), area (site, local, regional etc.) and level of impact (insignificant to severe, which would be broadly equivalent to IFC Performance Standard 6 impact on populations) against main receptors such as 'land withdrawal and land use change' or 'withdrawal of ground and

surface water'. The added values obtained are then referenced against those provided by the 'Methodological guide for environmental assessment of projects, Moscow, 2000' which provides an index of reference values for determining the environmental significance of the project and identifying significant impacts;

- As the Russkaya CS EIAs were developed to meet host country standards, the reports do not determine the presence of Critical Habitat according to IFC requirements;
- The EIAs describe the impacts on flora and fauna for the construction and operational phases, although these are not quantified. The EIAs state that the Russkaya CS is not located on any areas of special ecological protection under Russian legislation; and
- The EIA documents provide measures on protecting flora and fauna entered in the Red List of the Russian Federation and the Red Lists of the constituent entities of the Russian Federation, although not in great detail.

4.6.5 Combined Impacts of Russkaya CS and Project Development

For the purpose of the combined assessment, the Russkaya CS development is considered to comprise three key component parts: the compressor station, the four pipelines (referred to hereafter as the Russkaya CS RoW) running from the compressor station to the Project's landfall facility, and a permanent access road which runs from near the town of Varvarovka eastward across the Graphova Gap past the Project's landfall facilities to the safety valve station of the Russkaya CS development (the 'Gazprom Invest permanent access road' - see **Chapter 5 Project Description**). The Gazprom Invest permanent access road does not appear to have been specifically considered as part of the Russkaya CS EIAs. It is, however, considered to be an important feature of the Russkaya CS development and has thus been considered herein.

4.6.5.1 Combined Impacts – Construction Phase

Habitat Loss and Degradation

Table 4.11 presents the total habitat loss occurring as a result of the Project (see **Chapter 11 Terrestrial Ecology**) and that anticipated as a result of the Russkaya CS development[7].

[7] Russkaya CS development habitat losses have been estimated assuming that the Russkaya CS RoW comprises a 120 m wide construction corridor which equates to a construction area of approximately 38.7 ha; the compressor station construction footprint is assumed to be 52 ha, whilst the construction footprint for the GPI Permanent Access Road is estimated to be approximately 4.5 ha plus a 16.1 ha area used for temporary construction purposes. Total Russkaya CS construction footprint of 111.3 ha (see Section 2.1.1 of this Appendix).

Table 4.11 Predicted Habitat Loss[8] of the Project and the Russkaya CS Development

Habitat Type	Project Habitat Loss (ha)	Russkaya CS Habitat Loss (ha)
Shiblyak	3.5	57
Juniper woodlands	2.6	5.3
Mesophilic forest	1.4	5.4
Steppefied secondary meadow	4.1	21.3
Mesophilic meadow	0	0.4
Agricultural habitats	53.5	21.9
Total	*65.1*	*111.3*

Construction of both developments will collectively result in the loss of various habitats which have intrinsic ecological value. This includes mesophilic forest which the Project ESIA has identified as being a component of Critical Habitat (as defined by IFC Performance Standard 6) (see **Chapter 11 Terrestrial Ecology**), as well as other natural habitats including shiblyak, juniper woodland, and mesophilic meadow which have been assessed in this ESIA as having moderate sensitivity.

The residual impact for habitat loss for the Project is anticipated to be Not Significant due to the provision of mitigation measures to safeguard habitats during construction, and mitigation through implementing habitat reinstatement and creation (see **Chapter 11 Terrestrial Ecology**). This includes provision for a Biodiversity Action Plan (BAP) which will aim to achieve no net loss of biodiversity, and in the case of a component of Critical Habitat (such as mesophilic forest), a net gain.

The Russkaya CS EIAs propose control measures to avoid impacts to habitats, and proposes mitigation measures aimed at replacing lost habitat, measures to avoid pollution and degradation to habitats, and habitat creation and compensatory planting measures (see Section 4.6.3 of this Appendix). Table 4.11 illustrates that the Russkaya CS development will result in habitat losses that could generate significant impacts upon terrestrial ecology if appropriate mitigation measures are not implemented (including habitat reinstatement, creation, and enhancement). This is largely due to relatively large losses to habitats such as shiblyak and, to a lesser extent, mesophilic forest. Section 4.6.6 below considers potential mitigation proposals that aim to reduce the combined residual impact of the Russkaya CS development and the Project (noting that the contribution of the Project to the combined residual impact due to habitat loss is anticipated to be Not Significant).

[8] This includes both temporary and permanent habitat loss.

Fauna

Both the Russkaya CS EIAs and the Project ESIA predict likely impacts on fauna to include the following:

- Mortality, injury and disturbance to species;
- Loss and degradation to habitat used for foraging, sheltering, breeding and hibernation; and
- Habitat fragmentation and severance.

The sections below consider the combined impact of the Russkaya CS development and the Project on the following faunal groups:

- Invertebrates;
- Reptiles and amphibians;
- Birds; and
- Mammals.

Invertebrates

The Russkaya CS EIAs do not specifically assess the impact of the Russkaya CS development on invertebrates. It is, therefore, not possible to determine from a review of the Russkaya CS EIA documentation, the residual impact of the Russkaya CS development on these fauna. The Project ESIA and Russkaya CS EIA, however, confirm that:

- The development areas of both projects have the potential to support notable assemblages of invertebrate species, including RDB species and most notably Levantine skipper, a component of Critical Habitat; and
- Habitats which are likely to support a notable assemblage of invertebrates, including forest and meadow habitats (see Table 4.11 above), will be affected during Russkaya CS and Project construction activities.

The mitigation measures proposed by the Project (see **Chapter 11 Terrestrial Ecology**) are anticipated to reduce all Project impacts on invertebrates, including direct mortality and loss of habitat, to Not Significant levels. This includes the implementation of commitments contained within the Biodiversity Construction Management Plan that will include habitat restoration and enhancement. The Russkaya CS development also proposes various mitigation measures which are anticipated to reduce long term residual impacts on invertebrates. These include measures to restrict damage and degradation to adjacent habitats, and habitat reinstatement measures (see Section 4.6.3 of this Appendix).

Section 4.6.6 of this Appendix considers options for the alignment of ecological mitigation measures between the Russkaya CS development and the Project, particularly in relation to habitat reinstatement and creation in order to reduce potential combined impacts.

Reptiles and Amphibians (Herpetiles)

Both the Project ESIA and the Russkaya CS EIAs identify the potential for significant impacts to herpetiles during construction activities, including potential direct mortality or injury, loss of habitat, and habitat severance. This includes impacts to a range of RDB species, including Nikolski's tortoise which has been identified in this ESIA as a component of Critical Habitat.

For the purpose of this combined assessment, Nikolski's tortoise has been used as a surrogate for the potential combined impact of both developments on herpetiles in general. This is considered appropriate for the following reasons:

- Nikolski's tortoise is a highly sensitive receptor and therefore represents a 'worst-case' scenario in terms of identifying significant impacts to herpetiles arising from both developments;
- The ecology of Nikolski's tortoise encompasses a wide range of habitats which are used by other herpetiles for similar purposes (i.e. open habitat for foraging and basking, woodlands for sheltering and hibernating); and
- Mitigation measures which are designed to safeguard Nikolski's tortoise are also likely to succeed in safeguarding the range of other herpetiles species across the study area.

Based upon the data presented above, an estimate of the number of Nikolski's tortoise potentially supported by habitats contained within both projects' construction footprints has been made[9]. This estimate is based on density figures for the tortoise within the Abrau peninsula, derived from a recent publication by Dr Olga Leontyeva (Ref. 9). The combined area which is likely to be directly affected by the Project and the Russkaya CS development, and the extrapolated density value, are presented in Table 4.12. It is important to note that these figures are based on the density of tortoises within each habitat type during the species' activity period (approximately April – November) and do not reflect species density during hibernation.

[9] This estimate, based on the area of habitat to be directly impacted, should be viewed as the minimum number of tortoises which could potentially be affected by both developments. This does not take into account the range of indirect impacts (disturbance during breeding/hibernation, habitat severance and associated reduced access to resources etc.) which have the potential to affect the wider local tortoise population supported by habitats outside of the development's construction footprint. The number of tortoises affected could, therefore, be significantly higher than the 80 – 188 which have the potential to experience direct effects.

Table 4.12 Number of Nikolski's Tortoise Potentially Present in Areas of Direct Habitat Loss (Combined for the Project and the Russkaya CS Development)

Habitat	Area of Loss[10] (ha) (combined for the Project and the Russkaya CS development)	Density of Nikolski's Tortoise/ha	Individuals Potentially Present
Juniper woodlands	7.9	1.95 – 2.85	15.4 – 22.5
Mesophilic forest	6.8	0.1 – 1.6	0.7 – 10.9
Steppefied secondary meadow	25.8	2.21	57
Shiblyak	60.5	0.1 – 1.6	6.1 – 96.8
Agricultural habitats	75.4	Unknown	na
Total	*176.4*		*79.2 – 187.2*

Assuming that the published density figures are applicable to the combined development construction areas, Table 4.12 indicates that removal of various habitat types has the potential to directly affect (through mortality, injury, or direct loss of habitat) 80 - 188 tortoises (noting that the contribution of the Project equates to approximately 19% of the lower range (or 15 of the 80 tortoises) and approximately 13% of the upper range (or 24 of the 188 tortoises)). Combined direct habitat losses could thus impact upon approximately 1.1% - 2.7% of the Abrau peninsula's Nikolski's tortoise population (Ref. 9). In the absence of mitigation, this would constitute a combined significant impact, regardless of impacts to other herpetiles species which are potentially supported within similar habitats.

In addition to impacts through mortality, injury, or loss of habitat, the Project ESIA and the Russkaya CS EIAs identify potential adverse impacts due to obstruction of herpetile movement caused by:

- The Project landfall facilities and RoW (running generally east – west);
- The Russkaya CS and RoW (running generally east – west);
- The Varvarovka Bypass access road (running north – south);
- The western-most microtunnel access road (running north – south); and
- The permanent access road (running east – west).

Construction of the RoWs for both developments will result in a temporary obstruction (anticipated to be approximately two years) to movement. Once construction is completed, the

[10] Includes both temporary and permanent habitat loss.

RoWs are not anticipated to limit the ability of these species to move within the landscape. However, the access roads (i.e. the Varvarovka Bypass and the Gazprom Invest Permanent Access Road) have the potential to disrupt the movement of species (as well as cause mortality due to collisions) in the long term.

The Project ESIA states that without mitigation, the impacts arising at the construction phase have the potential to affect the integrity of a locally – regionally significant population of Nikolski's tortoises in the medium – long term. The ESIA thus proposes a suite of mitigation measures which are designed to avoid significant impacts on Nikolski's tortoise and other herpetiles. These measures comprise:

- Measures to exclude herpetiles from construction areas, including the installation of exclusion fencing and translocation of located individuals;
- Installation of under-road passes ("tortoise tunnels") to mitigate the impact of severance;
- Habitat reinstatement and enhancement; and
- Development and implementation of a BAP.

It is anticipated that implementation of the mitigation measures proposed within the Project ESIA will reduce the residual impact of construction of the Project on herpetiles such that impacts are Not Significant.

The Russkaya CS EIA proposes a number of measures that are anticipated to reduce mortality and injury to herpetiles, reduce damage to their habitat, and for a portion of the affected areas, replace lost habitat (see Section 4.6.3 of this Appendix). No measures are, however, proposed to reduce the impact of severance posed by the GPI Permanent Access Road. Measures to exclude herpetiles from construction areas are also not currently proposed.

Section 4.6.6 of this Appendix considers options for the alignment of ecological mitigation measures between the Russkaya CS development and the Project, including avoiding impacts (mortality and injury) to herpetiles and reducing the impact of habitat severance.

Birds

The key construction impacts on birds identified in both the Russkaya CS EIAs and Project ESIA include:

- Mortality or injury, and indirect disturbance to breeding or migratory birds; and
- Loss of breeding or foraging habitat.

The Project ESIA proposes various measures to avoid impacts to birds, including preconstruction breeding bird surveys, avoidance of vegetation clearance during the bird breeding season, and general measures to reduce noise and visual disturbance to birds potentially present within the area during construction. Habitat reinstatement and creation measures are expected to enhance habitats for birds in the medium – long term. Consequently, residual impacts during construction of the Project are anticipated to be Not Significant.

Measures specified within the Russkaya CS EIAs intend to reduce direct mortality to birds and disturbance to individuals at key periods in their lifecycle (breeding and migration), including

most notably a commitment to '*ban construction activities during the reproduction and migration of terrestrial vertebrate animals*'. It is not specified when exactly this period is considered to be, or if it is in relation to a specific species group (e.g. herpetiles, birds, or mammals). Other measures include restricting construction to only essential areas (protection of adjacent habitat), avoiding excessive noise and light, ensuring that construction workers and traffic stay within the demarcated construction area, and habitat reinstatement (where possible). These measures and those described in Section 4.6.3 of this Appendix will potentially reduce impacts on birds, although the significance of residual impacts remains uncertain due to a lack of clarity with regards to their implementation.

Considering that the combined Project and Russkaya CS areas potentially support a breeding bird population which is assessed as being of up to moderate sensitivity, and includes RDB species such as wood lark, short-toed snake eagle, booted eagle, rufous-tailed rock thrush, and peregrine falcon, the bird mitigation measures as proposed by the Project (see **Chapter 11 Terrestrial Ecology**) and the Russkaya CS development (see Section 4.6.3 of this Appendix) are required to reduce potential impacts.

Mammals

The combined impact of Russkaya CS and Project construction activities on mammals is very similar to those discussed for herpetiles above. These include:

- Mortality or injury, and indirect disturbance to species;
- Loss of breeding, foraging, and hibernation; and
- Habitat severance and restriction of movement.

A number of RDB bat species have been identified in the Russkaya CS EIAs and the Project ESIA as being relatively rare; including four species of bat considered to be of moderate sensitivity (as detailed in the Project ESIA). A number of other small and larger mammals may also be present, although these comprise relatively common species of negligible to low sensitivity.

The Project ESIA has proposed mitigation measures which are likely to reduce the residual impact of Project construction activities on mammals to Not Significant levels. These include adherence to a suite of impact avoidance and minimisation measures contained within the Construction Management Plan (CMP), a lighting strategy which is sensitive to biodiversity, pre-construction surveys for roosting bats, and habitat reinstatement and enhancement. The under-pass tunnels (discussed above for herpetiles) are also anticipated to reduce the severance, and assist smaller, non-flying mammals to move within the local landscape.

The Russkaya CS EIAs present various measures to safeguard mammals during construction, including restriction of the construction area, covering of pits and trenches, sensitive lighting, and, as discussed above, a banning of construction during mass reproduction and breeding of animals (see Section 4.6.3 of this Appendix). These measures are likely to reduce the construction impacts on mammals. However, a number of additional measures could be employed to further minimise, and in some cases, avoid impacts to mammals (see Section 4.6.6 of this Appendix for further details).

4.6.5.2 Combined Impacts – Operational Phase

Designated Sites, Habitats and Flora

The majority of potentially significant impacts on habitats and flora (due to direct habitat loss and damage) occur during the Project and Russkaya CS construction phases. Assuming that the mitigation measures proposed within the Project ESIA and the Russkaya CS EIA documentation are adhered to during the operation phases, significant impacts associated with direct loss / damage to habitat and flora are not anticipated.

With regards to habitat degradation, the Project ESIA does not predict significant impacts on designated sites, habitats, or flora due to adverse impacts on air quality during the operational phase of the Project (see **Chapter 9 Air Quality** and **Chapter 11 Terrestrial Ecology** of the ESIA). However, air quality modelling undertaken for the Russkaya CS EIA as reported within this combined assessment (see Section 4.3 Air Quality of this Appendix) indicates that operation of the Russkaya CS will result in NO_2 emissions (noting that concentrations of sulphur within the emitted gasses are anticipated to be trace). Nitrogen is known to potentially cause acidification and eutrophication within both woodland and grassland habitats, with these changes potentially reducing the fitness of trees and reducing species diversity within grassland and woodland ground-flora[11]. In terms of designated sites, the Utrish SPNA is located approximately 3 km to the south of the Russkaya CS. The vegetation within the Utrish SPNA is characterised predominantly by xerophilous (shiblyak) vegetation comprising juniper *Juniperus* sp. and pubescent oak *Quercus pubescens* within the lower altitudinal belt (0 – 200 m), and mesophilic broad-leaved forests of oriental beech *Fagus orientalis*, oriental hornbeam *Carpus orientalis*, sessile oak *Quercus petraea* and ash *Fraxinus excelsior* within the upper altitudinal belt (150 – 500 m) (see **Chapter 11 Terrestrial Ecology** for further details). Broadleaved forests (as well as the areas of coniferous (juniper) woodland) are recognised as being sensitive to the deleterious effects of nitrogen.

An effort has been made to determine whether the change in air quality associated with operation of the Russkaya CS will exceed the critical load[12] associated with broad-leaved and coniferous woodlands. This assessment is based on the following to sources of information:

- Air quality modelling undertaken for this combined assessment (see Section 4.3 Air Quality of this Appendix); and
- Information sourced from the UK Air Pollution Information System[13] (APIS), a resource containing information on the effects of pollutants on various habitat types.

[11] http://www.apis.ac.uk/node/965

[12] Critical load is a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The exceedance of a critical load is defined as the atmospheric deposition of the pollutant above the critical load.

[13] http://www.apis.ac.uk/. It is recognised that the habitat types for which the APIS database contains information do not strictly conform to those present within the study areas, although, in the case of the woodland habitats, they are considered to be of sufficient similarity (i.e. species type and composition) to allow for comparisons and an assessment to be made.

The dominant habitat within the Utrish SPNA, containing broad-leaved species such as oak, oriental hornbeam, beech, and ash, as well as coniferous species such as juniper, therefore approximates the 'broad-leaved, mixed, and yew woodland' habitat classification provided by APIS. The critical load[14] for nitrogen for this habitat type, is considered to be between 10 - 20 kilograms (kg) per hectare (ha) per year. Modelling has determined that the levels of nitrogen deposition (caused by the Russkaya CS development) at Utrish's closest point to the Russkaya CS, is 0.86 kg/ha/year (see Figure A4.3). This contribution is less that 1% of the lower-range critical load (i.e. 10 kg/ha/year) and is not considered to be significant enough to affect vegetation health, structure and/or composition of the Utrish SPNA. The combined operational impact of the Russkaya CS and the Project on the Utrish SPNA is, therefore, not considered to be significant.

Areas of natural habitat (which are not within any statutory designated area), and some of which fall outside of the development areas, could also be affected by changes in air quality. Habitats identified as potentially sensitive include areas of shiblyak, juniper woodland, mesophilic forest, and tomillyar. It has been calculated that combined emissions from the Project and from the Russkaya CS may exceed 1% of the lower-range critical load (considered to be 10/kg/ha) for these habitats (see Figure A4.1):

- Shibyak – 346 ha;
- Mesophilic forest – 53 ha;
- Juniper woodland – 36 ha; and
- Unknown (includes a range of habitat types including agricultural land and meadow – 53 ha.

It is important to note that contribution of more than 1% of critical load does not automatically infer that these habitats will be measurably affected by nitrogen deposition. The potential for significant impacts largely depends on the existing levels of nitrogen deposition to the habitats in question and whether the contribution of the Russkaya CS facility is likely to result in these habitats exceeding their critical load. The background levels of nitrogen deposition within the area have been calculated to be approximately 2.7 kg/ha/year[15] (without the contribution of the Russkaya CS), or approximately 27.5% of the lower range critical load. Within the areas receiving the highest deposition rates (with atmospheric concentrations of 3 µg/m^3) resulting from the Russkaya CS (see Figure A4.1), deposition rates are not anticipated to exceed 3.6 kg/ha/year, or 36.3 % of the lower range critical load. The levels of nitrogen deposition within all areas are, therefore, well below the lower range critical load for these habitat types, and measurable changes to these natural habitats are, therefore, not anticipated. The combined impact of the Russkaya CS and the Project is, therefore, anticipated to be no more than Low Adverse significance.

[14] Critical Loads are defined as: "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" (Source: http://www.unece.org/env/lrtap/WorkingGroups/wge/definitions.htm). For the purpose of impact assessment, it is considered that a contribution by the project of less than 1% of the Critical Load will not significantly affect sensitive receptors.

[15] Based on background atmospheric concentrations of 9.6 µg/m^3 (see Table 9.7 within **Chapter 9 Air Quality** of the ESIA).

Fauna

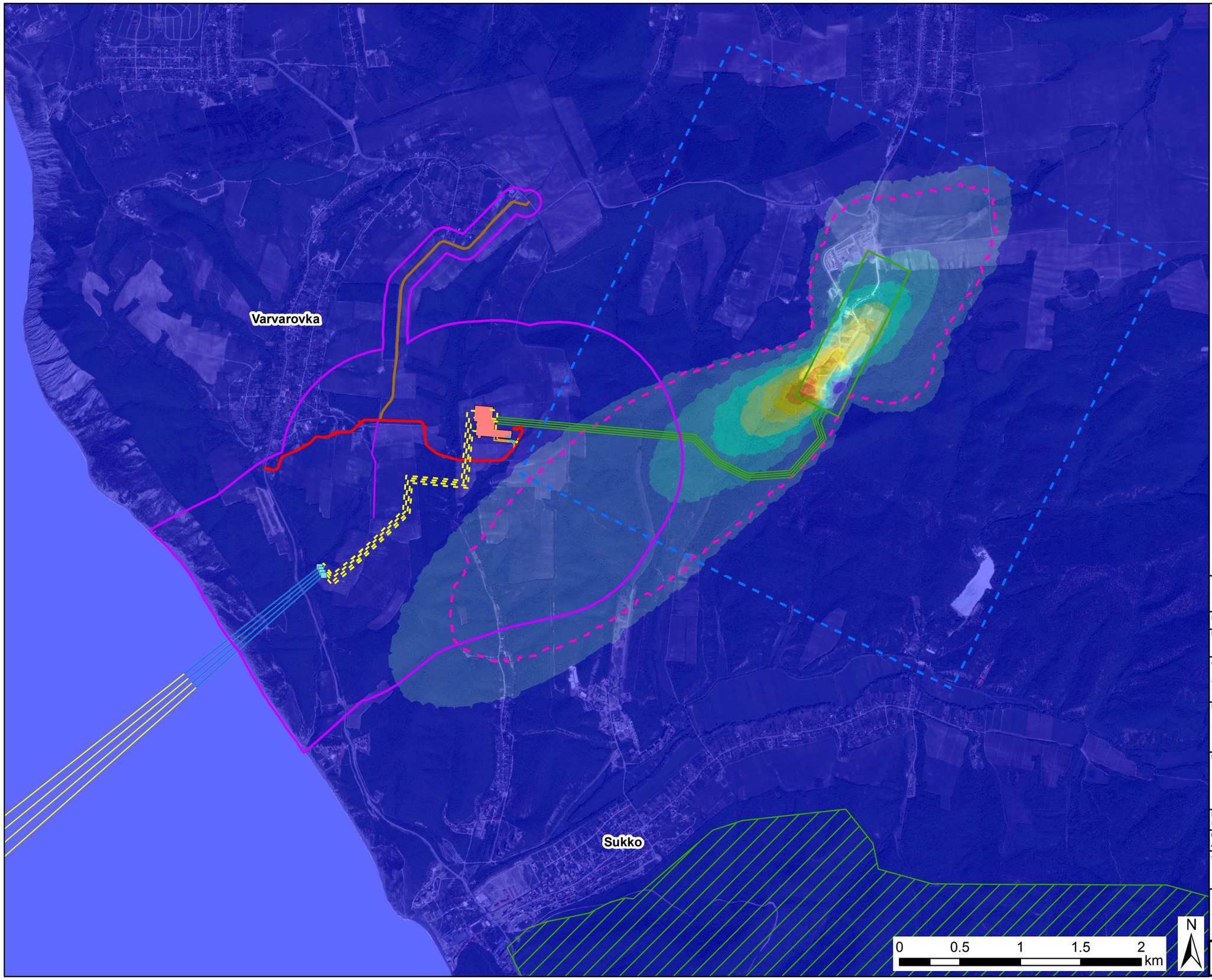
The operation of the Russkaya CS and the Project has the potential to affect fauna in a number of ways (and as discussed in the Russkaya CS EIA and the Project ESIA). These include:

- Increased risk of mortality or injury during maintenance activities;
- Increased risk of hunting or poaching; and
- Disturbance to species due to increased human presence and light and noise disturbance associated with operation of infrastructure (including most notably the Russkaya CS itself).

The above impacts could affect various species, including most likely herpetiles, birds, and mammals.

The Project ESIA proposes measures which are anticipated to reduce Project operational impacts on all fauna to Not Significant levels (see **Chapter 11 Terrestrial Ecology**). This includes sensitive timing of maintenance activities to avoid important points in the lifecycle of fauna (such as the bird breeding season and herpetile activity period), and the implementation of speed limits for maintenance vehicles to reduce the likelihood of collisions with fauna, and the use of under road tunnels to reduce the effect of habitat severance in the long-term. The Russkaya CS EIAs propose a similar suite of mitigation measures to avoid direct impacts to fauna, as well as monitoring to ensure that poaching does not become a problem (see Section 4.6.3 of this Appendix).

In terms of indirect disturbance to species during operation, no significant impacts are anticipated to arise as a result of the Project. However, although the Russkaya CS EIA does not specifically identify or assess the impact of operational noise pollution on species such as birds and mammals, it is recognised that this could potentially impact species during facility operation. Based on noise modelling undertaken for this combined assessment (see Section 4.5 of this Appendix), there is the potential for some habitats within the immediate vicinity of Russkaya CS to be affected by operational noise. However, based on the area of habitat likely to be affected, and the character of the noise produced by the compressor station (a constant, low frequency sound to which fauna are likely to become habituated), operational noise levels are unlikely to affect the ability of mammals or birds to survive within the local area. The impact of Russkaya CS and the Project on fauna during the operational phase is, therefore, not anticipated to be significant.



LEGEND

- Landfall study area
- Russkaya CS study area
- Boundary of the state nature reserve "Utrish"

Impact on ground level annual mean (µg/m³)

- 0 - 0.3
- >0.3 - 0.6
- >0.6 - 0.9
- >0.9 - 1.2
- >1.2 - 1.5
- >1.5 - 1.8
- >1.8 - 2.1
- >2.1 - 2.4
- >2.4 - 2.7
- >2.7 - 3
- Percentage concentration of lower range critical load below 1%

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Anode ground bed for cathodic protection of pipelines
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Anode ground bed connection to landfall facilities
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Temporary Varvarovka bypass road to be constructed by SSTTBV

United Gas Supply System

- Russkaya compressor station
- United Gas Supply System pipelines
- Permanent access road to be constructed by Gazprom Invest

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: GROUND LEVEL ANNUAL MEAN NO_2 CONCENTRATIONS DURING RUSSKAYA CS OPERATION AND ECOLOGICAL ISSUES

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4.6.6 Mitigation and Management – Combined Impacts

The following section presents mitigation proposals which aim to reduce potential combined residual ecological impacts of the Russkaya CS and the Project.

4.6.6.1 Combined Impact Mitigation – Construction Phase

Designated Sites, Habitats and Flora

South Stream Transport will engage with Gazprom Invest to seek alignment of Russkaya CS terrestrial ecology mitigation measures with those of the Project, where practicable. In addition, South Stream Transport will engage with Gazprom Invest to identify a site representative to work with SST's Ecological Clerk of Works (ECoW) to ensure that all mitigation relevant to terrestrial ecology is implemented in accordance with industry good practice.

The Project will implement mitigation measures which are anticipated to achieve a no net loss, and where required, a net gain in biodiversity values due to Project construction. However, based upon the review of available information, the level of impact reduction that will be achieved by the ecological mitigation measures as proposed within the Russkaya CS EIAs has not been quantified.

Given the above, South Stream Transport will engage with Gazprom Invest with an aim of developing measures to enhance biodiversity management within the wider area. Engagement objectives include:

- Mitigation across both developments should aim to achieve a no net loss of biodiversity in natural habitat, and in the case of components of Critical Habitat, a net gain;
- Mitigation measures include habitat reinstatement and enhancement and possibly compensatory habitat creation; and
- Develop a long term monitoring plan of an appropriate duration that aims to assess no net loss/net gain.

Fauna

South Stream Transport will engage with Gazprom Invest with the aim of aligning the Russkaya CS faunal mitigation measures with those of the Project, where practicable. Alignment of the following measures (if not already being undertaken by Gazprom Invest) in particular will be beneficial:

- Adherence to the 'General Mitigation Measures' as contained within Section 11.6.9.1 of **Chapter 11 Terrestrial Ecology**;
- Avoidance of site vegetation clearance during the bird breeding season (potentially between March and September). If this is not possible, a suitably experienced ecologist should check vegetation prior to removal for evidence of nests. If active nests of species of ecological importance are identified, an appropriate exclusion zone should where possible be established around the nest site until any young have fledged;

- Implementation of fencing and a programme of translocation to ensure that mammals and, most importantly, RDB herpetiles such as Nikolski's tortoise, are excluded from construction areas;
- Where relevant and feasible, installation of under-road tunnels (and road design features which are sensitive to herpetiles) along permanent access roads to reduce the impact of severance on herpetiles and small mammals in the long term; and
- Investigate whether pre-construction surveys for roosting bats are to be undertaken prior to the staged take-down of suitable trees during construction of the pipeline RoW linking Russkaya CS and the Project landfall facilities to minimise impacts on roosting bats.

The above measures will be aimed at achieving where possible or feasible no net loss, and in the case of Critical Habitat, a net gain.

4.6.6.2 Combined Mitigation – Operational Phase

South Stream Transport will engage with Gazprom Invest to align the Russkaya CS mitigation measures with those of the Project, where practicable. Alignment of the following measures in particular will be beneficial:

- Any operation phase vegetation management works (i.e. periodic cutting of vegetation along the pipeline corridor) to be undertaken in the winter period only (November – February) when tortoises (and other amphibian / reptile species) are hibernating. Low impact hand-held machinery to be used to complete this vegetation management. Vegetation to be cut to no lower than 100 mm and no ground broken during these works;
- During the operation of the pipeline, any maintenance / project vehicles to adhere to an on-site speed limit of 10 km/hr and drivers mindful that tortoises could be present along any of the access tracks. Any casualties noted to be recorded and reported to the project manager.

4.7 Marine Ecology

4.7.1 Combined Impacts of Russkaya CS and Project Development - Construction and Operation

Whilst the Russkaya CS development will not involve any construction activities that will have a direct impact upon the marine environment, marine vessels will be used for materials supply. Marine vessel usage is not specifically considered within the Russkaya CS EIA documentation.

As reported in **Chapter 12 Marine Ecology**, marine mammals may be impacted by Project construction activities due to noise generated by dredging, trenching, pipelaying and trench backfill works. Such ecological impacts are not anticipated due to marine vessel passage. As such, it is considered that marine vessels used to support the Russkaya CS development will also not generate any potentially significant marine ecological impacts. It follows, therefore, that the combined impacts of the Project and the Russkaya CS development will be as reported for the Project in **Chapter 12 Marine Ecology**.

4.8 Landscape and Visual Impacts

4.8.1 Summary of Russkaya CS Impacts - Construction and Operation

The Russkaya CS EIA documentation does not specifically consider the potential impacts of the Russkaya CS development upon the prevailing landscape character or impacts upon visual amenity during the construction phase or during the facility's operational phase (from the review of Chapters 4, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3).

4.8.2 Russkaya CS Design Controls and Mitigation

Whilst the Russkaya CS EIA documentation does not specifically include a landscape and visual impact assessment, a number of environmental protection measures are defined in the EIAs that will assist in mitigating potential adverse landscape impacts, including:

- Minimal land take for construction;
- Remediation of land not required for permanent use, such as grass hydroseeding on cleared forest strip, regrading / backfilling trenches / holes, removing felled vegetation from the site;
- General tidy and safe working and strict adherence to the boundaries of construction.

No specific mitigation measures are included in the Russkaya CS EIA documentation with regard to the mitigation of landscape character or visual amenity impacts during the facility operational phase.

As noted in **Chapter 13 Landscape and Visual** (Section 13.5.5) "*The distinctive linear patterned vegetation and seasonally changing appearance of the agricultural fields would provide opportunity to tolerate change such as the temporary removal of vegetation cover and excavation during construction; and the undulating nature of the topography provides opportunity to tolerate and conceal localised development, such as spoil storage and site plant, without degrading the overall character of the LCA*." This would apply to the Russkaya CS development in a similar manner that it applies to the Project.

4.8.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

Landscape character and visual amenity issues are not referenced directly in IFC Performance Standards, however, environmental impact assessment good practice would anticipate that for an industrial facility the size of the Russkaya CS that an assessment of these issues would be undertaken.

4.8.4 Combined Impacts of Russkaya CS and Project Development and Impact Management

The aim of this section is to consider the potential combined impact of the Project in combination with the Russkaya CS on the prevailing landscape character and visual amenity on the basis of available data (Ref. 2 and Ref. 3).

The character and visual appearance of the Russkaya CS has been interpreted from data as included in the Russkaya CS EIA documentation, noting however that the Russkaya CS EIAs include little information regarding the proposed visual appearance of the construction works or the completed built elements of the compressor station (for example, the appearance and heights of buildings, completed structures and fencing etc.). Assumptions have therefore been made regarding the nature of the development, whilst the appraisal has used professional judgement to determine whether both developments could be visible simultaneously for a receptor group, or whether sequential views of the two developments could be visible for a receptor group. This could not be verified by a digitally produced Theoretical Zone of Visibility, due to an absence of facility height data within the Russkaya CS EIA documentation.

4.8.4.1 Combined Impacts

4.8.4.2 Combined Impacts – Construction Phase

Table 4.13 summarises residual landscape and visual amenity impacts upon the sensitive receptors as associated with the Project (as detailed in **Chapter 13 Landscape and Visual**), and what change, if any, could potentially be experienced due to the combined Project and Russkaya CS construction activities. These qualitative changes have been defined using professional judgement and made with reference to Figure 13.4 Topography, Figure 13.5 Landscape and Seascape Character Area, Figure 13.9 Viewpoint Location Plan, and Appendix 13.1 Photographs (included in **Chapter 13 Landscape and Visual**).

Table 4.13 illustrates that the Russkaya CS development has the potential to increase some landscape and visual amenity impacts beyond those as associated with the Project as reported in **Chapter 13 Landscape and Visual** (e.g. impacts upon the Undulating Plateau Landscape Character Area (LCA) and impacts on visual receptors such as travellers on the Varvarovka-Gai-Kodzor road and residents living close to the road access roads from the M25 at Rassvet).

Table 4.13 Potential Combined Landscape and Visual Amenity Impacts Associated with Combined Project and Russkaya CS Development

Sensitive Receptors	Project Residual Impact Significance	Potential Change to Residual Impact due to Combined Project and Russkaya CS
Undulating Plateau LCA	Moderate	Potential increase in adverse impacts. Direct and permanent.

Continued…

Sensitive Receptors	Project Residual Impact Significance	Potential Change to Residual Impact due to Combined Project and Russkaya CS
Black Sea Coastal SCA	Low	No change.
Visitors to the Russian Orthodox and Armenian cemetery at Varvarovka	Moderate	Potential small increase in adverse impact. Direct, localised, permanent.
Residents living at northeast Varvarovka	Moderate	Potential increase in adverse impact. Direct, localised, permanent.
Walkers on the coastal path along the cliff top	Moderate	Potential small increase in adverse impact. Direct, localised, permanent.
Travellers on the Varvarovka-Sukko road	Low	No change.
Travellers on the Varvarovka-Gai-Kodzor road	Low	Potential large increase in adverse impact. Direct, permanent. Potential sequential views of the combined developments leading to increased adverse impacts.
Agricultural workers on the land	Low	Potential increase in adverse impact. Direct, localised, permanent. Potential sequential views of the combined projects leading to increased adverse impacts.
Residents of the Clearing in the Woods "Lesnaya Polyana" development currently under construction	Not Significant	Potential small increase in adverse impact. Direct, localised, permanent.
People living and working at Sukko and visitors to the town	Low	Potential small increase in adverse impact. Direct, localised, permanent.
Recreational visitors to the seashore, including the public beaches at Sukko and Anapa, and the private beach at the Shingari and Don holiday complexes	Moderate	No change.

Continued…

Sensitive Receptors	Project Residual Impact Significance	Potential Change to Residual Impact due to Combined Project and Russkaya CS
Visitors to state nature reserve "Utrish"	Low	Potential small increase in adverse impact. Direct, localised, permanent.
Recreational boat users	Moderate	No change.
Residents living close to the road access roads from the M25 at Rassvet	Low/Moderate	Potential large increase in adverse impact. Direct, permanent. Potential sequential views of the combined developments leading to increased adverse impacts.

Complete.

4.8.4.3 Combined Impacts – Operational Phase

Table 4.14 summarises residual landscape and visual amenity impacts upon sensitive receptors as associated with the Project (as detailed in **Chapter 13 Landscape and Visual**), and what change, if any, could potentially be experienced due to combined Project and Russkaya CS operation. These qualitative changes have been defined using professional judgement and made with reference to Figure 13.5 Landscape and Seascape Character Area, Figure 13.9 Viewpoint Location Plan, and Appendix 13.1 Photographs (included in **Chapter 13 Landscape and Visual**). Those receptors that would experience no potential combined impact are excluded from the table.

Table 4.14 illustrates that during the operational phase, the Russkaya CS development has the potential to increase some landscape and visual amenity impacts beyond those as associated with the Project as reported in **Chapter 13 Landscape and Visual** (e.g. impacts upon the Undulating Plateau LCA, and impacts on visual receptors such as travellers on the Varvarovka-Gai-Kodzor road).

Table 4.14 Potential Combined Landscape and Visual Amenity Impacts Associated with Combined Project and Russkaya CS Operation

Sensitive Receptors	Project Residual Impact Significance	Potential Change to Residual Impact due to Combined Project and Russkaya CS
Undulating Plateau LCA	Low	Potential increase in adverse impact. Direct, permanent.
Visitors to the Russian Orthodox and Armenian cemetery at Varvarovka	Low	Potential small increase in adverse impact. Direct, localised, permanent.
Residents living at The Chateau development, Varvarovka	Low	Potential increase in adverse impact. Direct, localised, permanent.
Walkers on the coastal path along the cliff top	Low	Potential small increase in adverse impact. Direct, localised, permanent.
Travellers on the Varvarovka-Gai-Kodzor road	N/A	Potential large increase in adverse impact. Direct, permanent. Potential sequential views of the combined developments leading to increased adverse impacts.
Agricultural workers on the land	Low	Potential increase in adverse impact. Direct, localised, permanent. Potential sequential views of the combined developments leading to increased adverse impacts.
Residents of the Clearing in the Woods "Lesnaya Polyana" development currently under construction	Low	Potential small increase in adverse impact. Direct, localised, permanent.
People living and working at Sukko and visitors to the town	Not Significant	Potential small increase in adverse impact. Direct, localised, permanent.
Visitors to state nature reserve "Utrish"	Not Significant	Potential small increase in adverse impact. Direct, localised, permanent.
Residents living close to the road access roads from the M25 at Rassvet	Not Significant	Potential small increase in adverse impact. Direct, permanent. Potential sequential views of the combined developments leading to increased adverse impacts.

4.8.4.4 Mitigation and Management – Combined

Chapter 13 Landscape and Visual defines a range of mitigation and management actions that will be applied during construction and operation of the Project, many of which accord with GIIP. South Stream Transport will investigate whether the landscape and visual mitigation measures defined for the Project can be applied to the Russkaya CS development, noting that due to the scale and location of the Russkaya CS, the scope to mitigate prevailing landscape and visual impacts is limited.

4.9 Socio-economics

4.9.1 Summary of Russkaya CS Impacts - Construction and Operation

The sections below provide a summary of the construction and operation phase socio-economic findings presented in the Russkaya CS EIA documents (principally from the review of Chapters 4, 5, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3).

4.9.1.1 Construction Phase

The Russkaya CS EIA documentation reviewed considers potential beneficial socio-economic impacts and potential negative impacts. These potential impacts are considered at various scales, namely local (within the specific localities or administrative area of a constituent entity of the Russian Federation), regional (within a constituent entity of the Russian Federation), and national (within the Russian Federation). The sections below provide a summary of Russkaya CS EIA documentation with regard to economic impacts, transport impacts, land use and community health and safety.

Economic Impacts

The primary impact identified in the EIA documentation during the Russkaya CS construction phase was the beneficial temporary impact on living standards associated with the creation of new jobs with relatively higher income levels in the construction industry and more jobs within the service sector as a result of the development.

The Russkaya CS EIAs states that locals will be employed for the construction work and that in the absence of the necessary number of qualified professionals in the area, other qualified professionals may be hired from other areas of the Krasnodar Krai during the construction period. In addition, the Russkaya CS EIAs indicate that the presence of a non-local workforce will generate increased demand for goods and services, and therefore turnover, for local consumer service enterprises, trade and public catering businesses. This in turn will benefit local residents that own or that are employed in these businesses. A beneficiary of the development construction works would be industrial sectors such as the manufacturing of building materials, some of which may be purchased from local producers. The EIAs consider that construction companies supplying equipment and building materials to the project will experience increased output and as a result this will deliver beneficial commercial impacts at a local and / or regional scale.

Other than the potential for qualified professionals from other areas of Krasnodar Krai to be hired, the Russkaya CS EIAs state that impacts upon other processes of population development (including impacts on demographics) are not expected. A temporary in-migration of workers to the site is possible, but this is assessed as a low significance impact which is short-term in duration.

Transportation and Traffic Impacts

The Russkaya CS EIAs state that the construction of the Russkaya CS is expected to lead to reconstruction and improvement of the existing transportation infrastructure, with both permanent and temporary roads. The EIAs further state that in general, these improvements to transport infrastructure can be expected to lead to an intensification of land use, and a fuller use of land resources. This has been assessed in the EIAs as a beneficial impact.

The EIAs state that the delivery of appropriate building materials will increase the intensity of the traffic, increase road transport cargo turnover in the consideration period resulting in additional profits for shipping enterprises. The EIAs report this as a beneficial impact, both for the district and for regional organisations (depending where the orders are placed).

Land Use Impacts

The Russkaya CS EIAs report that acquisition of land for temporary use (by lease) for the construction of the Russkaya CS and the permanent facilities primarily concerns lands used for agricultural purposes. The negative impact of this intervention in these areas results in a reduction in agricultural land. The EIAs report that losses and damages to agriculture and forestry associated with land acquisition will be compensated following the procedures established by Russian law. The estimated size of the economic damage was calculated and the impact on agriculture was assessed as being not significant, due to the fact that damage will be compensated in full in accordance with current Russian law; the impact will be temporary as upon completion of construction activities, some land will be recultivated and returned to the land users in a condition suitable for agriculture. Thus, the EIAs consider that the existing compensation mechanisms for agricultural losses mitigate the negative implications of the acquisition of lands for construction purposes.

Community Health and Safety

The Russkaya CS EIAs assess only the impact on the sanitary-epidemiological conditions and do not account for other potential community health and safety impacts as related to traffic, noise, or communicable diseases. According to the Russkaya CS EIA documentation, construction will occur in a district with some epidemiological risks associated with diseases such as leptospirosis, haemorrhagic fever with renal syndrome, pseudo-tuberculosis, tularaemia, Lyme disease and tick-borne encephalitis, Crimean haemorrhagic fever and helminthiasis. The Russkaya CS EIAs report that there will be a risk of infection of the construction and operation staff with these diseases, although the level of risk is not quantified. It is also stated that there is a possibility of an increase in foci and natural focal diseases during relocation of soil in

autumn and winter, and the potential that construction activities may increase the human impact on the environment and animals, especially as it relates to zoonotic diseases[16].

The Russkaya CS EIAs do not contain an assessment of occupational health and safety risks, although there is an assessment of impacts in relation to emergency situations which includes diesel spills during the construction phase and the risks of fire and explosion due to gas in the compressor station pipelines during the operational phase. The EIAs commit in general to technical and organisational measures to reduce and minimise the impacts of such emergency situations.

4.9.1.2 Operational Phase

The Russkaya CS EIA documentation considers that impacts during the operational phase would last for a 30-year period. Beneficial impacts will be similar in nature to those experienced during the construction phase – thus having a beneficial economic impact (albeit for a longer duration), whilst during the operational phase negative impacts upon the local population as associated with construction activities (noise, excavation, and logging) will no longer occur. The Russkaya CS EIAs assess that the local population will be able to adapt to the presence of the compressor station development during the construction stage such that impacts will be limited during the operational phase. The EIAs conclude that all impacts during the operational phase will be beneficial and will impact primarily across regional and national levels.

Economic Impacts

The Russkaya CS EIA documentation reports that for the local population, the main operational economic impact will be the presence of service staff and the creation of new local employment opportunities. However, the small number of service staff will not cause significant changes in the existing structure of population employment, but it can be regarded as a beneficial impact on a regional scale.

The operation of the Russkaya CS during the 30-year expected operational life of the facility has been assessed in the Russkaya CS EIAs to have the following long-term beneficial impacts, primarily at the national level:

- Foreign trade integration will intensify;
- The possibility of gas exports will be significantly enhanced;
- Further development of the gas industry will be stimulated in view of the substantial increase in transport capacity;
- Foreign currency revenues to the state budget will increase;
- Tax revenues to the state budget will increase; and
- Indirect benefits include the promotion of improved gas production technology and transportation.

[16] A zoonotic disease is a disease that can be passed between animals and humans.

4.9.2 Russkaya CS Design Controls and Mitigation

Due to the fact that most socio-economic impacts assessed in the Russkaya CS EIAs during both construction and operational phases are considered to be beneficial, the EIAs did not highlight the need for any specific design controls or mitigation measures. The Russkaya CS EIAs state that comprehensive studies to assess the current state of vertebrates, blood-sucking insects and ticks, and natural foci of infection should be undertaken.

In regards to the impacts on land and agriculture, the Russkaya CS EIAs state that impacts on the loss of income (agricultural) will be mitigated through compensation in full accordance with current Russian law. Furthermore, the EIAs state that mitigation measures would be put in place to ensure that upon completion of construction activities, temporarily acquired land will be recultivated and returned to land users in a condition suitable for agriculture.

The Russkaya CS EIAs highlight that during the construction and operational phases, the Russkaya CS facilities will be operated safely in order to protect workers. In the assessment of impacts in relation to emergency situations (includes construction phase diesel spills and risk of fire and explosion due to gas in the compressor station pipelines during the operational phase), the EIAs commit in general to technical and organisational measures to reduce and minimise the impacts of such emergency situations.

4.9.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

As detailed in Section 3.2 of this Appendix, a comparison of the Russkaya CS EIA documentation against IFC Performance Standards and good international industry practice has been undertaken. Issues and gaps specific to potential socio-economic impacts are highlighted in the sections below:

- **Performance Standard 1 Assessment and Management of Environmental and Social Risks**

  The Russkaya CS EIA documentation reviewed does not provide details of stakeholder engagement (noting that it is understood that public meetings would have been needed to comply with applicable Russian EIA procedures). The EIAs contain little information related to the outcomes of engagement with Affected Communities; stakeholder engagement; disclosure of relevant project information; informed consultation and participation; or grievance mechanisms procedures.

- **Performance Standard 2 Labour and Working Conditions**

  The Russkaya CS EIAs do not contain an assessment of labour and working conditions, including no assessment of the worker's accommodation and standards therein (noting that the Russkaya CS development includes a workers camp on site), as well as the other issues such as human resources policies / procedures or working conditions and the management of worker relations (such as documentation provided to workers; collective bargaining; terms and conditions of non-migrant and migrant workers; worker accommodation; worker grievance mechanism; worker organisations; worker recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to

training, job assignment, promotion, termination of employment or retirement, and disciplinary practices; non-discrimination; collective dismissal; severance etc.).

The Russkaya CS EIAs do not contain an assessment of occupational health and safety risks, although there is an assessment of impacts in relation to emergency situations. Other than the mention of design controls for emergency situations, there is no indication in the EIAs that the Russkaya CS development has safeguards in place to protect the workforce, including a ban on child employment and forced labour.

- **Performance Standard 4 Community Health, Safety and Security**

  The health assessment in the Russkaya CS EIAs focus on an 'assessment of the impact on the sanitary-epidemiological conditions' as it relates to impacts on the workforce. The assessment does not take into account the impact of project related activities on community health and safety. For example, there is no assessment of impacts related to the conduct of the workforce in the community (i.e. due to potential anti-social behaviour); the spread of sexually transmitted infections (STIs) due to an increase in non-local workforce; impacts due to increases in traffic; and no assessment of the impact in terms of local health and emergency service resources due to the in-migration of workers.

  The Russkaya CS EIAs do not assess the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases, and communicable diseases that could result from project activities; emergency preparedness and response activities, resources, and responsibilities.

  There is also no mention in the Russkaya CS EIAs of human rights, security personnel (hiring, rules of conduct, training, equipping and monitoring of security personnel) or grievance mechanism for Affected Communities relating to security arrangements and acts of security personnel. There is also no assessment of the potential negative impacts of road and transportation networks on the health and safety of local communities.

- **Performance Standard 5 Land Acquisition and Involuntary Resettlement**

  The Russkaya CS EIAs acknowledge the potential for impacts associated with the acquisition of land for temporary use (lease) for construction activities and for the industrial facilities and states that impacts on agriculture will be mitigated such that they are not a significant impact due to the compensation paid for the temporary use. However, there is no discussion on the compensation process or grievance procedures, and / or impact on Affected Communities, land expropriation procedures, the requirement for (or the development of) a Resettlement Action Plan and / or Livelihood Restoration Plan.

It is considered that on the basis of the review as reported above, the Russkaya CS EIAs do not contain all the requirements of IFC Performance Standards 1, 2, 4 and 5. However, where there are gaps in the EIA documentation, it does not necessarily mean that such issues are not being appropriately managed by Gazprom Invest outside of the EIA process.

4.9.4 Combined Impacts of Russkaya CS and Project Development and Impact Management

4.9.4.1 Combined Impacts

Economic Impacts

It is understood that the Russkaya CS construction could employ a peak of approximately 1,500 workers during the first quarter of 2015, although the number of local and non-local workers that will be employed is uncertain. It can thus be assessed that in terms of economic related impacts, that both the Project and the Russkaya CS development will result in limited, short-term beneficial economic impacts as a result of additional employment and increased demand for goods and services at the local level during their construction.

In the longer term, and throughout the Project and Russkaya CS facility operation, it can also be assessed that the combined developments will have beneficial economic impacts at the national level associated with an increase in revenues for both the Russian gas industry and the Russian Federal government, due to the increase in Russian gas exports that the developments will enable.

During the Construction and Commissioning Phases, there is the potential for Low adverse economic pre-mitigation impacts on Shingari and Don Holiday Complexes and on the Anapa Resort Town tourism sector as a result of the Project's impacts on the coastal area amenity (see **Chapter 14 Socio-Economic**). This may affect customers of these two named businesses or of other tourism-related businesses in the Anapa Resort Town district, and thereby potentially reduce revenues for the local tourism sector in general. Although no economic assessment was completed in the Russkaya CS EIAs, given that the Russkaya CS development is set well back from the coastline, it is anticipated that the Russkaya CS development is unlikely to exacerbate local tourism impacts on these receptors or on any other tourism receptors in Sukko or the town of Anapa. Nevertheless, the Russkaya CS development will increase the industrial nature of the area in the immediate vicinity of the facility.

Both developments have the potential to impact on the Varvarovka Horse Riding Business. However, the exact alignment of the horse riding business' routes are not known and so an assessment has been concluded based on a potential worst-case scenario whereby it is assumed that the construction of the Project may result in severance of the route used by the business. A commitment has been made to work with the horse riding business to undertake further investigation and, if necessary, to identify a suitable alternative route. This mitigation, if required, will also consider the potential for Russkaya CS to temporarily sever any routes used by the horse riding business, and take this into account in identifying appropriate mitigation. Accordingly, this will help ensure that the residual impact on the Varvarovka Horse Riding Business remains Low Adverse, even if the routes used by the horse riding business intersect with the Russkaya CS works area.

Amenity Impacts

There is the potential for amenity related impacts on visitors to Varvarovka (Russian Orthodox and Armenian) Cemetery as a result of vehicles servicing the Project that will use an access

route located near the cemetery. This route will also be used by the Russkaya CS development. Both the visual impact assessment and the cultural heritage chapter have concluded that the increase in traffic associated with the use of the route by the Russkaya CS in addition to the Project has the potential to result in a small increase in adverse impact. Section 4.8.4.4 and Section 4.10.4.2 present mitigation to deal with the potential for combined visual and cultural heritage impacts, respectively, on the Varvarovka Cemetery

The socio-economic assessment has also identified the potential for Moderate Adverse amenity-related impacts assessed on residents in North East Varvarovka. This assessment has been concluded on the basis of the results of the noise and visual impact assessments; which have shown the potential for Low and Moderate adverse residual impacts. In both cases, the assessment of noise and visual impacts have not identified further significant impacts on residential receptors in North East Varvarovka arising due to the Russkaya CS. Accordingly, it is concluded that there would be no additional amenity-related impacts on residential receptors in North East Varvarovka.

Land Impacts

The requirement by the Project for land on both a temporary and permanent basis will result in Low adverse impacts due to the take up of Agrifirm Kavkaz vineyards and associated economic displacement of vineyard activity (see **Chapter 14 Socio-Economics**). However, it is considered unlikely that there would be any loss of employment - the land holdings of the vineyard are extensive and the vineyard operator is likely to be able to redeploy workers to other areas and tasks within the vineyard.

For the Russkaya CS development, the specifics regarding direct economic displacement on landowners and agricultural activity in the local and regional populations is not assessed; however, of the 111.3 ha of habitat loss occurring due to the development, less than 20% (approximately 21.9 ha) is agricultural land (see Table 4.11). Further, the Russkaya CS EIAs assess post-mitigation impacts on affected landowners and agricultural displacement as being not significant.

Community Health and Safety

The Project has the potential to have negative impacts on the community related to health and safety, including the spread of STIs, the potential to strain local health and emergency services, and the conduct of the workforce in the community – such impacts are assessed to be of Low significance following the adoption of applicable mitigation measures (see **Chapter 15 Community Health, Safety and Security**).

The Russkaya CS EIA documentation does not consider community health and safety impacts aside from those that relate to the interaction between animals and humans.

It is considered that the combined impact of the Project and the Russkaya CS development on community health and safety (as it pertains to the strain on local health and emergency services) as a result of the combined workforces during the construction phase could exacerbate impacts upon local community health and safety impacts indicating that further mitigation or management may be needed.

The Russkaya CS EIA documentation reviewed did not assess transportation and traffic impacts, aside from noting the potential beneficial impacts for shipping enterprises. The Russkaya CS EIAs reviewed do not specifically take into account the potential for increased traffic along supply routes and roads leading through communities which could have an impact on accident rates. As indicated in Section 4.12.1.1 of this Appendix, following the start of Russkaya CS construction activities, the Russkaya CS development took the responsibility for the repair of the main road through the communities of Rassvet and Gai-Kodzor, and the design and construction of a new bypass road around the community of Gai-Kodzor to be used by construction traffic related to both the Russkaya CS and the Project. The new bypass was completed in May 2013.

It is considered that concurrent construction of the Project and the Russkaya CS will increase traffic on some transportation links, especially levels of construction trucks. This includes traffic flows through Rassvet which is already experiencing traffic flow increases associated with Russkaya CS construction vehicles. The additional presence of traffic associated with the Project has the potential to increase traffic impacts through Rassvet and to extend the period over which such traffic impacts are experienced.

With regard to human rights, there were no significant adverse potential impacts identified with the Project that cannot be mitigated through adherence to policies, plans and procedures, as well as through community engagement (see **Chapter 14 Socio-Economics**). However, the Russkaya CS EIAs reviewed do not assess human rights issues in the same context.

4.9.4.2 Mitigation and Management – Combined Impacts

Chapter 14 Socio-Economics includes details of mitigation measures to be applied to the Project related to potential adverse socio-economic impacts. South Stream Transport will engage with Gazprom Invest with the aim of aligning the Russkaya CS socio-economic mitigation measures with those of the Project, where practicable. Alignment of the following measures in particular will be beneficial (if not already being undertaken by Gazprom Invest):

- A Grievance Procedure to address and resolve grievances from stakeholders. South Stream Transport will liaise with Gazprom Invest with the aim of developing a consistent (and where necessary reciprocal) approach to a Grievance Procedure, as far as practicable;
- Regular and ongoing stakeholder engagement will be required throughout the life of the Project which intends to inform and update stakeholders about planned construction activities and the construction programme. Some concerns fall outside the scope of the Project's influence, such as gas supply, community development, and political or regulatory concerns. However, there may be ways in which South Stream Transport can support positive changes and initiatives in local communities beyond the immediate scope of Project impacts. To this end, South Stream Transport has a Community Investment Programme, and will work with local stakeholders and agencies to identify potential themes and initiatives for investment and where appropriate will coordinate with Gazprom Invest to undertake projects of joint interest;
- A Compensation Framework will be utilised to assess situations where an adverse impact may have occurred as a direct result of the Project such as to businesses, land owners, and other potentially affected stakeholders for any reduction in business revenues or economic losses. South Stream Transport will liaise with Gazprom Invest with the aim of

understanding their approach to the evaluating and addressing claims for compensation and develop a consistent approach as far as practicable;

- The Project's Construction Monitoring Programmes for transportation will record the impact of construction transport on road safety and community severance in Rassvet. Monitoring will include vehicle counts and consultation with residents of Rassvet. If the monitoring indicates that road safety or community severance becomes a concern for the local community, then further mitigation measures will be investigated. South Stream Transport traffic safety monitoring programme will capture vehicle movements and community consultation relating to both projects in the Rassvet area, the results of which will inform the need for further traffic safety mitigation measures (also see Section 4.12 of this Appendix);
- South Stream Transport will liaise with Gazprom Invest with the aim of understanding their approach to labour and working conditions practices and to develop a consistent approach to these as far as practicable;
- South Stream Transport will work with local health and other emergency response service providers to monitor local service resource use by the Project's workforce. If monitoring indicates that service demand as a result of the Project is causing resource shortages, further mitigation measures will be investigated to ensure that local communities are not adversely affected. The South Stream Transport monitoring programme will aim to capture potential impacts on local health and emergency response service providers in relation to both projects; and
- South Stream Transport will liaise with Gazprom Invest with the aim of understanding their approach to security management practices and to develop a consistent approach to these as far as practicable.

4.10 Cultural Heritage

4.10.1 Summary of Russkaya CS Impacts - Construction and Operation

The sections below provide a summary of potential cultural heritage impacts as presented in the Russkaya CS EIA documents (principally from various Proekt design documents Ref. 16 - 22).

4.10.1.1 Baseline Assessment

An archaeological baseline assessment of the Russkaya CS facilities and associated pipelines was undertaken by Kuban Heritage LLC between December 2011 and February 2012. The Proekt documentation indicates that this involved detailed archaeological surveys within the boundaries of the Russkaya CS facilities and along a linear 500 m wide corridor that extended at least another 50 m. A linear RoW area west of the Russkaya CS was surveyed, but the route corridor alignment subsequently changed and it is not clear whether this new alignment required re-survey, or has been subject to a re-survey. The baseline assessment aimed to identify and map cultural heritage constraints in the vicinity of the Russkaya CS, define their status, permitted uses and protection zones (Ref. 16; Ref. 17/18; Ref. 19). These reports set out

mitigation options and the costs of implementing recommended mitigation measures, including archaeological watching briefs and archaeological excavations (Ref. 20) (see Section 4.10.2 for further details).

Baseline research was carried out in three stages as follows:

- Desk-based assessment of known Cultural Heritage Objects (CHO) involving consultation of regional databases, archives, cartographic materials and documentary sources;
- Field walkover survey (detailed visual inspection) of the development area, noting the presence and condition of known CHOs, identifying new CHOs and areas of archaeological potential, and undertaking topographic mapping of sites, including their statutory protection zones; and
- Test pit sample hand-excavation to assess archaeological potential of land to identify presence or absence of archaeological remains.

The fieldwork was carried out in accordance with a Permit for Archaeological Excavations and Surveys, No. 1149 (2011). The fieldwork and reporting adhered to national legislation and guidance, including:

- Federal Law No.73-FZ of June 25, 2002 On the objects of cultural heritage (monuments of history and culture) of the peoples of the Russian Federation;
- On the Designated Areas and Protection Zones of Immovable Cultural Heritage (Historical And Cultural Monuments) of Regional and Local Value Located in the Krasnodar Region" (No. 2316-KZ, 19.07.2011);
- On Cultural Heritage (historical and cultural) of the Russian Federation located in the Krasnodar Territory (and subsequent amendments, No. 558-KZ, 06.02.2003);
- 1990 Guidelines for the design of archaeological work in areas of national economic construction. Moscow;
- 2007 Regulations on the Execution of Archaeological Fieldwork (archaeological excavations and surveys) and Compiling Scientific Report Documentation. Moscow; and
- Guidance document RD 91.010.30-KTN-170-06 Technical requirements for project documentation for construction, modernization, reconstruction, repair of trunk pipelines (as amended. Jan. 2007, 2 March 2008).

4.10.1.2 Sensitive Receptors

Copies of consultation correspondence within the Russkaya CS cultural heritage baseline reporting indicates that the design of the pipeline route from the landfall facilities to the Russkaya CS no longer corresponds to the RoW that was subject to baseline research and archaeological field survey. Therefore, a new survey of the pipeline alignment was indicated to be required (Ref. 16; Appendix, letter from the Department for the Preservation, Restoration and Operation of Historic and Cultural Values (Heritage), Administration of Krasnodar Region (Krasdnodar Krai Heritage Department) to GeoInvest LLC, Ref. 78-6145/11-01-21, dated 10.10.2011).

Sensitive receptors identified in the archaeological baseline report within the Russkaya CS footprint comprise the following (Ref. 16):

- 'Ugory Shirokaya' settlement site and a group of three burial mounds, located within the pipeline corridor immediately west of the Russkaya CS, which covers an area of 7,780.21 m². The monument is subject to state protection according to Article 18 Sections 6 and 8 of Federal Law No. 73-FZ (25.06.2002):
    - Burial mound No 1: diameter 8.7 m, height 0.6 m;
    - Burial mound No 2: diameter 6.9 m, height 0.7 m; and
    - Burial mound No 3: diameter 6.9 m, height 0.4 m.
- 'Ugory Shirokaya-1' archaeological complex which consists of a settlement, a farm / villa / homestead estate and a group of three burial mounds, located within the Russkaya CS construction footprint and covering an area of 77, 540.56 m². The monument is subject to state protection according to Article 18 Sections 6 and 8 of Federal Law No. 73-FZ (25.06.2002):
    - Burial mound No 1: diameter 4.9 m, height 1.2 m;
    - Burial mound No 2: diameter 4.8 m, height 0.2 m; and
    - Burial mound No 3: diameter 3.6 m; height 0.5 m.

The sensitivity of receptors is not explicitly noted in the Russkaya CS EIAs. However, based on the criteria set out in the **Chapter 16: Cultural Heritage** (refer to Section 16.6.3 Impact Assessment Criteria), it is judged that these sites are of high sensitivity as they are designated national monuments and are extensive and complex archaeological sites comprising multiple burials mounds or both settlement remains and burials.

4.10.1.3 Construction Phase

Impact Sources

Given that cultural heritage baseline data and information on mitigation measures is contained in a series of separate Proekt design documents (Ref. 16; Ref. 17 / 18; Ref. 19; Ref. 20), the main Russkaya CS EIA documentation (e.g. Chapters 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3) does not mention archaeology or cultural heritage. Cultural heritage is only noted briefly (Ref. 21) under Section 4.9.4 'The nature of land use: Culture heritage territories' (Ref. 2), which provides a series of facts about the number of different types of archaeological and historic monuments within Krasnodar Krai. Cultural heritage is mentioned in the Stage 1 Socio-Economic chapter (Ref. 21) Section 4.9.8 'Culture sector' (Ref. 2), which has an overview of local cultural heritage / tourism events and programmes and lists state-funded cultural institutions.

The Proekt design documents do not explicitly note the sources of impact on cultural heritage, or cross-reference the relevant appendices. However, it is considered that the following activities have the potential to damage or destroy upstanding archaeological and cultural heritage remains, surface scatters or buried, sub-surface remains:

- Construction phase ground clearance and / or ground excavation activities (such activities have the potential to damage or destroy buried archaeological deposits);
- Vehicle-related collision damage to upstanding monuments and earthworks, and rutting of the ground surface caused by vehicle wheel rutting and machine tracking; and

- The unauthorised removal of artefacts or vandalism to CHOs.

Assessment of Construction Phase Residual Impacts

The pre-mitigation cultural heritage impacts and residual impacts are not explicitly mentioned in the Proekt design documents. However, based on the criteria set out in the **Chapter 16: Cultural Heritage** (Section 16.6.3 Impact Assessment Criteria), it is considered that without mitigation, the significance of construction phase cultural heritage impacts would be High adverse.

As detailed in Section 4.10.2 of this Appendix, the Proekt design documents include a range of defined mitigation measures (including further survey, archaeological watching brief and excavation). Following the implementation of these mitigation measures, it is assessed that the significance of residual cultural heritage impacts would be reduced to Low adverse, as the loss induced by pipeline construction would be mitigated by archaeological preservation by record and offset by gains to archaeological knowledge.

4.10.1.4 Operational Phase

Russkaya CS operational phase cultural heritage impacts, mitigation measures and residual impacts for terrestrial cultural heritage are not explicitly noted in the Proekt design documents. However, it is considered that Russkaya CS operational activities will have little potential to impact on cultural heritage receptors, as such activities will take place in areas that will have already undergone ground disturbance during the construction phase and will have had mitigation measures implemented.

4.10.2 Russkaya CS Design Controls and Mitigation

Mitigation measures required by Krasnodar Krai Heritage Department for the Russkaya CS construction phase are set out in consultation correspondence (Ref. 16: Appendix, letter from the Department for the Preservation, Restoration and Operation of Historic and Cultural Values (Heritage), Administration of Krasnodar Region (Krasdnodar Krai Heritage Department) to GeoInvest LLC, Ref. 78-6145/11-01-21, dated 10.10.2011). Costed mitigation measures are set out in a separate report (Ref. 20). Defined mitigation measures comprise the following:

- Preserving sites in place by re-designing the project to avoid impacting archaeological remains; or
- Committing to undertake professional, permitted and developer-funded archaeological investigation and recording works (archaeological watching briefs and archaeological rescue excavations) in accordance with Federal Law No 73-FZ (25.06.2002) and Krasnodar region Law No. 558-CL (06.02.2003), including:
    - Archaeological excavation of 'Ugory Shirokaya' settlement site and a group of three burial mounds;
    - Archaeological excavation of 'Ugory Shirokaya-1' archaeological complex, including the settlement, farm / villa / homestead estate and a group of three burial mounds; and

  - Archaeological watching brief on intrusive groundworks; if archaeological remains are found, Krasnodar Krai Heritage Department must be informed and construction work must cease until any required archaeological investigations are completed.

- Carrying out a new archaeological survey, assessment and design of mitigation measures for the route west of Russkaya CS to identify and protect or investigate any archaeological remains within the new, re-aligned pipeline corridor.

4.10.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

As detailed above, baseline cultural heritage information and mitigation requirements are contained in a series of Proekt design documents. These documents contain appropriate information on selected tangible archaeological remains which are extensively mapped and compliant with Russian procedures and standard practice (Ref. 16 - 20) (refer to Sections 4.10.1.1 of this Appendix).

In an international context, cultural heritage is defined as '*artefacts, monuments, buildings and sites that have a diversity of values including symbolic, historic, artistic, aesthetic, ethnological or anthropological, religious, scientific and social significance*' (Ref. 22) and includes both tangible and intangible heritage (Ref. 24). Such issues are also considered in IFC Performance Standard 8 Cultural Heritage. The Russkaya CS documentation reviewed (Ref. 16 - 20) does not mention some of these wider aspects of cultural heritage such as tangible heritage with paleontological values, recent / modern cultural heritage, intangible cultural heritage (e.g. oral traditions, performing arts, religious practices, community events / celebrations, traditional lifestyles etc.).

The Proekt design documents reviewed do not consider cultural heritage in a synthetic and holistic manner, but instead analyse development impacts on specific archaeological sites with reference to federal and regional legislation and land use policy. There is no consideration of historic or cultural landscapes, or of the setting of heritage assets (Ref. 25). In addition, there is no mention of minority nationalities or indigenous peoples (e.g. IFC Performance Standard 7 Indigenous Peoples and IFC Performance Standard 8 Cultural Heritage), or whether the need for their assessment has been scoped out.

Ref. 16 – 20 indicate that consultation with the statutory authorities (Krasnodar Krai Heritage Department) was undertaken; because any consents obtained are not contained within the documentation reviewed, it is however, uncertain whether consultation, negotiation or consent has been obtained from any Affected Communities, civil society organisations, local communities, religious and / or community representatives. It is considered that a number of IFC issues which are generally related to use of living, religious and community cultural heritage sites could be scoped out of the assessment due to the nature of the CHOs and the relationship between local populations and CHOs. These issues are not covered in the Russkaya CS EIA documentation or the Proekt design documents and include:

- Maintenance of access to cultural heritage sites. The known sites identified in the Proekt design documents are tangible archaeological sites comprising prehistoric, antique and medieval period burial mounds and settlements. These sites have no strong or special

continuing association with any particular community or cultural group for social, cultural or spiritual reasons. These are not sacred sites and are not the focus of traditional beliefs and ceremonies, mainstream religious practices, secular pilgrimage or cultural identity. Severance of access to these sites would not impact either the cultural heritage sites themselves or living cultural practices, as there are no associated cultural activities;

- Maintenance of value and functionality of cultural heritage and / or ecosystem processes. It is considered that the perceived value of the cultural heritage within the development area is principally historic and scientific, rather than being of aesthetic, community / social or spiritual value for present or future generations; and
- Compensation for loss of cultural heritage. This is not applicable, as there is no current use of CHO and no requirement for closure ceremonies, relocation of religious sites etc. Compensation will be achieved through mitigation in the form of developer-funded archaeological investigations, analysis and dissemination of results.

The footprint of the Russkaya CS development, and the pipelines leading inland towards the northeast, cross the sites of a series of nationally designated kurgan burial mounds / settlement complexes. Mitigation by record (developer-funded archaeological watching brief and programmed detailed archaeological excavation) is proposed. Although this is an acceptable solution, preservation in place (avoidance) is the preferred approach to cultural heritage mitigation. The Russkaya CS documentation reviewed (Ref. 16 – 20) does not provided details regarding how such identified heritage constraints have been incorporated into the design development process. However, where there are gaps in the EIA documentation, it does not mean that such issues are not being appropriately managed by Gazprom Invest.

4.10.4 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

4.10.4.1 Combined Impacts

During the Construction and Pre-Commissioning Phase, the significance of residual cultural heritage impacts of the Project are assessed as being Not Significant or L**ow Adverse** (terrestrial **cultural heritage** features) and Not Significant to Moderate adverse (marine cultural heritage features) (refer to **Chapter 16 Cultural Heritage**). Mitigation measures include avoidance by sensitive design, microtunnelling, the recovery or relocation of two marine cultural heritage objects, terrestrial and marine archaeological watching briefs and the application of chance find procedures and cultural heritage awareness training. The Operational and Commissioning Phase of the Project will not impact upon terrestrial cultural heritage features, whilst marine cultural heritage impacts are assessed as Low adverse. Such operational impacts will be largely mitigated through avoidance by protective buffering, tether management, minimising propeller or thruster washing and avoiding ROV strikes by careful piloting.

The Russkaya CS residual impacts upon terrestrial cultural heritage features are judged to be Low adverse on the basis of the information reviewed as detailed in Section 4.10.1.3 of this Appendix. Mitigation measures will be applied including further survey, archaeological watching

brief and excavation (see Section 4.10.3 of this Appendix), and it is judged that the losses induced by excavation will be offset by gains to archaeological knowledge (Ref. 20).

The impact sources on terrestrial cultural heritage objects in the Project and the Russkaya CS sections are similar, and similar mitigation methods will be applied. Overall, it is assessed that the combined impact of the Russkaya CS and the Project are assessed as being Low adverse significance with regard to terrestrial cultural heritage features. Combined impacts upon marine cultural heritage features would be the same as those reported for the Project (refer to **Chapter 16 Cultural Heritage**), given the absence of Russkaya CS development marine archaeological impacts.

4.10.4.2 Mitigation and Management - Combined

No cultural heritage mitigation measures additional to those already defined have been indicated to be required by the combined impact assessment (refer to Section 4.10.3 of this Appendix and **Chapter 16 Cultural Heritage**).

In the interests of efficient logistics and archaeological good practice, South Stream Transport will liaise with Gazprom Invest with the aim of:

- Investigating terrestrial mitigation works (archaeological watching briefs and excavations) are either a) undertaken by the same organisation, or that b) site visits, communication and sharing results between archaeological contracting organisations is encouraged and facilitated as far as practicable. Any information gathered by archaeological contracting organisations will be shared to the benefit of the collective developments. It is important that continuity is maintained throughout the analytical stage and that archaeological teams share datasets and have access to each other's assemblages for comparison, in order to enable holistic analysis and reporting. Krasnodar Krai Heritage Department is the regional heritage regulator for both the Project and the Russkaya CS development, which will assist in harmonising mitigation works; and
- Assisting Gazprom Invest to adopt and implement additional IFC-compliant elements of cultural heritage mitigation where practicable and if not already in place – such as a systematic chance finds procedure and cultural heritage awareness training for construction staff.

Construction vehicles servicing the Project will use some of the same access routes as used by the Russkaya CS development. The design of the permanent access way to be constructed by Gazprom Invest is located in proximity to a known cultural heritage receptor (the Varvarovka Armenian cemetery (RU-TCH-07)), but its design avoids running directly alongside the cemetery (refer to **Chapter 16 Cultural Heritage**). Due to the sensitive design of the access way, this receptor will experience an impact of negligible magnitude (resulting in a residual impact of Not Significant) due to the Project. Nevertheless, the increase in traffic may result in greater cumulative impact upon cultural heritage and in order to minimise such impacts, South Stream Transport will liaise with Gazprom Invest with the aim of developing aligned and coordinated traffic management plans (see Section 4.12.4.2 of this Appendix for further details).

4.11 Waste Management

The sections below provide a summary of the construction and operational phase waste management findings as presented in the Russkaya CS EIA documents (principally Chapters 5, 6 and 7 in Ref. 2 and Chapters 6 and 7 in Ref. 3).

4.11.1 Summary of Russkaya CS Impacts - Construction and Operation

4.11.1.1 Construction and Pre-Commissioning Phase

The Russkaya CS EIA documentation estimates the types and quantities of waste to be generated during the main construction works, using the Russian Federal Waste Classification Catalogue (FWCC) (refer to **Chapter 18 Waste Management** for a description of the FWCC). Waste generation data are summarised in Table 4.15.

Table 4.15 Construction Waste Generation Associated with Main Russkaya CS Construction Works (Ref. 3)

Waste Designation	Source of Waste	FWCC Code	Waste Generated (tonnes)	Waste Transferred for Recycling or Treatment (tonnes)	Waste Landfilled (tonnes)
II hazard category					
1. Lead storage batteries (spent undamaged, with undrained electrolyte)	Operation of motor vehicles and construction machinery	9211010113012	8.75	8.75	-
Total for II hazard category:			*9*	*9*	
III hazard category					
2. Spent engine oils	Operation of road transport and construction equipment	5410020102033	114.62	114.62	-
3. Spent transmission oils	Operation of road transport and construction equipment	5410020602033	109.63	109.63	-

Continued…

Waste Designation	Source of Waste	FWCC Code	Waste Generated (tonnes)	Waste Transferred for Recycling or Treatment (tonnes)	Waste Landfilled (tonnes)
4. Solid waste - industrial materials contaminated with oil and mineral fat products (used oil filters)	Operation of road transport and construction equipment	5490300003	2.63	2.63	-
Total for III hazard category:			*227*	*227*	
IV hazard category					
5. Materials contaminated by oils (oil content less than 15%)	Operation of road transport and construction equipment	5490270101034	3.26	-	3.26
6. Tyres	Operation of road transport and construction equipment	5750020413004	18.672	18.672	-
7. Worker footwear	Replacement of work footwear	1470060113004	5.872	-	5.872
8. Welding slag	Welding	3140480001994	0.322	0.322	-
9. Domestic trash (excluding large-size items)	Activities of employees	9120040001004	234.867	-	234.867
10. Waste generated by employees	Activities of employees	911001000	1,056.90	-	1,056.90
11. Construction trash	Construction work, dismantling of temporary structures	9120060001004	35,860.80	-	35,860.80

Continued…

Waste Designation	Source of Waste	FWCC Code	Waste Generated (tonnes)	Waste Transferred for Recycling or Treatment (tonnes)	Waste Landfilled (tonnes)
12. Waste (sediment) from septic tanks and domestic sewage	Work execution	95100000004	27,446.37	27,446.37	-
13. Wastes and scrap - ferrous metals with impurities or contaminated by hazardous substances (packaging waste from paintwork material)	Paint/varnish work	3515000001000	1.322	-	1.322
14. Wastes and scrap - ferrous metals with impurities or contaminated by hazardous substances (packaging waste from bitumen)	Insulation	3515000001000	9.806	-	9.806
Total for IV hazard category:			*64,638*	*27,465*	*37,173*
V hazard category					
15. Timber wastes	Clearing the construction site of forest growth	1730010101005	1,044.57	-	1,044.57
16. Mineral waste (drill cuttings and spent drilling mud)	Drilling operations	3100000000	30.7	-	30.7

Continued…

Waste Designation	Source of Waste	FWCC Code	Waste Generated (tonnes)	Waste Transferred for Recycling or Treatment (tonnes)	Waste Landfilled (tonnes)
17. Excavated soil - not contaminated by hazardous substances	Dismantling of temporary structures	3140110008995	428,469.50	-	428,469.50
18. Residues from welding electrodes	Welding work	3512160101995	0.0161	0.0161	-
19. Polyethylene film waste	Dismantling work, unpacking of equipment	5710290201995	532.106	-	532.106
20. Polypropylene film waste	Unpacking of equipment	5710300201995	1,513.49	-	1,513.49
21. New polyethylene packaging (damaged)	Unpacking of equipment	5710290313995	557.015	-	557.015
22. Rubble - reinforced concrete products, reinforced concrete	Dismantling work	3140270201995	2,233.62	-	2,233.62
23. Scrap - ferrous metals (uncontaminated)	Dismantling work	3513020001995	33.1	33.1	-
24. Mixed fabrics	Replacement of work outfits	5810110801995	28.184	-	28.184
25. Wooden packaging (non-returnable containers)	Construction work	1711050213005	2,638.39	-	2,638.39

Continued…

Waste Designation	Source of Waste	FWCC Code	Waste Generated (tonnes)	Waste Transferred for Recycling or Treatment (tonnes)	Waste Landfilled (tonnes)
26. Waste packaging board (uncontaminated)	Construction work	1871020201005	487.037	-	487.037
27. Food wastes from the kitchens and catering companies	Preparation of food	912010010	42.981	-	42.981
Total for V hazard category:			*437,611*	*33*	*437,578*
Total			*502,485*	*27,734*	*474,750*

Complete.

Table 4.15 illustrates that a total of approximately 500,000 tonnes of waste is estimated to be generated by the Russkaya CS construction works, the vast majority of which (428,000 tonnes) comprises inert, non-contaminated excavated soil. A total of 236 tonnes of waste falls into one of the top three hazard categories (I to III in the FWCC classification system), all of which is reported to be subject to reuse or recovery.

The Russkaya CS EIA documentation reports that waste will be managed either at Ecobio, or at Alpha landfill - these are the same facilities which have been identified as potential management facilities for waste generated by the Project (refer to **Chapter 18 Waste Management**).

Alfa landfill is not designed or operated as an engineered landfill, and hence this has been identified as being a potentially unsuitable facility for the Project (**Chapter 18 Waste Management**). However, the wastes that require landfill disposal are non-hazardous and relatively small in quantity (typically less than 1,000 tonnes per waste stream). Alfa landfill is due to be replaced once it ceases operation in 2016, and thereafter the replacement landfill would be an engineered facility (although its location is yet to be confirmed by the local government). In the event that any Russkaya CS wastes are deposited at Alfa landfill, the impacts are not expected to be significant since the wastes are non-hazardous, and those wastes arising from the development would form only a very small proportion of the overall waste disposed of at Alfa, such that they would not significantly increase any existing environmental impacts associated with the site.

Based on the review of the Russkaya CS EIA documentation (Chapters 5, 6 and 7 in Ref. 2 and Ref. 3), the waste management impacts of Russkaya CS development are not anticipated to be significant given that:

1. Quantities of hazardous waste are very small and suitable facilities are available in the region for management of such wastes; and
2. Quantities of other waste (excluding uncontaminated soil) are small, and well within the capacity of existing regional facilities to accommodate.

This assessment is based on the assumption that South Stream Transport and Gazprom Invest will not both place all of their respective projects' uncontaminated soil in the Alfa landfill and that the Russkaya CS developers have identified suitable facilities or beneficial uses for the large quantities of uncontaminated soil that will be generated. Disposal of such material is generally straightforward and is unlikely to give rise to significant environmental impacts given that it can typically be used either as fill in other construction projects, for backfilling of quarries, or for capping and restoration of landfill sites.

4.11.1.2 Operational Phase

The Russkaya CS EIA documentation describes the estimated types and quantities of waste to be generated during facility operation using the FWCC (see Table 4.16). Wastes marked with an asterix (*) are proposed to be incinerated in an on-site incineration facility that will be provided as part of the Russkaya CS development.

Table 4.16 Russkaya CS Operational Waste Generation

Type of Waste	FWCC Code	Source of Waste	Waste Generation (tonnes/year)
Production waste			
Hazard category III waste			
Waste from emulsions and mixtures of oil products	544 000 00 00 00 0	Pig receiving point, gas treatment plant, GTU gas treatment units	36.381*
Material contaminated with oil (oil content of 15% or more)	549 027 01 01 03 3	CS, MRS, PISN, CS equipment maintenance	0.180*
Synthetic and mineral oil waste	541 002 00 02 00 0	CS, gas pumping units' oil supply system, drainage containers	7.560*
Slurry from cleaning pipes and tanks (barrels, containers, cisterns, bitumen sprayers) containing oil and oil products	546 015 00 04 03 0	CW, drainage containers, EDPS, diesel fuel storage tanks, diesel fuel jettisoning tanks, cleaning oily waste collection containers	0.083*

Continued…

Type of Waste	FWCC Code	Source of Waste	Waste Generation (tonnes/year)
Turbine oil waste	541 002 12 02 03 3	CS, gas pumping units' oil supply system	1.752*
Sludge from oil separation plants	546 003 00 04 03 3	CW, gas pumping units' oil supply system, cleaning the oil from the mechanical impurities and water	0.033*
Remnants of diesel fuel	541 011 00 02 03 3	EDOS, diesel fuel jettisoning tanks	2.200*
Spent engine oil	541 002 01 02 03 3	PISN, oil supply system for units	14.130*
Waste lube oil	546 002 00 06 03 3	WWTP for surface waste water ("KOU-20D"), waste water treatment	0.061*
Total for III hazard category waste:			*0*
Waste of hazard class IV			
Abrasive dust and powder from grinding and polishing of ferrous metals (metal content of less than 50%) (abrasive-metal dust)	314 003 00 11 00 4	Repair shop, tooling of parts on a grinder	0.02
Waste steel (including steel dust)	351 201 11 01 00 4	Repair shop, tooling metal on metal-working machines	0.055
Complex combined waste (products, equipment, devices not included in other items)	920 000 00 00 00 0	PISN, oil supply system for units	0.273
Waste from non-halogenated organic solvents and their mixtures	553 000 00 00 00 0	PIN, cooling system	3.288*
Paper and cardboard waste	187 000 00 00 00 0	MRS, warehouse operations	0.060*
Waste (sediment) from waste water treatment (not included in other items)	948 000 00 00 00 0	WWTP for surface waste water ("KOU-20D"), waste water treatment	4.766

Continued...

Type of Waste	FWCC Code	Source of Waste	Waste Generation (tonnes/year)
Waste (sediment) from mechanical and biological treatment of waste water	943 000 00 00 0 0	WWTP for household waste water ("KOU-20D"), household waste water treatment	11.750*
Ash, slag and flue dust (from furnace plant and thermal treatment of waste)	313 000 00 00 00 0	Thermal waste disposal unit KTO-50	4.263
Total waste of hazard class IV:			*9.377*
Waste of hazard class V			
Spent abrasive disks, spent abrasive disks	314 003 02 01 99 5	Repair shop, tooling of parts on a grinder	0.007
Total hazard class V waste:			*0.007*
Total production waste:			*9.384*
Consumption waste			
Hazard category I waste			
Mercury lamps, fluorescent tubes containing mercury	353 301 00 13 01 1	Energy service, changing spent mercury-containing lamps	0.062
Total for I hazard category waste:			*0.062*
Waste of hazard class IV			
Domestic waste (excluding large-size items)	912 004 00 01 00 4	CS operation	14.85
Total waste of hazard class IV:			*14.85*
Waste of hazard class V			
Food waste from kitchens and catering companies (unsorted)	912 010 01 00 00 5	Operation of the canteen	4.632*
Municipal solid waste	910 000 00 00 00 0	CS grounds maintenance	58.2
Total hazard class V waste:			**58.2**

Continued…

Type of Waste	FWCC Code	Source of Waste	Waste Generation (tonnes/year)
Total consumption waste:			**73.112**
Total for CS "Russkaya":			**82.496**

Complete.

Table 4.16 indicates that less than 200 tonnes of waste per year is estimated to be generated during operation of the Russkaya CS facility, of which approximately half will be incinerated in an on-site incinerator provided as part of the development (reported to be "of KTO-50 type"). Details of the design and operation (including atmospheric emissions) of this incinerator are not reported in the Russkaya CS EIA documentation.

The disposal routes for the remaining residual waste are described in the Russkaya CS EIA documentation. Although the actual facilities to be used are not specified (since it will depend on which facilities are operational at the time of waste generation), the EIA documentation demonstrates that there are facilities within the region at present which are capable of accepting all wastes that will be generated during Russkaya CS operation.

Based on the details provided in the Russkaya CS EIAs, the waste management impacts of Russkaya CS operation are not anticipated to be significant since the quantities of waste anticipated to be generated are indicated to be very small (in comparison to the construction phase). This assessment assumes that the incinerator to be used at the Russkaya CS is designed and operated in accordance with GIIP.

4.11.2 Russkaya CS Design Controls and Mitigation

The Russkaya CS EIA documentation reviewed (principally Chapters 5, 6 and 7 in Ref. 2 and Ref. 3) sets out procedures for handling and temporary storage of waste in accordance with Russian regulations and which generally reflect GIIP. Specific construction and operational phase mitigation measures to be applied include the following:

- Use of suitably licenced recycling and disposal facilities;
- Provision of adequate temporary storage facilities for waste awaiting collection, in compliance with relevant Russian standards, and which include measures to prevent contamination of soil, water or air;
- Use of proper storage receptacles which are appropriate for the material being stored; and
- Prohibition of mixing of wastes during transport.

4.11.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

The quantities and types of waste estimated to be generated by the Russkaya CS are typical of general construction and industrial developments. The development is not predicted to generate

large quantities of hazardous waste, nor any waste types which would pose any particular difficulties in handling or management.

IFC Performance Standard 3 requires that facilities managing hazardous wastes are operated in accordance with GIIP, whilst the IFC EHS Guidelines for Waste Management provide specific guidelines on the performance of waste incinerators (including examples of emissions standards). Since the reviewed Russkaya CS EIA documentation does not include full details of the proposed incinerator, it is unclear if it will conform with the IFC EHS Guidelines for Waste Management Facilities.

Although the reviewed Russkaya CS EIA documentation does not specify the route for uncontaminated soil that will be generated from excavations during the construction phase, this material is inert and hence the associated environmental risks are considered to be small; there are likely to be a range of potential outlets in the region.

4.11.3.1 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

Chapter 18 of this ESIA Report included an assessment of waste management impacts arising from the Project waste streams that will be produced during the Construction and Pre-Commissioning Phase, and during the Operational Phase. The chapter indicates that residual waste impacts would generally be Negligible or Low Adverse following the implementation of comprehensive waste management procedures within the Environmental and Social Management Plan (ESMP). However, **Chapter 18 Waste Management** indicates that the main regional landfill site (Alfa landfill) is not designed or operated as an engineered landfill in accordance with GIIP, and hence has been identified as being a sub-optimal waste disposal facility. As a result, any Project waste disposed at the Alfa landfill would result in a Moderate Adverse impact (due to waste disposal in an unlined landfill). As indicated above, Alfa landfill is due to be replaced once it ceases operation in 2016, and thereafter the replacement landfill would be used by the Project which is expected to be an engineered facility. In the event that any Project wastes are deposited at Alfa landfill, the impacts are not expected to be environmentally significant. This is the case since the Project wastes that require landfill disposal are non-hazardous, whilst the waste quantities arising from the Project are relatively small (typically less than 1,000 tonnes per waste stream) and would form only a very small proportion of the overall waste disposed of at Alfa, such that they would not significantly increase any existing environmental impacts associated with the landfill site.

As detailed in Sections 4.11.1.1 and 4.11.1.2 of this Appendix, waste impacts associated with the Russkaya CS construction and operation are not anticipated to be significant. It follows that the combined impacts of waste resulting from the Russkaya CS development and from the Project are not anticipated to be significant. This is the case given that the existing waste infrastructure in the region has the capacity to manage wastes from both developments. This assessment is based on the assumption that a suitable outlet will be identified for the uncontaminated soil from Russkaya CS construction works; and that the Russkaya CS incinerator will be designed and operated in accordance with GIIP as described in IFC EHS Guidelines for Waste Management Facilities.

4.11.3.2 Mitigation and Management - Combined

The individual mitigation and management measures defined for the Project (**Chapter 18 Waste Management**) and the Russkaya CS development (see Section 4.11.2 of this Appendix) are considered to be adequate. Each development will manage their waste streams separately and in accordance with Russian regulations.

South Stream Transport will engage with Gazprom Invest to investigate the potential beneficial use of inert materials (soils / rock) generated by the Project and the Russkaya CS development. South Stream Transport will investigate whether the Russkaya CS incinerator will be designed and operated in accordance with GIIP.

South Stream Transport will engage with Gazprom Invest regarding their waste management monitoring and audit proposals (e.g. auditing of waste management facilities being used) and to illustrate operations in accordance with GIIP.

4.12 Land-based Traffic and Transportation

4.12.1 Summary of Russkaya CS Impacts - Construction and Operation

The sections below provide a summary of the construction and operation phase traffic and transportation findings as presented in the Russkaya CS EIA documents (principally Chapters 5, 6 and 7 in Ref. 2 and Chapters and 7 in Ref. 3).

4.12.1.1 Construction and Pre-Commissioning Phase

The Russkaya CS EIA documentation highlights that transport vehicles will be used during the construction phase to transport industrial equipment, pipes, soil, construction cargo, labourers, to dispose of waste for storage and recycling etc. However, the EIA documentation does not provide specific details regarding construction traffic volumes, transportation routes, and associated management activities. The Russkaya CS EIA documentation does, however, highlight the potential for construction traffic to impact upon air quality, noise, and to impact upon sensitive ecological receptors and the water environment.

The Russkaya CS EIA documentation recognises that the delivery of appropriate building materials will increase the intensity of traffic on the local road network and thus that construction activities will increase road transport cargo turnover during the construction period and result in potential additional profits for shipping enterprises. The EIA documentation states that there will be resultant positive socio-economic effects both for the district and for regional organisations (depending on where the orders will be placed) (see Section 4.9.1 of this Appendix).

Apart from constructing an access road to the construction site, the Russkaya CS EIA documentation does not provide specific details regarding consideration given to the impact of construction traffic on the surrounding highway network, vulnerable road users (such as pedestrians in the two settlements through which the construction route passes– namely Gai-Kodzor and Rassvet). The Russkaya CS EIA does not specifically identify expected levels of

construction traffic using the local highway network, including traffic using the route from the Russkaya CS construction site to the M25 at Rassvet.

Following the start of Russkaya CS construction activities, the condition of the road passing through Gai-Kodzor suffered serious deterioration (during the period from December 2012) due to the movement of heavy trucks delivering construction materials to and from the Russkaya CS construction site. As a result, the Russkaya CS development took the responsibility for the repair of the main road through Gai-Kodzor, and the design and construction of a bypass road to be used by construction traffic. The new bypass was completed and was operational in May 2013.

4.12.1.2 Operational Phase

The Russkaya CS EIA documentation does not provide specific details regarding operational traffic data. However, given the nature of the Russkaya CS facility, it is anticipated that operational traffic levels will be low.

4.12.2 Russkaya CS Design Controls and Mitigation

The Russkaya CS EIA documentation does not contain specific details of traffic related mitigation measures to be adopted during the construction phase (e.g. construction traffic management plans etc.). However, as indicated in the sections above, following the start of construction activities, it became necessary to design and construct a bypass road to remove construction traffic from Gai-Kodzor. In addition, it is understood that repairs have been undertaken to reinstate the road through Gai-Kodzor and maintain the road through Rassvet which is suffering damage that is likely to be attributable to the increase in the number of large trucks travelling through the settlement.

The Russkaya CS EIA provides details of mitigation measures to be applied that aim to minimise the potential for environmental impacts associated with construction traffic. Mitigation measures included in the Russkaya CS EIA documentation include the following:

- Banning the washing of cars and machinery outside specially allocated areas in order to protect water resources;
- In defined water conservation zones it is prohibited to fuel, wash and repair cars, tractors and other vehicles and machinery; or to arrange parking of transport vehicles;
- Banning of traffic, particularly tracked vehicles off roads in order to reduce the mechanical load on soil and vegetation; and
- Waste transportation will be performed in a manner that prevents the possible loss of waste (e.g. specially equipped and specially marked transport vehicles; compliance with the requirements on safety for transportation of waste by transport vehicles).

4.12.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

The Russkaya CS EIA documentation does not provide specific details of construction phase traffic impacts upon the surrounding highway network and the potential impacts upon

vulnerable road users (including impacts upon road safety and community severance) which are considerations related to IFC Performance Standard 4.

4.12.4 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

4.12.4.1 Combined Impacts

Appendix 9.1 Traffic and Transport Study indicates that the Project has the potential to increase traffic flows on some transportation links during the Construction and Pre-Commissioning Phase. Once the Project is operational, traffic will be limited to servicing and maintenance vehicles - such low levels of traffic will not have a traffic impact.

Appendix 9.1 indicates that during the Construction Phase, the Project will generate traffic arising from the transportation of materials from a Russian Black Sea port. Pipes and equipment that are required for the landfall section will be delivered by existing roads to a point north of Gai-Kodzor. The temporary bypass constructed for heavy construction vehicles to avoid this community will be used both by the vehicles related to the construction of the Russkaya CS development and by Project vehicles. Workers may also have to be transferred to / from Anapa on a daily basis if they are accommodated in Anapa. There will also be a need to export excavated material that is not suitable as fill material, and to import suitable fill material, if needed. The construction traffic has been estimated for a range of Project activities which indicates that over the predicted 27 month duration of the contract, there will be a total of over 110,000 traffic movements which averages at approximately 4,300 movements per month or 178 per day. In terms of vehicle kilometres travelled by construction related traffic, a significant portion of trips will occur on the M25 either west or east of Rassvet. The geometry of the M25 and the current traffic flows are such that it is a satisfactory route to be used by construction traffic. Traffic flow impacts associated with construction traffic travelling between the junction on the M25 at Rassvet and the landfall site will be partially negated by the provision of the bypass around Gai-Kodzor and the proposed access road from the south of that settlement to the landfall site, which means that to the south of Rassvet the heavy construction traffic will avoid locations where there may be sensitive receptors.

The section of the road the M25 at Rassvet and the northern end of the temporary construction bypass of Gai-Kodzor could experience increases in traffic flow due to the Project of up to 30% with an increase in the number of heavy construction vehicles approaching 200%.

It is noted that the road through Rassvet already carries appreciable levels of heavy goods vehicles associated with the construction works of the Russkaya CS development. Therefore, the traffic associated with the Project will be an extension of an existing impact, rather than the introduction of a new impact. The Project traffic assessment concludes that with the provision of the construction traffic bypasses, the highway network is capable of accommodating the additional traffic without there being any perceptible impact on other road users with the exception of the section of route that runs through Rassvet.

Project construction activities will be taking place at the same time as Russkaya CS construction activities. Whilst the Russkaya CS EIA documentation does not provide traffic figures, the traffic surveys that were undertaken for the Project in August 2013 to provide baseline data included a

count of vehicles entering and leaving the bypass to the north of Gai-Kodzor (surveys were undertaken on a Tuesday, Thursday and Saturday and for each day the count continued from 06:00 to 20:00). The total number of vehicles using the Gai-Kodzor bypass, that is the sum of vehicles travelling both to and from the Russkaya CS construction site, for the three days was 827 (92%), 209 (64%), and 719 (93%) respectively. The figures in brackets show the proportion of vehicles that were trucks.

Although the Russkaya CS construction traffic bypasses Gai-Kodzor, it still passes through Rassvet. The main road through Rassvet includes a number of sensitive receptors including a kindergarten, whilst a school is located just off the main road. The changes to traffic through Rassvet has been considered using the traffic data that was collected at the northern end of the temporary Gai-Kodzor bypass. Considering the two survey days when the construction traffic was higher (Tuesday and Saturday), the overall increase in traffic that appears to be related to the construction of the Russkaya CS was between 15% and 17%. However, the increase in the number of larger trucks (that is with three or more axles) is very high, with 459% recorded on the Tuesday and 710% recorded on the Saturday. The proportional increase in traffic will be diluted to some extent in that the surveys were undertaken in August, a period when traffic flows on these roads are inflated by holiday traffic. The absence of any details regarding the profile of the volume of construction traffic during the building of the Russkaya CS means that it is not possible to establish how typical these flows are for the remainder of the construction phase.

Given the details as presented above, it is considered that concurrent construction of the Project and the Russkaya CS will increase traffic in particular the number of construction trucks on some transportation links. Of most concern are traffic flows through Rassvet which is already experiencing traffic flow increases associated with Russkaya CS construction vehicles. The additional presence of traffic associated with the Project has the potential to increase traffic impacts through Rassvet and to extend the period over which such traffic impacts are experienced.

Combined traffic impacts are not anticipated during the concurrent operational phases, given the anticipated low levels of traffic associated with Project and Russkaya CS maintenance and inspection activities.

4.12.4.2 Mitigation and Management - Combined

The Project includes a range of mitigation measures that aim to minimise the environmental and social consequences of traffic flows, including the impacts associated with traffic increases through Rassvet (as set out in Appendix 14.1 Health and Safety Report).

Given that Project and Russkaya CS construction traffic pass through Rassvet, South Stream Transport traffic safety monitoring programme will capture vehicle movements and community consultation relating to both projects in the Rassvet area, the results of which will inform the need for further traffic safety mitigation measures.

4.13 Ecosystem Services

4.13.1 Summary of Russkaya CS Impacts - Construction and Operation

The Russkaya CS EIAs were completed to Russian national standards which do not require the consideration of ecosystem services. Thus the Russkaya CS EIA documentation does not make specific reference to, or assess impacts upon, ecosystem services.

4.13.2 Russkaya CS Design Controls and Mitigation

The Russkaya CS EIAs do not include mitigation measures that are specific to ecosystem services. However, the Russkaya CS EIA mitigation measures as detailed in Sections 4.2 through 4.12 will assist in mitigating potential ecosystem service impacts.

4.13.3 Russkaya CS EIA Assessment Gaps and Benchmarking Against IFC Performance Standards

Given that the Russkaya CS EIAs were not prepared with reference to IFC Performance Standards requirements, ecosystem services were not considered (a requirement of IFC Performance Standard 6).

4.13.4 Combined Impacts of Russkaya CS and Project Development and Combined Impact Management

4.13.4.1 Appraisal of Potential Russkaya CS Development Impacts on Ecosystem Services

Whilst the Russkaya CS EIAs did not include an ecosystem service assessment, information presented in the EIA documentation can be used to inform a qualitative appraisal of potential ecosystem service issues. The sections below use the data presented in the Russkaya CS EIAs to assess likely ecosystem service impacts due to Russkaya CS construction and operation taking account of defined mitigation measures.

4.13.4.2 Russkaya CS Construction Phase

- **Crops:** The total area of land required for the Russkaya CS development is estimated to be approximately 111.3 ha including 21.9 ha used for agriculture (see Table 4.11 of this Appendix). Following mitigation, the Russkaya CS EIA documentation estimates (Ref. 2 and 3) that the residual impact on agriculture would be negligible given that: damage will be compensated in accordance with Russian law; some impacts will be temporary; and upon completion of construction, some land will be recultivated and returned to the land users in a condition suitable for agriculture.
- **Water (Supply):** The main impacts on water resources during the Russkaya CS development construction include disruption of the natural runoff due to activities such as

vegetation clearing, soil compaction, and changes to surface water courses; and the use of water for the needs of construction activities, hydrotesting, and consumption (see Section 4.2.1 of this Appendix). Sources include a water supply from a nearby settlement for industrial needs and bottled water for potable water. Hydrotest water will be sourced from the Maskaga River and tankered to the site. It is estimated that the rate of water withdrawal from the Maskaga River will be significantly below the natural water flow rate so that impacts on water supply would be avoided. The mitigation measures identified in the Russkaya CS EIAs broadly align with those identified by the Project (as defined in **Chapter 8 Soil, Groundwater and Surface Water**) (including restoration of vegetation and the natural drainage system). The implementation of such measures have the potential to minimise the Russkaya CS development impacts upon water supplies.

- **Global Climate Regulation:** The Russkaya CS EIA documentation does not include details of GHG emissions during the construction phase. However, given the nature of the development, the extent of vegetation clearance (which, in addition to releasing GHGs will also reduce the ability of ecosystems to sequester and store carbon), and the energy requirements for construction, it is anticipated that the Russkaya CS development has the potential to result in GHG emissions greater than 25,000 tonnes of CO_2-equivalent annually during construction (see Section 4.4 of this Appendix).

- **Hazard Regulation:** Construction of the Russkaya CS will impact soil properties and groundwater regimes through activities such as clearing of forest and wetland surfaces; soil compaction; embankment filling; arranging culverts; and fortifying watercourses on construction sites (see Section 4.2.1 of this Appendix). Flooding and waterlogging may also occur due to issues such as the clogging of drainage structures. Flooding of adjacent areas may occur due to disruption of the hydrological regime due to the construction of roads, embankments, and other facilities. A number of mitigation measures are set out to minimise the impact on hazard regulation (see Section 4.2.2 of this Appendix).

- **Air Quality Regulation:** During construction, air quality may be affected due to exhaust fumes from internal combustion engines; operation of construction machinery and vehicles; welding and insulation; applying paint and varnish; natural gas discharges during commissioning activities; and when transporting bulk materials (gravel, sand, and gravel). The Russkaya CS EIA concludes that, if the technical operational conditions are complied with, pollutant emissions produced by construction activities should not cause considerable deterioration in atmospheric air quality and thus will not significantly impact on the living conditions in the areas adjacent to the construction sites (see Section 4.3.1 of this Appendix).

- **Water Quality Regulation:** The disposal of wastewater into natural water courses and accidental leaks and spills could impact on water quality. In order to minimise the likelihood of adverse impacts a number of mitigation measures are set out in the Russkaya CS EIAs, such as preventing the discharge of fuels and lubricants into water, and preventing washing and parking of vehicles within the floodplain (particularly the River Sukko) (see Section 4.2.2 of this Appendix). Based on this mitigation, the Russkaya CS EIA documentation concludes that construction is not likely to have a substantial impact on water quality or aquatic organisms.

- **Disease and Pest Control:** The introduction of pathogens and pests during the creation of field camps can have a negative impact on the existing capacity of ecosystems to regulate the spread of diseases. Intense haulage and development of communal facilities increases the probability of rats and mice being introduced. Creation of favourable food and protective conditions for rodents is likely during construction. If they reproduce in large numbers and come into contact with residential complexes, an increased risk of human exposure to epizootics (e.g. tularaemia, leptospirosis) could result. Furthermore, damage to individual trees by machinery, storms, flooding, failure to observe the rules of felling, brush disposal etc. can give rise to outbreaks of insect pests and forest diseases. There is also an increased risk of diseases and pests in clearings, timber depots, as well as in areas of flooding, storm damage and fires. The risk of introducing and facilitating the spread of invasive pests and diseases will be controlled through appropriate mitigation measures (see Section 4.6 of this Appendix).

- **Soil Quality Regulation:** Construction of the Russkaya CS may impact on soil quality regulation through: leaks and spills; soil compaction; clearance of vegetation within the construction area; selective removal and storage of topsoil by bulldozers (for further land recultivation); placing fertile layers of soil in piles at topsoil storage sites; excavation and backfill of earthen trenches for laying of utility lines; and earth moving by bulldozers etc. (see Section 4.2.1 of this Appendix). The Russkaya CS EIAs set out a number of mitigation measures to minimise impacts on soil quality (see Section 4.2.2 of this Appendix).

- **Tourism and Recreation Values:** Although no assessment of the impact on tourism and recreation was included in the Russkaya CS EIAs, given that the Russkaya CS development is set well back from the coastline and does not impact upon the marine environment, it is anticipated that the Russkaya CS development is unlikely to exacerbate local tourism impacts. Nevertheless, the Russkaya CS development will increase the industrial nature of the area in the immediate vicinity of the facility (see Section 4.9 of this Appendix).

- **Cultural and Spiritual Values:** The Russkaya CS documentation reviewed identifies objects of archaeological heritage which could be damaged or disturbed (see Section 4.10.1 of this Appendix). The objects of archaeological heritage are valuable from the point of view of history, archaeology, anthropology and culture. Recommendations are described for the protection and recovery of cultural heritage objects and archaeological monuments located within 500 m of the survey strip and within the boundaries of the RoW (see Section 4.10.2 of this Appendix). The sites have no strong or special significance for any particular community or cultural group for social, cultural or spiritual reasons. The sites of cultural or archaeological heritage identified are not sacred sites and are not the focus of traditional beliefs and ceremonies, mainstream religious practices, secular pilgrimage or cultural identity. As such, the value of the cultural heritage within the development area is considered to be principally historic and scientific, rather than of aesthetic, community / social or spiritual value for present or future generations (see Section 4.10 of this Appendix).

- **Wild Species Diversity:** Animals may be impacted during the Russkaya CS development construction phase, due to impacts upon their habitats, as well as direct impacts by construction equipment (see Section 4.6.2 of this Appendix). The main types of impacts on habitat during Russkaya CS construction are: habitat destruction; mechanical disturbances

caused by transport movements and earthworks; contamination of the vegetation cover by runoff and construction site wastewater; accidental spillage of oil products and fuel / lubricants; and emission of pollutants into the atmosphere from construction vehicles and machinery. In addition, during the construction phase, some animals may be subject to disturbance. If construction is carried out during the breeding season, the disturbance of the annual breeding cycle of animals within the zone of impact of construction could affect the population and the annual productivity of species present. Following the implementation of defined mitigation measures (see Section 4.6.3 of this Appendix), the Russkaya CS EIAs consider that construction activities will not cause much harm to animal populations; however, some negative impacts may be felt due to increased disturbance which could impact on the ability of people to observe animals in the area or undertake hunting etc. Further, the Russkaya CS EIAs do not explicitly identify residual impacts on individual species receptors following the implementation of defined mitigation measures (see Section 4.6 of this Appendix).

4.13.4.3 Russkaya CS Operational Phase

- **Water Supply:** During operation of the Russkaya CS, water will be required for household and potable uses and for dealing with potential fires. The water supply for the Russkaya CS facility is stated to be from two wells (duty and standby). The exact location of wells and the associated source protection zone are not specified in the EIA documents, nor is the impact of the supply wells on groundwater resources or those who use them (see Section 4.2 of this Appendix)**.** It is assumed that the Russkaya CS use of water supply wells will be undertaken in compliance with local regulatory authority requirements in a manner that does not adversely impact upon groundwater resources.

- **Global Climate Regulation:** The Russkaya CS EIA documentation does not estimate operational phase GHG emissions. However, as detailed in Section 4.4 of this Appendix, operational total annual GHG emissions from Russkaya CS operation have been estimated herein which equate to approximately 0.3% of the Russian Federation's annual GHG emissions.

- **Water Quality Regulation:** The Russkaya CS EIA documentation highlights that during facility operation, impacts on water quality and water resources may occur due to water use and the discharge of treated wastewater. However, separate sewer systems for domestic, industrial and rain water will be provided. Wastewater will be collected and treated. Collected rain water will be re-cycled as irrigation water, directed to fire protection water storage tanks, and any excess will be discharged to surface water. Treated domestic and industrial water will be discharged to surface water courses. Monitoring of waste water quality at the point of surface water discharges will be undertaken to demonstrate regulatory compliance (see Section 4.2 of this Appendix).

- **Air Quality Regulation:** During the Russkaya CS development operation phase, the main sources of air impacts will be exhaust gases from gas turbines, heating units and heaters. In addition there will be small, temporary emissions from tanks with oil products and the emergency diesel power station. When conducting planned inspections and repairs, there will also be sporadic emissions of natural gas into the atmosphere emitted through special vent stacks in main and auxiliary equipment. Based on the results of pollutant dispersion

modelling, the Russkaya CS EIAs conclude that, if the technical operational conditions are complied with, atmospheric emissions produced should not cause considerable deterioration in atmospheric air quality (or the ability of ecosystems to assimilate and regulate pollutant levels) and will not significantly impact on the living conditions in the areas adjacent to the site (also see Section 4.3.1 of this Appendix).

4.13.4.4 Combined Impacts

Taking into account the ecosystems services impact of the Project as reported in **Chapter 17 Ecosystem Services** and the details as presented in Sections 4.13.4.2 and 4.13.4.3 above, a qualitative appraisal has been undertaken as based upon professional judgement in order to identify where potential combined impacts could occur. This appraisal has identified the following:

- **Global Climate Regulation:** The Project has an ability to increase GHG emissions due to vegetation clearance and emissions generated by fuel combustion during construction activities. The concurrent construction of the Project and the Russkaya CS will increase GHG emissions. During the operational phase, the combined Russkaya CS and Project GHG emissions will be dominated by emissions from the Russkaya CS.

- **Wild Species Diversity:** Both the Project ESIA and the Russkaya CS EIAs identify the potential for significant impacts to herpetiles during construction activities, including potential direct mortality or injury, loss of habitat and habitat severance (see Section 4.6.5 of this Appendix). This includes impacts to a range of RDB species, including Nikolski's tortoise which has been identified as a component of Critical Habitat. The mitigation measures proposed for the Project within the ESIA will reduce the residual impact of construction of the Project on herpetiles such that impacts are Not Significant. The Russkaya CS EIA proposes a number of measures that are anticipated to reduce mortality and injury to herpetiles, reduce damage to their habitat, and for a portion of the affected areas, replace lost habitat (see Section 4.6.3 of this Appendix). No measures are, however, proposed to reduce the impact of severance posed by the GPI Permanent Access Road. Measures to exclude herpetiles from construction areas are also not currently proposed. Due to the high sensitivity of this receptor and the interest from the global conservation community, there could thus be a combined impact on this species and those who value it. As such, Section 4.6.6 of this Appendix considers options for the alignment of ecological mitigation measures between the Russkaya CS development and the Project, including avoiding impacts (mortality and injury) to herpetiles and reducing the impact of habitat severance

In addition to the services discussed above, there are a number of potential ecosystem services provided by natural habitats in the area. These include use of forest resources and natural habitats for collection of wild foods, hunting, medicinal plants, timber, fuel wood, and ornamental resources. Impacts on such services were scoped out of the ecosystem services assessment within the Project ESIA (**Chapter 17 Ecosystem Services**) principally due to the small extent of habitat loss resulting from Project activities relative to the extent of habitat in the surrounding area. As set out in Table 4.11 in Section 4.6 of this Appendix, the Project will require approximately 65.1 ha of vegetation clearance, the majority (approx. 82%) of which is land used for agricultural use. Impacts on access to forest resources are thus not considered to

be significant. However, the Russkaya CS will entail the clearance of approximately 111.3 ha of land of which approximately 80% is natural habitat (predominantly shiblyak 57 ha) (see Table 4.11 of this Appendix). Thus, taken together, the combined loss of natural habitat resulting from the Project and the Russkaya CS development has the potential to impact upon the provision and access to natural resources as provided to local communities (such as access to timber, wild foods, medicinal plants, fuel wood and ornamental resources).

4.13.4.5 Mitigation and Management - Combined

South Stream Transport will undertake the following mitigation measures which aim to reduce potential impacts on the ecosystem services as identified in Section 4.13.4.4 above (additional to the mitigation measures as defined in the Project ESIA, the Russkaya CS EIA documentation):

- **Global Climate Regulation:** As detailed in Section 4.4.4.2 of this Appendix, South Stream Transport will request data from Gazprom Invest to track and report annual GHG emissions from Russkaya CS (including actual plant or fuel usage in order to calculate tonnes GHG emissions per year). When reporting annual GHG emissions, consideration will be given to the carbon sequestration potential as associated with the restoration of large areas of vegetation (as set out in Section 4.6 of this Appendix).
- **Wild Species Diversity:** As detailed in Section 4.6.6 of this Appendix, South Stream Transport will engage with Gazprom Invest with the aim of aligning the Russkaya CS mitigation measures with those of the Project, where practicable to address potential impacts on wild species diversity.
- **Forest Resources:** South Stream Transport will engage with Gazprom Invest to co-ordinate appropriate mitigation measures in the event that any local communities dependent on forestry resources could be negatively impacted by the combined developments. It is considered that the habitat restoration and creation activities as set out in Section 4.6 of this Appendix could assist in securing provision of such services if designed appropriately.

5 Potential Cumulative Impacts

5.1 Introduction

The Russkaya CS EIA documentation (Ref. 2 and Ref. 3) did not consider the potential for cumulative environmental and social impacts as associated with other developments in the near vicinity of the Russkaya CS development, including impacts associated with the Project. IFC Performance Standard (PS) 1: Assessment and Management of Environmental and Social Risks and Impacts recognizes that in some instances, developers need to consider cumulative impacts in their environmental and social impact and risk identification and management process (Ref. 30).

Chapter 20 Cumulative Impact Assessment of the Project ESIA presents a cumulative impact assessment (CIA) that considers the potential for cumulative environmental and social impacts to be generated due to the occurrence of planned and reasonably defined developments in the vicinity of the Project. Thus Chapter 20 considers the potential for the Project to generate potential cumulative impacts associated with developments that were scoped into the CIA, namely the Lesnaya Polyana, Club Village Chateau, and the Anapolis development[17] as well as the Russkaya CS development. Details of these developments are provided in Chapter 20 (see Figure 20.1), including details of their construction footprints and programmes. The CIA in Chapter 20 thus considers the risks that a cumulative environmental or social impact may be generated if, for example, the Project is constructed / operated at the same time as say the Anapolis development.

This section provides a further cumulative impact appraisal, investigating whether the combined development of the Project and the Russkaya CS (as though these were one development with resultant environmental and social impacts as indicated in Sections 4.2 to 4.13 herein) has the potential to generate additional or different cumulative impacts when considering the other planned and reasonably defined developments that are in the vicinity of both the Project and the Russkaya CS development. For example, the potential for cumulative environmental or social impacts to be generated if, for example, the Project and the Russkaya CS are constructed / operated at the same time as say the Anapolis development.

5.2 Potential for Cumulative Impacts to Occur during Combined Development of the Russkaya CS and Project and Combined Impact Management

Table 5.1 below presents a qualitative analysis of the potential for cumulative impacts to be generated during the development of the Project and the Russkaya CS due to interactions with the Lesnaya Polyana, Club Village Chateau and Anapolis developments.

[17] The Lesnaya Polyana, Club Village Chateau and Anapolis developments are all being progressed by Fund Yug properties.

Table 5.1 indicates that these developments have the potential to increase the developed nature of the area in the vicinity of the Project / Russkaya CS. However, significant cumulative impacts are not anticipated, although the Anapolis and the Club Village Chateau developments have the potential to increase impacts associated with cumulative ecological habitat losses within the wider environment. Thus, where there is opportunity to do so, South Stream Transport will engage with Fund Yug properties with the aim of aligning their mitigation measures with those of the Project, where practicable.

Table 5.1 Further Qualitative Cumulative Impact Appraisal (During Project / Russkaya CS Construction (C) and Operation (O))

VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Soil, Surface Water, & Groundwater (Section 4.2 of this Appendix)	C: Given the nature and scale of the development (16.5 ha), its location on highly modified land on the outskirts of Varvarovka, and given that it is understood that site levelling has already been carried out, cumulative soil, surface water and groundwater impacts are not anticipated. This is particularly the case if the development construction works are completed prior to Project development. O: The Lesnaya Polyana development is not anticipated to generate any cumulative soil, surface water and groundwater impacts given the residential nature of the development (without any significant soil, surface water and groundwater impact sources). Whilst the source of water supply to the development is uncertain, it is assumed that the use of any water supply wells will be undertaken in compliance with local regulatory authority requirements in a manner that does not adversely impact upon groundwater resources.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: During the Project / Russkaya CS operational phase, construction and then use of the Club Village Chateau development is not anticipated to generate any cumulative soil, surface water and groundwater impacts given the disturbed nature of the site and the semi-rural residential nature of the development (without any significant soil, surface water and groundwater impact sources). Whilst the source of water supply to the development is uncertain, it is assumed that the use of any water supply wells will be undertaken in compliance with local regulatory authority requirements in a manner that does not adversely impact upon groundwater resources.	C: It is currently uncertain if this development's construction phase will coincide with those of the Project and the Russkaya CS development. If such works were to coincide, it is considered that given the nature of the Anapolis development, and given the mitigation measures to be employed by the Project and by the Russkaya CS development, that significant cumulative soil, surface water and groundwater impacts will be avoided. O: During the Project / Russkaya CS operational phase, use of the Anapolis development is not anticipated to generate any cumulative soil, surface water and groundwater impacts given the mixed use residential nature of the development (without any significant soil, surface water and groundwater impact sources). Whilst the source of water supply to the development is uncertain, it is assumed that the use of any water supply wells will be undertaken in compliance with local regulatory authority requirements in a manner that does not adversely impact upon groundwater resources.

Continued…

VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Air Quality (Section 4.3 of this Appendix)	C: Given the nature and scale of the development (16.5 ha), its location on the outskirts of Varvarovka, and given that it is understood that site levelling has already been carried out, cumulative air quality impacts are not anticipated. This is especially the case if the development construction works are completed prior to Project development. O: The residential nature of the development means that it will not be major source of atmospheric emissions (traffic associated with the development is not expected to have a discernible impact upon air quality). Cumulative air quality impacts are thus not anticipated.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: During the Project / Russkaya CS operational phase, construction and then use of the Club Village Chateau development is not anticipated to generate any cumulative air quality impacts given the distance from the landfall facilities and the compressor station and given the semi-rural residential nature of the development (traffic associated with the development is not expected to have a discernible impact upon air quality).	C: It is currently uncertain if this development's construction phase will coincide with those of the Project and the Russkaya CS development. If such works were to coincide, it is considered that any dust and site plant emissions would likely only be an issue in the immediate vicinity of the sites (with the majority of the construction generated dust depositing within 100 m), and hence should not contribute to a cumulative air quality impact. In addition, the mitigation measures to be employed by the Project and by the Russkaya CS development will further reduce the potential for significant cumulative air quality impacts. O: During the Project / Russkaya CS operational phase, use of the Anapolis development is not anticipated to generate any cumulative air quality impacts given the distance from the landfall facilities and the compressor station and given the mixed use residential nature of the development (without any significant air emission impact sources whilst traffic associated with the development is not expected to have a discernible impact upon air quality).

Continued…

VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Greenhouse Gases (Section 4.4 of this Appendix)	C & O: It is considered that the scale of the development means that it will not be a significant source of GHG emissions during its construction and use. As such, cumulative GHG impacts are not anticipated.	C & O: It is considered that the scale of the development means that it will not be a significant source of GHG emissions during its construction and use. As such, cumulative GHG impacts are not anticipated.	C & O: It is considered that the scale of the development means that it will not be a significant source of GHG emissions during its construction and use. As such, cumulative GHG impacts are not anticipated.
Noise and Vibration (Section 4.5 of this Appendix)	C: Given the nature and scale of the development, its location on the outskirts of Varvarovka, and given that it is understood that site levelling has already been carried out, cumulative noise impacts are not anticipated. This is especially the case if the development construction works are completed prior to Project development. O: The residential nature of the development means that it will not be major source of noise (traffic associated with the development is not expected to have discernible noise impacts). Cumulative noise impacts are thus not anticipated.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: During the Project / Russkaya CS operational phase, construction and then use of the Club Village Chateau development is not anticipate to generate any cumulative noise impacts given the distance from the landfall facilities and the compressor station and given the semi-rural residential nature of the development (development will not be major source of noise, whilst traffic associated with the development is not expected to have discernible noise impacts).	C: It is currently uncertain if this development's construction phase will coincide with those of the Project and the Russkaya CS development. If such works were to coincide, it is considered that given the nature of the Anapolis development, and given the mitigation measures to be employed by the Project and by the Russkaya CS development, that significant cumulative noise impacts will be avoided. O: During the Project / Russkaya CS operational phase, use of the Anapolis development is not anticipated to generate any cumulative noise impacts given the distance from the landfall facilities and the compressor station and given the mixed use residential nature of the development (development will not be major source of noise, whilst traffic associated with the development is not expected to have discernible noise impacts).

Continued…

VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Terrestrial Ecology (Section 4.6 of this Appendix)	C: The development will result in the disturbance of approximately 16.5 ha of land currently used for vineyards. Given the nature and scale of the development, its location on disturbed ground on the outskirts of Varvarovka, and given that it is understood that site levelling has already been carried out, cumulative terrestrial ecology impacts are not anticipated. O: The residential nature of the development means that it will not be major source of ecological impacts following the completion of construction activities.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: The Club Village Chateau development will result in the loss of approximately 16.6 ha of land (see Table 20.10 in Chapter 20 of the ESIA) occupied by vineyard habitat, secondary meadow habitat and shiblyak woodland. Such habitat losses due to the development are not anticipated to result in any significant cumulative terrestrial ecology impacts. However, where there is opportunity to do so, South Stream Transport will engage with Fund Yug properties with the aim of aligning their mitigation measures with those of the Project, where practicable.	C: Construction of the Anapolis development could result in the direct loss and indirect degradation of 65 ha of land, including ecological habitats that are likely to support populations of species which have been recorded during surveys for the Project (including herpetiles, birds, mammals, and invertebrates) (see Table 20.9 in Chapter 20 of the ESIA). This development has the potential to increase impacts associated with the cumulative habitat loss within the wider environment and could result in potentially significant adverse impacts if appropriate measures are not taken to mitigate for this loss. Where there is opportunity to do so, South Stream Transport will engage with Fund Yug properties with the aim of aligning their mitigation measures with those of the Project, where practicable. O: The mixed use residential nature of the development means that it will not be a major source of additional ecological impacts following the completion of construction phase site clearance activities as described above.
Marine Ecology (Section 4.7 of this Appendix)	C & O: The development will have no marine ecological impacts and thus no cumulative impacts will occur.	C & O: The development will have no marine ecological impacts and thus no cumulative impacts will occur.	C & O: The development will have no marine ecological impacts and thus no cumulative impacts will occur.

Continued…

VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Landscape & Visual (Section 4.8 of this Appendix)	C & O: The development will increase the urbanisation of the Undulating Plateau Landscape Character Area (LCA). The location and scale of development will not impact upon the overall integrity of the LCA such that significant cumulative impacts are not anticipated. The residential nature of the development also indicates that the development is not anticipated to result in significant cumulative visual impacts upon potential sensitive receptors due to the visual separation between the developments.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: During the Project / Russkaya CS operational phase, construction and then use of the Club Village Chateau development is not anticipate to generate any cumulative landscape impacts given that the development is not anticipated to impact upon the overall integrity of the Undulating Plateau LCA. Cumulative visual impacts are not anticipated given the semi-rural residential nature of the development and given that the development retains much of the existing vineyards.	C & O: The development will increase the urbanisation of the Undulating Plateau LCA. The location and scale of development will not impact upon the overall integrity of the LCA such that significant cumulative impacts are not anticipated. The mixed use residential nature of the development and its location remote from the landfall facilities and the compressor station, and its orientation towards the coastline in line with the existing topography, also indicates that the development is not anticipated to result in significant cumulative visual impacts upon potential sensitive receptors.

Continued…

VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Socio-Economic (Section 4.9 of this Appendix)	C: The scale and nature of the development suggest that a large non-local construction workforce is unlikely to be required, such that impacts upon public safety and security are not anticipated. The development is being built on former agricultural fields, thus removing such fields from agricultural use. It is assumed that appropriate compensation and the process of change of land use are being appropriately managed such that the development will not give rise to significant cumulative economic impacts. The development has the potential to generate additional employment and additional demand for goods and services in the municipal district, thus amplifying the beneficial economic impacts associated with the Project and the Russkaya CS for local communities. O: Development use is not anticipated to result in significant economic cumulative impacts, although the development may slightly amplify the beneficial economic impacts associated with the Project and the Russkaya CS for local communities.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: During the Project / Russkaya CS operational phase, construction and then use of the Club Village Chateau development is not anticipated to generate any significant cumulative socio-economic impacts given scale and nature of the development. The development may however, slightly amplify the beneficial economic impacts associated with the Project and the Russkaya CS for local communities.	C: The scale and nature of the development suggest that a large non-local construction workforce is unlikely to be required, such that impacts upon public safety and security are not anticipated. Parts of the development will be built on agricultural fields, thus removing them from agricultural use. It is assumed that appropriate compensation and the process of change of land use are being appropriately managed such that the development will not give rise to significant cumulative economic impacts. The development has the potential to generate additional employment and additional demand for goods and services in the municipal district, thus amplifying the beneficial economic impacts associated with the Project and the Russkaya CS for local communities. O: Development use is not anticipated to result in significant economic cumulative impacts, although the development may slightly amplify the beneficial economic impacts associated with the Project and the Russkaya CS for local communities.

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VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Cultural Heritage (Section 4.10 of this Appendix)	C & O: The development will result in the disturbance of approximately 16.5 ha of land currently used for vineyards. The development will impact upon the area of an Antique settlement, Varvarovka-1 (Site RU-TCH-03 in ESIA). Test pits excavated in 2011 recovered pottery sherds (vessel & storage jar (pithoi)) and fired clay. Occupation strata have been destroyed by vineyard ploughing, surviving only where cut into the bedrock. This is an undesignated area of unstratified (redeposited) cultural layers. Whilst the development has the ability to directly impact upon some cultural heritage features as detailed above, the development will not impact upon any of the heritage resources that will be directly impacted by the Project or the Russkaya CS development. In addition, vehicles servicing the development are not anticipated to significantly exacerbate indirect impacts upon cultural heritage features due to construction traffic. The development will not involve any marine construction activities / seabed intervention works – thus cumulative marine cultural heritage impacts will be avoided.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: The Club Village Chateau development will impact upon the area of a Bronze Age to early medieval settlement, Varvarovka-3 (Site RU-TCH-05 in ESIA). Test pits excavated in 2011 recovered pottery vessel and storage jar (pithoi) sherds from topsoil and ploughsoil. Occupation strata have been destroyed by vineyard ploughing, surviving only where cut into the bedrock. This is an undesignated area of unstratified (redeposited) cultural layers. Whilst the development has the ability to directly impact upon some cultural heritage features as detailed above, the development will not impact upon any of the heritage resources that will be directly impacted by the Project and the Russkaya CS development. In addition, vehicles servicing the development are not anticipated to significantly exacerbate indirect impacts upon cultural heritage features due to construction traffic. The development will not involve any marine construction activities / seabed intervention works – thus cumulative marine cultural heritage impacts will be avoided.	C & O: The area of the proposed Anapolis development includes the site of the Grave of DS Kalinin, Hero of the Soviet Union (1910-1943), erected in 1958 (Site RU-TCH-01 in ESIA). This monument is located east of the main coastal highway and is a designated cultural heritage site, National Monument No: 383. Whilst the development has the ability to directly impact upon some cultural heritage features as detailed above, the development will not impact upon any of the heritage resources that will be directly impacted by the Project and the Russkaya CS development. In addition, vehicles servicing the development are not anticipated to significantly exacerbate indirect impacts upon cultural heritage features due to construction traffic. The development will not involve any marine construction activities / seabed intervention works – thus cumulative marine cultural heritage impacts will be avoided.

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VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Waste Management (Section 4.11 of this Appendix)	C: Given the nature and scale of the development, and given that it is understood that site levelling has already been carried out, cumulative waste management impacts are not anticipated. O: Given the scale and the residential nature of the development, significant volumes of waste are not anticipated to be generated during the development's use. As such, significant waste management cumulative impacts are not anticipated.	C: Construction phase impacts will be avoided given that it is understood that the development will be delayed until after completion of Project construction activities (thus also avoiding the majority of the Russkaya CS construction works). O: Given the scale and low intensity residential nature of the development, significant volumes of waste are not anticipated to be generated during the development's construction phase or during its use. As such, significant waste management cumulative impacts are not anticipated.	C & O: Given the scale and mixed use residential nature of the development, significant volumes of waste are not anticipated to be generated during the development's construction phase or during its use. As such, significant waste management cumulative impacts are not anticipated.
Traffic and Transportation (Section 4.12 of this Appendix)	C & O: Given the scale and nature of the development, the development is not anticipated to be a significant source of traffic (during either the construction phase or during development use). Thus significant cumulative impacts on traffic and transportation are not anticipated.	C & O: Given the scale and nature of the development, the development is not anticipated to be a significant source of traffic (during either the construction phase or during development use). Thus significant cumulative impacts on traffic and transportation are not anticipated.	C & O: Given the scale and nature of the development, the development is not anticipated to be a significant source of traffic (during either the construction phase or during development use). Thus significant cumulative impacts on traffic and transportation are not anticipated.

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VEC	Lesnaya Polyana Development	Club Village Chateau	Anapolis Development
Ecosystem Services (Section 4.13 of this Appendix)	C & O: Given that no potentially significant environmental or social cumulative impacts have been identified, potentially significant cumulative impacts in terms of ecosystem services are not anticipated.	C & O: Given that no potentially significant environmental or social cumulative impacts have been identified, potentially significant cumulative impacts in terms of ecosystem services are not anticipated. However, in order to minimise ecological impacts due to habitat losses associated with the development, where there is opportunity to do so, South Stream Transport will engage with Fund Yug properties with the aim of aligning their mitigation measures with those of the Project, where practicable.	C & O: The Anapolis development has the potential to increase impacts associated with the cumulative habitat loss within the wider environment and could result in potentially significant adverse terrestrial ecological impacts if appropriate measures are not taken to mitigate for this loss. Such cumulative habitat loss may have the potential to adversely impact wild species diversity if appropriate measures are not taken to mitigate for this loss. As such, where there is opportunity to do so, South Stream Transport will engage with Fund Yug properties with the aim of aligning their mitigation measures with those of the Project, where practicable. Given that no other environmental or social cumulative impacts have been identified, potentially significant cumulative impacts in terms of other ecosystem services are not anticipated.

Complete.

6 Alignment of Mitigation and Management Plans – Integrated Approach

The ESIA undertaken for the Project presents a wide range of environmental and social mitigation measures such that the development can be delivered in a manner that is consistent with relevant IFC requirements.

The Russkaya CS EIAs were prepared to meet the requirements of Russian national EIA legislation, and not with reference to IFC Performance Standard requirements. Thus it was envisaged, and subsequently confirmed, that some Performance Standards aspects are not included in the Russkaya CS EIA documentation. Where there are such gaps, it does not necessarily mean that such issues are not being appropriately managed by Gazprom Invest outside of the EIA process.

The combined appraisal presented in Section 4 herein considers the potential impacts of the Project and the Russkaya CS development as though this were one development upon the area's sensitive receptors. This combined appraisal has highlighted a number of areas where the alignment of mitigation approaches and management plans would be advantageous with regard to reducing potential combined environmental and social impacts. South Stream Transport will use the findings of this combined appraisal to discuss opportunities for aligning the mitigation and management approaches.

South Stream Transport's commitments, including mitigation and management of co-ordination measures commensurate to identified environmental and social risks, will be managed through the ESMPs. Interface management procedures with Gazprom Invest will be detailed in South Stream Transport's Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS) which will also document and implement mitigation and management measures as mutually agreed with Gazprom Invest.

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