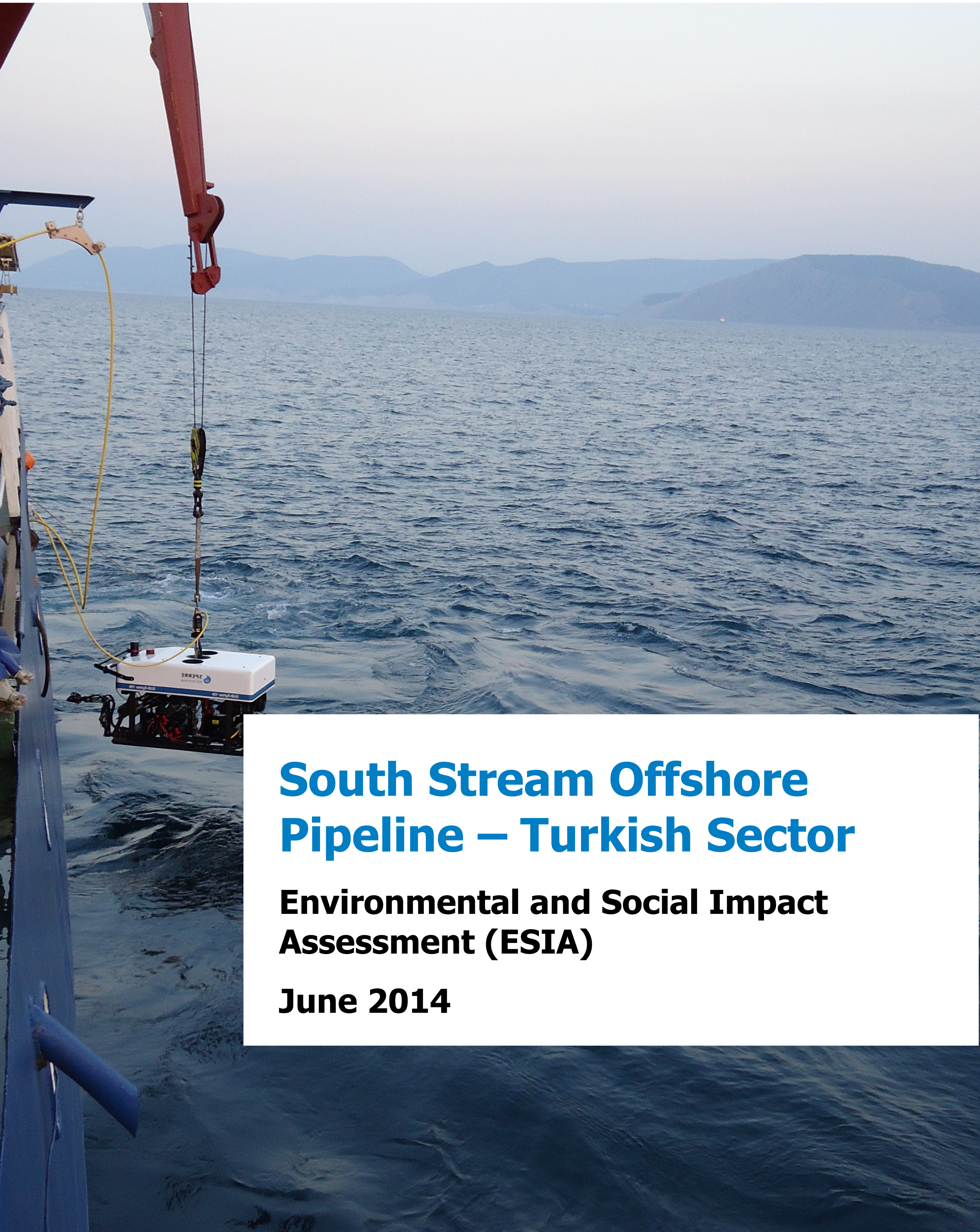

South Stream Offshore Pipeline – Turkish Sector

Environmental and Social Impact Assessment (ESIA)

June 2014

This report has been prepared by URS Infrastructure & Environment UK Limited on behalf of South Stream Transport B.V.

URS-EIA-REP-203876

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Glossary

Accession

"Accession" is the act whereby a state accepts the offer or the opportunity to become a party to a treaty already negotiated and signed by other states. It has the same legal effect as ratification. Accession usually occurs after the treaty has entered into force.

Acropolis

A citadel or fortified part of an ancient Greek city, typically one built on a hill.

Actual human rights impact

An "actual human rights impact" is an adverse impact that has already occurred or is occurring.

Adverse human rights impact

An "adverse human rights impact" occurs when an action removes or reduces the ability of an individual to enjoy his or her human rights.

Aerobic Respiration

Respiration requiring oxygen.

Affected Party/Parties

A country involved in a transnational linear project whose territory may be significantly adversely affected by the activity in a Party of Origin. See Party of Origin below.

Algae

Algae are photosynthetic organisms that occur in the sea, in freshwater and moist habitats on land. They vary from small, single-celled forms (e.g. phytoplankton) to complex multicellular forms (seaweeds).

Anaerobic Respiration

A form of respiration using electron acceptors other than oxygen.

Anaerobic

Relating to the absence of free oxygen.

Anionic Surfactant

Chemicals that act as a surface agent to reduce the surface tension of liquids. Commonly used in synthetic detergents but also used in industrial processes such as plastic and paint manufacture.

Anoxic

Relating to or marked by a severe deficiency of oxygen.

Anthropogenic

Relating to, or resulting from, the influence of human activity on the environment.

Archaeological context

The physical setting, location, and cultural association of artefacts and features within an archaeological site.

Archaeological excavation

A programme of controlled, intrusive fieldwork with defined research objectives which examines and records archaeological deposits, features and structures and, as appropriate, retrieves artefacts, environmental evidence and other remains within a specified area or site (on land or underwater). The records made and objects gathered during fieldwork are studied and the results of that study published in detail appropriate to the project design and the significance of the results.

Archaeological sites

Locations with physical evidence for where people once lived, hunted, farmed, camped, held ceremonies or were buried.

Archaeology

The scientific study of the physical evidence of past human societies recovered through collection, artefact analysis, and excavation. Archaeologists not only attempt to discover and describe past cultures, but also to formulate explanations for the development of cultures. Conclusions drawn from study and analyses provide answers and predictions about human behaviour that add, complement, and sometimes correct the written accounts of history and prehistory.

Artefact

An object or part of an object that has been used or created by a human and provides physical clues to the activity carried out by humans in the area of discovery. These include worked stone tools and tool-making waste, bone, pottery and metalwork.

Assemblage

A group of artefacts related to each other based upon their recovery from a common archaeological context.

Associated Facility

Defined by IFC PS 1 as: "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".

Atterberg Limits

Tests which identify the consistency and behaviour of sediment

Bacterioplankton

The bacterial component of the plankton.

Bar

Metric unit of atmospheric pressure.

Baseline

Term used to describe existing conditions of the physical, biological, socio-economic, and cultural heritage environmental aspects. The ESIA process assesses likely impacts on baseline conditions.

Baseline Data

Data gathered during the Environmental and Social Impact Assessment and used to describe the relevant existing conditions (see 'Baseline').

Bathymetry

Measuring the depths of the oceans.

Before Christ

Before Christ (BC) is a designation used to label or number years prior to the birth of Christ, as calculated by the Gregorian calendar.

Before Present

Before Present (BP) years is a time scale used to specify when events in the past occurred; standard practice is to use 1950 as the "present", reflecting the artificial alteration of the proportion of the carbon isotopes in the atmosphere due to nuclear weapons testing in the 1950s. The BP scale is generally used for dates established by radiocarbon dating.

Beneficiary

An individual or group of individuals that derive(s) benefit from ecosystem services.

Benthic

Of or relating to the bottom of a sea, lake, or other body of water.

Benthos

Flora and fauna organisms that live on/in sediment at the bottom of a water column.

Bronze Age

The prehistoric period following the Stone Age and preceding the Iron Age characterised by the use of weapons and implements made of bronze and by intense trading activity. It is generally dated from around 3000 BC.

Carbon Monoxide (CO)

Carbon monoxide is a colourless, odourless, and tasteless gas that is slightly lighter than air. It is toxic to humans and animals when encountered in higher concentrations.

Cathodic Protection System

Protections of a metal structure from corrosion under water by making it act as an electrical cathode.

Cenozoic

The Cenozoic Era is the current and most recent of the three geological eras covering the period from 66 million years ago to the present.

Chance Find

An archaeological site or object that was unknown prior to discovery during construction (despite best efforts to identify all sites prior to construction through cultural heritage surveys).

Chance Find Procedure

Chance find procedure is a project-specific procedure that outlines what will happen if previously unknown physical resources are encountered during project construction or operation. The procedure includes record keeping and expert verification procedures, chain of custody instructions for movable finds, and clear criteria for potential temporary work stoppages that could be required for rapid disposition of issues related to the finds.

Coccolith

A minute rounded calcareous platelet, numbers of which form the spherical shells of coccolithophores.

Comment Form

A paper form through which stakeholders can submit written comments, views and opinions. Comment forms are distributed at public consultation meetings and made available in locations where ESIA documentation is disclosed and made available for comments.

Conservation

The measures taken to extend the life of cultural heritage in ways that will best sustain its significance and heritage values (ICCROM 1998).

Consultation

The process of formally consulting or discussing a subject. For the purposes of this document, consultation involves two-way communication between the project developers and affected or interested stakeholders.

Copepod

Any of a large subclass (Copepoda) of usually minute freshwater and marine crustaceans.

Critical Cultural Heritage

Critical cultural heritage consists of one or both of the following types of cultural heritage: (i) the internationally recognised heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation (IFC 2012 Performance Standard 8, para 13). To be considered critical, the cultural heritage must be internationally recognised prior to the proposal of the project (IFC 2012, Guidance Note 8, paragraph GN24).

Ctenophore

Any of a phylum (Ctenophora) of marine animals superficially resembling jellyfish but having biradial symmetry and swimming by means of eight bands of transverse ciliated plates. Also called comb jelly.

Cultural Heritage

Cultural Heritage is defined as the heritage that includes artefacts, monuments, groups of buildings and sites that have a diversity of values including symbolic, historic, artistic, aesthetic, ethnological or anthropological, religious, scientific and social significance (UNESCO 1972).

Cultural Landscape

Landscapes which represent combined works of nature and by humans, and they express a long and intimate relationship between people and their natural environment (UNESCO 2007).

Cultural Resources

Movable or immovable cultural heritage objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, spiritual, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

Cumulative Impact

The combination of multiple impacts from existing projects, the proposed project, and/or anticipated future projects that may result in significant adverse and/or beneficial impacts that would not be expected in case of a stand-alone project.

Decommissioning

Planned shut-down of a facility, equipment, plant, etc., from operation or usage. Commencing 2065.

Density (sigma-T)

Sigma-t is a quantity used in oceanography to measure the density of seawater at a given temperature.

Diatom

Planktonic algae possessing a silicaceous cell called a frustule. Globally, diatoms are the most abundant group within the phytoplankton.

Dinoflagellate

A group of single celled organisms possessing a flagellum (whip like locomotory structure). Many are photosynthetic organisms and form a major component of marine phytoplankton.

Disclosure

Release of information into the public domain. For the purposes of this document, disclosure refers to the release of the project and EIA/ESIA information to affected and interested stakeholders.

Ecosystem

A biological community of interacting organisms and their physical environment.

Ecosystem services

The benefits people obtain from ecosystems. Following the lead of the Millennium Ecosystem Assessment, ecosystem services are typically classified along functional lines into four broad categories:

i. Provisioning services: the products people obtain from ecosystems such as food and fibre, fuel in the form of peat, wood or non-woody biomass, or water from rivers, lakes and aquifers. Goods may be provided by heavily managed ecosystems, such as agricultural and aquacultural systems and plantation forests, or by natural or semi-natural ones, for example in the form of capture fisheries or the harvest of other wild foods;

ii. Regulating services: the benefits people obtain from the regulation of ecosystem processes including, for example, the regulation of climate, hazards, noise, water, soil and air quality, and pollination;

iii. Cultural services: the cultural, spiritual, and educational benefits people obtain from ecosystems through, for example, recreation and tourism, spiritual or religious upliftment, or cultural heritage; and

iv. Supporting services: the natural processes that maintain the other services such as soil formation, nutrient and water cycling, or primary production.

Emergency Preparedness and Response Plan

The Emergency Preparedness and Response Plan defines how South Stream Transport plans, prepares and manages incidents and emergencies.

Emergency Response Plan

Emergency Response Plans are required for each high risk emergency incident/ scenario as identified by the Emergency Risk Analysis. Contractors who will be doing the work will be responsible for preparing Emergency Response Plans for their work activities, and specifically those events identified by the Emergency Threat Analysis.

Emergency Shutdown Valve

A valve designed to stop the flow of gas in the pipeline upon the detection of a dangerous event. This provides protection against possible harm to people, equipment or the environment.

Emergency Threat Analysis

Emergency Threat Analysis determines the risks posed by potential emergencies and the need for specific Emergency Response Plans and related procedures as a contingency for emergency events.

Engagement

A process that involves consultation and/or disclosure.

Ethnology

The study of the characteristics of different peoples and the differences and relationships between them.

Environmental and Social

For the purposes of this EIA, the term "Environmental and Social" refer to all environmental, socio-economic and cultural heritage factors of the Project.

Environmental and Social Impact Assessment / Environmental Impact Assessment

Systematic review of the environmental or socio-economic changes a proposed project may have on its surrounding environment.

Environmental and Social Management Plan

A planning instrument that contains the following key elements: mitigation measures, monitoring programme, and institutional arrangements for implementation.

Environmental and Social Management System

A system established to plan, manage, document and monitor an organisation's activities and processes and resultant environmental and social impacts in accordance with requirements of ISO 14001:2004 and IFC Performance Standard 1.

Equator Principles (EP)

A credit risk management framework for determining, assessing and managing environmental and social risk in project finance transactions. The EPs are designed to help financial institutions overcome the challenges of incorporating risks associated with biodiversity and ecosystem services into their lending decisions.[1]

Espoo Convention

The Espoo (EIA) Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries. The Convention was adopted in 1991 and entered into force on 10 September 1997.

Eutrophication

Excessive nutrient enrichment of a body of water, often leading to detrimental ecological changes.

Exclusive Economic Zone

Seazone prescribed by the United Nations Convention on the Law of the Sea over which a state has special rights over the exploration and use of marine resources, including energy production from water and wind.

Fault

A planar fracture or discontinuity in a volume of rock, across which there has been significant displacement of one side with respect to the other. Rapid movement of faults causes earthquakes.

Fauna

The animals of a particular region, habitat, or geological period.

[1] Definition as per the EP website www.equator-principles.com.

Footprint

The spatial impact/ impression on the seabed or land from a project.

G-20

The G20 is a forum for international cooperation on the most important issues of the global economic and financial agenda. It brings together finance ministers and central bank governors from 19 countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States of America plus the European Union, which is represented by the President of the European Council and by Head of the European Central Bank.

Gastropod

A class of molluscs comprising slugs and snails, typically having a flattened muscular foot with a head bearing stalked eyes.

Geohazard

Geological or geomorphological situation that represents, or has the potential to develop further into, a situation leading to damage or uncontrolled risk. It includes landslides, seismic faults and volcanic activities, among other situations.

Geomorphology

Refers to the study of the evolution and configuration of landforms and the processes which shape them.

Good International Industry Practice

Good International Industry Practice is the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally.

Grievance

Formal complaint by individuals, groups or organisations who feel they have been adversely affected by project-related activities.

Grievance procedure

Process of recording and addressing grievances so that they can be tracked through to a resolution.

Halocline

A vertical gradient in ocean salinity.

Holoplankton

Holoplankton are organisms that are planktonic for their entire life cycle. Examples of holoplankton include diatoms, radiolarians, dinoflagellates, foraminifera, amphipods, krill, copepods, and salps.

Hominin

The group consisting of modern humans, extinct human species and all our immediate ancestors (including members of the genera Homo (e.g. Homo neanderthalensis, Homo erectus, Homo habilis), and various species of Australopithecus, Paranthropus and Ardipithecus).

Hydrochemistry

Water quality refers to the chemical, physical and biological characteristics of water.

Hydrocarbon

A compound of hydrogen and carbon, such as any of those which are the chief components of petroleum and natural gas.

Hypoxic

Oxygen deficiency.

Ichthyoplankton

Term used to describe the fish egg and fish larvae component of the plankton.

Intangible Cultural Heritage

The Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO 2003) defines the intangible cultural heritage as the practices, representations, expressions, as well as the knowledge and skills (including instruments, objects, artefacts, cultural spaces), that communities, groups and, in some cases, individuals recognise as part of their cultural heritage. It is sometimes called living cultural heritage, and is manifested inter alia in the following domains:

- Oral traditions and expressions, including language as a vehicle of the intangible cultural heritage;
- Performing arts;
- Social practices, rituals and festive events;
- Knowledge and practices concerning nature and the universe; and,
- Traditional craftsmanship.

International Finance Corporation (IFC)

Organisation that is a member of the World Bank and promotes sustainable private sector investment in developing countries.[2]

International Finance Corporation Performance Standards

The Performance Standards provide guidance on how to identify environmental and social risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way. There are eight Performance Standards that clients must meet throughout the life of an investment by IFC.

Larva

Juvenile form of an animal, differing in shape and appearance from the adult. Larvae undergo metamorphosis before reaching the adult form. Larvae can form an important component of the plankton in marine systems.

Meroplankton

Meroplankton are organisms that are planktonic for only a part of their life cycles, usually the larval stage. Examples of meroplankton include the larvae of echinoderms (such as sea urchins and sea stars), crustaceans, marine worms, some marine gastropods and most fish.

Meteorology

Refers to the study of weather.

[2] Definition as per the IFC website www.ifc.org.

Methanotrophic

Prokaryotes that are able to metabolize methane as their only source of carbon and energy.

Metocean

Abbreviation of the words 'meteorology' and 'oceanography'.

Mesozoic

Relating to or denoting the era between the Palaeozoic and Cenozoic eras, comprising the Triassic, Jurassic, and Cretaceous periods.

Millennium Ecosystem Assessment

The Millennium Ecosystem Assessment (MA), a collaboration of over 1,360 experts, was published in 2005 and provided the first state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide and the options to restore, conserve or enhance their sustainable use.

Million tonnes of oil equivalent (mtoe)

A unit of energy representative of the amount of energy released by combustion of one million tonnes of crude oil. Conversion of mtoe to bcm were calculated using a factor of 1 mtoe=0.89(bcm).

Miocene

Relating to or denoting the fourth epoch of the Tertiary period, between the Oligocene and Pliocene epochs.

Mitigation Measures

Management measures put forward to prevent, reduce and where possible, offset any adverse environmental or socio-economic impacts. For the purposes of this document, these measures also include enhancement strategies aimed at increasing beneficial impacts.

Monument

Architectural works, works of monumental sculpture and painting, including cave dwellings and inscriptions, and elements, groups of elements or structures of special value from the point of view of archaeology, history, art or science (UNESCO 1972).

Multi-beam echo sounder

A device that sends beams of sound through water and receives their reflections, the results of which can be processed by a computer to determine depth of the water and map the bottom surface.

Necropolis

A cemetery, especially a large one belonging to an ancient city.

Neolithic

The Neolithic culture (c. 7000-2000 BC) developed animal husbandry and agricultural cultivation, alongside hunting wild animals, fishing and gathering wild foods.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is one of several nitrogen oxides and is emitted by (and forms from emissions of) cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system.

Oceanography

Branch of science that deals with the physical and biological properties and phenomena of the sea.

OECD Common Approaches

The mission of the Organisation for Economic Co-operation and Development (OECD) is to promote policies that will improve the economic and social well-being of people around the world. The OECD provides a forum in which governments can work together to share experiences and seek solutions to common problems. The OECD Common Approaches are Recommendations of the Council on Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence adopted by the OECD Council on 28 June 2012.

Oil Spill Prevention and Response Plan

All contractors and operators of vessels working on behalf of South Stream Transport will be contractually bound to developing and implementing an Oil Spill Prevention and Response Plan which will define actions to be taken to minimise the risks of marine oil spillages, as well as the actions to be undertaken following a spillage.

Organochlorine

Any of a large group of pesticides and other synthetic organic compounds with chlorinated aromatic molecules.

Palaeolithic

Relating to or denoting the early phase of the Stone Age, lasting about 2.5 million years, when primitive stone implements were used.

Palaeontology

The branch of science concerned with fossil animals and plants.

Party/Parties of Origin

A country involved in a transnational linear project where an activity is planned to be undertaken, which may affect an Affected Party. See Affected Party above.

Pelagic

The open part of a water body that is not influenced by the coast or seabed.

Pelite

Clay

pH

Measure of the acidity or basicity of an aqueous solution.

Phenol

A mildly acidic toxic white crystalline solid obtained from coal tar and used in chemical manufacture, and in dilute form (under the name carbolic) as a disinfectant.

Photic zone

The depth zone of the water column in the sea or other water body that is exposed to sufficient sunlight for photosynthesis to occur. Also known as the 'euphotic' zone the depth of which depends on the clarity of the water and consequent light penetration.

Phytoplankton

The plant component of the plankton comprising a variety of organisms. The most common components of marine phytoplankton are the diatoms and dinoflagellates.

Plankton

Minute plants (phytoplankton) and animals (zooplankton) that drift in the surface waters of seas and lakes.

Pliocene

Relating to or denoting the last epoch of the Tertiary period, between the Miocene and Pleistocene epochs.

Polychaete

An important group of segmented marine worms that can be either free-living or tube-dwelling. A major component of the benthos in many areas, polychaete tubes may also form biogenic reefs.

Potential human rights impact

A "potential human rights impact" is an adverse impact that may occur but has not yet done so. Potential impacts are analogous to human rights risks, i.e. the risks that an activity may lead to one or more adverse human rights impacts.

Pre-Commissioning

Pre-commissioning is the process of proving the ability of a pipeline and piping systems to meet operational requirements prior to putting the pipeline into service.

Prehistoric

The time before recorded history and writing. Includes the Palaeolithic, Epipalaeolithic, Neolithic, Copper Age/Chalcolithic/Eneolithic, Bronze Age and Iron Age periods.

Preservation

The preferred sectoral good practice method of treating cultural heritage remains. Where feasible and appropriate, this involves preserving sites in place (in situ).

Priority ecosystem services

IFC Performance Standard 6 (para. 24) defines priority ecosystem services as:

i. Those services on which project operations are most likely to have an impact and, therefore, which result in adverse impacts to Affected Communities; and/or

ii. Those services on which the project is directly dependent for its operations (e.g. water).

The Performance Standards also state that *"when Affected Communities are likely to be impacted, they should participate in the determination of priority ecosystem services in accordance with the stakeholder engagement process as defined in Performance Standard 1".*

In order to identify priority services in a transparent and systematic manner which supports participation of Affected Communities, priority services are identified in this assessment as those services for which the impacts are assessed to be of moderate or high significance.

Project Area

The Project Area is defined by a 2 km buffer either side of the outermost pipeline. The Project Area has an overall length of approximately 470 km. It extends from the border of the Russian and Turkish EEZs to the border of the Turkish and Bulgarian EEZs in the Black Sea.

Project Area of Influence

Where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence. This area of influence encompasses, as appropriate:

- The area likely to be affected by:
    - The project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;
    - Impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or
    - Indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.
- Associated facilities, which are 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.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted."

Project Proponent

The developer, or sponsor, of a project. For the Project, this is South Stream Transport B.V.

Protozoa

A phylum or grouping of phyla which comprises the single-celled microscopic animals, which include amoebas, flagellates, ciliates, sporozoans, and many other forms.

Public meeting

Open meeting which may be attended by any member of the public. Need not be a meeting required under specific legislation.

Pycnocline

The layer in which the density gradient is greatest within a body of water.

Phytoplankton

Plankton consisting of microscopic plants.

Ratified

sign or give formal consent to (a treaty, contract, or agreement), making it officially valid.

Receptor

The aspect of the environment (air, water, ecosystem, human, fauna, etc.) that is affected by/interacts with an environmental or socio-economic impact.

Residual Impacts

Residual impacts are impacts that remain after mitigation measures, including those incorporated into the project's Base Case design and those developed in addition to the Base Case design, have been applied.

Sacrificial Anodes

A sacrificial anode is the main component of a galvanic cathodic protection system used to protect buried or submerged metal structures from corrosion.

Scoping

Early stage in the ESIA process that appraises the likely key issues requiring detailed assessment. A scoping process (in relation to IFC PS1) is the establishment and maintenance of a process for identifying the initial environmental and social risks and impacts of a project. The aspects of the project (i.e., type, scale and location) along with available baseline data is used to guide the scope and level of effort devoted to the risk and impacts identification in the ESIA. The scoping process is to be consistent with Good International Industry Practice (GIIP) and will determine the appropriate / relevant methods and assessment procedures. The process also involves a mechanism for the collection of comments made by different stakeholders.

Screening

The process by which a decision is taken on whether or not EIA is required for a particular Project.

Seismicity

The frequency, intensity and distribution of earthquakes in a specific area

Sensitivity

The recovery rate of the receptor from significant disturbance or degradation.

Setting (cultural heritage)

The setting of a heritage structure, site or area is defined as the immediate and extended environment that is part of, or contributes to, its significance and distinctive character. Beyond the physical and visual aspects, the setting includes interaction with the natural environment; past or present social or spiritual practices, customs, traditional knowledge, use or activities and other forms of intangible cultural heritage aspects that created and form the space as well as the current and dynamic cultural, social and economic context (ICOMOS 2005 X'ian Declaration on the Conservation of the Setting of heritage structures, sites and areas).

Shipwreck

The structural remains of a sunken vessel, including the cargo, ship's gear, and the personal belongings of crew and passengers.

Side-scan sonar

Device with an emitter that sends out sounds waves that are reflected back to a receiver and translated into a three dimensional representation of the seabed surface.

South Stream Offshore Pipeline

The overall South Stream Offshore Pipeline covering all three countries (Russia, Turkey and Bulgaria).

South Stream Transport

Previously, the Project was developed by Gazprom during 2009-2011, and then by South Stream Transport AG during 2011-2012. South Stream Transport then moved head office from Switzerland to the Netherlands and established South Stream Transport B.V., in November 2012.

Spill Response Plan

Plan which will be developed and maintained by each Project contractor defining the measures to be taken to minimise the risk of onshore oil spillages and the responses to be taken in the event of a spillage.

Stakeholder

Any individual, group or organisation potentially affected by a project, or which has an interest in, or influence over, a project.

Stakeholder Engagement

As stated by IFC in PS 01 "Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts." Thus, it is an activity covering different types of interactions with stakeholders over the life of a project. Can include, but is not limited to disclosure and consultation during preparation of an ESIA Report.

Stakeholder Engagement Plan

A Stakeholder Engagement Plan (SEP) forms part of the ESIA documentation and is intended to provide a plan and implementation strategy to guide stakeholder engagement throughout the project lifecycle.

Stray finds

Isolated finds of single archaeological artefacts, often portable objects, which do not form part of a wider archaeological site.

Study Area

The mapped geographical area in which potential impacts are predicted (as determined through scoping) and therefore warrants investigation during the ESIA process. This is different for each biophysical and social environmental aspect.

Sub-bottom profiler

An acoustic system that determines the nature of sediment layers beneath a water-sediment interface by sending an acoustic signal and receiving its reflection distorted by the partial penetration of the seabed by the signal.

Tectonics

Concerned with the processes which control the structure and properties of the Earth's crust and its evolution through time.

Terrigenous

A deposit made of material eroded from the land.

The Project

South Stream Offshore Pipeline – Turkish Sector.

Transboundary

Crossing a provincial, territorial or national boundary or border.

Transboundary Impacts

An impact which crosses any boundaries between two geopolitical boundaries (i.e. a border).

Transnational Linear Projects

Linear Projects that span multiple countries.

Vulnerable (or disadvantaged)

Term used to describe individuals and groups who may be directly and differentially or disproportionately affected by a project because of their disadvantaged or vulnerable status. This status may stem from an individual's or group's race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth, or other status. Other factors that may contribute to such a status are gender, age, ethnicity, culture, literacy, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural resources.

Waste management facility

An installation which receives waste and either: transfers waste to another destination for processing; prepares the waste for reuse or recycling; carries out a recycling or recovery process; or permanently disposes of the waste.

Welding

Fabrication or sculptural process that joins materials by causing coalescence.

Well-being

The IFC Performance Standards do not provide a definition of well-being although they do make reference to the MA in the context of well-being which defines the term as follows:

"Human well-being is assumed to have multiple constituents, including the basic aterial for a good life, such as secure and adequate livelihoods, enough food at all times, shelter, clothing, and access to goods; health, including feeling well and having a healthy physical environment, such as clean air and access to clean water; good social relations, including social cohesion, mutual respect, and the ability to help others and provide for children; security, including secure access to natural and other resources, personal safety, and security from natural and human-made disasters; and freedom of choice and action, including the opportunity to achieve what an individual values doing and being. Freedom of choice and action is influenced by other constituents of well-being (as well as by other factors, notably education) and is also a precondition for achieving other components of well-being, particularly with respect to equity and fairness."

Zooplankton

The animal component of the plankton, including holoplankton (animals that are permanently planktonic) and meroplankton (larval and juvenile stages of non-planktonic animals)

Abbreviations and Acronyms

Abbreviation/Term	Description
$	Dollar
%	Percent
°C	Degrees Celsius
3LPP	Three-layer-polypropylene
ABS	Autonomous Buoy Station
ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area
AD	Anno Domini
ALARP	As Low As Reasonably Practicable
AP	Action Plan
APEC	Asia-Pacific Economic Cooperation
AS	Anionic Surfactants
ASNT	American Society for Non-destructive Testing
ASTM	American Society for Testing Materials
AUT	Automated Ultrasonic Testing
AUV	Autonomous Underwater Vehicle
BAP	Biodiversity Action plan
BC	Before Christ
bcm	Billion Cubic Metres
BMP	Biodiversity Management Plan
BOD	Biological Oxygen Demand
BOTAS	Turkish Petroleum Pipeline Corporation
BP	Before Present

Abbreviation/Term	Description
BRF	Behavioural Response Function
BUCR	Back Up Control Room
BUNKER	International Convention on Civil Liability for Bunker Oil Pollution Damage
BWM	Ballast Water and Sediments
CATS	Corrective Action Tracking System
CCR	Central Control Room
Cd	Cadmium
CD	Compact Disc
Cells/L	Cells per Litre
CEO	Chief Executive Officer
CFS	Climate Forecast System
CH	Clay of high plasticity
CH_4	Methane
CHO	Cultural Heritage Object
CIA	Cumulative Impact Assessment
CIP	Community Investment Programme
CMP	Construction Management Plan
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon dioxide (CO_2) equivalent
CO_2-eq	Carbon Dioxide Equivalent
CoE	Council of Europe
CPT	Cone Penetration Test
CR	Critically Endangered

Abbreviation/Term	Description
CS	Compressor Station
CSR	Corporate Social Responsibility
dB	Decibel
DDT	Dichlorodiphenyltrichloroethane
dm^3	Cubic Decimentre
DMU	Discrete Management Unit
DNV	Det Norske Veritas
DoTPP	Department of Transit Petroleum Pipelines
DP	Dynamic Positioning
E&P	Exploration and Production
ECA	Export Credit Agency
ECoQO	Ecosystem quality objectives
EEC	European Economic Community
EEZ	Exclusive Economic Zone
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIAAF	Environmental Impact Assessment Application File
EN	European Standards
EN	Endangered
ENVIID	Environmental and Socio-economic Issues Identification
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
EPRP	Emergency Preparedness and Response Plan
EPRS	Emergency Pipeline Repair Strategy

Abbreviation/Term	Description
ERP	Emergency Response Plan
ESIA	Environmental and Social Impact Assessment
ESIVI	Ecosystem Services Identification, Valuation, and Integration
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESS	Ecosystem Services
EU	European Union
EU-28	28 member states of the European Union
EWC	European Waste Catalogue
FEED	Front End Engineering and Design
g/m^2	Grams per Square Metre
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIS	Geographic Information System
GPS	Global Positioning System
GRP	Gross Regional Product
GRT	Gross Registered Tonnage
GSHAP	Global Seismic Hazard Assessment Project
GVA	Gross Value Added
H_2S	Hydrogen Sulphide
HAZCON	Hazard Construction
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study

Abbreviation/Term	Description
HCH	Hexachlorocyclohexane
HEMP	Hazards and Effects Management Process
HF SBP	High-Frequency Sub-bottom Profiling
HFC	High Frequency Cetaceans
HFO	Heavy Fuel Oil
HIA	Health Impact Assessment
hPa	Hectopascal
HRA	Health Risk Assessment
HSE	Health, Safety and Environment
HSSE	Health, Safety, Security and Environment
HSSE-IMS	Health Safety Security and Environmental Integrated Management System
IBA	Important Bird Area
ICOMOS	International Commission on Monuments and Sites
IEA	International Energy Agency
IfA	UK Institute for Archaeologists
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standards
IFO	Intermediate Fuel Oils
ILO	International Labour Organisation
IMO	International Maritime Organisation
IPIECA	International Petroleum Industry Environmental Conservation Association
IPPC	Integrated Pollution Prevention and Control
ISO	International Organisation for Standardisation
IUCN	International Union for the Conservation of Nature

Abbreviation/Term	Description
IW	Immediate Water
JBIC	Japan Bank for International Cooperation
kg	Kilogram
kg/m^3	Kilogram per Cubic Metre
km	Kilometre
KPI	Key Performance Indicators
kW	Kilowatt
l	Litre
LF SBP	Low-Frequency Sub-bottom Profiling
LNG	Liquefied Natural Gas
LW	Light Weight
m	Metres
m/s	Metres per Second
m/s^2	Metres per Second Squared
m^3	Cubic Metre
Ma	Million Years Ago
MA	Millennium Ecosystem Assessment
MAE	Marine Antipollution Enterprise
MAH	Major Accidents Hazards
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multi-Beam Echo Sounder
MBSC	Main Black Sea Current
MDO	Marine Diesel Oil
MEG	Mono Ethylene Glycol

Abbreviation/Term	Description
MFC	Mid Frequency Cetaceans
mg/dm^3	Milligram / Cubic Decimeter
mg/kg	Milograms per Kilogram
MGO	Marine Gas Oil
ML	Silt (soil)
mm	Millimetre
MMO	Marine Mammal Observers
MMSCM	Million Standard Cubic Metres
MMSCM/day	Million Standard Cubic Metres per day
MoCT	Ministry of Culture and Tourism
MoENR	Ministry of Energy and Natural Resources
MoEU	Ministry of Environment and Urbanisation
MoFA	Ministry of Foreign Affairs
MoFAL	Ministry of Food, Agriculture and Livestock
mol%	Mole percent
MSV	Multi Service Vessel
MTA	General Directorate of Mineral Research and Exploration
mtoe	Million tonnes of oil equivalent
Mw	Megawatt
N_2	Nitrogen
NCDC	National Climatic Data Centre
NDE	Non-Destructive Examination
NEXI	Nippon Export and Investment Insurance
NGO	Non-Governmental Organisation

Abbreviation/Term	Description
Ni	Nickel
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NMVOC	Non-Methane Volatile Organic Compound
$N\text{-}NH_4$	Ammonium Nitrogen
$N\text{-}NO_2$	Nitrite Nitrogen
$N\text{-}NO_3$	Nitrate Nitrogen
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
N_{org}	Organic Nitrogen
NO_x	Nitrogen Oxide
N_{tot}	Total Nitrogen
NTS	Non-technical summary
O_2	Oxygen
OCR	Over Consolidation Ratio
ODA	Official Development Assistance
OECD	The Organisation for Economic Co-operation and Development
OGP	International Association of Oil and Gas Producers
OH	Organic clay / silt soil
OH&S	Occupational Health and Safety
OH&S	Occupational Health and Safety
OHSAS	Occupational Health & Safety Advisory Services
OMP	Operations Management Plan

Abbreviation/Term	Description
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-operation
OWS	Oily Water Separator
PAC	Project-Affected Community
PAH	Polycyclic Aromatic Hydrocarbons
PDEU	Provincial Directorate of Environment and Urbanisation
PGA	Peak Horizontal Acceleration
PIG	Pipeline Inspection Gauge
PIMS	Pipeline Integrity Management System
PM	Particulate Matter
PO_4-P	Phosphate
POP	Persistent Organic Pollutants
ppb	Parts per Billion
ppm	Parts per million
PS	Performance Standards (of the International Finance Corporation)
PSU	Practical Salinity Units
PSV	Pipe Supply Vessel
PTS	Permeneant Threshold Shift
QRA	Quantified Risk Assessment
RCM	Recording Current Meter
RDB	Red Data Book
REC	Review and Evaluation Committee
rms SPL	Root-mean-square sound pressure level metric
Ro-Ro	Roll-on Roll-off

Abbreviation/Term	Description
ROTV	Remotely Operated Tow Vehicle
ROV	Remote Operated Vehicle
SAP	Strategic Action Plan
SAR	International Convention for Maritime Search and Rescue
SBES	Single-Beam Echo Sounder
SBP	Sub-bottom Profiling
SCADA	Supervisory Control and Data Acquisition
SCD	Stakeholder and Consultation Database
SEL	Sound Exposure Level
SEP	Stakeholder Engagement Plan
Si	Silicate
SIMOPS	Simultaneous Operations
SM	Silty sand soil
SMPEP	Shipboard Marine Pollution Emergency Plans
SO_2	Sulphur Dioxide
SOLAS	International Convention for the Safety of Life at Sea
SOP	Standard operating procedure
SOPEP	Shipboard Oil Pollution Emergency Plan
SSFD	Scope and Special Format Determination
SSS	Side-Scan Sonar
SSTTBV	South Stream Transport BV
STCW	International Convention on Standards of Training, Certification and Watch keeping for Seafarers
SUR-KOOP	Central Union of fisheries Cooperatives

Abbreviation/Term	Description
SVP	Sound Velocity Profiler
T	Temperature
TBT	Tributyltin
TGNA	Turkish Grand National Assembly
TL	Turkish Lira
TPAO	Turkish Petroleum Corporation
TUIK	Turkish Statistical Institute
TURMEPA	Turkish Marine Protection Association
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNECE	United Nations Economic Commission for Europe
UNEP IE	United Nations Environment Program Industry and Environment
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
URS	URS Infrastucture and Environment UK
UXO	Unexploded Ordnance
VEC	Valued Environmental and Social Components
WM	Wood Mackenzie
WMP	Waste Management Plan
WPC	World Petroleum Council
WRI	World Resources Institute
µm	Micrometre
µPa	Micropascal
σt	Density

Chapter 1: Introduction

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1 Introduction

1.1 South Stream Offshore Pipeline Overview

The South Stream Offshore Pipeline is the offshore component of the South Stream Pipeline System that will transport natural gas extracted in Russia to countries of Central and South-Eastern Europe (Figure 1.1).

Figure 1.1 South Stream Pipeline System

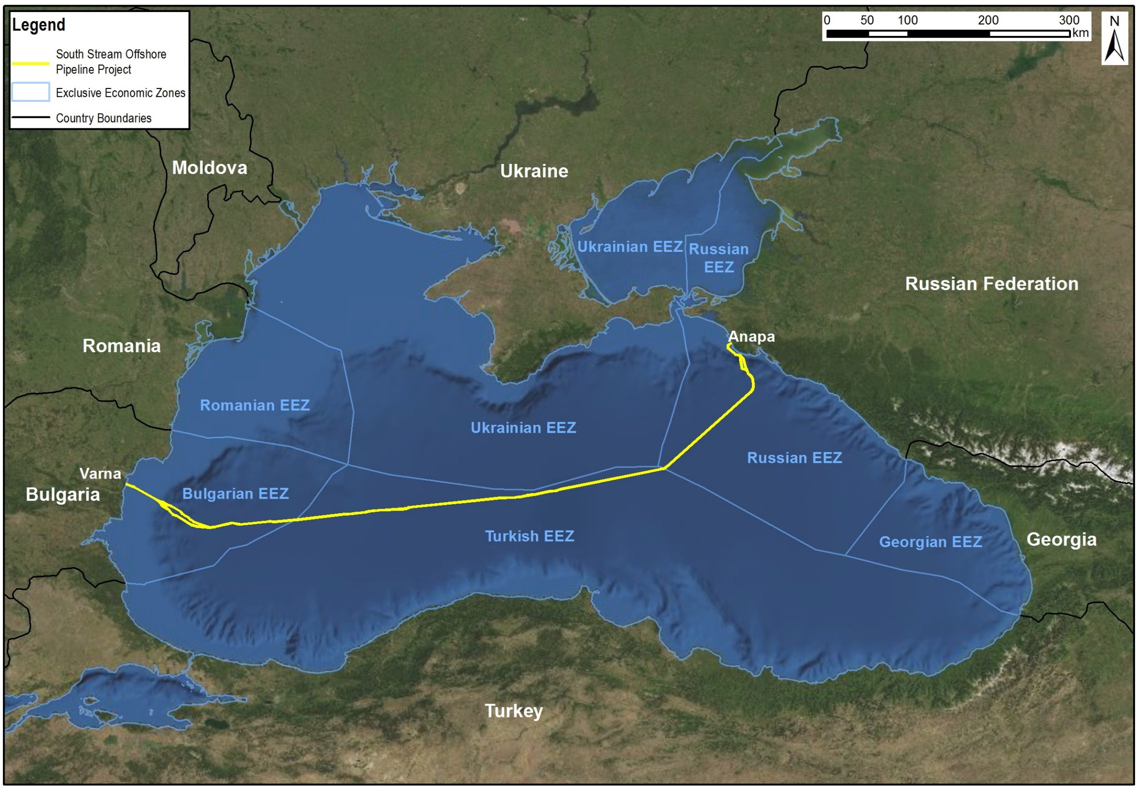
This Environmental and Social Impact Assessment (ESIA) Report has been prepared specifically for the Turkish Sector of the South Stream Offshore Pipeline, referred to as the 'South Stream Offshore Pipeline – Turkish Sector' or as 'the Project' throughout this ESIA Report[1].

Separate ESIAs Reports have been prepared by South Stream Transport B.V. (South Stream Transport) for the Russian and Bulgarian Sectors of the South Stream Offshore Pipeline. In addition, separate Environmental Impact Assessments (EIAs) have been undertaken by other companies for the other components of the South Stream Pipeline System.

[1] Where this report refers to the 'South Stream Offshore Pipeline', and not to 'the Project', the intent is to refer to the overall South Stream Offshore Pipeline covering all three countries (Russia, Turkey and Bulgaria).

The South Stream Offshore Pipeline will comprise four adjacent pipelines extending approximately 931 kilometres (km) across the Black Sea from the Russian coast near Anapa, through the Russian, Turkish, and Bulgarian Exclusive Economic Zones (EEZs), to the Bulgarian coast near Varna (Figure 1.2). In addition to the offshore pipelines, the South Stream Offshore Pipeline will consist of short onshore sections in Russia and Bulgaria, with facilities to meter the gas prior to and after transportation through the offshore system. When complete, the South Stream Offshore Pipeline will be able to transport 63 billion cubic metres (bcm) of natural gas annually. Each of the four pipelines will have a maximum flow rate of approximately 15.75 bcm per year, and a maximum design pressure of 300 bar.

Figure 1.2 South Stream Offshore Pipeline



Note: All geographic boundaries depicted in maps in this ESIA Report relate to February 2014.

This chapter provides an overview of the proposed development in Turkey, the impact assessment process, the scope of this ESIA Report, the anticipated schedule for development, and the structure and content of this ESIA Report.

1.1.1 Need for the South Stream Offshore Pipeline

1.1.1.1 Current European Union Gas Consumption, Demand, and Pipeline Capacity

Natural gas plays a significant role in Europe's energy mix: in 2011 approximately 24% (Ref. 1.1) of the European Union (EU) member states' (EU-28) primary energy consumption came from natural gas, with only around 41% of that demand being met by domestic EU-28 production (i.e. by gas fields within the EU).

In 2011, EU gross inland consumption (production plus net import) of dry natural gas was approximately 492 bcm (Ref. 1.2), production was approximately 185 bcm (Ref. 1.3), and net imports amounted to approximately 308 bcm (Ref. 1.4).

The EU secures imports from a variety of sources, including traditional suppliers such as Russia, Norway and Algeria (Ref. 1.5). Within the broader European region (e.g., not limited to the 28 EU member states), Russia supplied approximately 130 bcm in 2012 (Ref. 1.6).

1.1.1.2 European Union Production and Demand Forecasts

Future estimates of EU production and demand are inherently uncertain and require a number of assumptions regarding, for example, changes in gross domestic product (GDP), population, energy sector composition and prices, and government policy. Given these uncertainties, this section incorporates forecasts from two sources: International Energy Agency (IEA) (Ref. 1.1 to Ref. 1.5), which is an independent agency that produces yearly reports on World energy and production and consumption, and Wood Mackenzie (WM) (Ref. 1.7), an energy consulting company engaged by South Stream Transport B.V. as Lenders' Gas Market Consultant to carry out a market analysis with specific reference to the South Stream Offshore Pipeline. Each source analyses three scenarios designed to reflect future demand relative to supply. The following sections present the results from each of these reports.

The results from the IEA and WM reports are not directly comparable because they are based on different future demand scenarios and geographical scope. The IEA report bases its forecasts on a definition of Europe that is reflected by the 28 members of the EU, whereas the WM report defines Europe[2] as the 28 member states as well as Bosnia and Herzegovina, Norway, Serbia, Switzerland and Turkey. It should be noted that the inclusion of, particularly, Norway (production) and Turkey (demand) is a key source of the differences in the forecasts.

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[2] The WM data presented in this report reflects the forecast conventional natural gas supply for the following countries: Austria, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Hungary, Ireland, Italy, Norway, Netherlands, Poland, Romania, Serbia, Slovakia, Spain, Turkey, and United Kingdom. Forecast demand for conventional gas is presented for the following countries: Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Netherlands, Norway, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and United Kingdom.

International Energy Agency (IEA) Forecasts

Table 1.1 describes the IEA scenarios for future EU demand and the assumptions that underpin them.

Table 1.1 IEA Future Demand Scenarios for EU

	Scenario Assumptions
New Policies Scenario	The New Policies Scenario incorporates policies and measures that affect energy markets and that had been adopted as of mid-2013. It also takes account of other relevant commitments that have been announced, even when the precise implementation measures have yet to be fully defined. These commitments include programmes to support renewable energy and improve energy efficiency, initiatives to promote alternative fuels and vehicles, carbon pricing and policies related to the expansion or phase-out of nuclear energy, and initiatives taken by the G-20[3] and Asia-Pacific Economic Cooperation (APEC) economies to reform fossil-fuel subsidies. Under the New Policies Scenario, gas demand in the EU is forecast to reach 505 bcm per year by 2035.
Current Policies Scenario	The Current Policies Scenario takes into account only those policies and measures affecting energy markets that were formally enacted as of mid-2013. It describes a future in which governments do not implement any recent commitments that have yet to be backed-up by legislation or introduce other new policies bearing on the energy sector. The scenario is designed to provide a baseline picture of how global energy markets would evolve if established trends in energy demand and supply continue unabated. Under the Current Policies Scenario, gas demand in the EU is predicted to reach 566 bcm per year by 2035.
"450" Scenario	The "450" Scenario shows what is needed to set the global energy sector on a course comparable with a near 50% chance of limiting the long-term increase in the average global temperature to two degrees Celsius (2°C). This scenario leads to a peak in the concentration of greenhouse gases (GHGs) in the atmosphere around the middle of this century, at a level above 450 parts per million (ppm), but not so high as to be likely to precipitate changes that make the 2°C objective unattainable. For the period to 2020, policy action aiming at fully implementing the commitments under the Cancun Agreements is assumed to be undertaken. After 2020, Organisation for Economic Cooperation and Development (OECD) countries and other major economies are assumed to implement emissions reduction measures that, collectively, ensure a trajectory consistent with the target. From 2020, OECD countries are assumed to mobilise $100 billion in annual financing from a variety of sources for abatement measures in non-OECD countries. Under the "450" Scenario, gas demand in the EU is predicted to be 384 bcm per year by 2035.

[3] G-20 refers to the group of 20 finance ministers and central bank governors.

Table 1.2 contains estimated future demand for natural gas in the EU for all IEA scenarios to 2035. It also contains forecast EU production over the same period.

Table 1.2 IEA Predicted Gas Demand in EU (bcm)

	2020	2025	2030	2035
New Policy Scenario	452	477	491	505
Current Policy Scenario	467	n/a	533	566
450 Scenario	426	n/a	401	384
EU production (bcm)	135	122	114	104

Note: Converted from mtoe to bcm using conversion factor of 1.11

In contrast to increasing demand, EU natural gas production is forecast by IEA to fall from 185 bcm per year in 2011 to 104 bcm per year in 2035 (Ref. 1.1). Reduced domestic gas production means that under the New Policy Scenario approximately 79% of EU forecast demand in 2035, or 401 bcm per year in absolute terms, will have to be met by natural gas imports (Ref. 1.1). Table 1.3 shows the predicted net import requirements for all future scenarios, given forecast demand.

Table 1.3 IEA Gas Demand EU Minus Domestic Production: Net Import Requirements (bcm)

	2020	2025	2030	2035
New Policy Scenario	317	355	377	401
Current Policy Scenario	332	n/a	419	462
450 Scenario	291	n/a	287	280

Wood Mackenzie (WM) Forecasts

Table 1.4 describes the WM scenarios for future EU demand and the assumptions that underpin them.

Table 1.5 contains estimated future demand for natural gas in Europe for all WM scenarios to 2035. It also contains forecast European production over the same period. As with the IEA report, it shows demand for natural gas increasing at the same time that European production is declining.

Table 1.4 WM: Future Demand Scenarios for Europe

	Scenario Assumptions
Base case	Demand growth will be driven by increasing energy intensity in emerging European economies as well as recovery in the power sector. Gas demand in the power sector will recover somewhat gas utilisation from the current record low levels. This will be supported by a fundamental rebalancing of the EU Emission Trading Scheme taking effect towards the end of the forecast period, against a backdrop of coal retirements. In mature markets such as Italy, Germany and the UK gas demand will remain flat or decline slightly. Gas markets in Central and Eastern Europe, including Turkey, have greater long term scope for gas penetration driven by gas infrastructure developments and increasing energy demand per capita. Under the Base Case scenario, gas demand is estimated to be 623 bcm by 2035.
High case	This scenario assumes a faster economic recovery, lower efficiency gains and greater penetration of gas in the power sector. Total gas demand is forecast to reach 760 bcm by 2035.
Low case	This scenario assumes that gas demand declines in mature economies continue, however this is offset by increased energy intensity in emerging European economies, notably Turkey and new uses for gas such as Liquefied Natural Gas (LNG) bunkering. Total gas demand is forecast to grow, albeit at a slower rate. Gas demand grows from 502 bcm in 2013 to 544 bcm in 2035.

Table 1.5 WM: Predicted Gas Demand in Europe (bcm)

	2020	2025	2030	2035
Base case	568	590	600	623
High case	637	683	719	760
Low case	523	533	531	544
European production (base case)	261	224	201	185

Reduced domestic gas production means that, under the Base Case Scenario, approximately two thirds of European forecast demand in 2035, or 438 bcm per year in absolute terms, will have to be met by natural gas imports (Ref. 1.7).

Table 1.6 contains the predicted net import requirements for all future scenarios, given forecast demand.

Table 1.6 WM European Gas Demand Minus Domestic Production: Net Import Requirements (bcm)

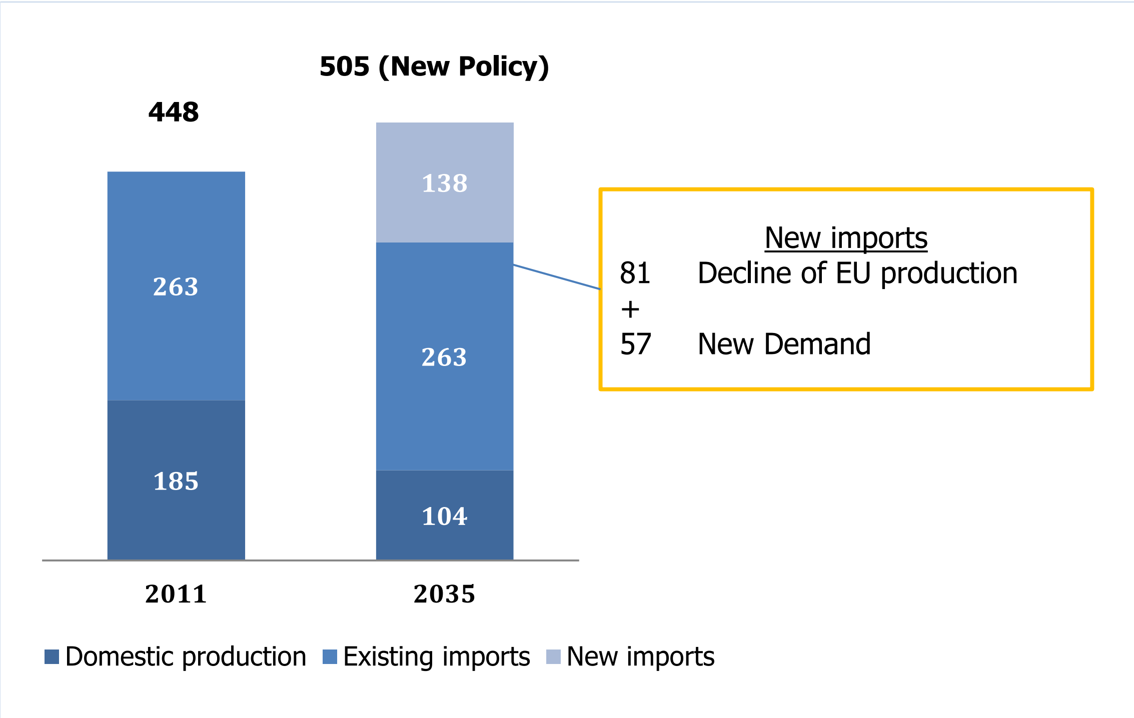
	2020	2025	2030	2035
Base case	307	366	399	438
High case	375	459	517	575
Low case	261	309	330	354

Summary

The South Stream Offshore Pipeline will respond to increased demand for foreign natural gas by providing a transport capacity of 63 bcm per year which, will be directed to the European supply network.

Results from the IEA report suggest that this capacity could contribute to the expected increased reliance on imported natural gas resulting from the combination of declining EU production and increased demand in 2035 under the New Policy Scenario (Figure 1.3).

Figure 1.3 EU Gas Demand and Import Forecast – New Polices Scenario 2010 to 2035 (bcm)



The results from the WM report suggest that the South Stream Offshore Pipeline will contribute to the expected increase in imported natural gas resulting from the combination of declining

European production and increased demand in 2030, under the Base Case Scenario (Figure 1.4).

Figure 1.4 Europe Gas Demand and Import Forecast – Base Case 2013-2035 (bcm)

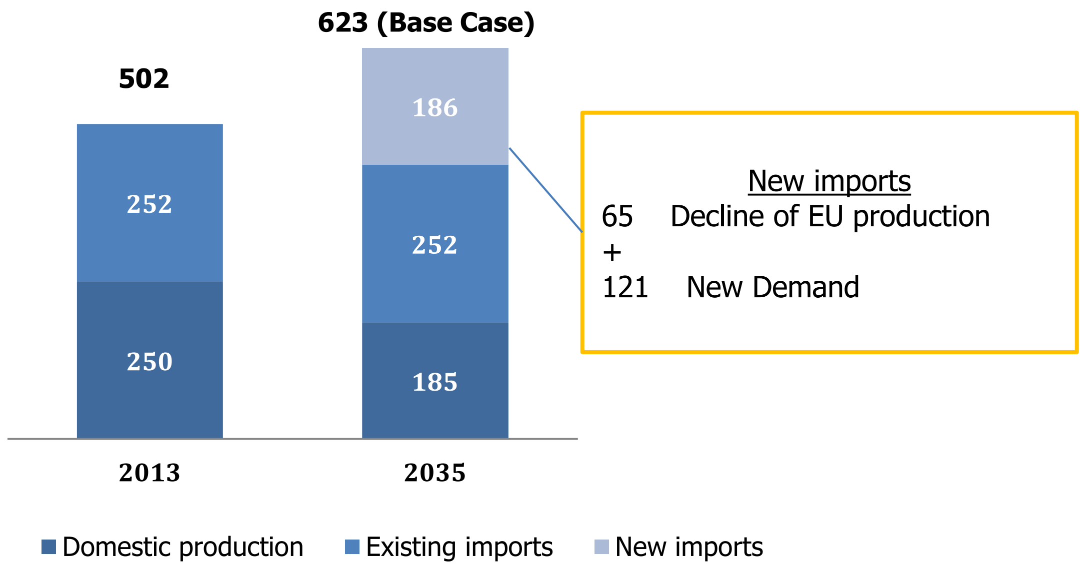


Table 1.7 contains the forecast contribution of the South Stream Offshore Pipeline to meeting future import demand for natural gas, for all IEA and WM scenarios. It shows that the contribution of the South Stream Offshore Pipeline is estimated to range from 11% to 22% under the future scenarios presented in the IEA and WM reports.

Although both the IEA 'New policy' and WM 'Base case' scenarios result in approximately the same estimated contribution being made to total import demand (i.e. 16% and 14%, respectively), this does not necessarily reflect agreement between the two estimates. As previously stated, the IEA and WM forecasts are not directly comparable because different future scenarios and geographical scopes have been used.

Table 1.7 South Stream Offshore Pipeline Forecast Maximum Contribution to Import Demand, 2035

	Potential Maximum Contribution to Total Import Demand
IEA Results	
New Policy scenario	16%
Current Policy scenario	14%
450 scenario	22%

Continued…

	Potential Maximum Contribution to Total Import Demand
WM Results	
Base case	14%
High case	11%
Low case	18%

It should be noted that these forecasts are based on the pipeline operating at full capacity.

Complete.

1.1.2 South Stream Offshore Pipeline Proponent

The South Stream Offshore Pipeline is being developed by South Stream Transport B.V. (South Stream Transport)[4], an international joint venture established on 14 November 2012 in Amsterdam, the Netherlands, for the planning, construction, and subsequent operation of the offshore gas pipeline through the Black Sea. The Russian company Gazprom holds a 50% stake in South Stream Transport, the Italian company Eni has a 20% stake and the French energy company EDF Group and German company Wintershall each hold 15%.

1.1.2.1 Gazprom, Russia

Gazprom is the world's largest supplier of natural gas, accounting for approximately 15% of global gas production in 2012. It was established as a joint stock company in 1993, and is partly owned by the Russian state (50.002%). The company's core activities include the exploration, production, transportation, storage, processing and marketing of hydrocarbons, as well as the generation and marketing of heat and electric power.

Gazprom controls 72% of Russian gas reserves producing 74% of all Russian natural gas output. A leading company in the construction and operation of gas pipelines, it controls the world's largest gas transmission network, the United Gas Supply System of Russia, with a total length of over 168 thousand kilometres.

1.1.2.2 Eni, Italy

Headquartered in Italy, Eni is one of the world's major integrated energy companies, operating in the sectors of oil and gas exploration and production, international gas transportation and marketing, power generation, refining and marketing, chemicals and oilfield services.

[4] Previously, the Project was developed by Gazprom during 2009-2011, and then by South Stream Transport AG during 2011-2012. South Stream Transport then moved head office from Switzerland to the Netherlands and established South Stream Transport B.V. in November 2012.

1.1.2.3 EDF Group, France

The EDF Group, one of the leaders in the European energy market, is an integrated energy company active in all areas of the business: generation, transmission, distribution, energy supply and trading, including provision of natural gas supplies. The EDF Group is the leading electricity producer in Europe.

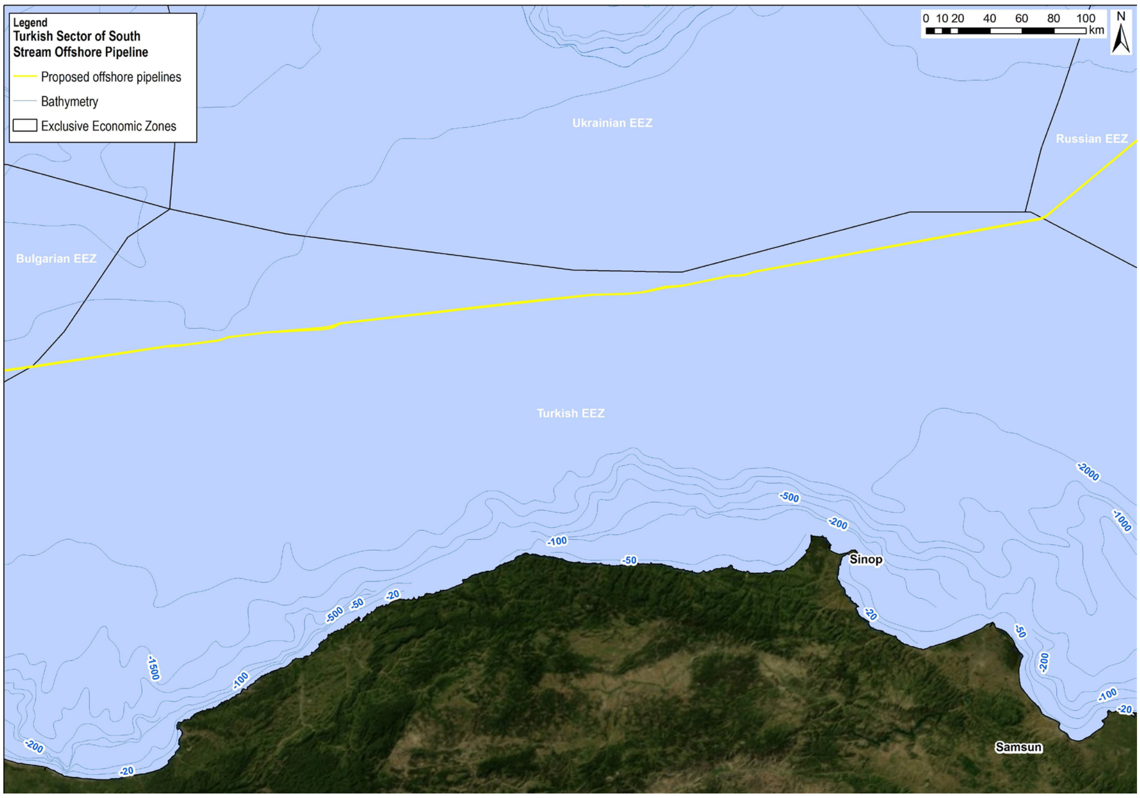
1.1.2.4 Wintershall, Germany

Wintershall, based in Kassel, Germany, is a wholly-owned subsidiary of BASF. The company has been active in the exploration and production of crude oil and natural gas for over 80 years and is now Germany's largest crude oil and natural gas producer.

1.2 Project Overview

The Turkish Sector extends approximately 470 km in length and runs through the Black Sea from the border between the Russian and Turkish EEZs in the east to the border between the Turkish and Bulgarian EEZs in the west (Figure 1.5).

Figure 1.5 South Stream Offshore Pipeline – Turkish Sector



The pipelines will be laid directly on the seabed at a depth ranging between approximately 2,000 metres (m) and 2,200 m. The water depth and the physical characteristics of the Black

Sea present a challenge for the Project and have influenced a number of key technical decisions, including the routing of the pipelines and the siting of the landfall facilities.

Further details on the Project and the proposed activities that will be carried out can be found in **Chapter 5 Project Description**.

The Russian and Bulgarian sectors of the South Stream Offshore Pipeline are the subject of separate ESIAs and, therefore, they are not considered in detail within this ESIA report with the exception of potential cumulative impacts (**Chapter 14 Cumulative Impact Assessment**).

1.2.1 Project Area

The Project Area is some 470 km in length and 2 km in width, extending along an east west orientation across the north of the Turkish EEZ. Its length is defined by the distance between the points where the four pipelines cross from the Russia and Turkey EEZ and Turkey and Bulgaria EEZ boundaries. Its width is defined by the width of the initial proposed corridor in which the pipelines would be laid, which was informed by the Front End Engineering and Design (FEED).

Since FEED, South Stream Transport has discussed the dimensions of the Project footprint with the relevant Turkish authorities. The Project footprint is defined as the area on the seabed encompassing the four pipelines and a safety zone either side of the outermost pipelines, which precludes any third party seabed activities within this zone. As a result of these consultations, it is proposed that the pipelines will be laid within a 420 m width corridor, in agreement with the relevant Turkish authorities. The corridor accommodates the four pipelines and Operational Safety Zone either side of the outermost pipelines, which will serve as the permanent Project footprint.

The pipelines will be laid in parallel, and in general, the distance between the pipelines will be 100 m, although this may vary locally in response to specific sea bed conditions.

Construction activities associated with the installation of the offshore pipelines will also require a number of vessels and support from ports in Russia and/or Bulgaria that will service the South Stream Offshore Pipeline as a whole.

During construction, a navigational Safety Exclusion Zone is proposed of 2 km radius centered on the pipe-lay vessel. This will be agreed with the relevant maritime authorities which will, in turn, ensure that it is communicated to vessels in passage in the vicinity of the pipe lay vessel. There are no plans for more than one pipe lay vessel to be operating within the Turkish EEZ at any one time.

There are no onshore facilities in Turkey. Furthermore, no temporary facilities associated with the Project will be constructed in Turkey and no Turkish ports will be used during the Project. At its closest point, the Project Area is approximately 110 km from the Turkish mainland.

1.2.2 Associated Facilities

Associated Facilities are defined by the OECD Common Approaches[5] (Ref. 1.8) as follows:

"…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."

The Equator Principles (Ref. 1.9) reference Associated Facilities indirectly through the International Finance Corporation (IFC) Performance Standards (PSs)[6] (Ref. 1.10).

Based on the above definitions, the Project (Turkish Sector) has no Associated Facilities.

1.2.3 South Stream Pipeline System

The South Stream Pipeline System consists of one offshore and four onshore components as summarised in Table 1.8.

Table 1.8 South Stream Pipeline System

Component/Developer	Key Data	EIA Status (as of 1 April 2014)
South Stream Offshore Pipeline being developed by South Stream Transport B.V.	Length: 931 km (Russia 230 km, Turkey 470 km, Bulgaria 230 km)	**Russia**: EIA was approved by State Expert Review in March 2014. **Turkey**: EIA report approval by Ministry of Environment and Urbanisation expected in May 2014. **Bulgaria**: EIA approved by the Ministry of Environment and Water in January 2014.
South Stream Pipeline Bulgaria being developed by South Stream Bulgaria AD	Length: 538 km Compressor Stations: 3 (Varna, Lozen and Rasovo) 300 MegaWatt (MW) aggregate capacity	EIA approved by the Ministry of Environment and Water in August 2013.

Continued…

[5] OECD Common Approaches are the environmental and social standards applicable to the Project. Further details are provided in **Chapter 2 Policy, Regulatory and Administrative Framework**.

[6] IFC PS1 paragraph 8: Associated Facilities are defined as *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*.

Component/Developer	Key Data	EIA Status (as of 1 April 2014)
South Stream Pipeline Serbia being developed by South Stream Serbia AG	Length: 422 km Compressor Stations: 1 (with 225 MW aggregate capacity)	EIA approved by the Ministry of Energy Development and Environmental Protection in December 2013
South Stream Pipeline Hungary being developed by South Stream Hungary Zrt	Length: 299 km Compressor Stations: 1 (100 MW capacity)	EIA to be submitted to authorities in January 2015
South Stream Pipeline Slovenia being developed by South Stream Slovenia d.o.o	**Length**: 266 km **Compressor Stations**: 2 (128 MW aggregate capacity)	EIA to be submitted to authorities in 2014/2015
TOTAL	**Length**: 2,456 km **Compressors Stations**: 8	

Complete.

The components of the South Stream Pipeline System on the territory of Bulgaria, Serbia, Hungary, and Slovenia are separate projects and are subject to separate EIAs in compliance with national legislations.

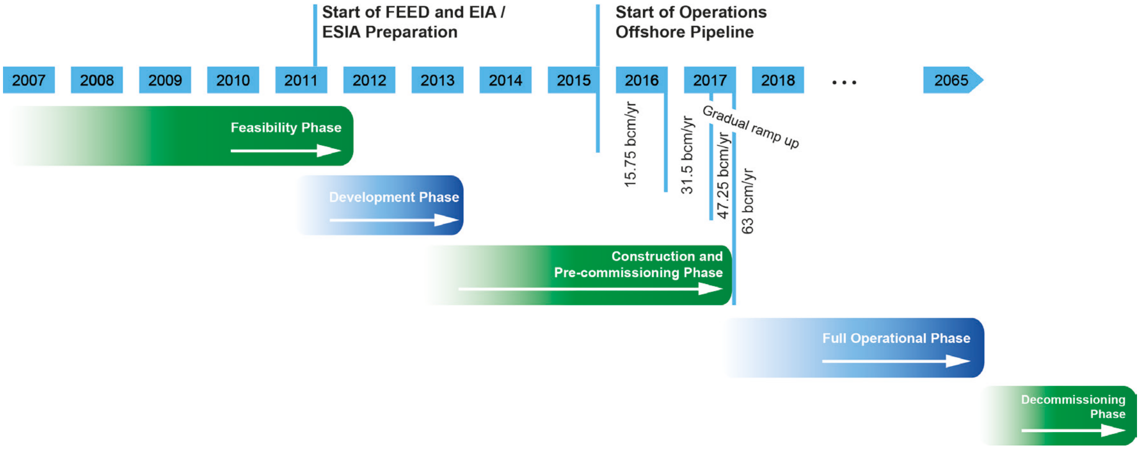
1.2.4 South Stream Offshore Pipeline Phases and Timeline

South Stream Offshore Pipeline development includes five key phases:

- **Feasibility Phase** (2007 to early 2012) initiated by Gazprom. This Phase involved the development of Feasibility Studies in which a number of gas pipeline routes and landfall options were assessed and a preliminary engineering (conceptual) design was developed;
- **Development (or Design) Phase** (late 2011 to late 2013) undertaken by South Stream Transport. This Phase involves development of the FEED together with the national EIA Application File, Scoping Report and Turkish national EIA. This Phase also includes development of the ESIAs and Environmental and Social Management Plans (ESMPs) to meet the international standards and guidelines for financing;
- **Construction and Pre-Commissioning Phase** (2014 to end 2017). This Phase will involve construction activities and a number of activities, known as pre-commissioning activities, which will be undertaken after each pipeline has been installed to ensure that the pipelines meet operational requirements;
- **Operational Phase (consisting of Commissioning and Full Operational Phase)** (2017 to 2065). The Project will have an operational design life of 50 years; and
- **Decommissioning Phase** (2065 onwards).

An indicative timeline for the South Stream Offshore Pipeline is provided in Figure 1.6.

Figure 1.6 South Stream Offshore Pipeline Timeline



1.3 EIA and ESIA Requirements for the Project

The Project is subject to impact assessments for national regulatory and international financing requirements.

As the Project is located within the EEZ of Turkey, the Project has submitted an EIA Report in accordance with Turkish regulatory requirements.

As the Project will be subject to project financing, this ESIA is aligned with the environmental and social performance standards and guidelines set by International Financial Institutions.

The environmental and social standards and guidelines of the Project are as follows:

- The OECD Common Approaches on the Environment and Officially Supported Export Credits, dated 2012 (Ref. 1.8);
- The Equator Principles III (2013) (Ref. 1.9);
- Japan Bank for International Cooperation ("JBIC") Guidelines for Confirmation of Environmental and Social Consideration, dated 2012 (Ref. 1.11); and
- The IFC Performance Standards (2012) (Ref. 1.10) and World Bank Group Environmental Health and Safety (EHS) Guidelines, which underpin the OECD Common Approaches and Equator Principles III.[7]

This ESIA Report has been prepared by URS Infrastructure & Environment UK Limited (URS) in accordance with the international standards and guidelines described above. A Turkish

[7] As per IFC PS, South Stream Transport is committed to implementing Good International Industry Practice (GIIP) in relation to environmental and social performance in all phases of the South Stream Offshore Pipeline. Further details on the standards and guidelines relevant to this ESIA Report are included in **Chapter 2 Policy, Regulatory and Administrative Framework**.

consultancy, ELC Group, prepared the EIA documentation in compliance with national requirements.

Information from the national EIA process preceded and therefore informed this ESIA Report. URS further addressed a number of issues that were necessary to meet requirements and standards for international financing. URS and ELC Group coordinated the technical development of the ESIA and EIA chapters to ensure consistency of methodology, approach and content as far as practicable.

Nevertheless, there are differences between the two documents in relation to their format, content and in the assessment of some impacts. These variances are due mainly to the difference between the Turkish EIA regulatory requirements and conventional ESIA practice as set out in the standards and guidelines for international financing.

1.4 Objectives of this ESIA

In accordance with the Equator Principles and the OECD Common Approaches, the objectives of this ESIA Report are based on those of IFC PS1: Assessment and Management of Environmental and Social Risks (Ref. 1.12), which are:

- *"To identify and evaluate environmental and social risks and impacts of the project;*
- *To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment;*
- *To promote improved environmental and social performance of clients through the effective use of management systems;*
- *To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately; and*
- *To promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated."*

1.4.1 Area of Influence of the Project

This ESIA Report has been prepared taking into consideration the definition of Project Area of Influence provided by IFC PS1 (Ref. 1.12) which states:

"Where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence. This area of influence encompasses, as appropriate:

- *The area likely to be affected by:*
    - *The project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;*

- *Impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or*
- *Indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.*

- *Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted."*

Consistent with the definition provided above, the Project Area of Influence includes those areas likely to be impacted by the main Project Facilities, and in the case of cumulative impacts, incremental impacts from other developments, unrelated to the Project, that will take place within the vicinity of the Project Area.

1.4.2 Cumulative and Transboundary Impacts

While the activities associated with a single project may or may not result in significant impacts, the "cumulative" effects of simultaneous projects, may be more significant and should be considered within an ESIA. This ESIA Report adopts the IFC PS (Ref. 1.10) definition of cumulative impacts which are defined as:

"*Cumulative impacts are those that result from the incremental impact of the Project when added to other existing, planned and reasonably predictable future projects and developments."*

Cumulative impacts may occur as a result of interactions between any residual (i.e. post-mitigation) Project impacts, and the impacts of other activities or developments in the vicinity of the Project Area.

Further details of the schemes considered within the cumulative impact assessment are provided in **Chapter 14 Cumulative Impact Assessment**.

Where specific impacts are anticipated to extend across Project Area boundaries (Section 1.2.1), the ESIA Report provides a description of the potential geographical extent associated with the impact. In particular, the potential for transboundary impacts (i.e. the potential for the Project Area of Influence to extend across Turkish national boundaries) is discussed in **Chapter 15 Transboundary Impact Assessment.**

As a supplement to the ESIA Report, an **ESIA non-technical summary (NTS)** has been prepared. The NTS describes the findings of the ESIA Report, including the potential environmental and social impacts, and actions that will avoid, reduce, or mitigate those impacts.

1.4.3 Structure of the ESIA Report

The ESIA chapter titles and a summary of the approach and content are provided in Table 1.9.

Table 1.9 ESIA Report Structure

ESIA Report Structure	
1. Introduction	Presents an overview of the South Stream Offshore Pipeline – Turkish Sector and the objectives of the ESIA Report. This chapter also details the purpose and scope of the ESIA Report.
2. Policy, Regulatory and Administrative Framework	The chapter includes: • Description of the Turkish regulatory process to be followed for all Project Activities; • Identification of Turkish environmental and social legislation of relevance to the Project; • Identification of international treaties and conventions to be adhered to; and • Identification of international standards and guidelines of relevance to the Project.
3. Impact Assessment Methodology	The chapter includes: • A description of the ESIA process; and • A description of the impact assessment methodology and of the adopted impact significance criteria.
4. Analysis of Alternatives	A comparison of the developmental options considered in the Project design phase including the 'zero' alternative, alternative gas transportation options and routing options.
5. Project Description	A detailed description of: • Project infrastructure; • Construction methodologies and staging; • Operational conditions and maintenance requirements; and • Decommissioning process.
6. Stakeholder Engagement	A summary of all Project consultation undertaken, the issues raised, and where these issues have been addressed within the ESIA documentation. The chapter also describes future consultation activities.

Continued…

<table>
<tr><th colspan="2">ESIA Report Structure</th></tr>
<tr><td>7. Physical and Geophysical Environment

8. Biological Environment

9. Socio-Economic

10. Cultural Heritage</td><td>These chapters include:
Description of the methods used and results from surveys and secondary data review to define baseline conditions relevant to the technical discipline;
Assessment of potential impacts arising from all phases of the Project and related activities;
Identification of design controls and practicable mitigation measures to be applied; and
Assessment of residual impacts associated with the Project following mitigation and the need for monitoring of residual impacts.</td></tr>
<tr><td>11. Ecosystem Services</td><td>The chapter includes:
Description of the methods used and results from surveys and secondary data review to define the scope of the ecosystem services assessment and the baseline conditions for the ecosystems present in the Project Area and their associated services and benefits;
Nature and significance of the potential impacts on ecosystem services and their beneficiaries arising from all phases of the Project and related activities;
Priority ecosystem services;
Practicable mitigation measures to be applied; and
Nature and significance of residual impacts associated with the Project following mitigation and the need for monitoring of residual impacts.</td></tr>
<tr><td>12. Waste Management</td><td>The chapter includes:
Description of the legal and regulatory framework applicable to the Project based on wastes anticipated to be generated by Project activities;
Identification of available waste facilities for the Project;
Assessment of potential impacts arising from the management of wastes;
Identification of practicable mitigation measures to be applied; and
Assessing the significance of the residual impacts post mitigation.</td></tr>
<tr><td>13. Unplanned Events</td><td>The chapter includes:
Description of the potential unplanned events and impacts that may arise as a result of the Project;
Identification of design control and mitigation measures able to be undertaken; and
Discussion of the residual risk posed by the identified unplanned events and relevant monitoring requirements.</td></tr>
</table>

Continued…

ESIA Report Structure	
14. Cumulative Impact Assessment	A description of the potential cumulative impacts as a result of Project development and other existing and proposed developments in the vicinity of the Project Area.
15. Transboundary Impact Assessment	A description of the potential for transboundary impact that may arise as part of the Project.
16. Environmental and Social Management	An outline of the key management measures, processes and monitoring requirements to be undertaken, based on the outcomes of the impact assessment.
17. Conclusions	A summary of the residual impacts arising as a result of the Project and provision of overall conclusions as to the overall environmental and social significance of impacts arising from the Project.

Complete.

1.5 Related South Stream Offshore Pipeline Impact Assessment Documents

In addition to this ESIA Report and the Turkish EIA Report that have been prepared specifically for the Turkish sector, additional impact assessment documentation has been prepared for the other host countries of the South Stream Offshore Pipeline, specifically:

- A Russian EIA Report to meet Russian regulatory requirements;
- A Russian ESIA Report to address international financing standards and guidelines for the Russian Sector;
- A Bulgarian EIA Report to meet Bulgarian regulatory requirements; and
- A Bulgarian ESIA Report to address international financing standards and guidelines for the Bulgarian Sector.

References

Number	Reference
Ref. 1.1	International Energy Agency, World Energy Outlook 2013, Annex A.
Ref. 1.2	International Energy Agency, World Energy Outlook 2013, Table 3.2.
Ref. 1.3	International Energy Agency, World Energy Outlook 2013, Table 3.4
Ref. 1.4	International Energy Agency, World Energy Outlook 2013 Table 3.6
Ref. 1.5	International Energy Agency, World Energy Outlook 2013
Ref. 1.6	BP, Statistical Review of World Energy 2013.
Ref. 1.7	Wood Mackenzie 2013 South Stream Offshore Pipeline Lenders' Gas Market Consultant: Final Draft Gas Market Report.
Ref. 1.8	Organisation for Economic Co-operation and Development (OECD) Revised Council Recommendation on Common Approaches for officially supported export credits and environmental and social due diligence (June 2012). http://search.oecd.org/officialdocuments/. Accessed 24 September 2013.
Ref. 1.9	Equator Principles (June 2013). http://www.equator-principles.com. Accessed 24 September 2013.
Ref. 1.10	International Finance Corporation (IFC) Performance Standards on Environment and Social Sustainability (January 2012). http://www1.ifc.org. Accessed 24 September 2013.
Ref. 1.11	Japanese Bank for International Cooperation (August 2012), http://www.jbic.go.jp/en. Accessed 31 October 2013.
Ref. 1.12	International Finance Corporation (IFC) 2012. Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. http://www1.ifc.org. Accessed 21 January 2013.

Chapter 2: Policy, Regulatory and Administrative Framework

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Tables

2 Policy, Regulatory and Administrative Framework

2.1 Introduction

This chapter provides an overview of the policy, regulatory and administrative framework relevant to the Project.

As the Project is located within the Turkish Exclusive Economic Zone (EEZ), this environmental and Social Impact Assessment (ESIA) Report will take into consideration relevant Turkish regulatory requirements and administrative structures.

South Stream Transport is also committed to implementing Good International Industry Practice (GIIP) in relation to environmental and social performance during all Project Phases: Construction and Pre-commissioning, Operational and Decommissioning Phases.

As part of GIIP, various guidance documents shall be referred to as listed below. Measures contained therein will be adopted as project standards where relevant and practical:

- Sector Guidance Note Integrated Pollution Prevention and Control (IPPC) S1.2 (Guidance for the Gasification, Liquefaction and Refining Sector) (Ref. 2.1);
- The Oil and Gas Industry: Operating in Sensitive Environments 23 – International Petroleum Industry Environmental Conservation Association (IPIECA) (Ref. 2.2); and
- Environmental Management in Oil and Gas Exploration and Production 1997 – United Nations Environment Program Industry and Environment (UNEP IE) and the Oil Industry International Explorations and Production Forum (E&P Forum) (Ref. 2.3).

The Project is being carried out in accordance with standards and guidelines for international financing, including those for Environmental and Social Impact Assessment. This commitment is reflected in South Stream Transport's *Health & Safety, Security and Environmental Policy*.

This chapter includes an overview of the following:

- South Stream Transport's relevant corporate policies (Section 2.2);
- Turkish regulatory and administrative structures (Section 2.3);
- Turkish Environmental Impact Assessment (EIA) process and other legislation relevant to the Project (Section 2.4);
- Turkish local and regional legislative requirements relevant to the Project (Section 2.5);
- International and regional conventions signed or ratified by Turkey relating to environmental protection, sustainable development, cultural heritage, socio-economic and human rights that are relevant for the Project (Section 2.6); and
- International standards and guidelines for financing that the Project will be undertaken in accordance with (Section 2.7), namely:

- The Organisation for Economic Co-operation and Development (OECD) Revised Council Recommendation on Common Approaches on the Environment and Officially Supported Export Credits (OECD Common Approaches) (Ref. 2.4);
- The Equator Principles (EP) III (Ref. 2.5);
- Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Consideration (Ref. 2.6); and
- The International Finance Corporation (IFC) Performance Standards (PS) and Word Bank Group EHS Guidelines, which underpin the OCED Common Approaches and EPIII (Ref. 2.7).

2.2 Corporate Policies

South Stream Transport has two policies that are relevant to this ESIA Report: a *Health & Safety, Security, and Environmental Policy*, and a *Corporate Social Responsibility and Sustainability Policy.* Both were signed into action by South Stream Transport's Chief Executive Officer (CEO) on 10 October 2013. The policy text is provided verbatim below and copies of the signed policies are available upon request.

2.2.1 Health & Safety, Security and Environmental Policy

The South Stream Transport *Health and Safety, Security and Environment Policy* is provided verbatim below:

"South Stream Transport B.V. (South Stream Transport) aims to provide reliable and secure energy to the European market responsibly and sustainably whilst creating value for society. We will do this by creating a major new infrastructure through the Black Sea; a gas pipeline that is safe, reliable and efficient.

South Stream Transport is committed to integrating social, economic, environmental and governance considerations into the everyday conduct of our business as we design, build and operate the South Stream Offshore Pipeline.

We are committed to environmentally and socially responsible management, in accordance with national, international and EU legislation, and internationally recognised standards for health & safety, security and environmental and social performance.

Our guiding principles are to:

- *Seek to achieve ZERO incidents and consequences related to health and safety, security and environment (HSSE);*
- *Ensure compliance with the requirements of applicable laws and regulations;*
- *Ensure compliance with applicable national and international standards and industry good practice;*
- *Set clear and transparent HSSE objectives and targets, and plan, implement and monitor performance in order to realise these goals;*

- *Prevent pollution and protect the environment by minimising adverse impacts throughout the project lifecycle;*
- *Manage construction and operational activities in a responsible and sustainable manner;*
- *Provide a safe and healthy workplace for employees, contractors and other persons to prevent injury or ill health, including definition of HSSE roles & responsibilities, measures to prevent injuries and ill health or minimise risks, information, instruction and training, and investigation of any incidents;*
- *Engage with Government and local authorities, Non-Governmental Organisations, local communities and members of the public, and other interested parties;*
- *Communicate and work closely with employees, contractors and other interested parties to ensure their understanding and shared commitment to conformance with this policy; and*
- *Ensure continual improvement of HSSE performance.*

This corporate policy applies to all our staff and across all our business activities, it guides our strategy, management, decisions and actions, it is incorporated into the documents governing our relationships with our suppliers and contractors, and guides our relationships with joint venture and other business partners.

We recognize that leadership and commitment from senior management is an essential component of success, and we are committed to ensuring that all senior executives and Directors of the Company are fully conversant with, and committed to, our policy and goals."

2.2.2 Corporate Social Responsibility and Sustainability Policy

The South Stream Transport *Corporate Social Responsibility and Sustainability Policy* is provided verbatim below:

"*South Stream Transport B.V. (South Stream Transport) aims to provide reliable and secure energy to the European market responsibly and sustainably whilst creating value for society. We will do this by creating a major new infrastructure through the Black Sea - a gas pipeline that is safe, reliable and efficient.*

South Stream Transport is committed to integrating social, economic, environmental and governance considerations into the everyday conduct of our business as we design, build and operate the South Stream Offshore Pipeline.

We are committed to good corporate citizenship in all the countries in which we operate, and intend to enter into transparent and respectful dialogue with our stakeholders enabling us to take their interests into account in our long term planning and everyday decision-making.

We aim to make the South Stream Offshore Pipeline safe, socially responsible and economically beneficial by:

- *Contributing to reducing climate change by delivering natural gas as a clean and efficient fossil fuel;*
- *Preserving the Black Sea environment, biodiversity and avoid any irreversible impact;*

- *Minimising our negative impacts and enhancing our positive impacts on the environment and communities;*
- *Applying good international industry practice in assessing and addressing any potential impacts;*
- *Adhering to international construction and quality standards in design, building and operating the gas pipeline and promoting best international safety standards and reducing risks for employers and local communities; and*
- *Development of opportunities for employers, suppliers and the wider community.*

Our guiding principles are to:

- *Guaranteeing the sustainability of its activities by applying a long-term strategy, providing a coherent framework for innovation development as well as integrated risk management and risk prevention management strategy;*
- *Respecting internationally recognized Human Rights in our own operations and promoting the respect of the aforementioned rights with regard to activities assigned to or carried out with Business Partners and in our relationships with stakeholders; and*
- *Conducting business with loyalty, fairness, transparency, honesty, and integrity and in compliance with the laws, regulations, similar mandatory requirements, and international standards and guidelines, both domestic and foreign that apply to its business.*

In operating, we shall respect the UN Global Compact Principles, including:

- *Protection of international human rights;*
- *Rights to free association, collective bargaining and employment non-discrimination;*
- *Protection and preservation of the environment; and*
- *Elimination of corruption, including bribery and extortion.*

This policy applies to all our staff and across all our business activities, it guides our strategy, management, decisions and actions, it is incorporated into the documents governing our relationships with our suppliers and contractors, and guides our relationships with joint venture and other business partners.

We recognize that leadership and commitment from senior management is an essential component of success, and we are committed to ensuring that all senior executives and Directors of the Company are fully conversant with, and committed to, our policy and goals."

2.3 Overview of Turkish Regulatory and Administrative Structures

2.3.1 Government Structure

Turkey is a democratic, secular, unitary, constitutional republic where the Prime Minister of Turkey is the Head of Government and the President of Turkey is the Head of State. The structure is as follows (Ref. 2.8):

- *Legislative*: Legislative power is vested in the Turkish Grand National Assembly (TGNA) which is composed of 550 deputies. Parliamentary elections are held every four years. The responsibilities of the TGNA include the adoption, amendment or repeal of laws, the supervision of the Council of Ministers (Cabinet), budgetary authority, the declaration of war, martial law or emergency rule and ratifying international agreements;
- *Executive*: The executive branch in Turkey has a dual structure composed of the President of the Republic and the Council of Ministers (Cabinet):
    - *President*: The Head of State and representative of the Republic of Turkey. The President is elected by the TGNA members and has a five year term of office. The president can be elected for two terms at most. The president has legislative, executive and judicial duties and is responsible for ensuring the implementation of the Constitution; and
    - *Council of Ministers (Cabinet)*: The Council of Ministers (Cabinet) consists of the Prime Minister, designated by the President, and various ministers nominated by the Prime Minister and approved by the President. Their fundamental duty is to formulate and implement the internal and foreign policies of the state.
- *Judicial*: Judicial power in Turkey is exercised by independent courts and high judicial organs. Judges work independently and rule on the basis of personal conviction in accordance with constitutional provisions, law and jurisprudence. The Constitutional Court, the Supreme Court of Appeals, the Council of State, the Supreme Military Court of Appeals, the Supreme Military Administrative Court and the Court of Jurisdictional Conflicts are the supreme courts stipulated in the judicial section of the Constitution.

The executive power in operational fields is divided into ministries (Food, Agriculture and Livestock; Culture and Tourism; Energy and Natural Resources; Environment and Urbanisation; Finance; Foreign Affairs; Health; Interior; National Education; Defence; Science, Industry and Technology; Justice; Labour and Social Security; Family and Social Policy; European Union Affairs; Economy; Youth and Sport; Custom and Trade; Development; Forestry and Water; and Transportation, Maritime Affairs and Communication) and at administrative levels into provinces (central administrative organisations, e.g. Provincial Directorates of the Ministry of Environment and Urbanisation), under which there are administrative districts and local government bodies (municipal districts).

2.3.2 Administrative Units

Turkey consists of 81 provinces for administrative purposes. Each province is divided into districts with a total of 923 districts. Each province is administered by an appointed governor from the Ministry of Interior. The Project is entirely offshore with no onshore sections. The closest province to the Project Area, at a minimum distance of 110 km, is Sinop.

2.3.3 Government Ministries, General Directorates and Offices

National level government organisations (ministries, agencies, services) with EIA regulatory functions relating to the Project include:

- Ministry of Foreign Affairs (MoFA);

- Ministry of Environment and Urbanisation (MoEU);
- Ministry of Energy and Natural Resources;
- Ministry of Food, Agriculture and Livestock (MoFAL);
- Ministry of Transportation, Maritime Affairs and Communication;
- Ministry of Interior; and
- Naval Forces.

Ministries, such as the MoEU, create policies and perform compliance assurance functions. The MoEU also contain a number of general directorates and offices, which coordinate and supervise the activities, within their jurisdiction, such as the following (Ref. 2.9):

- General Directorate of Environmental Impact Assessment Permits and Audits - Department of EIA for Industrial Investments; and
- General Directorate of Environmental Management.

The general directorates and ministries listed above supervise environmental management and issue licenses and permits for activities under their jurisdiction.

2.3.4 Hierarchy of Laws

The Turkish Constitution states that the TGNA has sole authority to enact laws throughout Turkey. The 7th Article of the Turkish Constitution states that "legislative power shall not be delegated." The TGNA can only delegate under certain terms the power of legislation to the Council of Ministers. The hierarchy of enacted or written laws is as follows:

- The Constitution;
- Codes and Statues - International Treaties;
- Statutory Decrees;
- Regulations; and
- By-laws (Ref. 2.10).

2.3.5 Official Gazette

The Official Gazette "Resmi Gazete" of the Republic of Turkey (Ref. 2.11) is the national journal of the country for publishing legislation. It began publishing on 7 October 1920 and is published every day including weekends. The General Directorate of Legislation Development and Publication is responsible for its preparation, publication and distribution.

2.4 Legislation of the Republic of Turkey

2.4.1 The Constitution

The Constitution was ratified on 7 November 1982. The Constitution recognises all basic human rights commonly found in liberal democratic constitutions, such as freedoms of speech, press, religion, association, assembly, travel and communications and right to property. It is based on the "rule of law" or "supremacy of law" principle, which signifies a system where governmental agencies must operate within the framework of law and their actions are subject to review by independent judicial authorities (Ref. 2.11).

2.4.2 Environmental and Socio-Economic Legislation & Statutory Requirements

Associated with legal requirements for EIA, is a range of statutory requirements and guidelines. Turkish environmental and social legislation applicable to the Project is outlined in Appendix 2.1: National Legislation. Any specific requirements arising out of this legislation that influence the impact assessment process are detailed in the relevant technical chapters of this ESIA Report. A Health, Safety, Security and Environment (HSSE) Legal Register has been produced for the Project, which lists all legislation relevant to all stages of the Project, not only those covered within this ESIA Report. This HSSE Legal Register has formed the basis of Appendix 2.1 and the legislation detailed in each technical chapter of this ESIA Report.

2.4.2.1 Relevant Legislation for Permitting

The legal framework and permitting process for the Project is unique as it is located entirely offshore within Turkey's EEZ with no onshore facilities. The Project is subject to Turkish legal requirements within the framework described in the "Decision on the Turkish Exclusive Economic Zone (1986)" enacted by the Turkish government.

Whilst the MoEU is the competent authority for the EIA process in Turkey, the MoFA is the primary coordinator of the Project's permitting process in Turkey. As the primary coordinator, the MoFA requires that all permitting related matters are first discussed directly with the MoFA which, in coordination with other departments of the Turkish Government, determines the applicability of Turkish regulations and permitting procedures.

Two bilateral agreements between the Turkish Government and the Government of the Russian Federation are of relevance to the Project, providing the overarching framework for the Project's permitting process:

- 'Protocol on Cooperation in the Gas Sphere' (6 August 2009), which states that the parties shall provide all necessary conditions and permissions for unimpeded construction of a new gas pipeline across the Black Sea; and
- 'Permit Letter' from the Turkish MoFA to the Russian Embassy in Ankara (28 December 2011) providing an affirmative decision regarding the permit for construction provided that certain legal requirements, conditions and technical requirements are fulfilled. These conditions are outlined below:

- Ensure the timely notification of the commencement and completion of construction works and their detailed program;
- Notification of the precise details on vessels, equipment and crew, which will perform the work;
- Information on Project financing and the person in charge of implementing the Project;
- Comply with the following regulations during the construction and operation of the Project:

  i. Environmental Law, No: 2872 (Official Gazette Date: 11 August 1983 and No: 18132);
  ii. Regulation on Water Pollution Control (Official Gazette with Date: 31 December 2004 and No: 25687);
  iii. Regulation on Waste Collection from the Ships and Control of Wastes (Official Gazette Date: 26 December 2004 and No: 25682); and
  iv. Law Pertaining to Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Harmful Substances No. 5312 (Official Gazette Date: 21 October 2006 and No: 26326).

- Fulfilment of the following technical requirements:

  i. Do not cause any damage to production areas for fisheries products within the framework of the Law on Aquatic Products (No: 1380) and Fishery Products Regulations;
  ii. Obtain separate permits for every activity to be implemented by the vessels;
  iii. Provide the co-ordinates of the pipeline at 5 mile intervals to the MoFA;
  iv. Notify the MoFA of any Cultural Heritage Objects (CHO) [1] finds without any intervention;
  v. Sign crossing agreement with the cable owners in the event that a cable is crossed;
  vi. Liaise closely with the Turkish Petroleum Corporation (TPAO) regarding the potential overlapping of activities; and
  vii. Coordinate with the Department of Navigation, Hydrography and Oceanography of the Turkish Naval Forces, the Turkish Coast Guard Command, and Regional Directorates of the Undersecretariat of Maritime Affairs (now known as the General Directorate of Marine and Inland Waters) of the Ministry of Transport, Maritime Affairs and Communication prior to construction to ensure the safe realisation of the Project.

Engagement with the MoFA and MoEU in mid-2012 confirmed the applicability of Turkish EIA legislation to the Project and thus required the development of an EIA Report. It was later clarified that the positive fulfilment of the EIA procedure would be the main permitting process for the Project. Thus a number of the conditions outlined in the 'Permit Letter' would be included in the scope of the EIA Report.

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[1] In a further letter from the MoFA of the Republic of Turkey to the Embassy of the Russian Federation in Ankara, dated 12 October 2012, ref. N2012/ESGY/4564285, it states that should any CHO be discovered along the pipeline route, they will be treated as per Article 35 of Law on the Conservation of Cultural and Natural Assets (No: 2863) and as CHO which are listed in the Official Gazette, No. 24533 and dated 24 September 2001.

The MoEU is the competent authority for the EIA process in Turkey and a Project specific EIA Review and Evaluation Commission (REC)[2] was formed upon submission and review of the Project's EIA Application File (EIAAF). The REC is composed of relevant Turkish authorities whom either have a technical function to review the EIA Report or who have jurisdiction over regulations applicable to the Project in the Turkish EEZ. Upon approval of the EIA Report by the MoEU, a 'Construction Consent' will be granted by the MoFA, subject to the conditions which may be included in the EIA decision and the fulfilment of the technical requirements outlined in the 2011 'Permit Letter'.

Table 2.1 below provides a summary list of the key permitting documentation requirements in Turkey at project Development, Construction and Pre-Commissioning and Operational Phases.

Table 2.1 Key Permitting Documentation for Turkey

Phase	Documentation / Permit	Description
Development	Environmental Impact Assessment Application File (EIAAF) EIA Report	An Environmental Permit is issued upon receipt of an "EIA Positive" decision.
Construction and Pre-Commissioning	Construction Consent	MoFA will approve the start of construction and inform of any additional requirements, upon approval of the EIA Report and satisfaction of relevant consents.
Operational	Operation Consent	Based on standard application form.

2.4.3 EIA and Associated Legislation

The EIA process in Turkey is controlled at the national level by the following laws:

- Environmental Law, No: 2872 (Official Gazette Date: 11 August 1983 and No: 18132) (Ref. 2.12); and
- EIA Regulation (Official Gazette No. 26939 and dated 17 July 2008) (Ref. 2.13).

2.4.3.1 EIA Review and Approval Process

During the EIA process, once the draft EIA Report is submitted, the commencement of the review and evaluation process and availability of the EIA Report for the public is announced by the MoEU. Those stakeholders who want to review the EIA Report may do so at the MoEU's

[2] The REC is usually composed of representatives of relevant General Directorates and units of the Provincial branches of the MoEU; local departments of authorities relevant to the Project; Municipalities and other relevant organisations. The MoEU may invite universities, institutes, research and professional organisations, trade associations, unions, trade unions and representatives of non-governmental organisations (NGOs) to the REC if considered necessary.

office or the relevant provincial directorates to express their opinions within a timeframe that is announced and these public opinions are passed to the REC which is established by the MoEU.

The EIA Report is assessed from five perspectives:

- If the report and appendices are adequate and suitable;
- If the review, calculations and assessments are based on sufficient data and information;
- If the possible environmental impacts of the project have been reviewed thoroughly;
- If the mitigation measures to prevent potential adverse impacts to the environment have been identified; and
- If solutions to issues raised in the Public Participation meetings have been included.

A review and evaluation meeting is then undertaken in which the REC members must express the view of the organisation they represent. If important elements of the report are missing then the REC stops reviewing until the missing information is included in the EIA Report.

The project owner usually submits the final EIA Report to the MoEU within five working days of receiving the final evaluation report of the review and evaluation meeting. The project owner stipulates (with a written contract and signature) that the final EIA Report and appendices are their undertaking. If the EIA Report and the contract are not submitted within this timescale, without notification of the delay, the EIA Report will be declared null and void.

Within five working days of submission of the final EIA Report, the MoEU decides whether the outcome is "EIA Positive" or "EIA Negative" taking into account the review and evaluation report completed by the REC. The MoEU informs the project owner and relevant organisation and institutions of their decision in writing and announces the decision, and the reasons behind it, to the public.

Projects with an "EIA Positive" decision must commence construction within five years of the decision; if not the positive decision will be invalid. A project with an "EIA Negative" decision can submit a new application, if all the design features resulting in the rejection of the project are removed.

2.4.3.2 History of the Project with Reference to National Requirements

With reference to the above legal frameworks, the history of the Project to date can be summarised in Table 2.2.

Table 2.2 EIA Process for the Project

Stage	Overview	Status
Commencement of EIA Process and Establishment of Review and Evaluation Committee (REC)	An EIAAF is submitted to the MoEU. This includes a description of Project activities, preliminary baseline, preliminary impact discussion, and proposed mitigation measures. A REC is established comprising the MoEU and representatives of relevant authorities.	EIAAF submitted 22 May 2013 Commission established Jun 2013
Public Participation Meeting	To present the Project to key stakeholders/ interested parties. Public comments received on the Project (sent to MoEU).	Meeting completed 2 Jul 2013
Scope and Special Format Determination Meeting	Discussion of the scope and format of the EIA Report. Terms of Reference for the EIA determined by MoEU and based on potential impacts and stakeholder opinions.	Meeting completed 4 Jul 2013
Submission of Draft EIA Report to MoEU	Submission of Draft EIA Report to MoEU. After a format review, the Draft EIA Report is published by the MoEU and open to public comment for 10 business days.	Nov 2013
Review of Draft EIA Report by the REC	REC reviews the Draft EIA Report. REC may request additional information from South Stream Transport during this time.	Nov 2013 to Jan 2014 REC Meeting 8 Jan 2014
Final EIA Report and Submission of Relevant Documents to MoEU	Based on the conclusion of the REC Meeting on 8 January 2014, South Stream Transport were requested to submit the Final EIA Report within 150 business days.	Final EIA Report submitted 9 May 2014
EIA Positive or Negative Decision	After the EIA Report is finalised, it is open to public comment for 10 business days. The Commission reviews the final EIA Report along with any comments received and gives a final "positive" or "negative" decision within 5 days. Decision announced to the public by the MoEU.	To be confirmed

2.5 Local and Regional Legislation

As the Project is located within the Turkish EEZ, there is no regional legislation related to the Project. Key legislation and their relevance to the Project are detailed in Appendix 2.1.

2.6 International and Regional Environmental and Social Conventions & Treaties

Turkey has ratified international conventions regarding environmental protection, sustainable development, socio-economics and human rights. Table 2.3 outlines the conventions and protocols, including ratification status, relevant to the Project.

Table 2.3 International Conventions and Protocol's Relevant to the Project

Convention	Ref.	Purpose / Relevance to the Project	Status
Air Quality			
Convention on Long-Range Transboundary Air Pollution (Geneva, 1979) (Official Gazette Date: 23 Mar 1983)	2.16	To provide a framework for controlling and reducing transboundary air pollution. / The Project will generate emissions that may be transboundary.	Ratified
United Nations Framework Convention on Climate Change (1997) (Official Gazette Date: 24 May 2004)	2.17	The Convention seeks to reduce climate change. / The Project will generate emissions that may contribute to climate change.	Accession
Convention for the Protection of the Ozone Layer (Vienna, 1985) (Official Gazette Date: 08 Sep1990)	2.18	To ensure global co-operation for the protection of the ozone Layer. / The Project should aim to reduce or eliminate emissions of manmade ozone depleting substances.	Accession
Protocol to the United Nations Framework on Climate Change (Kyoto Protocol), 1997	2.19	The Protocol introduces emission targets. / The Project will should aim to reduce emissions that will form part of Turkey's total emissions output.	Accession
Biodiversity			
Convention on Biological Diversity (Rio, 1992) (Official Gazette Date: 27 Dec 1996)	2.20	The Convention promotes conservation of biological diversity and sustainable use of its components. / Project construction could impact habitats.	Ratified
Convention on the Conservation of European Wildlife and Natural Habitats (Berne, 1979) (Official Gazette Date: 12 Jul 1995)	2.21	To ensure conservation of wild flora and fauna species and their habitats. Special attention is given to endangered and vulnerable species, including endangered and vulnerable migratory species specified in appendices. / Project construction could impact habitats.	Accession

Continued…

Convention	Ref.	Purpose / Relevance to the Project	Status
International Convention for the Protection of Birds (Paris, 1950) (Official Gazette Date: 17 Dec 1966)	2.22	To protect birds in the wild state, considering that in the interests of science, the protection of nature and the economy of each nation, all birds should as a matter of principle be protected. / The Project may have impacts on bird species.	Ratified
Convention on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), 2001	2.23	A cooperative tool for the conservation of marine biodiversity in the Mediterranean and Black Seas. Its purpose is to reduce threats to cetaceans in Mediterranean and Black Sea waters and improve our knowledge of these animals. / The Project may have impacts on cetaceans.	Not signed
Marine Protection			
Convention on the Protection of the Black Sea Against Pollution (Bucharest, 1992) (Official Gazette Date: 15 Jan 1994)	2.15	To provide a basic framework of agreement and three specific Protocols, which are: (1) the control of land-based sources of pollution; (2) dumping of waste; and (3) joint action in the case of accidents (such as oil spills). / The Project will generate offshore waste which may impact the marine environment.	Ratified
International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978,Regulations for the Prevention of Pollution by Oil (as amended 1991) Annex I to VI (MARPOL 1973) (Official Gazette Date: 24 Jun 1990 for Annex I, II and V, updated on 16 March 2013 and 14 May 2013 to include Annex III, IV and VI)	2.24	The MARPOL Convention covers the prevention of pollution of the marine environment by ships from operational or accidental causes. Annex I includes regulations for the Prevention of Pollution by Oil and is mandatory. Annex II includes regulations for the Control of Pollution by Noxious Liquid Substances in Bulk. Annex III covers Harmful Substances Carried by Sea in Packaged Form. Annex IV covers the Prevention of Pollution by Sewage from Ships. Annex V includes regulations for the Prevention of Pollution by Garbage from Ships. Annex VI covers the Prevention of Air Pollution from Ships. / The Project will generate discharges from vessels used during construction.	Accession
United Nations Convention on the Law of the Sea (UNCLOS), 1994	2.25	To define the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources.	Not signed

Continued...

Convention	Ref.	Purpose / Relevance to the Project	Status
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), 1972	2.26	The Convention controls pollution of the sea by dumping, and to encourage regional agreements supplementary to the Convention. / The Project will generate offshore waste which may impact the marine environment.	Not signed
International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004	2.27	The Convention aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. / There is the potential for invasive species to be introduced by the Project vessels.	Not signed
The International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001	2.28	Has the aim of prohibiting the use of harmful organotins in anti-fouling paints used on ships and establishing a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems. / Substances covered by this convention may potentially be used on this Project and guidance or restrictions governing these substances will be adhered to.	Not signed
International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER), 1978	2.29	The Convention aims to ensure that adequate, prompt, and effective compensation is available to persons who suffer damage caused by spills of oil, when carried as fuel in ships' bunkers. / Accidents may result in spills to sea from vessels during construction and operation.	Accession
Other			
Convention on Persistent Organic Pollutants (Stockholm, 2004)	2.30	To ensure the limitation of pollution by persistent organic pollutants (POPs). It defines the substances in question, while leaving open the possibility of adding new ones, and also defines the rules governing the production, importing and exporting of those substances. / Substances covered by this Convention may potentially be used on this Project and guidance or restrictions governing these substances will be adhered to.	Ratified

Continued...

Convention	Ref.	Purpose / Relevance to the Project	Status
Maritime Safety			
International Convention for the Safety of Life at Sea (SOLAS 1974) (Official Gazette Date: 31 Jan 2013)	2.31	To specify minimum standards for the construction, equipment and operation of ships, compatible with their safety. Flag States are responsible for ensuring that ships under their flag comply with its requirements, and a number of certificates are prescribed in the Convention as proof that this has been done. / The Project will use vessels, which must adhere to the SOLAS Convention.	Accession
International Convention on Maritime Search and Rescue (SAR 1979) (Official Gazette Date: 24 Mar 1986)	2.32	To develop an international SAR plan, so that, no matter where an accident occurs, the rescue of persons in distress at sea will be co-ordinated by a SAR organisation and, when necessary, by co-operation between neighbouring SAR organisations. / The vessels used during this Project will adhere to this Convention.	Accession
International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW 1978) (Official Gazette Date: 29 Sep 2003)	2.33	To establish basic requirements on training, certification and watch keeping for seafarers on an international level. The Convention prescribes minimum standards relating to training, certification and watch keeping for seafarers which countries are obliged to meet or exceed. / The personnel on board vessels used during the Project must comply with these requirements.	Accession
Labour			
International Labour Standards (ILO) Convention (No.29) on Forced Labour (30 Oct 1998)	2.34	The Convention adopts proposals to eliminate forced or compulsory labour. / The Project will need to employ people and recognise these principles.	In force
ILO Convention (No. 87) on Freedom of Association and Protection of the Right to Organize (12 Jul 1993)		The Convention protects the right to freedom of association and protection of right to organise. / The Project will need to employ people and recognise these principles.	In force
ILO Convention (No.98) on the Right to Organize and Collective Bargaining (23 Jan 1952)		The Convention determines that workers shall have protection from discrimination and interference. / The Project will need to employ people and recognise these principles.	In force

Continued...

Convention	Ref.	Purpose / Relevance to the Project	Status
ILO Convention (No.100) on Equal Remuneration (19 Jul 1967)		The Convention adopts proposals on the principle of equal remuneration for men and women for work of equal value. / The Project will need to employ people and recognise these principles.	In force
ILO Convention (No.105) on the Abolition of Forced Labour (29 Mar 1961)		The Convention stipulates that all parties shall eliminate and will not make use of any form of compulsory or forced labour. / The Project will need to employ people and recognise these principles.	In force
ILO Convention (No.111) on Discrimination (Employment and Occupation) (19 Jul 1967)		The Convention promotes equality of opportunity and treatment in employment and occupation. / The Project will need to employ people and recognise these principles.	In force
ILO Convention (No.138) on Minimum Age (of Employment) (30 Oct 1998)		The Convention pursues the abolition of child labour and increases the minimum age for admission to employment. / The Project will need to employ people and recognise these principles.	In force
ILO Convention (No. 182) on the Worst Forms of Child Labour (02 Aug 2001)		The Convention obliges parties to take effective measures to prohibit and eliminate the worst forms of child labour. / The Project will need to employ people and recognise these principles.	In force
United Nations (UN) Convention on the Rights of the Child, Article 32.1	2.35	The aim of the Convention is to set standards for the defence of children against the neglect and abuse they face to varying degrees in all countries every day and it allows for different cultural, political and material realities among states with the most important consideration being the best interest of the child. / The project will adhere to these standards in regards to local project affected communities.	Ratified
UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families, 1990	2.36	Aims at guaranteeing equality of treatment, and the same working conditions for migrants and nationals. / The Project will need to employ people and recognise these principles.	Not signed
ILO Maritime Labour Convention, 2006	2.37	The Convention outlines requirements, and labour and working conditions on vessels. / The Project will need to employ people and recognise these principles.	Not signed

Continued...

Convention	Ref.	Purpose / Relevance to the Project	Status
Socio-Economic and Human Rights			
International Covenant on Economic, Social and Cultural Rights, 1966 (23 Sep 2003)	2.38	The Convention promotes equal rights of men and women to enjoy all economic, social and cultural rights. / The Project will need to employ people and recognise these principles.	Ratified
UN Convention on the Elimination of All Forms of Discrimination against Women, 1979 (20 Dec 1985)	2.39	The Convention sets out agenda to end discrimination against women. / The Project will need to employ people and recognise principles of equality of men and women.	Accession
UN Convention on the Rights of Persons with Disabilities, 2006 (28 Sep 2009)	2.40	The Convention promotes non-discrimination and equality of opportunity. / The Project will need to employ people and recognise these principles.	Ratified
International Convention on the Elimination of All Forms of Racial Discrimination, 1966 (16 Sep 2002)	2.41	The Convention undertakes to eliminate racial discrimination in all its forms and promote understanding. / The Project will need to employ people and recognise these principles.	Ratified
European Convention for the Protection of Human Rights and Fundamental Freedoms, 1950 (18 May 1954)	2.42	The Convention is designed to protect human rights and fundamental freedoms in Europe. / The Project will need to employ people and recognise these principles.	Ratified
Supplementary Convention on the Abolition of Slavery, the Slave Trade, and Institutions and Practices Similar to Slavery (17 Jul 1964)	2.43	The Convention bans debt bondage, serfdom, early and servile marriage and child servitude. / The Project will need to employ people and recognise these principles.	Ratified
UN Covenant on Civil and Political Rights (23 Sep 2003)	2.44	The Covenant commits its parties to respect the civil and political rights of individuals, including the right to life, freedom of religion, freedom of speech, freedom of assembly, electoral rights and rights to due process and a fair trial. / The Project will need to employ people and recognise these principles.	Ratified

Continued…

Convention	Ref.	Purpose / Relevance to the Project	Status
Cultural Heritage			
European Convention for Protection of Archaeological Heritage (Valletta Treaty, 1992) (Official Gazette Date: 8 Aug 1999)	2.45	States that a governmental legal system is required for the protection of archaeological heritage. / There may be disturbance to archaeological sites in the Project Area.	Ratified
Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972) (Official Gazette Date: 14 Feb 1983)	2.46	The Convention confirms the protection and preservation of world's cultural and natural heritage. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified
European Cultural Convention (1954) (10 Oct 1957)	2.47	To develop mutual understanding among the peoples of Europe and reciprocal appreciation of their cultural diversity, to safeguard European culture, to promote national contributions to Europe's common cultural heritage respecting the same fundamental values. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified
European Convention on Offences relating to Cultural Property (1985) (26 Sep 1985)	2.48	Promotes the safeguard and protection of Europe's heritage from pillage, theft, destruction, illegal transfer, and any other unlawful activity. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified
European Convention for the Protection of the Architectural Heritage of Europe (Granada Convention, 1985) (11 October 1989, entered into force 1 Feb 1990)	2.49	Reinforces and promotes policies for conserving and enhancing Europe's heritage. Affirms the need for European solidarity with regard to heritage conservation and fosters practical co-operation among the parties. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified

Continued…

Convention	Ref.	Purpose / Relevance to the Project	Status
United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention for the Protection of Cultural Property in the Event of Armed Conflict with Regulations for the Execution of the Convention (The Hague Convention, 1954) (15 Dec 1965)	2.50	To ensure that cultural property and goods are protected during times of war and/or armed conflict through the adoption and use of protective signage. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Accession
UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (Convention on Cultural Property, 1970) (21 Apr 1981)	2.51	Prohibits and prevents the illicit import, export and transfer of ownership of cultural property and aims to discourage the pillage of archaeological sites and cultural heritage by controlling international trade in looted antiquities through import controls and other measures. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified
UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972)	2.52	To ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage on its territories. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage, 2003 (27 Mar 2006)	2.53	To safeguard and ensure respect for the world's intangible cultural heritage, including raising awareness of the importance of intangible heritage and encouraging international cooperation and assistance. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified
International Council on Monuments and Sites (ICOMOS) 1990 Charter for the Protection and Management of the Archaeological Heritage (Lausanne Charter) (11 Oct 1990)	2.54	Notes that archaeological heritage is a fragile and non-renewable cultural resource, and that policies for the protection of the archaeological heritage should be integrated into land use, development, planning, cultural, environmental and educational policies. Sets out principles of survey, investigation, maintenance, protection, presentation, information, reconstruction, training, international cooperation. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified

Continued...

Convention	Ref.	Purpose / Relevance to the Project	Status
ICOMOS 1996 Charter for the Protection and Management of the Underwater Archaeological Heritage (Sofia Charter) (9 Oct 1996)	2.55	This Charter, intended as a supplement to the ICOMOS Charter for the Protection and Management of Archaeological Heritage, is intended to encourage the protection and management of underwater cultural heritage in inland and inshore waters, in shallow seas and in the deep oceans. Defines fundamental principles, project design, funding, time-table, research objectives, methodology, techniques, and qualifications. / There may be disturbance to cultural/natural heritage sites in the Project Area.	Ratified
Unplanned Events			
International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC 1990) (Official Gazette Date: 18 Sep 2003)	2.56	To set requirements for all ships to carry a shipboard oil pollution emergency plan and to report incidents of pollution to coastal authorities and the convention details the actions that are then to be taken. The convention calls for the establishment of stockpiles of oil spill combating equipment, the holding of oil spill combating exercises and the development of detailed plans for dealing with pollution incidents. / For vessels over 400 tons to be used during the Project will need to carry a Shipboard Oil Pollution Emergency Plan (SOPEP) and comply with regulations in this Convention should any spills occur.	Accession
Transboundary Impacts			
Convention on Environmental Impact Assessment in Transboundary Context (Espoo Convention), 1991	2.14	Stipulates the obligations of parties to assess transboundary environmental impacts of a project in the early planning stages. It also specifies the obligation of Parties of Origin (parties under whose jurisdiction a planned activity is due to take place) to notify and consult Affected Parties (parties anticipated to be affected by transboundary impacts of a proposed activity) when a project in their territory is likely to have a significant adverse transboundary impact. Parties of origin can ask the developer to undertake further public consultation, in addition to normal EIA requirements. / The Project may have transboundary impacts	Not signed

Continued…

Convention	Ref.	Purpose / Relevance to the Project	Status
Convention on the Transboundary Effects of Industrial Accidents (Helsinki Convention), 1992	2.57	The Convention sets measures to protect human beings and the environment against the effects of industrial accidents, and to promote active international cooperation between the contracting parties before, during and after such accidents. / The Project may have industrial accidents and is transboundary.	Not Signed
Waste			
Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989) (Official Gazette Date: 22 Jun 1994)	2.58	To regulate the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. / The Project may generate hazardous wastes.	Ratified

Complete.

2.6.1 Espoo Convention

The United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, 1991 (Espoo Convention) came into force on 10 September 1997 (Ref. 2.14).

The main objective of the Convention is to promote environmentally sustainable economic development, as a preventive measure against transboundary environmental degradation. The Espoo Convention stipulates obligations of parties to assess transboundary environmental impacts of a project in the early planning stages. It also specifies the obligation of Parties of Origin (parties under whose jurisdiction a planned activity is due to take place) to notify and consult Affected Parties (parties anticipated to be affected by transboundary impacts of a proposed activity) when a project in their territory is likely to have a significant adverse environmental transboundary impacts. Parties of Origin can ask the developer to undertake further public consultation, in addition to normal EIA requirements.

The Republic of Turkey has not signed the Espoo Convention and therefore has no obligations under the Convention. Bulgaria has signed and ratified the Convention.

Nevertheless, in line with IFC Performance Standards, transboundary impacts have been assessed in **Chapter 15 Transboundary Impacts**.

2.6.2 Bucharest Convention

The Convention on the Protection of the Black Sea Against Pollution (Bucharest 1992) (Ref. 2.15), also referred to as the Bucharest Convention, was signed and ratified by the Russian Federation, Georgia, Ukraine, Romania, Bulgaria and Turkey.

The basic objective of the Bucharest Convention is to ensure that the contracting parties implement the necessary legislation in order to reduce and control the pollution in the Black Sea and to protect and preserve its marine environment. The Convention also provides a legal framework for co-operation and co-ordination of the signatory parties.

The Bucharest Convention foresees an obligation on Signatory Parties to assess the impact of and notify the results of this assessment to the Black Sea Commission for any activity under the jurisdiction of that party, which may cause substantial pollution or significant and harmful changes to the environment of the Black Sea. Mitigating measures should also be communicated.

South Stream Transport met with the Permanent Secretariat of Black Sea Commission in November 2012 to inform them about the Project and the national EIA and ESIA being undertaken in Russia, Turkey and Bulgaria for the South Stream Offshore Pipeline (further information is provided in **Chapter 6 Stakeholder Engagement**). It should be noted, that the obligation to notify activities that may significantly impact the environment of the Black Sea is the responsibility of the national governments of the respective signatory parties rather than the responsibility of the project owner.

2.7 Standards and Guidelines for International Financing

The Project is being carried out in accordance with applicable standards and guidelines for financing, including the OECD Common Approaches, the Equator Principles (EP) III, the Japanese Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Consideration and the International Finance Corporation Performance Standards (IFC PSs).

2.7.1 OECD Common Approaches, 2012

Governments provide official export credits, through Export Credit Agencies (ECAs), to support national exporters competing for overseas sales. The Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence (hereafter referred to as 'Common Approaches') recognise that the export credit policy can contribute positively to sustainable development and sets out common approaches for considering environmental and social risks in decisions to offer official support for export credits. The 2012 Common Approaches, as applied to this Project, draw heavily upon the application of recognised international financing institution standards (e.g. EPs and IFC PSs) and apply to all officially supported export credits for capital goods and/or services, excluding military equipment and agricultural commodities.

The Common Approaches objectives are to:

- Promote coherence between members' policies on officially supported export credits, their international environment, climate change, social and human rights policies, and their commitments under relevant international agreements and conventions;

- Develop common procedures and processes relating to the environment and social aspects for official support of export credits to reduce potential for trade distortion;
- Promote good practice and consistent review and assessment processes to achieve a high level of environmental and social performance as measured against international standards;
- Enhance efficiency of official support procedures and ensure administrative processes are relative to the objectives of the Common Approach; and
- Promote a global level playing field for officially supported export credits and increase awareness and understanding among non-members.

To satisfy the requirements of the Common Approaches, South Stream Transport:

- Has commissioned this ESIA Report (prepared to meet applicable international standards including relevant IFC PS);
- Will prevent or mitigate (as far as practicable) adverse environmental and social impacts of the Project;
- Will undertake consultation with relevant stakeholders throughout the life of the Project and encourage transparency through information disclosure; and
- Will implement a Health, Safety, Security and Environment Integrated Management System (HSSE-IMS) to monitor and improve performance of the Project in accordance with IFC PS1.

2.7.2 Equator Principles III

The Equator Principles (EP) (Ref. 2.5) is a set of ten voluntary environmental and social standards to be adhered to if the Project is to be financed by Equator Principles Financial Institutions (EPFIs). EPFIs are financial service providers that are contracted by a client to carry out banking services for a Project. The EPs were first launched in 2003, subsequently updated in 2006 (EPII) and then again in 2013 (EPIII).

For this Project, EPIII apply. EPIII draw on the 2012 version of the IFC PS and the World Bank Group Environmental, Health and Safety (EHS) Guidelines. The EPs focus on project environmental and social standards and responsibilities. Principles 1 to 6 are most applicable to the ESIA Stage of the Project and have been described below.

2.7.2.1 Principle 1: Review and Categorisation

Principle 1 applies where total Project capital costs are US$10 million or more and includes the steps to be taken by the EPFIs to determine the project category in relation to its potential impacts. Ahead of a formal categorisation by EPFIs South Stream Transport has proceeded with this ESIA process on the assumption that EPFIs will give the Project the categorisation of "A" on the basis that it fits the Category A description: '*Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented.*'

2.7.2.2 Principle 2: Environmental and Social Assessment

Principle 2 highlights the need to conduct an Environmental and Social Assessment (e.g. a full-scale ESIA process, a limited or focused audit, or a straight-forward application of environmental siting, pollution standards, design criteria, or construction standards depending on the categorisation and likely significance of impacts) to address relevant social and environmental impacts and risks of the Project. The assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the Project.

Given the nature and scale of this Project, a comprehensive ESIA process has been undertaken. Table 2.4 outlines where the ESIA process has addressed the following issues in accordance with Principle 2.

Table 2.4 EPIII, Principle 2 Illustrative List of Potential Environmental and Social Issues to be Addressed in the ESIA Report

Selected Specified Information	Location within ESIA Report
Assessment of the baseline environmental and social conditions.	Technical Chapters 7 to 12
Consideration of feasible environmentally and socially preferable alternatives.	Chapter 4 Analysis of Alternatives
Requirements under host country laws and regulations, applicable international treaties and agreements.	Chapter 2 Policy, Regulatory and Administrative Framework
Protection of human rights and community health, safety and security (including risks, impacts and management of project's use of security personnel).	Chapter 9 Socio-Economics
Protection of cultural property and heritage.	Chapter 10 Cultural Heritage
Protection and conservation of biodiversity, including endangered species and sensitive ecosystems in modified, natural and critical habitats, and identification of legally protected areas.	Chapter 8 Biological Environment
Sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems).	Chapter 16 Environmental and Social Management
Use and management of dangerous substances.	Chapter 5 Project Description Chapter 16 Environmental and Social Management
Major hazards assessment and management.	Chapter 5 Project Description Chapter 13 Unplanned Events
Labour issues (including the four core labour standards), and occupational health and safety.	Chapter 9 Socio-Economics

Continued…

Selected Specified Information	Location within ESIA Report
Fire prevention and life safety.	Chapter 5 Project Description Chapter 16 Environmental and Social Management
Socio-economic impacts.	Chapter 9 Socio-Economics
Land acquisition and involuntary resettlement.	No physical resettlement is foreseen
Impacts on affected communities, and disadvantaged or vulnerable groups.	Chapter 6 Stakeholder Engagement Chapter 9 Socio-Economics
Impacts on indigenous peoples, and their unique cultural systems and values.	No impact is foreseen
Cumulative impacts of existing projects, the proposed project, and anticipated future projects.	Chapter 14 Cumulative Impact Assessment
Consultation and participation of affected parties in the design, review and implementation of the project.	Chapter 6 Stakeholder Engagement
Efficient production, delivery and use of energy.	Chapter 5 Project Description
Pollution prevention and waste minimisation, pollution controls (liquid effluents and air emissions) and solid and chemical waste management.	Chapter 7 Physical and Geophysical Environment Chapter 8 Biological Environment Chapter 12 Waste Management

Complete.

2.7.2.3 Principle 3: Applicable Environmental and Social Standards

Principle 3 sets out responsibility of an ESIA Report to establish the Project's overall compliance with (or justified deviation from) the relevant host country laws, respective IFC PS, and applicable World Bank Group EHS Guidelines. The ESIA process has been structured in light of this requirement. Section 2.4.2 and this section (Section 2.7) give details of compliance with host country laws, respective IFC PS, and EHS Guidelines.

2.7.2.4 Principle 4: Environmental and Social Management System and Equator Principles Action Plan

Principle 4 defines the need for Category A (and B) projects to maintain or establish an Environmental and Social Management System (ESMS), which addresses the management of impacts, risks, and corrective actions required to comply with applicable host country social and environmental laws and regulations, and requirements of the applicable IFC PS and EHS

Guidelines. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an EP Action Plan (AP).

Principle 4 is being addressed through the development and implementation of a HSSE-IMS, developed in accordance with GIIP and in line with the requirements of International Organisation for Standardisation (ISO) 14001:2004 (Environmental Management System) and Occupational Health and Safety Advisory Services (OHSAS) 18001:2007 (Health and Safety Management System). The HSSE-IMS is being developed and refined during the lifetime of the Project. The overall approach to environmental and social management of the Project is summarised in **Chapter 16 Environmental and Social Management**.

2.7.2.5 Principle 5: Stakeholder Engagement

Principle 5 establishes the requirement to consult with Project Affected Communities in a structured and culturally appropriate manner. For projects with significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process and facilitate informed participation by Project Affected Communities to establish whether a project has adequately incorporated their concerns.

The Project has consulted and will continue to consult with relevant stakeholders (people or groups who may be affected by the Project, or who have an interest in it). This engagement to date has included consultation and dialogue about the ESIA process and content, including Project design, expected impacts and measures taken to mitigate and manage impacts.

The South Stream Offshore Pipeline – Turkish Sector: Scoping Report (available on the South Stream Transport website) was made publicly available for review on 17 July 2013 for a period of 30 days. During this time, stakeholders had the opportunity to review and comment on the Scoping Report. During this period, South Stream Transport held meetings with fishery groups, non-governmental organisations (NGOs) and academic and research institutes. Due to the location of the Project Area, a minimum of 110 km from the Turkish coastline, there are no 'Project Affected Communities' in the Turkish Sector.

Further details on consultation and disclosure are included in **Chapter 6 Stakeholder Engagement** and **Chapter 9 Socio-Economics.**

2.7.2.6 Principle 6: Grievance Mechanism

Principle 6 sets out responsibility to establish a grievance mechanism as part of the management system that allows the proponent to receive and facilitate concerns and grievances about the Project's social and environmental performance raised by individuals or groups. The proponent should inform the affected communities about the mechanism in the course of its community engagement process and ensure that the mechanism addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible to all segments of the Affected Communities.

The requirements for a Grievance Mechanism will be incorporated into the Project HSSE-IMS. The HSSE-IMS will be developed in accordance with GIIP and in line with the requirements of ISO 14001:2004 (Environmental Management System) and OHSAS 18001:2007 (Health and

Safety Management System). The overall approach to environmental and social management of the Project is summarised in **Chapter 16 Environmental and Social Management**.

2.7.3 Japan Bank for International Cooperation Environmental Guidelines

The Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Consideration (Ref 2.6) aims to contribute to efforts towards sustainable development, through consideration of the environmental and social aspects in all projects subject to lending or other financial operations by JBIC and the Nippon Export and Investment Insurance (NEXI).

2.7.4 International Finance Corporation Performance Standards

For this Project the 2012 current IFC PS will apply. The IFC PSs are voluntary standards that set out underlying principles of sustainable project management, including impact and risk assessment, mitigation strategies, public consultation and performance monitoring. The IFC PSs are mandatory for projects seeking funding from the IFC and are also frequently adopted by other financial institutions, including EPFIs and ECAs. Due to their wide application, South Stream Transport has elected to adhere to 2012 IFC PSs regardless of the source of Project financing.

The IFC PSs of relevance to the Project, namely PS 1, 2, 3, 6 and 8, and a brief description of how they have been addressed in the ESIA process is included below. Due to the fact that this Project is offshore, IFC PS4 (Community Health, Safety and Security), PS5 (Land Acquisition and Involuntary Resettlement), and 7 (Indigenous People) are not relevant and therefore have not been discussed below.

2.7.4.1 IFC PS1: Assessment and Management of Environmental and Social Risks and Impacts

PS1 outlines the requirements for social and environmental performance management throughout the life of a project. This is achieved through an integrated assessment to identify the environmental and social impacts, risks, and opportunities of the Project, effective engagement with affected local communities and other stakeholders, and the application of an ESMS to monitor and improve performance.

This PS applies to business activities with environmental and/or social risks and/or impacts. The level of environmental and social assessment and management is expected to be appropriate to the nature and scale of the project. Given the nature and scale of this Project, a comprehensive ESIA process is required to be undertaken, as documented through this ESIA Report. This impact assessment process has taken into consideration the requirements of PS1, 2, 3, 6 and 8, which are of particular relevance to the Project, as well as, the requirements of the Turkish EIA legislation (Section 2.4.2).

As recommended in the IFC's Guidance Notes: Performance Standards on Environmental and Social Sustainability (Ref. 2.7), the following stages have been undertaken as part of this ESIA process:

- *Initial Screening of the Project* – this involved the early identification of Project components and activities and environmental, socio-economic and cultural heritage receptors; the examination of relevant legislative and lender requirements and of the community values and uses associated with the receptors. A preliminary analysis of alternatives was also conducted during this stage to identify and evaluate alternative routes for the offshore pipeline (**Chapter 4 Analysis of Alternatives**);
- *Environmental Impact Identification (ENVIID)* – this process enabled the comprehensive identification of the Project's potential interactions (beneficial and adverse) with environmental, socio-economic and cultural heritage receptors (**Chapter 3 Impact Assessment Methodology**);
- *Scoping* – this stage identified the likely significant impacts that require further investigation and defined the final scope of the ESIA process by developing terms of reference for studies to assess Project impacts. Details of the Scoping Stage are reported in the South Stream Offshore Pipeline – Turkish Sector: Scoping Report (Ref. 2.59);
- *Stakeholder Engagement* – stakeholder engagement has been undertaken throughout the development of the Project to ensure that all interested parties are aware and informed of the Project and that any potential issues are addressed appropriately (**Chapter 6 Stakeholder Engagement**). South Stream Transport has developed a Stakeholder Engagement Plan (SEP) based on the principles and guidance presented in the IFC's PS1. The SEP also includes engagement activities necessary to meet Turkish requirements for the national EIA process. The SEP will be updated periodically throughout the Project lifecycle;
- *Baseline Studies* – the prevailing environmental and social conditions against which the potential impacts of the Project are assessed have been established. This allowed the identification of potentially sensitive receptors (such as ecosystems and local communities) and an evaluation of their level of sensitivity to the impacts. The results are presented on a discipline basis in Chapters 7 to 11 of this ESIA Report; and
- *Impact Significance Assessment* – this was an iterative process considering the following:
  - **Prediction**: What will happen to the environment as a consequence of this Project (i.e. defining Project activities and impacts)?
  - **Evaluation**: Will it have a beneficial or adverse effect? How big is the change expected to be? How important will it be to the affected receptors?
  - **Mitigation**: If the impact is of concern, can anything be done to avoid, minimise, or offset the impact? Or to enhance potential benefits?
  - **Residual Impact**: After mitigation, is the impact still of concern?

This process is further described in **Chapter 3 Impact Assessment Methodology** and the results are presented on a discipline basis in Chapters 7 to 12 of this ESIA Report;

- *Cumulative Impact Assessment* – identified the combined effects of the Project with other projects and activities that may, individually or in combination have a significant cumulative impact. Further details regarding the cumulative impacts can be found in **Chapter 14 Cumulative Impact Assessment**; and

- *Transboundary Impact Assessment* – an assessment was undertaken to identify whether any Project impacts were considered likely to extend across international borders (e.g. air or water pollution impacts). Further details regarding the transboundary impacts can be found in **Chapter 15 Transboundary Impact Assessment**.

Chapter 3 Impact Assessment Methodology of this ESIA Report provides an overview of the process followed in compiling this ESIA Report and the methodology used to assess impact significance.

Regarding disadvantaged and vulnerable individuals and groups as defined in PS1, small-scale and artisanal fishermen are the only potentially vulnerable group that has been identified with respect to the Turkish Sector (**Chapter 6 Stakeholder Engagement** and **Chapter 9 Socio-Economics**).

PS1 also stipulates that the Project proponent develop a formal environmental and social policy that reflects the principles captured in the PSs. The South Stream Transport Sustainability Policy is presented in Section 2.2 and a HSSE-IMS is being developed in accordance with GIIP and in line with the requirements of ISO 14001:2004 (Environmental Management Systems) and OHSAS 18001:2007 (Health and Safety Management Systems). The overall approach to environmental and social management of the Project is summarised in **Chapter 16 Environmental and Social Management**.

2.7.4.2 IFC PS2: Labour and Working Conditions

PS2 establishes the need for workers' rights regarding income generation, employment creation, relationship management, commitment to staff, retention and staff benefits. It identifies and outlines the need to provide workers with a safe and healthy working environment. This PS is guided by international conventions, in particular those of the ILO. Ultimately, the scope of application of this PS depends on the type of employment relationship between the Project and the worker e.g. it applies to workers directly engaged by the client (direct workers), as well as, workers engaged through third parties (such as construction contractors).

It is recognised that up to approximately 1,100 workers (including all sub-contracted parties and workers) may be engaged at any one time for the Project and, as such, compliance with PS2 is considered to be of relevance to the Project. Worker rights will be consistent with those of South Stream Transport, which is firmly committed to the protection of worker rights in compliance with the conventions listed in Table 2.3 and the relevant Turkish statutory requirements.

South Stream Transport is cognisant of the potential labour and working condition risks associated with confined employment and shift work conditions associated with offshore vessel operations. As part of the Project HSSE-IMS, regular audits of working conditions upon these vessels shall be undertaken.

Implementation of the necessary actions required by this PS will be managed through the Project HSSE-IMS. Further details on labour and working conditions are included within **Chapter 9 Socio-Economics**, whilst information on occupational health is contained in Appendix 9.2 Occupational Health and Safety. The overall approach to environmental and social management of the Project is summarised in **Chapter 16 Environmental and Social Management**.

2.7.4.3 IFC PS3: Resource Efficiency and Pollution Prevention

PS3 defines an approach to pollution prevention and abatement in line with current internationally available technologies and good practice. It deals with ambient and cumulative considerations, resource conservation and energy efficiency, hazardous materials and waste management, pesticide use and management, and emergency preparedness and response provisions.

The Project will utilise resources which have the potential to generate pollution. The majority of resources that will be used and potential pollution events (e.g. waste spillage, noise, air pollutants, and greenhouse gases) will arise through the Project's Construction and Pre-Commissioning Phase. The main resource used during the Construction and Pre-Commissioning Phase will be steel for the Pipeline. Throughout the Project Development Phase, efficiency of resource use has been considered and a range of minimum performance criteria and standards have been adopted. **Chapter 5 Project Description** details the range of design, construction and operational standards adopted for the Project.

For both the Construction and Pre-Commissioning and Operational Phases, specific mitigation measures (encompassing both avoidance and minimisation measures) to address Project emissions (e.g. emissions associated with exhaust fumes of vehicles) are described in the relevant technical chapters of this ESIA Report. In particular, Project resource efficiency measures and Project-related greenhouse gas (GHG) emissions are considered within **Chapter 5 Project Description**.

In terms of waste, **Chapter 12 Waste Management** of this ESIA Report details how wastes will be managed throughout the Project, taking into consideration the need for resource use efficiencies. Specifically, the Project will adopt a waste management hierarchy. The waste hierarchy ranks waste management options according to what is best for the environment. In particular, the prevention, re-use and recycling of Project items where possible will help maximise resource use efficiency throughout the Project.

The overall approach to environmental management in line with these standards is summarised in **Chapter 16 Environmental and Social Management**.

2.7.4.4 IFC PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

PS6 sets out an approach to protect and conserve biodiversity, including habitats, species and communities, ecosystem diversity, and genes and genomes, all of which have potential social, economic, cultural and scientific importance. It also sets out definitions of natural, modified and critical habitat types, stating that there should be no net loss of critical habitat as a result of the Project.

The Project has the potential to directly and indirectly impact the natural offshore marine environment. Any potential impacts have been assessed according to IFC requirements. The potential impacts and the relevant identified mitigation measures to address these impacts are detailed in **Chapter 8 Biological Environment**.

The Project may affect potential beneficiaries who benefit from some ecosystem services. A discussion of the ecosystem services received and potential Project impacts upon these services is provided in **Chapter 11 Ecosystem Services**.

2.7.4.5 IFC PS 8: Cultural Heritage

PS8 aims to protect irreplaceable cultural heritage and to provide guidance for protecting cultural heritage throughout a project's lifecycle. PS8 states cultural heritage refers to tangible forms of cultural heritage (e.g. property, sites, structures, or groups of structures with archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious value), unique natural features or tangible objects that embody cultural values (e.g. sacred groves, rocks, lakes, and waterfalls), and certain instances of intangible forms of culture that are proposed to be used for commercial purposes (e.g. cultural knowledge, innovations, and practices of communities embodying traditional lifestyles).

Two confirmed cultural heritage objects (CHOs) have been identified (both shipwrecks) and several potential CHOs have been identified through marine surveys. A full description of all identified cultural heritage items is provided in **Chapter 10 Cultural Heritage**.

It is not anticipated that the Project will have an impact on intangible cultural heritage due to the offshore location with no specific notable or listed cultural traditions that could be affected by the Project. Further details on tangible cultural heritage receptors and the potential impacts associated with the Project are included in **Chapter 10 Cultural Heritage.**

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Chapter 3: Impact Assessment Methodology

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3 Impact Assessment Methodology

3.1 Introduction

The impact assessment methodology used in this Environmental and Social Impact Assessment (ESIA) Report provides a basis to characterise the potential environmental and social impacts of the Project. The methodology is based on models commonly employed in impact assessment, and takes into consideration the International Finance Corporation (IFC) Performance Standards (PS).

Potential impacts arising from planned activities and unplanned events are assessed. Planned activities include routine and non-routine Project Activities or events required for the Construction and Pre-Commissioning, Operational, or Decommissioning Phases of the Project. Unplanned events are those not anticipated to occur during the normal course of Project Activities; for example, the unlikely event of a vessel collision that may lead to a spill of fuel.

The impact assessment methodology for planned activities takes into consideration impact magnitude and receptor sensitivity. A matrix is also used to derive impact significance, for pre- and post-mitigation conditions.

The concept of likelihood is included in the methodology for unplanned events. The likelihood of the event occurring, and the likelihood of impacts arising, is considered.

The assessment of discipline-specific impacts is presented in Chapters 7 to 12. Unplanned Events are addressed in Chapter 13, and Cumulative and Transboundary impacts are assessed in Chapters 14 and 15, respectively.

3.2 ESIA Process

The ESIA process is a systematic approach to identifying the environmental and social impacts of a project, and describing the mitigation, management and monitoring measures that will be implemented to address these impacts. Ultimately, it allows relevant organisations to make informed decisions about development proposals, and allows potentially affected stakeholders to participate in the process.

In order to ensure a robust and detailed impact assessment, the ESIA process has been structured over a series of progressive and iterative stages (Figure 3.1). Stakeholders, the Project team, and the assessment team provided input to these stages during the ESIA process.

As part of the Project design, measures to avoid or minimise impacts were identified and incorporated into the design. These are referred to as "design controls" and include physical design features and management measures. These design controls considered the IFC mitigation hierarchy as discussed in PS1. Section 3.3.10 of this report discusses this hierarchy and how it was applied to the Project's impact assessment in more detail. They are based on Good International Industry Practice (GIIP) and are intended to assist in the avoidance and control of unacceptable impacts. Specific design controls are described in greater detail in **Chapter 5 Project Description**. Where the outcome of the ESIA indicates that design controls are insufficient to manage an impact to an acceptable level, further measures have been identified. These measures have been termed "mitigation measures" and are described in respective chapters and detailed in Environmental and Social Management Plans (**Chapter 16 Environmental and Social Management**).

As shown in Figure 3.1, the ESIA process comprised the following stages:

- *Screening*: an initial identification of potential interactions between the Project and physical, ecological and human receptors (Section 3.2.1) indicating the level of impact assessment required;
- *ESIA Scoping*: outlines the perceived required scope of the ESIA to be undertaken, taking into consideration the nature of the Project, the results of the screening and applicable requirements. This stage included:
    - Environmental Issues Identification (ENVIID): a process of systematic identification of potential interactions between Project activities or events and known receptors (Section 3.2.2.1);
    - Desk-based studies: a review of existing environmental and social information, and gap analysis to identify additional baseline information required for the impact assessment. This included review of previous environmental and geophysical/geotechnical survey data collected by Peter Gaz LLC on behalf of Gazprom between 2008 and 2012 (Section 3.2.2.2);
    - Identification of potential physical, ecological, and human receptors that may be affected by the Project (Section 3.2.2.3);
    - Alternatives: assessment of Project technical alternatives at the Scoping Stage, including alternative routes and methods (Section 3.2.2.4); and
    - Stakeholder engagement: in July 2013, the South Stream Offshore Pipeline – Turkish Sector: Scoping Report (Ref. 3.1) was published by South Stream Transport on the company website. Copies were also made available in Sinop, and provided directly to some stakeholders. Interested and affected parties were invited by direct invitation to participate in scoping meetings, held in Istanbul, Ankara and Trabzon during the week of 29 July to 2 August 2013. (See **Chapter 6 Stakeholder Engagement** for further details). Feedback from the scoping meetings was taken into consideration in the ESIA process.
- *Baseline Surveys and Studies*: following a gap analysis undertaken as part of the ESIA Scoping Stage, baseline surveys and studies were undertaken to complement existing information. The baseline environmental and social conditions against which the impact assessment was to be undertaken (Section 3.2.3) were described;
- *Impact Assessment*: this stage included:
    - Building on the ENVIID conducted during the Scoping Stage to describe activities and potential impacts (Section 3.2.2);
    - Determining the nature of impact (Section 3.3.2), the expected magnitude of impact (Section 3.3.3) and the sensitivity of receptors (Section 3.3.4);
    - Assessing the significance of potential impacts (Section 3.3.5) prior to planned mitigation;

- Considering unplanned events, i.e. those events which are not expected to happen during the Project but for which the risk of the event occurrence needs to be assessed (Section 3.3.7);
- Considering the potential for Project impacts to combine with other impacts associated with existing or planned developments (cumulative impacts, Section 3.3.8) and the potential for Project impacts to extend across national boundaries (transboundary impacts, Section 3.3.9); and
- Assessing the significance of residual impacts (Section 3.3.5) taking into consideration proposed mitigation measures (Section 3.3.10).

- *Environmental and Social Management Plan*: this stage included the development of management plans and procedures as part of South Stream Transport's Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS), which captures all of the mitigation measures identified so that they can be practically applied as part of Project development (Section 3.3.12);
- *Stakeholder Engagement*: consultation with regulators and other stakeholders regarding the scope and content of the ESIA Report as well as aiding in the identification of potential Project impacts. Stakeholder engagement has and continues to run across the entire ESIA process (Section 3.4); and
- *ESIA Report Disclosure*: release of the ESIA Report to the public so that they can provide opinion and comment on the report or the planned environmental and social management of the Project.

The process is summarised in Figure 3.1, and is described in further detail in the following subsections.

3.2.1 Screening

Screening [1] was the first stage undertaken during the ESIA process to identify potential interactions between the Project and existing physical, ecological, and human receptors. Undertaking screening early in the ESIA process facilitated the incorporation of environmental and social considerations into the development of the Project design.

The Screening Stage included the following key steps:

- Identification of Project components and activities;
- Identification of likely physical, ecological and human receptors based on existing knowledge of the environmental and social baseline conditions and professional expertise;
- Examination of relevant national and international legislative requirements; and
- Development of a screening matrix to illustrate the potential interactions of Project Activities with the physical, ecological and human receptors.

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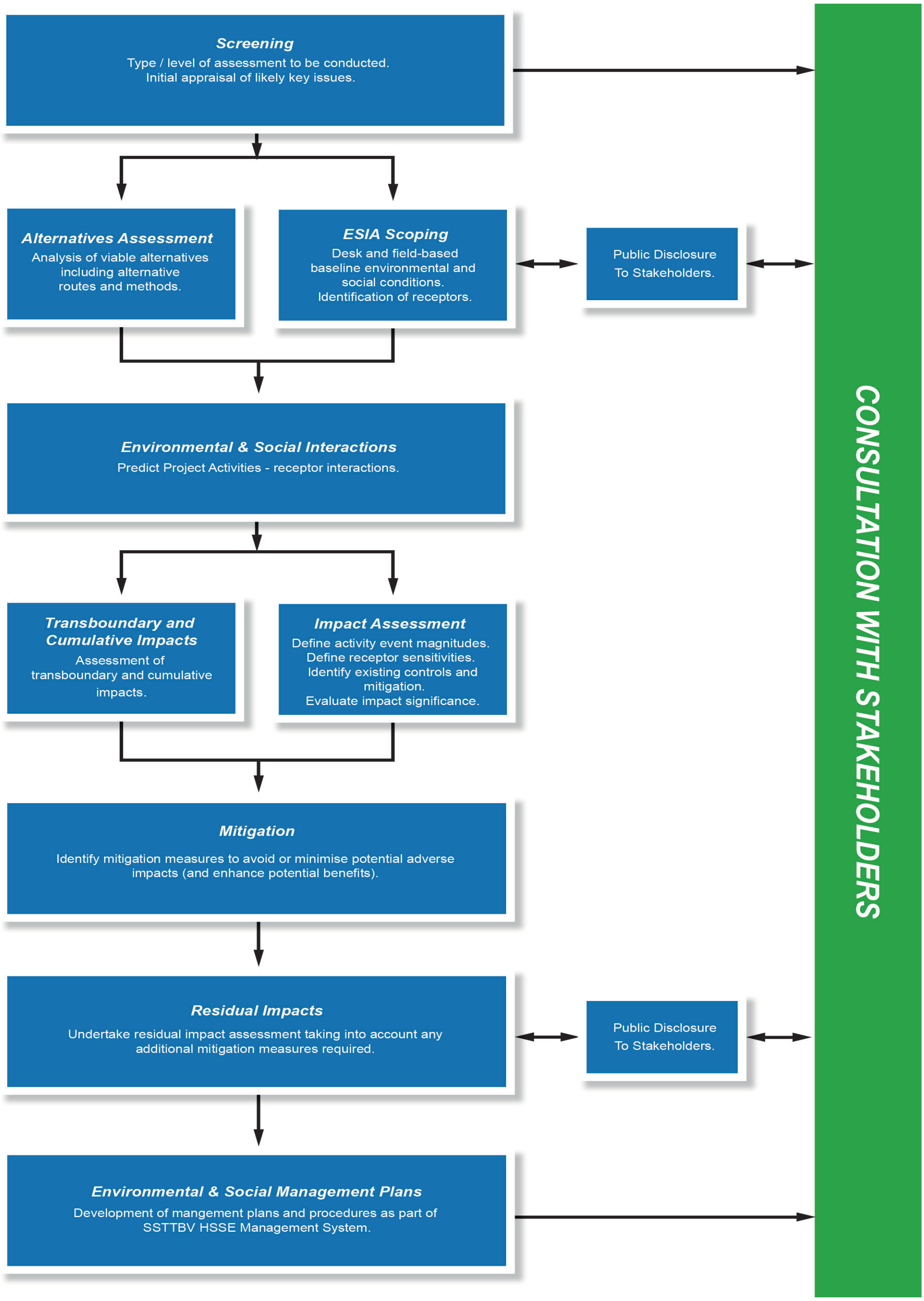
[1] Screening in the context of this section refers to early stage of scoping prior to the preparation of the Scoping Report (Ref 3.1).

Figure 3.1 Overall ESIA Process



Decommissioning activities were not considered in detail during the Screening Stage due to limited information available at that time. The resultant screening matrix is presented in Table 3.1.

Table 3.1 Environmental and Social Screening Matrix

Impact Receptors	Project Activities	
	Construction Activities	Operational Activities
Physical		
Water	✓	
Sediments	✓	
Climate and Air Quality	✓	
Ecological		
Plankton	✓	
Marine Mammals	✓	
Seabirds	✓	
Fish	✓	
Human		
Cultural Heritage	✓	
Marine Users	✓	✓

3.2.2 ESIA Scoping

Following the Screening Stage, scoping was undertaken to provide further detail of potential environmental and social effects of the Project using additional engineering and baseline data. The Scoping Stage intended to facilitate impact identification in a consistent and robust manner.

3.2.2.1 Environmental Issues Identification (ENVIID) Register

Scoping included a systematic consideration of Project Activities and their potential impact on physical, ecological and human receptors. An ENVIID was conducted to determine activities, receptors and impacts of all phases of the Project. This process, supported by interdisciplinary workshops (attended by Project engineers and environmental and social scientists), enabled a comprehensive identification of the Project's potential interactions (beneficial and adverse) with physical, ecological and human receptors. This information was recorded in an ENVIID Register that provided a reference for potential impacts requiring further investigation during the ESIA process.

3.2.2.2 Desk-Based Studies – Review of Existing Baseline Information

An important component of the Scoping Stage is the definition of existing baseline conditions (i.e. the prevailing environmental and social characteristics against which the potential impacts of the Project can be assessed). Baseline conditions were outlined during the Scoping Stage through a review of existing environmental and social information.

Information was available in environmental and geophysical and geotechnical survey data and reports prepared for the Project between 2009 and 2012 (Ref. 3.2 and Ref. 3.3). This information included the results of marine ecology, water quality, sediment and geology surveys undertaken within the Survey Areas as well as a thorough literature review.

In addition to Project-specific information, scientific journals, reports by government agencies and by other groups, were reviewed for relevant baseline information.

Existing baseline information used for the Scoping Stage also formed the core of baseline information in the impact assessment (Section 3.3). Where gaps were identified between baseline information available at the Scoping Stage and that required for the ESIA Report (e.g. out of date, too narrow in scope, etc.), additional surveys or studies were carried out to collect the required information.

3.2.2.3 Identifying Receptors

Receptors are environmental components, people and cultural heritage assets that may be affected, adversely or beneficially, by the Project. Potential receptors were identified through both desk- and field-based studies, taking into consideration likely Project impacts. Based on the review of existing information, three high-level categories of Project receptors were identified:

- Physical (i.e. non-living environmental components, including air quality and marine sediments and geology);
- Ecological (i.e. fauna); and
- Human (i.e. marine users and cultural heritage).

Individual receptors within these groups were assessed as part of the impact assessment (Chapters 7 to 12) for their sensitivity to the potential impacts of the Project. Human receptors identified formed the basis of the stakeholder engagement activities undertaken (Section 3.4).

3.2.2.4 Analysis of Alternatives

An analysis was undertaken of technically and financially feasible alternatives that would allow the development of a new supply route that provides a safe and reliable means to export Russian gas to the countries of Central and South-Eastern Europe via the Black Sea.

The presentation of the Analysis of Alternatives follows a 'narrowing approach' involving a series of logical steps, starting with the high-level alternatives and progressively narrowing-in on more detailed alternatives. Using this commonly adopted approach the Analysis of Alternatives considers each of the following in series:

- The 'Zero' or 'No Project' alternative;
- South Stream Offshore Pipeline alternatives:
    - Alternative means of gas transportation; and
    - Offshore (macro) routing.
- Project Alternatives:
    - Route optimisation.

Further information is provided in **Chapter 4 Analysis of Alternatives**. Alternative mitigation and monitoring measures were also considered in the course of the assessment.

3.2.3 Additional Baseline Field Surveys and Studies

Field studies and desk-based research required to address identified gaps in baseline data were carried out during 2012 and 2013, and included:

- *Geophysical and Geotechnical Surveys*: identification of geological anomalies in the Survey Area (Ref. 3.2 and Ref. 3.3);
- *Abyssal Plain Study*: analysis of geophysical data was also undertaken along with a review of published literature to assess the presence of benthic habitats in the Project Area (Ref. 3.4); and
- *Fisheries Study*: through a review of published data and consultation with fisheries organisations (Ref. 3.5).

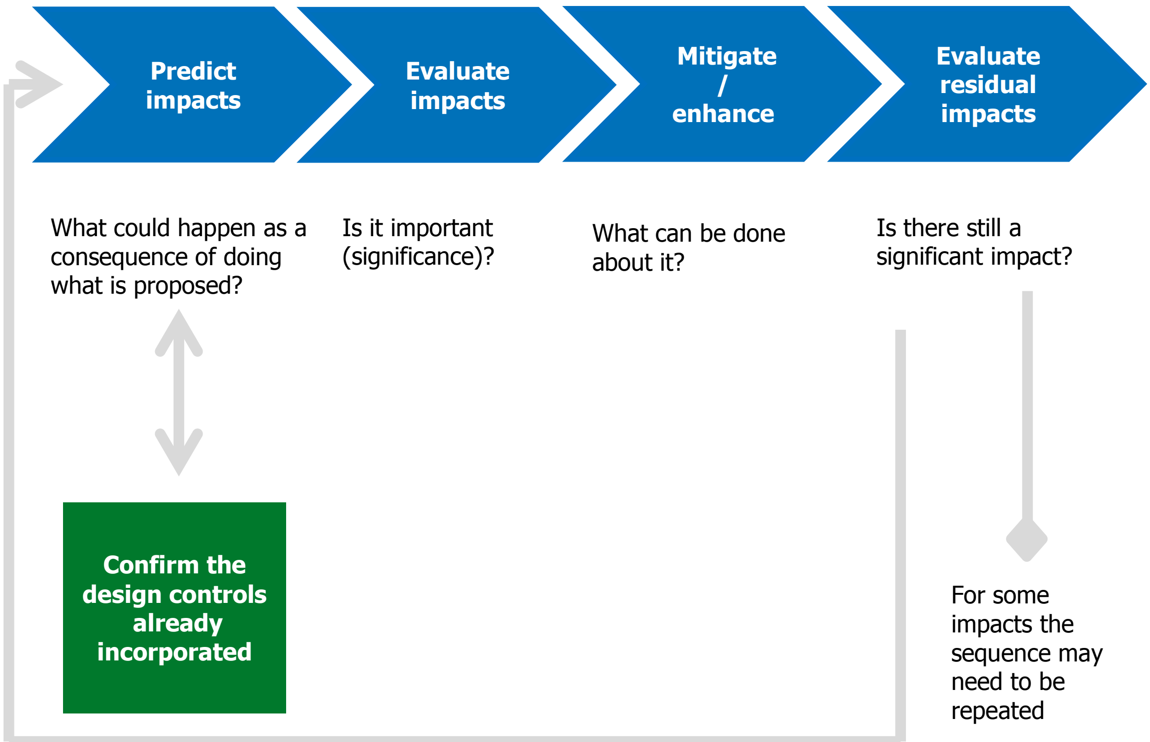
The details of the surveys undertaken (timing, location, methods and results), together with information gathered through the desk-based studies, are presented in the relevant chapters of this ESIA Report.

3.3 Impact Assessment Framework

The process for assessing potential Project impacts is illustrated in Figure 3.2 and involved:

- *Prediction*: What will happen to the environment as a consequence of this Project (i.e. defining Project activities and impacts)?
- *Evaluation*: Will it have a beneficial or adverse effect? How big is the change expected to be? How important will it be to the affected receptors?
- *Mitigation*: If the impact is of concern, can anything be done to avoid, minimise, or offset the impact? Or to enhance potential benefits?
- *Residual Impact*: After mitigation, is the impact still of concern?

Figure 3.2 Impact Identification and Assessment Process



Impact significance was assessed with and without mitigation measures in place. The impact significance without mitigation measures was assessed with the design controls in place (Section 3.2). Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified.

The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this ESIA Report.

For some types of impact there are empirical, objective and established criteria for determining the potential impact significance (e.g. if a standard is breached or a protected area is damaged). However, in other cases assessment criteria are more subjective and require professional judgement to a greater degree. The criteria against which the significance of planned impacts was evaluated, for the purposes of this Project, has been described in terms of two components: impact magnitude (Section 3.3.3) and receptor sensitivity (Section 3.3.4). The assessment of unplanned impacts is described in Section 3.3.7.

3.3.1 Activities and Impacts

Building upon the ENVIID process conducted during the Scoping Stage, Project Activities and potential environmental, socio-economic and cultural heritage impacts upon receptors were further defined. For this purpose, the definition of a Project impact was adapted from ISO 14001:2004 (Ref. 3.6) [2] as:

- *"Any change to the environment [or social receptors], whether adverse or beneficial, wholly or partially resulting from an organization's environmental [or social] aspects."*

Definitions of an 'activity' and a 'receptor' are not included within ISO 14001:2004, but for the purposes of this Project the following definitions are provided:

A Project Activity is considered to be:

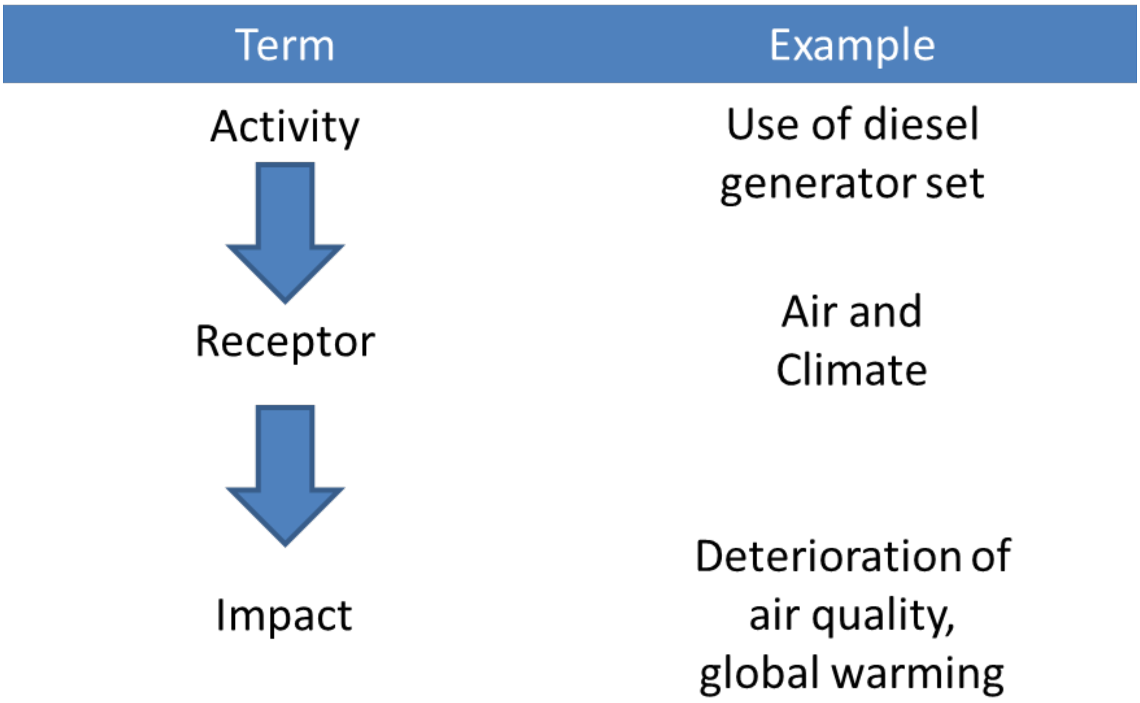
- A physical action or presence of infrastructure associated with the operation of Project plant, equipment or vehicles, or the actions of Project employees.

A receptor is considered to be:

- Someone or something that could be influenced by the Project, including water resources, air quality, ecological habitats or species, cultural heritage, and the wider environment.

An impact therefore represents the effect of an interaction of a Project Activity with the receptor. Two examples of these relationships are provided in Figure 3.3.

Figure 3.3 Example of Project Activity - Impact Pathways



[2] Although not designed specifically for use in impact assessment certain terms and principles of this standard were adopted to assist with the impact identification / Scoping Stage.

Project Activities were identified through a review of the project description (**Chapter 5 Project Description**). Potential impacts were identified based on the details of Project activities and their potential interactions with the surrounding environment, and physical, ecological, and/or human receptors. This also required an understanding of the potential sources of impacts and impact pathways, and was supported by:

- An understanding of baseline conditions and potential receptors (Chapters 7 to 12);
- The spatial and temporal extent of the Project Area of Influence (**Chapter 1 Introduction**);
- Information from stakeholders, including authorities, experts, and the public (**Chapter 6 Stakeholder Engagement**); and
- Professional knowledge and experience of comparable projects or developments.

To some extent, the identification and understanding of Project Activities and impacts was an iterative process conducted throughout the ESIA process as more Project and environmental and social baseline information became available.

The assessment of these environmental, socio-economic and cultural heritage impacts has been structured according to the following technical disciplines:

- Physical and Geophysical environment (Chapter 7);
- Biological Environment (Chapter 8);
- Socio-economics (Chapter 9);
- Cultural heritage (Chapter 10);
- Ecosystem services (Chapter 11); and
- Waste (Chapter 12).

3.3.2 Impacts Nature and Type

Whether an impact is considered to be beneficial or adverse, i.e., impact nature, and the way in which it is related to the Project, i.e., impact type, e.g. direct, indirect, are relevant to the ESIA process. In particular, the degree to which an impact may be managed or modified by the mitigation measures is dependent upon the impact nature and type; Table 3.2 provides definitions.

Table 3.2 Impact Assessment Terminology

Term	Definition
Impact Nature	
Adverse Impact	Impacts that are considered to represent an adverse change from the baseline condition or introduces a new undesirable factor.

Continued…

Term	Definition
Beneficial Impact	Impacts that are considered to represent an improvement on the baseline condition or introduces a new desirable factor.
Impact Type	
Direct Impact	Impacts that result from a direct interaction between a Project Activity and the receiving environment (e.g. between occupation of an area of seabed and the area lost for other marine users).
Secondary Impact	Impacts that follow on from the primary interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g. loss of part of a habitat (e.g. the open sea) affects the viability of a species population over a wider area).
Cumulative Impact	Impacts that act together with other impacts, from other existing, planned and reasonably predictable future projects and developments, to affect the same environmental resource or receptor.

Complete.

In considering impacts related to the Project, both adverse and beneficial impacts have been identified. Where appropriate, the impact assessment chapters further identify impacts as direct, indirect or secondary impacts. Where appropriate, both impact nature and type definitions have been applied throughout the ESIA Report to provide clarity regarding the significance of the impacts. Cumulative impacts are discussed in Section 3.3.8 and in **Chapter 14 Cumulative Impact Assessment**.

3.3.3 Impact Magnitude

The magnitude of an impact is a measure of change from baseline conditions. This measure of change can be described in terms of its:

- *Extent*: spatial extent (e.g. area impacted) or population extent (e.g. proportion of the population / community affected) of an impact;
- *Duration*: how long the impact will interact with the receiving environment;
- *Frequency*: how often the impact will occur; and
- *Reversibility*: how long before impacts on receptors cease to be evident.

Thus, these characteristics collectively describe the nature, physical extent, and temporal condition of the impact. To facilitate a structured description of impact magnitude, a qualitative scale was applied, ranking the magnitude of change as negligible, low, moderate, or high developed for each of the magnitude characteristics.

The criteria for each of these impact magnitude categories (i.e. negligible, low, moderate and high ranking criteria) were developed as appropriate for each discipline, and are described in Chapters 7 to 12.

The determination of overall impact magnitude rating was determined on the basis of professional judgement and GIIP, considering all four characteristics collectively where relevant.

3.3.4 Receptor Sensitivity (Resilience and Value)

Receptor sensitivity is the degree to which a particular receptor is more or less susceptible to a given impact. Receptor sensitivity takes into consideration receptor resilience and value.

Receptor resilience (or conversely, vulnerability) describes the ability of the receptor to withstand adverse impacts. It takes into consideration not only activity-impact-receptor pathways, but also environmental characteristics of the receptor that might make it more or less resilient to change. As such, a receptor can be considered as existing within a spectrum of 'vulnerable' to 'resilient', with the former more likely to experience significant impacts as a result of a given change.

Receptor value takes into consideration its quality and its importance as represented, for example, by its conservation status, its cultural importance and / or its economic value. It recognises that, for a given magnitude impact, different receptors (either directly or indirectly) may be deemed to be of greater importance and as such the significance of the impact is greater than the impact magnitude alone.

Similar to the approach adopted for impact magnitude, a structured description of receptor sensitivity employed a qualitative category scale of negligible, low, moderate, and high for each of the sensitivity characteristics, resilience and value. Likewise, criteria for receptor sensitivity (i.e. negligible, low, moderate and high ranking criteria) were developed as appropriate for each discipline, and are described in Chapters 7 to 12.

3.3.5 Impact Significance

Impact magnitude and receptor sensitivity were used to assess impact significance according to the impact assessment matrix in Table 3.3, and the impact assessment definitions in Table 3.4.

For adverse impacts, this methodology was applied to both pre- and post-mitigation scenarios for all impacts identified. The significance matrix provides basic guidance for the determination of impact significance; however, the resulting significance level was also interpreted based on professional judgement and expertise, and the definitions provided in Table 3.4, and adjusted if necessary. The reasoning behind each evaluation is explained in the Chapters 7 to 12, depending on the relevant discipline, including a detailed discussion of the issues contributing to the determination of residual significance.

The impact assessment in each technical chapter includes an impact summary table for each phase of the Project (an example is presented in Table 3.5), including residual impact significance ratings for all impacts identified.

Table 3.3 Impacts Significance Matrix

		Receptor Sensitivity (Vulnerability and Value)			
		Negligible	*Low*	*Moderate*	*High*
Impact Magnitude (Extent, Frequency, Reversibility, Duration)	*Negligible*	Not significant	Not significant	Not significant	Not significant / Low*
	Low	Not significant	Low	Low / Moderate†	Moderate
	Moderate	Not significant	Low / Moderate	Moderate	High
	High	Low	Moderate	High	High

* Allows technical discipline author to decide if impact significance is **Not significant** or **Low**
† Allows technical discipline author to decide if impact significance is **Low** or **Moderate**

Table 3.4 Impact Significance Definitions

Adverse Impacts	**High**	**Significant**. Impacts with a "**High**" significance are likely to disrupt the function and value of the resource/receptor, and may have broader systemic consequences (e.g. ecosystem or social well-being). These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
	Moderate	**Significant**. Impacts with a "**Moderate**" significance are likely to be noticeable and result in lasting changes to baseline conditions, which may cause hardship to or degradation of the resource or receptor, although the overall function and value of the resource or receptor is not disrupted. These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
	Low	**Detectable but not significant**. Impacts with a "**Low**" significance are expected to be noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause hardship, degradation, or impair the function and value of the resource or receptor. However, these impacts warrant the attention of decision-makers, and should be avoided or mitigated where practicable.
	Not significant	**Not Significant**. Any impacts are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

Table 3.5 Assessment of Potential Impacts: Example Table

Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Vessel routine operations Night time works.	Birds (particularly those that migrate at night) may be attracted to lights and suffer damage as a result of collisions with vessels.	Birds	Moderate to High	Negligible to Low	**Moderate**	Remove unnecessary illumination, reduce light intensity and shield light sources during the most active migration period for birds.	**Low**, direct, short term

3.3.6 Waste

In contrast to the other environmental and social technical disciplines assessed within this ESIA Report, no pre-mitigation assessment of impact was undertaken for waste production, storage, management and disposal as this is considered part of the Project design, as described in **Chapter 5 Project Description**. Rather, **Chapter 12 Waste Management** focuses upon identification of appropriate mitigation measures given the type and volume of wastes to be produced and identification of residual impact significance ratings. This methodology is described in further detail in **Chapter 12 Waste Management**.

3.3.7 Unplanned Events

Environmental and social impacts that might result from unplanned events (e.g. fuel spill) are addressed in **Chapter 13 Unplanned Events** of this ESIA Report. In addition to impact magnitude and receptor sensitivity, the impact assessment methodology for unplanned events also considered the likelihood of occurrence of the event(s). This methodology is described in further detail in **Chapter 13 Unplanned Events**.

3.3.8 Cumulative Impacts

This ESIA adopts the IFC definition of cumulative impacts (Ref. 3.7): "*Cumulative impacts are those that result from the incremental impact of the Project when added to other existing, planned and reasonably predictable future projects and developments.*"

The IFC has released a guidance note Cumulative Impact Assessment and Management – Guidance for the Private Sector in Emerging Markets in August 2013 (Ref. 3.8). The guidance note introduces a framework for identifying and assessing potentially significant cumulative impacts. The cumulative impact assessment (CIA) has been prepared taking into account the IFC guidance note.

A predominantly qualitative approach was taken in the identification and assessment of cumulative impacts during the construction and operations phases of the Project, taking into account geographic and scheduling overlaps with the Project. The methodology for the CIA is described in further detail in **Chapter 14 Cumulative Impact Assessment**.

3.3.9 Transboundary Impacts

Transboundary impacts are defined as:

"*Impacts that extend to multiple countries, beyond the host country of the project, but are not global in nature. Examples include air pollution extending to multiple countries, use or pollution of international waterways, and transboundary epidemic disease transmission*" (Ref. 3.7).

As the South Stream Offshore Pipeline spans multiple countries and is being constructed across a dynamic marine environment, there is the potential for some Project Activities to generate transboundary impacts. Such impacts may arise from Project Activities which traverse country boundaries, or impacts that originate within one country, but have the ability to extend across national borders.

For the purposes of the transboundary impact assessment included within this ESIA Report, the boundary of the Turkish EEZ in the Black Sea with its neighbouring countries defines the transboundary impact boundaries. Any changes in baseline conditions extending across these boundaries would be considered to be a transboundary impact.

IFC PS1 (Ref. 3.7) recognises the need to consider transboundary impacts. The transboundary impact assessment has considered the potential for transboundary impacts to be generated by the Project as required by IFC PS1.

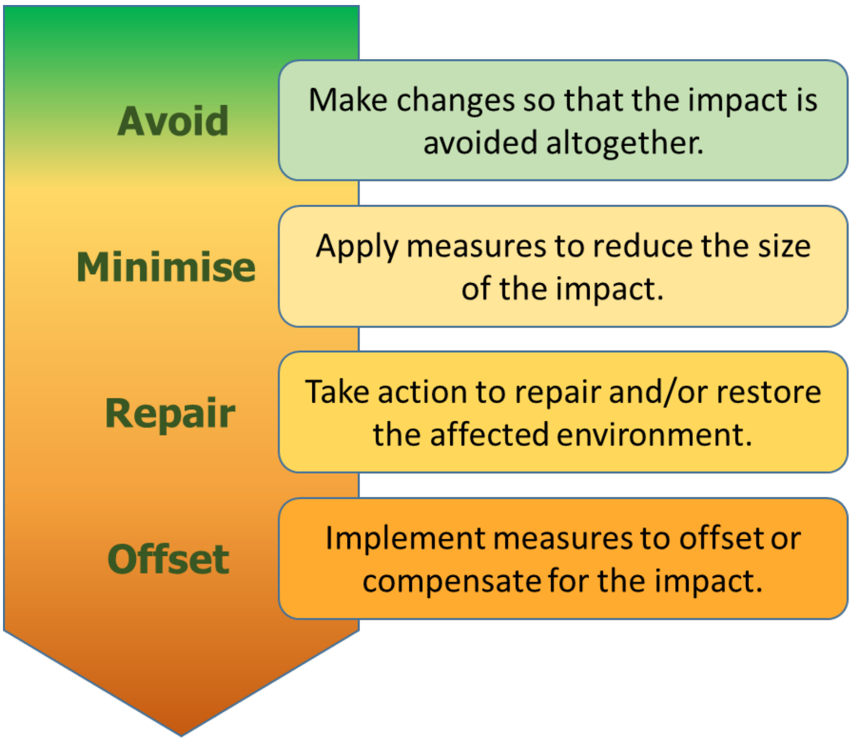
Further details regarding potential transboundary impacts can be found in **Chapter 15 Transboundary Impact Assessment**.

3.3.10 Impact Mitigation

As part of the ESIA process, where the impact assessment identified impacts as potentially arising, mitigation measures, which the Project will commit to, were developed (including avoidance, management and monitoring actions). Where an adverse impact is identified, the next step is to find a way to avoid or minimise the impact.

The process of identifying "design controls" and "mitigation measures" considered the mitigation hierarchy (Figure 3.4), as specified in IFC PS1, which is widely regarded as a best practice approach to managing risks.

Figure 3.4 Mitigation Hierarchy



For the Project, efforts were made to firstly avoid or prevent, then minimise or reduce adverse impacts, which were principally achieved through the application of "design controls" (Section 3.2). Avoidance, minimisation, repair and/or restoration were considered during the application of "mitigation measures" to manage the risks of adverse impacts. Any remaining significant residual impacts would then be considered in terms of offsetting or compensation.

For biodiversity, the same hierarchy was applied to all stages of the impact assessment process. Any significant residual impacts were addressed via offsetting or compensation in order to achieve "no net loss" of biodiversity. The assessment of critical habitat for biodiversity was identified separately to the above impact assessment process, albeit using the same hierarchy, to achieve "net gain" of the biodiversity values for which the critical habitat was designated.

The mitigation hierarchy adopted for the Project is shown in Figure 3.4.

This process involved ESIA experts working with the Project team engineers to identify practicable and cost-effective approaches to mitigate impacts. These measures were agreed and integrated into the Environmental and Social Management Plan.

Specific mitigation measures are described in the relevant discipline Chapters (Chapters 7 to 12).

3.3.11 Residual Impact Assessment

Once feasible mitigation measures were identified and agreed, the ESIA team reassessed the potential impacts, assuming the mitigation measures were effectively implemented as planned.

In general, residual adverse impacts assessed as being of "**Low**" significance or "**Not Significant**" were not considered to be of concern to the development of the Project[3]. For adverse impacts of "**Moderate**" and "**High**" significance, an iterative process is undertaken to further investigate opportunities for mitigation, according to the hierarchy above. Where the significance cannot be further reduced, an explanation is provided of why further reduction is not practicable. Monitoring is required to confirm the measures used to mitigate adverse impacts are working properly and that the impact is not worse than predicted. Monitoring requirements are outlined in the respective assessment chapters.

3.3.12 Environmental and Social Management Plans

Environmental and Social Management Plans (ESMPs) have been developed to capture all mitigation and management measures, and environmental and social commitments made within the ESIA Report. Adherence to these plans will be a condition of any Project construction and operation contracts awarded. It is noted that, the ESMPs shall also incorporate environmental

[3] A more stringent approach was taken in the assessment of ecological receptors of high sensitivity, such as critical habitat, or species classified as having vulnerable or above conservation status. In this case, residual impact significance of Low and above was a concern to the further development of the Project.

and social management commitments relevant to the Bulgarian and Russian sectors. How the ESMPs fit into this broader South Stream Transport HSSE-IMS is described in **Chapter 16 Environmental and Social Management**.

3.4 Stakeholder Engagement

As part of the ESIA process, stakeholder engagement was and continues to be undertaken throughout the development of the Project to ensure that all interested parties are aware and informed of the Project and have an opportunity to provide feedback regarding potential Project impacts and mitigation measures. To date, consultations have been undertaken with:

- National authorities;
- Regional authorities;
- Black Sea coastal communities;
- Marine area users;
- Non-governmental organisations (NGOs); and
- Academic and scientific organisations.

South Stream Transport has developed a Stakeholder Engagement Plan which identifies stakeholders and their interests, describes the consultation undertaken and that planned as part of the Project's ESIA process, and establishes a framework for stakeholder engagement activities to be undertaken as the Project progresses beyond the ESIA phase.

The stakeholder consultation process has helped the ESIA Report to scope potential impacts and concerns identified by the public. As indicated in Figure 3.1, stakeholder consultation has been a part of the ESIA process from the initial screening phase, and will continue with the submission of this ESIA Report, and during Project implementation to ensure the management of impacts takes stakeholder's concerns into account.

Details of the stakeholder engagement process for the ESIA are discussed further in **Chapter 6 Stakeholder Engagement**.

This ESIA Report has been released to the public for review and comment. The purpose of this disclosure is:

- To help stakeholders understand the potential impacts, following the application of mitigation measures, that may arise as a result of the Project;
- To provide an opportunity for stakeholders to raise comments or concerns about the Project, and request any additional mitigation measures deemed appropriate; and
- To confirm to stakeholders that their opinions obtained through the stakeholder engagement process have been considered in both Project design and ESIA evaluation.

Further details about this disclosure are provided in **Chapter 6 Stakeholder Engagement**.

3.5 Data Limitations

This ESIA Report has been based on design information available at the time of its preparation. Where necessary assumptions have been made and discussed in the relevant chapters. Consequently the ESIA Report has been undertaken on Project engineering design information at a Front End Engineering Design (FEED) level.

During the detailed design, Construction and Pre-commissioning and Operational Phases of the Project, there may be a requirement to amend design elements or processes which results in a deviation from that presented in this Project description. The Project has a management of change process to manage and track any such amendments, and to:

- Assess their potential consequences with respect to environmental and social impact; and
- In cases where a significant impact is likely to arise as a consequence of the amendment or change, to inform and consult with relevant parties on the nature of the impact and on proposed mitigation measures, where practical and appropriate.

All design changes will be added to a register of changes, which will summarise the change, the assessment, and the justification for South Stream Transport's actions. The management of change process will be incorporated into the HSSE management of change procedure, which is described in further detail in **Chapter 16 Environmental and Social Management**.

Comprehensive data have been used to inform this ESIA Report to enable sufficient confidence in the assessment conclusions. Notwithstanding the data set used, some gaps in baseline data necessitated some conservative assumptions as described in the relevant chapters and a precautionary approach to the mitigation measures adopted.

In this ESIA Report, predictions are made using accepted ESIA methods ranging from qualitative assessment and expert judgement to quantitative modelling. Each technical discipline impact assessments, in Chapters 7 to 12, detail specific relevant data and assumptions made.

References

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Chapter 4: Analysis of Alternatives

South Stream Offshore Pipeline
ENERGISING EUROPE

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4 Analysis of Alternatives

4.1 Introduction

The Project is the Turkish Sector of the South Stream Offshore Pipeline, which in itself is part of the larger South Stream Pipeline System. The objective of the South Stream Pipeline System is to develop a new gas supply route via the Black Sea that provides a safe and reliable means to transport Russian gas to the countries of Central and South-Eastern Europe.

This chapter examines the technically and financially feasible alternatives to achieve the Project objective, which, consistent with the objective of the overall South Stream Pipeline System, is to form a key part of the new supply route via the Black Sea. These alternatives were considered during the Feasibility and Development Phases of the Project and have led to the validation of the Project as it is described in **Chapter 5 Project Description**.

Alternatives to the overall South Stream Pipeline System have not been considered within this Environmental and Social Impact Assessment (ESIA) Report, although reference is made to decisions made for the South Stream Offshore Pipeline and the wider South Stream Pipeline System. Such reference is made to provide context, particularly where decisions were made by third parties that directly influence the design of the South Stream Offshore Pipeline, recognising that the South Stream Offshore Pipeline is an integral part of the wider South Stream Pipeline System.

Alternatives that were considered and assessed during the Feasibility Phase are referenced to the source documentation in the text. As indicated above, not all alternatives that are described in this chapter were considered and assessed during the Feasibility Phase. Some were examined later during the Development Phase, which includes the ESIA process.

The objective of this chapter is to outline how the Project represents an optimised design that is technically and financially feasible whilst minimising overall environmental and social impacts. The assessment of impacts that will arise as the result of the Project, along with the identification of appropriate mitigation measures, is contained in Chapters 7 to 12 of this ESIA Report.

This chapter starts by considering the zero alternative; it goes on to describe the high level strategic options (e.g. alternative means of gas transport) initially considered and progressively focuses in on the more detailed Project specific alternatives considered as part of the Front End Engineering and Design (FEED) process (e.g. route refinement options) (Ref. 4.1 and 4.2). Routing and siting alternatives have been analysed in the context of the engineering, environmental, socio-economic and cultural heritage optimisations that have been carried out during both the Feasibility and Development Phases of the Project.

4.2 Approach to Analysis of Alternatives

As recommended in the International Finance Corporation (IFC) Performance Standards Guidance Note 1: Assessment and Management of Environmental and Social Risks and Impacts (Ref. 4.3), the ESIA Report includes:

"An examination of technically and financially feasible alternatives to the source of such impacts, and documentation of the rationale for selecting the particular course of action proposed."

It is important to recognise that the South Stream Offshore Pipeline is the offshore component of the entire South Stream Pipeline System. Consequently, the South Stream Offshore Pipeline and the Project (Turkish Sector), which forms part of it, are significantly influenced by the route selection for the broader South Stream Pipeline System. Alternatives to the South Stream Offshore Pipeline as a whole are briefly discussed in Section 4.3 followed by the more detailed discussion of alternatives to the Project (Turkish Sector).

Decisions taken by Gazprom as part of the wider South Stream Pipeline System have significantly influenced the route selection (Ref 4.2). This chapter briefly refers to the consideration of alternatives and to these decisions which have to a large extent pre-defined the Project design i.e. the general location of landfall facilities and the routing of the offshore section of pipeline. Consequently the Analysis of Alternatives described in this chapter is structured to follow a 'narrowing approach' involving a series of logical steps, starting with the high-level alternatives (including those determined by third parties) followed by description of more detailed alternatives considered as part of the Project. Using this commonly adopted narrowing approach, the Analysis of Alternatives considers alternatives in the following sequence:

- The 'Zero' or 'No Project' alternative;
- South Stream Offshore Pipeline alternatives:
    - Alternative means of gas transportation; and
    - Offshore (macro) routing.
- Project Alternatives:
    - Route optimisation.

4.3 No Project or Zero Alternative

The 'Zero' alternative for the purposes of this ESIA Report is the situation where the Project, (i.e. the South Stream Offshore Pipeline – Turkish Sector) does not proceed. Under this scenario, there are no adverse environmental or social impacts in Turkey, as there is no construction or operation of the Pipeline in Turkey.

However, the need for the South Stream Pipeline System and therefore the Project is driven by Europe's long-term demand for natural gas; further details are provided in **Chapter 1 Introduction**. Should the Project not proceed the entire South Stream Offshore Pipeline would not proceed and therefore, the objective to provide a new supply route to the countries of Central and South-Eastern Europe via the Black Sea would not be met. This would, in turn, mean that diversifying existing supply routes to Central and South-Eastern Europe and providing additional supplies of natural gas to meet its growing energy demand would not be possible.

4.4 South Stream Offshore Pipeline Alternatives

4.4.1 Alternative Means of Gas Transportation

Based on the premise that gas will be exported via a new route across the Black Sea, consideration can be given to offshore transportation of gas by means other than pipeline systems. The main alternative to pipelines for transporting natural gas from Russia to the countries of Central and South-Eastern Europe by sea is the liquefaction of natural gas at a Black Sea port in Russia, and transportation of Liquefied Natural Gas (LNG) using LNG Carriers to either:

- A port on the Western Black Sea coast (Bulgaria or Romania); or
- A port in Southern Europe beyond the Turkish Straits.

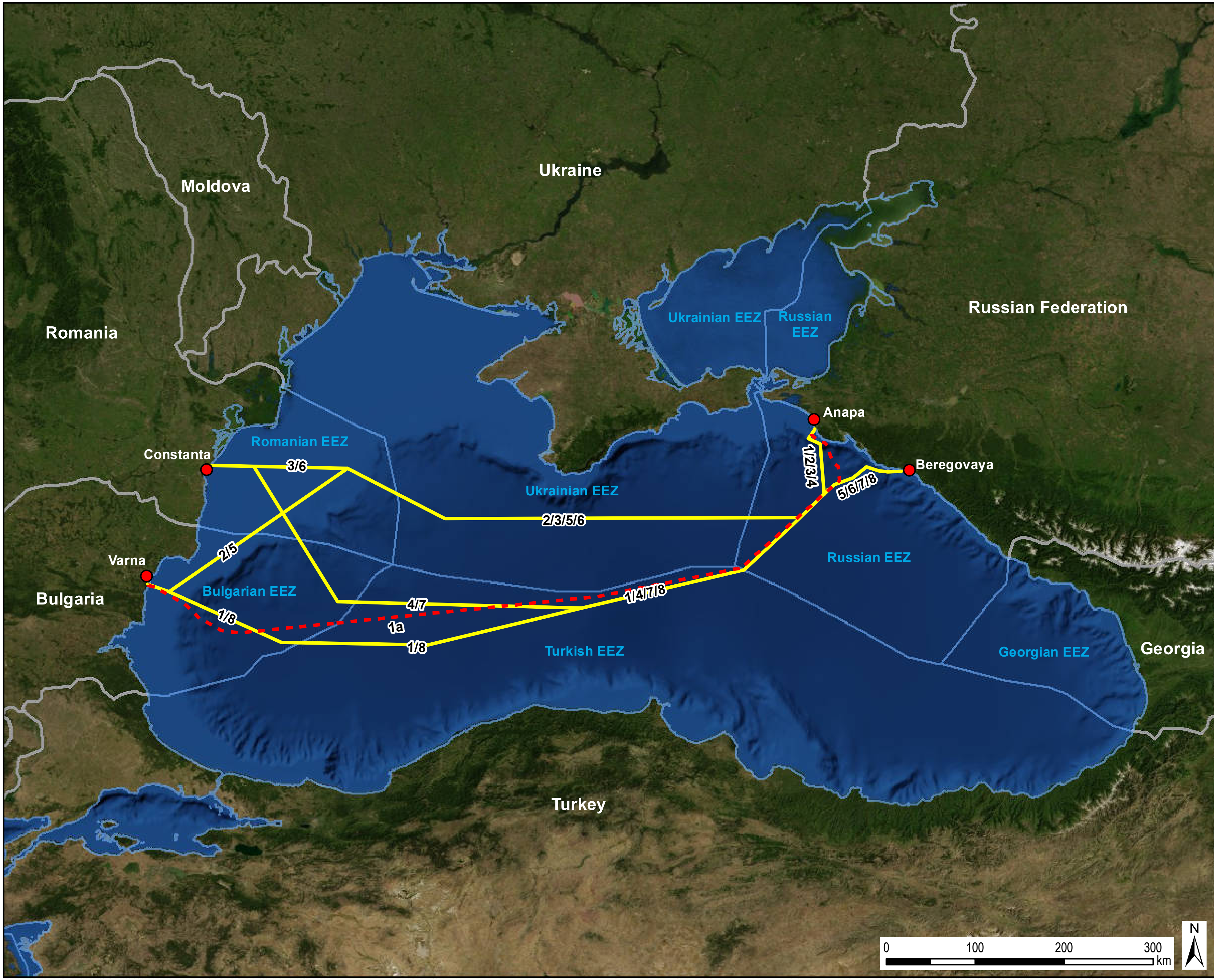
The following factors were considered in the assessment of these alternatives:

1. Liquefaction and transportation of LNG to gas markets is usually undertaken for 'stranded gas' deposits where the source of gas is so distant and isolated from its markets as to make transportation by pipeline uneconomic;
2. Liquefaction would require the construction of a liquefaction plant on the Russian coastline. The onshore environmental impacts associated with the construction and operation of an LNG plant would be greater than those of a pipeline and associated compressor station;
3. This alternative would require the presence of an unloading jetty or offshore buoy and a regasification plant on the shores of a receiving country. In view of the sensitivity and often designated protected status and recreational value of the Western Black Sea coastlines it is undesirable to develop a regasification plant on the coastal areas of the Western Black Sea. In order to avoid construction of a permanent regasification plant, export to an existing Southern European LNG regasification terminal could be considered; and
4. Transportation of LNG would require approximately 600 to 700 LNG carrier movements per year to export 63 billion cubic metres (bcm) of natural gas per year. This would equate to approximately two full LNG carrier movements per day passing through the Turkish Straits, which include the densely populated areas adjacent to the Bosphorus Strait, Istanbul. In view of the hazardous nature of the cargo, the existing high density of maritime traffic through the Turkish Straits and the population density around the Bosphorus Strait, this number of vessels movements would introduce an additional and potentially unacceptable safety risk.

On the basis of the above the LNG alternative is not considered further.

4.4.2 Offshore Routing

Eight potential offshore pipeline corridors were considered across the Black Sea; four offshore pipeline corridors from a shore crossing area near Beregovaya, and four from a shore crossing area near Anapa, both located in the Russian Federation as shown in Figure 4.1.



LEGEND

Route alternatives

Option 1a

Exclusive Economic Zones

Offshore Pipeline Route Alternatives
Option 1 - Anapa to Varna (Turkish waters)
Option 1a - Anapa to Varna (Turkish waters)
Option 2 - Anapa to Varna (Ukrainian & Romanian waters)
Option 3 - Anapa to Constanta (Ukrainian waters)
Option 4 - Anapa to Constanta (Turkish & Bulgarian waters)

Discounted Offshore Pipeline Route Alternatives
Option 5 - Beregovaya to Varna (Ukrainian & Romanian waters)
Option 6 - Beregovaya to Constanta (Ukrainian waters)
Option 7 - Beregovaya to Constanta (Turkish & Bulgarian waters)
Option 8 - Beregovaya to Varna (Turkish waters)

Projection: Lambert Conformal Conic

Purpose of Issue
For Information

Client
South Stream
Offshore Pipeline
ENERGISING EUROPE

Project Title
SOUTH STREAM OFFSHORE PIPELINE

Drawing Title
PIPELINE ROUTE OPTIONS

Drawn	Checked	Approved	Date
DH	RW	MW	03/06/2014

URS Internal Project No.	Scale @ A4
46369082	1:5,500,000

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Drawing Number
Figure 4.1

Rev

Plot Date: 03 Jun 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Tukey ESIA\Chapter 4\Figure 4-1 Pipeline Route Options.mxd

The comparative assessment of these two locations, carried out by Gazprom (Ref. 4.2), showed that the location at Anapa has less potential for environmental impacts compared to the Beregovaya location.

Following selection of Anapa as the preferred site for the Russkaya Compressor Station (CS), four offshore pipeline corridors were assessed for crossing the Black Sea to potential landfall sites in Bulgaria and Romania. Table 4.1 summarises the four offshore pipeline routes considered, which are shown on Figure 4.1.

Table 4.1 Offshore Pipeline Route Alternatives

Option	Landfall (Russia)	Landfall (West Black Sea Coast)	Transit Exclusive Economic Zones (EEZs)	Length of Assessed Route in kilometres (km)
1	Anapa	Varna	Russia, Turkey and Bulgaria	940.3
2	Anapa	Varna	Russia, Ukraine, Romania and Bulgaria	928.4
3	Anapa	Constanta	Russia, Ukraine, Romania	933.2
4	Anapa	Constanta	Russia, Turkey, Bulgaria and Romania	931.3

Of these four corridors, two cross the Turkish Exclusive Economic Zone (EEZ) (Options 1 and 4) and two cross the Ukrainian EEZ (Options 2 and 3). Options 2 and 3 could not be surveyed within the timeframe required and were therefore discarded from further consideration. Further technical investigations were performed for Option 1, landing in Bulgaria and Option 4, landing in Romania (Ref. 4.2).

Various landfall site alternatives were assessed on the Western Black Sea coast, in Bulgaria and Romania. This assessment identified two preferred sites; one near the Bulgarian port of Varna and one near the Romanian port of Constanta.

After Bulgaria and Russia signed an Intergovernmental Agreement on South Stream, the remaining Romanian landfall alternative (Option 4) was no longer considered, leaving Option 1 as the preferred option. Following this decision, shore crossing sites in the vicinity of Varna on the Bulgarian Black Sea coast were further considered.

4.5 Project Alternatives

4.5.1 Route Optimisation Across Turkish Waters

The continental slopes in Russian and Bulgarian waters are unstable regions where the depth of the sea rapidly changes and the seabed is generally characterised by unstable sediments, dynamic conditions (e.g. submarine slumps and sediment flows) and irregular morphology.

The continental slope near Anapa in Russia is characterised by an extensive network of canyons. Two stable lateral canyons running down the continental slope were identified during the survey programme. On the basis of the width of the canyons, it was established that the best technical option was to route two pipelines in each canyon.

On the Bulgarian continental slope, two submerged canyons, immediately adjacent to each other, were deemed adequate for the laying of the four Project pipelines. Given the engineering constraints and risk management benefits associated with divergent pipeline alignments, the best technical option identified involved the routing of three pipelines in the larger of the two canyons and one pipeline in the smaller, narrower canyon.

Following selection of the optimal continental slope crossing locations in the Russian and Bulgarian EEZs, it was necessary to address environmental and technical considerations for the preferred offshore route along the abyssal plain within the Turkish EEZ. This investigation formed part of the wider South Stream Offshore Pipeline survey of the abyssal plain, which also included areas in the Bulgarian and Russian EEZs. The required locations for the continental slope crossing in the Bulgarian and Russian EEZs constrain where the Pipeline in the Turkish EEZ can be laid as it has to join these two continental slope crossings.

Option 1 was subsequently subject to route optimisation with consideration of a direct route across the Turkish EEZ as opposed to an alignment to the south. Option 1 was originally proposed to avoid the potential impacts of the southern edge of the Danube Delta sediment fan[1]. Following further engineering investigation, it was concluded that due to the relatively low relief and inactive depositional nature of the outer submarine fan, the effects associated with deposition of sediment in the Danube fan system were minor. The direct approach shown as Option 1a in Figure 4.1 was therefore adopted and subjected to further consideration of environmental and cultural heritage sensitivities (**Chapter 8 Biological Environment** and **Chapter 10 Cultural Heritage**).

One of the key reasons for selecting the preferred option (Option 1a) is that it is shorter than the alternative routes. It reduces the total offshore length of the pipeline route by approximately 20 km per pipeline, and the length of the Turkish Sector by approximately 50 km per pipeline thereby minimising the Project footprint.

[1] A sediment fan is a fan- or cone-shaped deposit of sediment crossed and built up by streams. The Danube fan system is a relict sedimentary feature in the North-Western part of the bottom of the Black Sea.

In summary, the selection process for the offshore route of the South Stream Offshore Pipeline was largely constrained by engineering and environmental factors in Russian or Bulgarian waters. The landfall options and continental slope crossing significantly influenced where the EEZ border crossing with Turkey would be and as such, also determined where the Pipeline could run in the Turkish EEZ (and thus dictated the location of the Project).

No significant engineering or social constraints were identified on the Turkish abyssal plain, based on the information available on the environmental constraints (e.g. marine ecosystems) at that stage. Therefore, direct line routes were initially adopted within the preferred corridor.

The route alignments were subsequently selected on the basis of further geophysical and environmental surveys. The entire corridor was mapped and the geological, bathymetric and cultural features were recorded for further analysis.

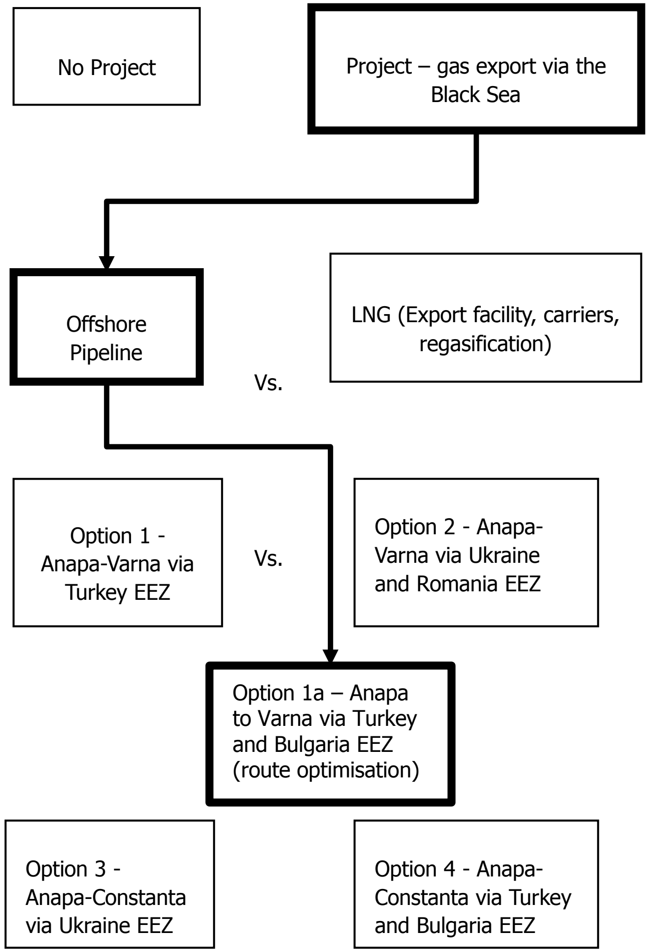
Specifically, a thorough review of the seabed features was carried out to determine the presence of features of biological importance and cultural heritage objects (CHOs). The findings of this review are included in **Chapter 7 Physical and Geophysical Environment** and **Chapter 10 Cultural Heritage**.

Whereas no significant features of biological importance were identified, two CHOs were identified on the abyssal plain within 150 metres (m) of the initial proposed Pipeline route. These CHOs were first identified in side-scan sonar images and were earmarked for visual inspection via submersible Remotely Operated Vehicles (ROVs) to determine their identity and potential cultural significance, prior to construction of the Pipeline (Ref. 4.4). As these objects were found to be of cultural heritage value, route adjustments have been made to avoid them and to maintain at least a 150 m buffer between the pipelines and any CHOs. **Chapter 10 Cultural Heritage** discusses these objects, their potential value and measures required to ensure their protection in more detail.

4.6 Summary

This chapter summarises the Analysis of Alternatives reflecting the initial design of the South Stream Pipeline System and subsequent considerations during the Feasibility and Development Phases of the South Stream Offshore Pipeline and subsequent Project. Within the Turkish Sector, the assessment was constrained by the preferred routes in Russian and Bulgarian waters where there are more constraints (such as continental slope crossings) that could impact the route. The Analysis of Alternatives reported here has adopted a typical narrowing approach, starting with high level alternatives such as means of transporting gas across the Black Sea, honing in on more detailed consideration of alternatives, such as consideration of detailed pipeline routing. Figure 4.2 summarises the analysis of alternatives process, including the rationale for discarding certain alternatives.

Figure 4.2 Summary Analysis of Alternatives (South Stream Offshore Pipeline)



Options	Outcome and rationale
The 'No Project' or 'Zero' alternative	Project Objective: *to diversify supply routes for transportation of gas from Russia to the countries of Central and South-Eastern Europe via the Black Sea, and to help meet projected increased demand for natural gas.* If the Project does not proceed: • Impacts attributed to the Project would not occur, but other impacts associated with alternative transit routes would occur; and • An opportunity to diversify gas supply routes will be missed. **The 'No Project' option was dismissed**. Refer to **Chapter 1 Introduction** for the Project need
Alternatives to cross the Black Sea	LNG could be exported beyond Central and South-Eastern Europe, however: • It is not the Project intent to export beyond Central and South-Eastern Europe; • Transit through the Turkish Straits, for example to Italy, carries higher safety and environmental risks; and • LNG would generate more greenhouse gases (GHG) emissions. **LNG dismissed on the grounds that a pipeline system was considered more safe and reliable avoiding the need to construct a new regasification plant on the Black Sea coast/ship LNG through the Turkish Straits. Also, less GHG emissions from a pipeline.**
Offshore routing (Macro alignment) based on decision to land at Varna, Bulgaria	Options 2 and 3 were dismissed because survey work would have resulted in schedule delays. Option 4, landing in Romania, was dismissed after Bulgaria and Russia signed an Intergovernmental Agreement on South Stream. Option 1 underwent further route optimisation through on-going investigations and studies. **Option 1a was the preferred alternative** selected for detailed route alignment studies

References

Number	Reference
Ref. 4.1	Giprospetzgaz, 2010. Feasibility Study for the Offshore Section of the "South Stream" Project Pipeline, Volume 17 of the Environmental Impact Assessment (Russian Sector), Second Part of the Environmental Impact Assessment on Alternative Route Options for Pipeline (land area), Archive number: 6976.101.003.11.14.17.02-1 (replacement for 6976.101.003.11.14.17.02, St. Petersburg.
Ref. 4.2	Giprospetzgaz. 2010. Feasibility Study For Construction of South Stream Gas Pipeline, Volume 9: Route Evaluation. Part 3. Route Selection Manual. Archive No 6976.101.003.11.14.09.03-1 Instead of Archive No 6976.101.003.11.14.09.03
Ref. 4.3	IFC 2012. Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. http://www1.ifc.org. Accessed 21 January 2013.
Ref. 4.4	Seascape Consultants Ltd. 2013. Interpretation of Seabed Survey Data for the South Stream Offshore Pipeline Project, Report No 2013/07.

Chapter 5: Project Description

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Tables

Figures

5 Project Description

5.1 Introduction

This chapter describes the design philosophy of the Project, the construction schedules and the characteristics of the Construction and Pre-Commissioning, Operational and Decommissioning Phases. It describes the principal materials, wastes and emissions associated with the Project and anticipated labour requirements. Finally, it describes how material changes to the Project, and any consequent changes to the assessment and management of environmental and social impacts will be managed.

5.2 The Project

As described in **Chapter 1 Introduction**, the Project is the Turkish Sector of the South Stream Offshore Pipeline, which itself, is the offshore component of the South Stream Pipeline System that will deliver natural gas from Russia to the countries of Central and South-Eastern Europe.

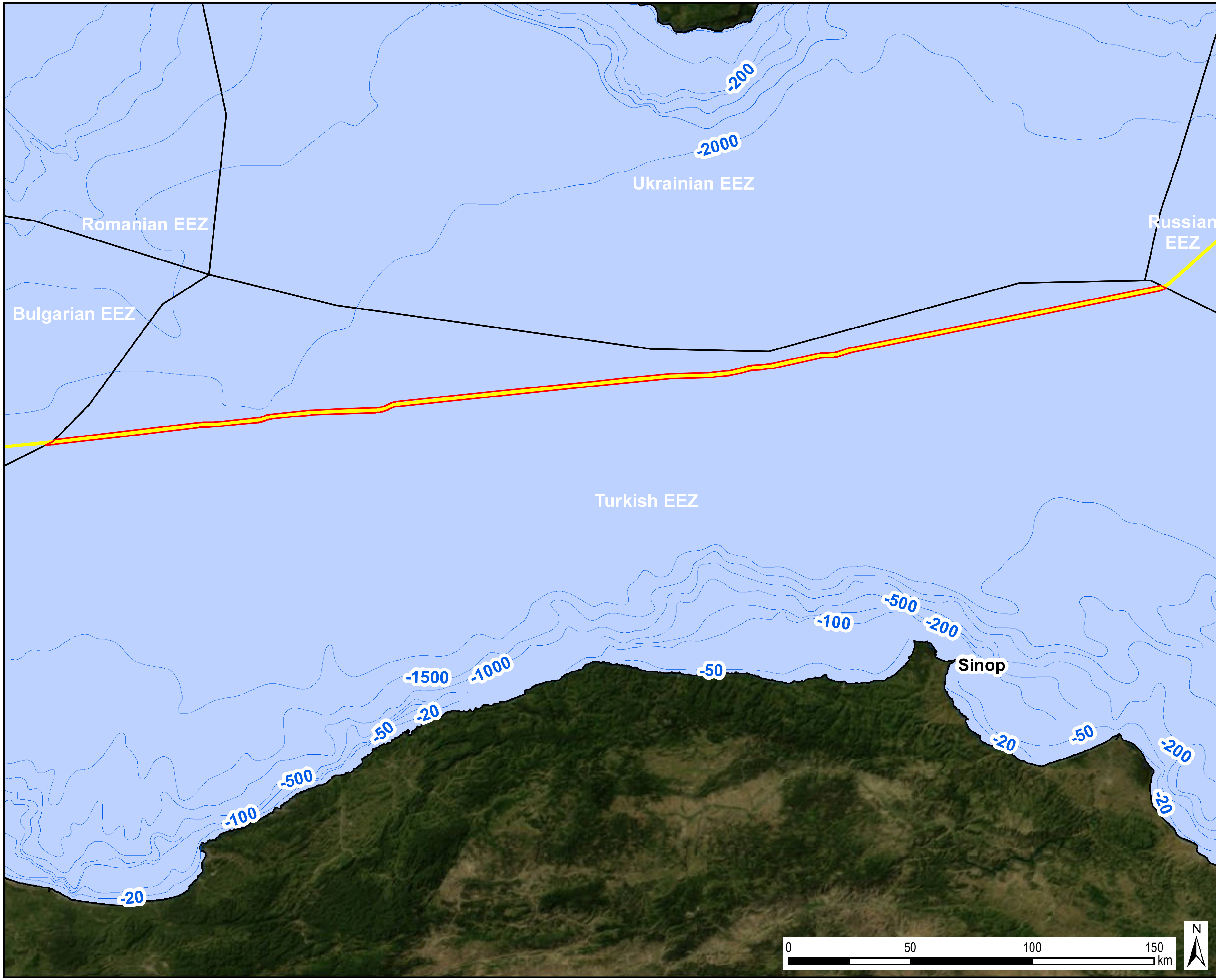
The Project is approximately 470 kilometres (km) in length and extends through the Black Sea from the border of the Russian EEZ in the east to the border of the Bulgarian EEZ in the west (Figure 5.1). The Project will comprise the construction and commissioning, operation and decommissioning of four 32-inch diameter (813 millimetres (mm)) pipelines within the Turkish EEZ.

The four pipelines will be laid directly on the seabed. No seabed intervention works are anticipated either before or after pipe-lay. There will be no landfall facilities within the Turkish Sector.

At maximum capacity the South Stream Offshore Pipeline will be able to transport up to 63 billion cubic metres (bcm) of natural gas per year from Russia to Bulgaria. Each of the four Project pipelines will have a maximum flow rate of approximately 47.9 million standard cubic metres (MMSCM) per day (approximately 15.75 bcm per year), and a maximum design pressure of 300 bar.

The proposed route of the Project was selected following an Analysis of Alternatives as described in **Chapter 4 Analysis of Alternatives**. Final Pipeline route alignments may be further optimised during the detailed design phase; however any such changes are not anticipated to result in changes to the impact assessments presented in technical Chapters 7 to 12 of this ESIA Report.

During detailed design, Construction and Pre-Commissioning and Operational Phases of the Project, there may be a requirement to amend design elements or processes which results in a deviation from that presented in this project description. The Project has a management of change process to manage and track any such amendments. Further information is set out in Section 5.12.



LEGEND
Turkish Sector of South Stream Offshore Pipeline
Proposed offshore pipelines
Turkish Project Area
Exclusive Economic Zones
Isobaths

Projection: Lambert Conformal Conic

Purpose of Issue
For Information

Client
South Stream Offshore Pipeline ENERGISING EUROPE

Project Title
SOUTH STREAM OFFSHORE PIPELINE

Drawing Title
TURKISH PROJECT AREA

Drawn	Checked	Approved	Date
AH	RW	MW	23/04/2014

URS Internal Project No. 46369082
Scale @ A4 1:2,000,000

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Drawing Number
Figure 5.1
Rev

Plot Date: 23 Apr 2014
File Name:\\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Tukey ESIA\Chapter 5\Figure 5.1 Turkish Project Area_Layout.mxd

It is proposed that the pipelines will be laid within a 420 metre (m) corridor, in agreement with the relevant Turkish authorities. This corridor accommodates the four pipelines and a safety zone either side of the outermost pipelines. In general, the four pipelines will be laid in parallel 100 m apart, although this may change in response to specific seabed conditions.

5.3 Design Philosophy

The overall design philosophy is to ensure compliance with internationally recognised standards for the design, material use, fabrication, installation, testing, commissioning, operation, maintenance and environmental and social management of pipeline systems. Specific considerations which have informed the approach to and eventual design are discussed below.

5.3.1 Pipeline System Design Codes and Standards

The Project will comply with applicable Turkish regulations, construction permit and other related permits. The Project will be designed in accordance with recognised and respected pipeline industry standards.

The pipeline will be designed and constructed in compliance with the internationally-recognised offshore design code Det Norske Veritas (DNV) Offshore Standard DNV-OS-F101 Submarine Pipeline Systems (DNV, October 2010), which is harmonised with International Organisation for Standardisation (ISO) 13623:2009 and other relevant ISO standards. This design code has been used for 65% of offshore pipelines worldwide, including Blue Stream that connects Russia with Turkey across the Black Sea, and Nord Stream, which is the only high pressure offshore pipeline constructed in the Baltic Sea.

DNV will certify compliance with the above referenced standard.

5.3.2 Pipeline Design Parameters and Gas Properties

5.3.2.1 System Export Capacity

The South Stream Offshore Pipeline has a design life of 50 years. When fully operational, it will have a design export capacity of 63 bcm per year. Each of the four pipelines will have an export capacity of 15.75 bcm and a daily flow rate of approximately 47.9 MMSCM per day (MMSCM/day).

The entire South Stream Offshore Pipeline, including the Turkish Sector, will have a design pressure of 300 bar although the expected maximum operating pressure is anticipated to be approximately 284 bar.

5.3.2.2 Gas Composition and Properties

The gas will consist of approximately 97 mol%[1] of methane and 0.41 mol% carbon dioxide. The gas density is anticipated to vary between approximately 60 and 250 kilograms per cubic metre (kg/m^3).

Table 5.1 provides a summary of the likely composition of the gas. These gas properties apply as design values only and the properties of the processed natural gas provided to the South Stream Offshore Pipeline may vary slightly from those identified in Table 5.1. However, any changes will be very small deviations around the design natural gas parameters and will not result in changes to the size and design of the main Project components.

Table 5.1 Gas Composition

Component	Mol%	Component	Mol%
Methane	97.5389	n-pentane	0.0171
Nitrogen (N_2)	0.9305	Hexane	0.0205
Carbon Dioxide (CO_2)	0.4101	Heptane	0.0033
Ethane	0.8800	Octane	0.0004
Propane	0.1399	Nonane	0.0001
i-butane	0.0150	Water	0.0014
n-butane	0.0249	Methanol	0.0005
i-pentane	0.0171	Hydrogen sulphide (H_2S)	0.0003

5.3.2.3 Resource Efficiency

Resource efficiency measures will form part of South Stream Transport's Environmental and Social Management Plan (ESMP). Examples of such measures in Turkey include:

- Appropriate vessels will be chosen and maintained correctly; and
- Systematic monitoring of the condition and the adjustment of the fuel systems of ship equipment to ensure efficient use of fuel.

[1] Mol% describes the percentage of moles (or molecules) within a given mixture.

5.4 Pipeline Description

5.4.1 Pipeline Overview

The pipelines will be constructed of steel in 12 m sections. The pipe sections will be coated both inside and outside prior to delivery. The internal coating will be an epoxy paint which improves internal cleanliness and gas flow, whilst the external coating will be made of three-layer-polypropylene (3LPP) to protect the pipelines from corrosion.

In addition, the pipelines will also be protected against corrosion by a cathodic protection system consisting of sacrificial anodes. Further details are presented below.

5.4.2 Pipe Dimensional Data

The properties of the steel pipe are summarised in Table 5.2.

Table 5.2 Pipeline Dimensional Data of 32-inch Pipe

Parameter	32-inch Pipe
Pipe nominal outside diameter	812.8 mm
Pipe nominal inside diameter	734.8 mm
Wall thickness	39 mm
Internal or external corrosion allowance	0 mm
Wall thickness fabrication tolerance	±1 mm

5.4.3 Buckle Arrestors

Buckle arrestors, i.e. pipe reinforcement, are used in the pipeline to avoid buckle propagation in the event of local buckling by placing arrestors at regular intervals and/or in susceptible areas along the length of the pipeline. The buckle arrestors will be welded into the pipelines in those areas that are susceptible to collapse, local buckling or propagation buckling.

Buckle arrestors are manufactured from the same steel grade as the pipes and essentially act as a reinforcing ring placed around the outside of the pipe.

An integral ring buckle arrestor is considered to be the most effective type of arrestor for deep water pipeline projects. As such, an integral ring buckle arrestor approximately 4.1 m long with wall thickness of 74 mm (tapering down to 39 mm) is proposed. Buckle arrestors will be required throughout the Project (i.e. the Turkish Sector) and it is proposed that a buckle arrestor spacing of 2,000 m is used. As the exact spacing of arrestors will depend on the pipe-lay installation methodology, the final spacing of the arrestors will be determined in consultation with the appointed construction contractor.

5.4.3.1 Welding

Line pipe sections will be welded to form the four pipelines. Each weld will be subject to visual inspection and non-destructive examination (NDE) to ensure it meets the required specification. The weld specification will be agreed with the installation contractor in compliance with design standards prior to construction and supported by an Engineering Critical Assessment. The weld specification will be produced to complement the NDE procedures.

Critical processes such as welding will be inspected by the contractor's quality assurance crew, and thereafter inspected by DNV and South Stream Transport.

5.4.3.2 Corrosion Protection, Internal and External Coatings

Corrosion Protection System

Corrosion protection will be achieved through a combination of an external anti-corrosion coating with associated field joint coatings, and cathodic protection.

Anti-Corrosion Coating

A three-Layer-Polypropylene (3LPP) external coating will be applied to protect the steel line pipe from external corrosion. The 3LPP coating combines excellent mechanical properties and heat resistance (up to 105ºC) with a high degree of resistance to chemical attack and cathodic disbondment. The external coating is selected to provide additional mechanical strength for handling (given the heavy weight of pipe joints) and high reliability protection against a severe environment in combination with a long lifetime.

Internal Flow Coating

An internal coating will be applied to the pipelines to improve the flow efficiency. An internal flow coating will also assist in maintaining a dry internal pipe surface as less water will be absorbed by the coating compared to the steel. Furthermore, the smooth internal surface will reduce wear of pigging instruments during pre-commissioning tests and inspections. The proposed internal flow coating is two component epoxy paint with a thickness of minimum 100 micrometres (μm).

Field Joint Coating

The application of the external anti-corrosion coating on the line pipe leaves the pipe ends exposed for welding during installation. Coating of the girth weld area after completion of welding is an integral component of the pipeline protection system. Such a coating system is called the field joint coating.

Field joint coating needs to ensure a good corrosion protection in the weld area. Given the particular chemical characteristics of the Black Sea, which is anoxic and saturated with H_2S at a water depth below 150 m, it is particularly important to protect the weld area with a highly reliable field joint coating. This is in addition to the normal functions of field joint coating, which are to provide protection from impacts and against corrosion.

The selected field joint coating system is injection moulded polypropylene coating on top of a fusion bonded epoxy layer. The field joint coating will consist of a heat shrink sleeve applied directly over the joint. The thickness will be 5 mm minimum over the weld and 8 mm minimum on the pipe body.

Cathodic Protection

Cathodic protection will be provided by sacrificial anodes developed in accordance with the recommended practice design code DNV-RP-F103.

The anodes will consist of a zinc alloy half-shell bracelet that will be attached to the pipeline at intervals of up to 300 m along each pipeline. Approximately 1,650 zinc alloy bracelets are anticipated in the Turkish Sector, equivalent to a total anode mass of 620 tonnes.

5.5 Construction Phase

This section describes the activities that will take place during construction of the Project.

5.5.1 Indicative Construction Schedule

The overall South Stream Offshore Pipeline phases and timeline is provided in **Chapter 1 Introduction**. The base case construction schedule for the Project is summarised in Table 5.3. Pipe-laying is programmed for early 2015, with first gas from Pipeline 1 scheduled for late 2015, and all four pipelines fully operational by the end of 2017.

As with all large construction projects there may be some changes made to the schedule, during the Construction and Pre-commissioning Phase, as a result of unforeseen delays such as weather conditions, logistics, geological conditions or administrative procedures with national governments. Should there be any material change to the construction schedule, which may affect the results of the ESIA Report; the management of change process described in Section 5.12 will be followed.

Two main methods of pipe-lay are generally employed; J-Lay and S-Lay (refer to Section 5.5.3.5). The construction schedule presented in Table 5.3 assumes a J-Lay method, in which the pipeline vessel moves more slowly than in S-Lay, and is therefore a more conservative assumption in identifying and assessing environmental and social effects.

Table 5.3 indicates the sequence of Pipeline construction. Pipelines would be laid in an east to west direction, and from north (Pipeline 1 being most northerly) to south. There are no plans for there to be two construction spreads in Turkish waters at the same time. Given the construction spreads will be travelling at approximately the same speed, there will also be at least 470 km between the spreads at any given time.

Table 5.3 Indicative Construction Schedule (All Four Pipelines)

	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17
Pre-Lay Surveys(in Turkish Waters)																																						
All	■	■											■					■	■					■	■													
Pipe-Laying (in Turkish Waters)																																						
1			■	■	■	■	■	■																														
2														■	■	■	■	■	■	■																		
3																				■	■	■	■	■	■	■												
4																										■	■	■	■	■	■	■						
Pre-Commissioning																																						
1											■	■	■	■																								
2																							■	■	■	■												
3																													■	■	■	■						
4																																			■	■	■	■
Commissioning and First Gas																																						
1														■																								
2																										■												
3																																■						
4																																						■

5.5.2 Logistics and Material Supply

The Project will require the procurement of materials, equipment and labour from locations both within and outside of the European Union (EU). The steel line pipe is anticipated to come from pipe mills located in Europe, Russia, Japan, and/or India.

It is currently anticipated that all of the pipe required to construct the Project will arrive at marshalling yards in Bulgaria via sea.

5.5.2.1 Marshalling Yards

Large scale pipeline construction work requires considerable support from onshore support facilities, known as marshalling yards, for the delivery, storage and load out of pipe, plant and equipment. The marshalling yards will also provide support facilities, which will provide general storage for supply of consumables to the offshore fleet, and managerial support for South Stream Transport and its contractors.

Marshalling yards for the construction of pipelines 1 and 2 will be located at the ports of Varna East, Varna West and Burgas in Bulgaria. The impacts of the development and use of these marshalling yards are assessed in the South Stream Offshore Pipeline – Bulgarian Sector: ESIA Report. The Project is committed to using these marshalling yards for construction of pipelines 1 and 2, including construction of the landfall (onshore) components in Russia and in Bulgaria. The location of marshalling yards for the construction of pipelines 3 and 4 will be determined as construction contracts for these lines are determined.

There will be no marshalling yards located in Turkey.

5.5.3 Construction Phase

5.5.3.1 General Overview

The main construction activities to be undertaken within the Project Area include:

- Surveys of the Pipeline route prior to, during and after the pipe-laying process; and
- Offshore pipe-laying.

5.5.3.2 Construction Vessel Spread

The number, types and technical specifications of vessels associated with the pipe-lay, and the associated requirements for the transport of personnel (via vessel or helicopter) will be determined by the principal construction contractors. For the purposes of this ESIA Report, a typical array of construction vessels, machinery and equipment has been assumed; details are provided in Table 5.4 and illustrated in the schematic in Figure 5.2.

Table 5.4 Typical Offshore Construction Vessel Spread per Pipeline

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating in kilowatts (kW)	Persons on Board	Utilisation (%)
Offshore Pipe-laying	Deep water pipe-lay vessel	Deep water pipe-laying	1	170 (470 km at 2.75 km per day)	Saipem 7000 Castorone	70,000	725	40
	Tug	General support	1	As above	Normand Neptun	13,880	40	60
	Pipe Supply Vessel (PSV)	Supplying pipe to pipe-lay vessel	5*	As above	Normand Flipper	7,160	16	60
	Survey vessel	Surveying the sea floor in front and behind the pipe-lay vessel	2	As above	GSP Prince	7,604	62	60
	Multi Service Vessel (MSV)	ROV support Diving support Consumables supply Bunker supply Provisions supply Water supply	2	As above	Normand Mermaid	10,000	70	60
	Fast supply vessels	Crew changes	1	5 (i.e. 10 half day trips)	GSP Lyra	2,520	70	60

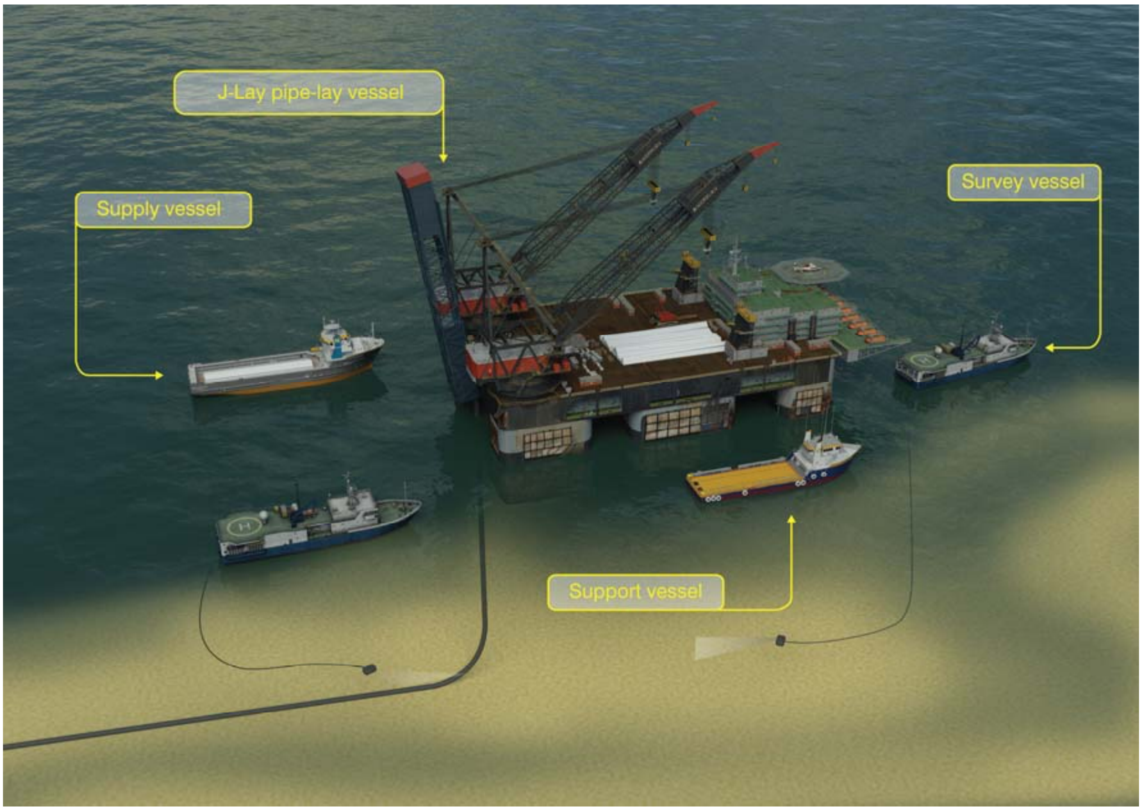
Continued…

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating in kilowatts (kW)	Persons on Board	Utilisation (%)
Offshore Pipe-laying	Helicopter	Crew changes	1	9 (i.e. 18 half day trips)	Super Puma	1,200	10	60
	Maintenance vessel	Delivery of spare parts / equipment	1	9	Normand Flipper	7,160	16	60
	Fuel / waste water collection vessel	Bilge and waste water gathering	1	9	Bryansk	610	5	60
	Rescue vessel	Safety and rescue operations	1	Only required in case of emergency	GSP Vega	9,548	23	60

* This indicative number only accounts for the anticipated maximum number of PSVs that would be present inside the Turkish EEZ at any one time to supply the spread whilst pipe-laying is undertaken in Turkey. PSVs will also pass through the Turkish EEZ to reach the construction spread when pipe-laying is occurring in Russia. These additional PSV movements are accounted for in the estimated fuel use (Table 5.6) and CO_2 emissions estimates (Table 5.10).

Complete.

Figure 5.2 Typical Offshore Pipeline Construction Spread



Note: Not to scale, water depth greater than 2,000 m.

5.5.3.3 Surveying

The design and routing of the pipelines has been informed by a number of studies as outlined in the baseline data sections of Chapters 7 to 12 of this ESIA Report. However, a number of further surveys will be required before, during and after installation of the pipelines to ensure they avoid any obstacles, are laid along the correct route and are laid without defect.

Pre-Construction Surveys

Pre-lay surveys will be carried out along each pipeline route prior to commencement of the pipe-lay works to confirm the previous route surveys undertaken during the Feasibility and Development Phases, and to help to finalise any minor re-routing of the pipelines. The survey will include a range of geophysical survey techniques and/or visual surveys using, where necessary, a Remotely Operated Vehicle (ROV) and confirm the absence of any obstructions along the route (to be avoided by minor re-routing).

An unexploded ordnance (UXO) survey may be carried out along each pipeline route well in advance of pipe-laying. A UXO clearance plan (if required) will be developed by South Stream Transport in close conjunction with relevant national authorities at the appropriate time. Survey results will be submitted to the Ministry of Foreign Affairs (MoFA) as appropriate.

Touch-Down Monitoring and As-Laid Surveys

During pipe-laying, touch-down monitoring will be conducted in real-time to ensure correct installation of each pipeline on alignment and with respect to lateral separation criteria for adjacent pipelines, and avoidance of obstacles (against minimum offset criteria). An as-laid survey will be performed once each pipeline has been laid on the seabed. The surveys will establish the as-laid position (horizontal and vertical) and condition of the pipelines and would comprise bathymetry and other survey sensors in conjunction with visual inspection by ROV.

As-Built Survey

After completion of pipe-laying, an as-built survey will be conducted to ensure the Pipeline has been installed correctly, to document the condition and to ensure the integrity of the installed pipelines. The survey would comprise the integration of as-laid survey results from pipe-lay installation operations with the post-installation rectification/acceptance surveys for specific construction activities.

5.5.3.4 Pipe-Laying Process

The following is a general description of typical pipeline laying arrangements.

Offshore pipe-laying is accomplished by the sequential alignment, welding and lowering of pipe segments from a pipe-laying vessel. Pipe-laying may be performed by the S-lay or J-lay technique; the method to be employed is yet to be confirmed. The final choice will be defined after award of the construction contracts.

Line pipe sections are transported to the pipe-lay vessel by supply vessels, from which they are lifted and stacked on board the pipe-lay vessel. Pipe sections are then transported using conveyor systems to the pipe bevelling station where the pipes are made ready for welding. The bevelling process produces scrap metal which will be required to be stored in containers for collection and disposal onshore.

The pipe segments are moved to the first welding station where they are clamped and welded. The welded pipe segment is moved to the inspection station where the weld is subject to Non-Destructive Examination (NDE), performed by visual inspection and Automated Ultrasonic Testing (AUT), to ensure the weld meets the required specification. Any welds not meeting the specification are removed by cutting out the cylinder of pipe containing the weld. The pipe is then re-welded and subject to another full NDE. Following successful weld testing, the pipe segments move along to the coating stations. The number of coating stations depends on the pipe-lay vessel used. In the coating stations, a field joint coating is applied to the welds for corrosion protection.

The pipe-lay vessel utilises dynamic positioning (DP), a computer controlled system that drives the vessel's thrusters (directional propellers) to maintain position or move the vessel forward. Once the pipe segments have exited the pipe-lay vessel, the vessel stops forward motion, and work commences on welding the next pipe segments together.

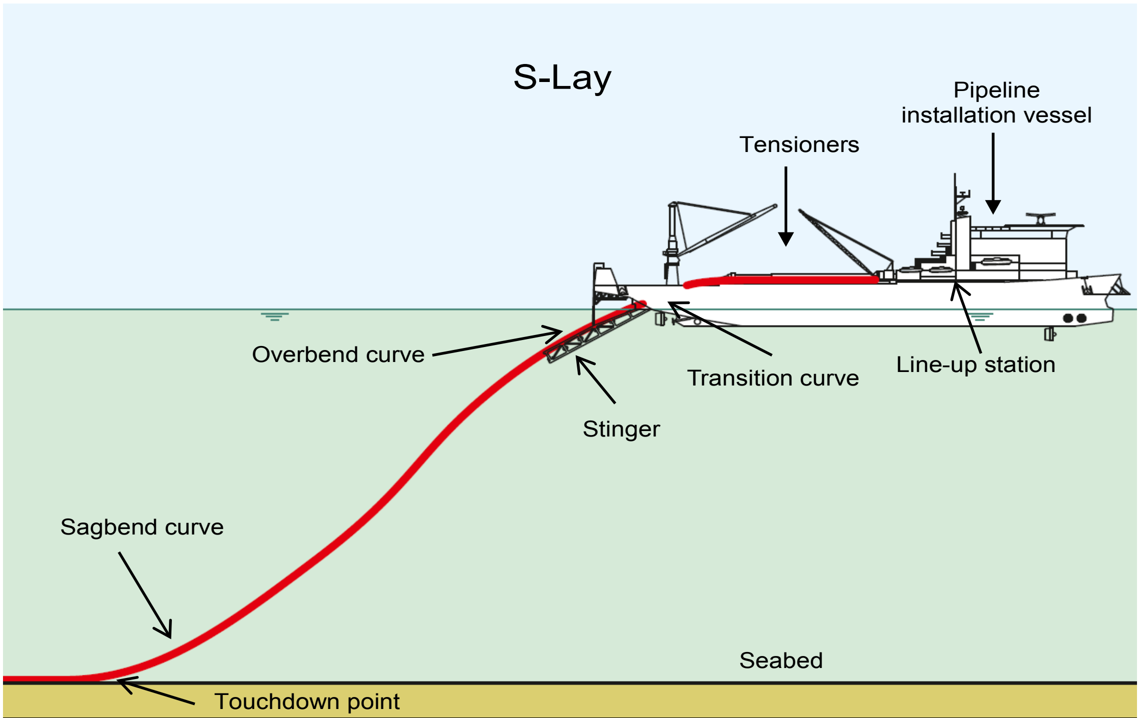
During the pipe-lay process, a navigational Safety Exclusion Zone is proposed of 2 km radius (1.1 nautical miles (NM)) centred on the pipe-lay vessel. The navigational Safety Exclusion Zone will be agreed with the relevant maritime authorities who will, in turn, ensure that it is communicated to vessels in passage in the vicinity of the pipe-lay vessel. The pipe-lay vessel will be equipped with navigation lights, radar and radio communications. Due to the construction spread advancing along the Pipeline route as the pipe is laid, regular consultation will be undertaken by the contractor with the appropriate marine authorities to inform them of the location of the construction spread. The marine authorities will then be responsible for informing marine traffic of the location of the pipe-laying activities and the position of the associated navigational Safety Exclusion Zone.

5.5.3.5 Pipe-Lay Techniques

As indicated above, two pipe-lay techniques may be employed for projects of this nature.

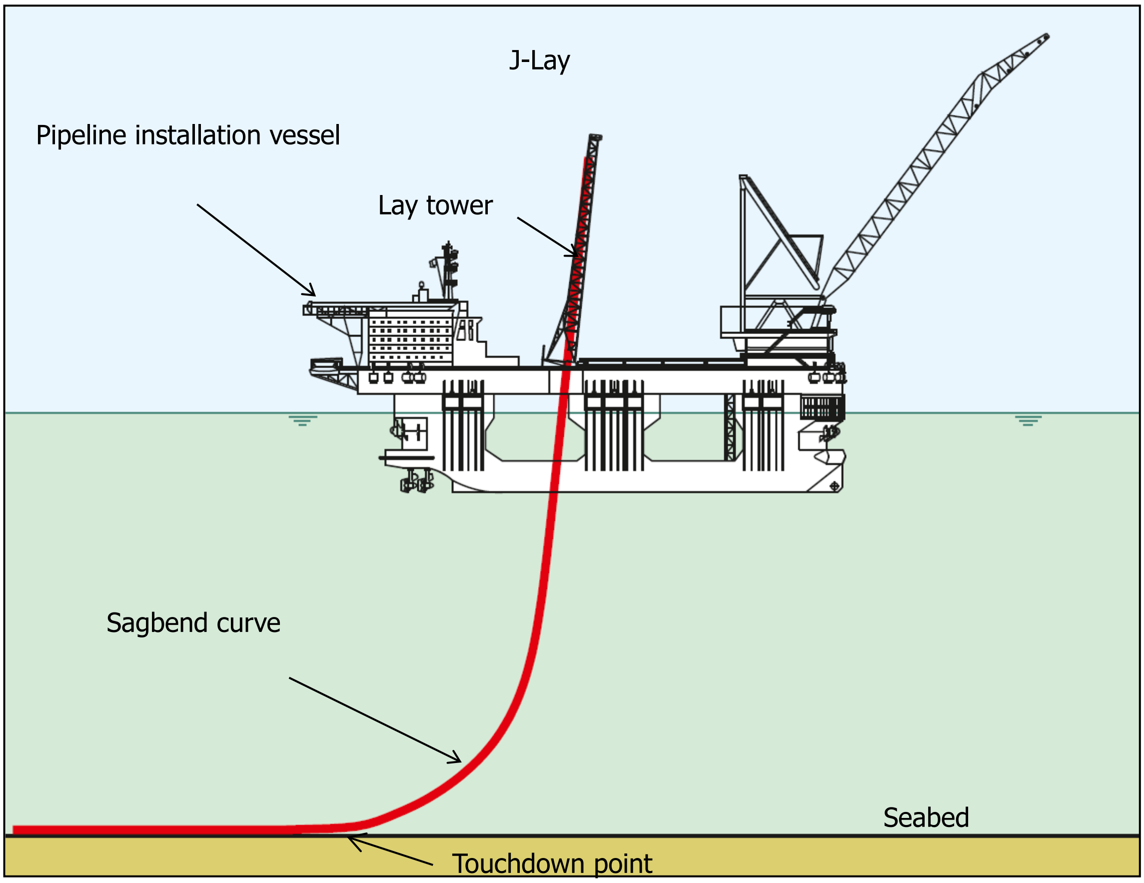
The S-Lay technique (Figure 5.3) requires the load out of single 12 m pipe segments to the pipe-lay vessel and welding the pipe segments together horizontally. The pipe segments are continuously 'fed' over the vessel's pipe-laying stinger from the stern of the vessel as the vessel moves forward in such a way that the pipeline forms an "S" shape from the vessel's exit point to the touchdown point on the seafloor. Sufficient tension is required during the S-Lay process to avoid overstressing the pipeline. This tension is maintained via tensioning rollers and a controlled forward thrust to prevent the pipeline from buckling. The average pipe-lay rate for S-Lay technique is expected to be approximately 3.5 km per day (24 hour period), depending on weather conditions.

Figure 5.3 Schematic of S-Lay Pipe-Lay Method



J-lay pipeline installation (Figure 5.4) was developed for laying pipe in deep waters (over 600 m) as it puts less stress on the pipeline at these depths. In the J-Lay method, the pipeline segments are quad or double jointed i.e. 48 m or 24 m long sections onshore at the marshalling yards. Pipe segments are then transported to the pipe-lay vessel where they are assembled and welded vertically in a tower erected on the centre or side of the pipe-lay vessel. A pipe tensioner or support frame is used to lower the pipeline through the tower. As the pipe-lay vessel moves forward, the pipeline is lowered in a "J" shape down to the seafloor. The average pipe-lay rate using J-Lay technique is expected to be in the order of 2.75 km per day (24 hour period), depending on weather conditions.

Figure 5.4 Schematic of J-Lay Pipe-Lay Method



Under both techniques, the weight of the pipeline will cause it to sink to the seabed, and settle on the bottom sediment. There will be no fixing mechanisms required to secure the pipeline on the seabed. No excavation and no fill materials are expected to be required to create a level platform for the pipelines. Based on bathymetry data presented in **Chapter 7 Physical and Geophysical Environment**, the seabed through the Project Area is understood to be essentially flat. The intention therefore is to lay the pipelines directly on the seabed. Figure 5.5 shows a typical S-Lay vessel and Figure 5.6 shows a typical J-Lay pipe-lay vessel.

Figure 5.5 Typical Deep Water S-Lay Vessel

Image supplied courtesy of Allseas, Switzerland

Figure 5.6 Typical Deep Water J-Lay Vessel

Image supplied courtesy of Saipem

5.5.3.6 Pipeline Flood Protection during Installation

A flood prevention device will be developed by the appointed pipe-lay contractor for installation within the Pipeline during construction. Possible methods are listed below:

- Air pressure from a start-up head;
- Control umbilical connected to the pipe-lay vessel; and
- A battery powered drive unit.

In the event that there is a loss of tension or loss of vessel position during pipe-laying causing the Pipeline to become overstressed to the point where it ruptures and floods, then the flood prevention device will detect the change in pressure, will activate and seal the Pipeline, thus preventing untreated seawater from flooding the Pipeline. The damaged section of the Pipeline between the flood prevention device and the pipe-lay vessel will then be removed and the undamaged pipeline section (protected by the flood prevention device) will be recovered back to the pipe-lay vessel and pipe-laying will resume.

5.5.3.7 Construction Material Use

Use of Resources

Materials

During construction of the Project, a variety of materials will be required. An estimate of the quantities of the main materials to be consumed is shown in Table 5.5. Quantities are approximate and subject to final optimisation.

Table 5.5 Material Consumption

Material	Quantity per Pipeline	Total (all four pipelines)
Steel (pipelines)	345,483 tonnes	1,381,932 tonnes
Coating (3LPP)	4,565 tonnes	18,260 tonnes
Coating (Field Joint)	308 tonnes	1,232 tonnes
Weld Material	339 tonnes	1,356 tonnes

Fuel

Where possible, vessel bunkering will be undertaken at support ports in Russia and Bulgaria. However, when this is not practicable (i.e., for vessels located continually at sea or at large distances from the coast), the bunker will be pumped into the ships' tanks by the bunkering tanker. All bunkering activities will be undertaken in accordance with the Vessels and Marine Transport Construction Management Plan (CMP), which will be developed as part of South Stream Transport's Environmental and Social Management Plan (ESMP). The CMP will contain activity-specific requirements, to be met by both South Stream Transport and the appointed contractors (and sub-contractors). All bunkering activities at sea will be undertaken by designated persons with appropriate training. Further details on the Vessels and Marine Transport CMP and South Stream Transport's ESMP are described in **Chapter 16 Environmental and Social Management.**

Estimates of the average daily fuel consumption during the Construction and Pre-Commissioning Phase are provided in Table 5.6.

Table 5.6 Estimated Fuel Consumption

Fuel	Use	Average Quantity per Day (tonnes)
MGO/MDO	Vessels	241
Diesel	On board Equipment	Included within MGO/MDO calculation

Water Consumption

During construction of the Project water will be required for domestic purposes on-board the vessels (this includes drinking water, washing, cooking, laundry and general vessel cleaning) and industrial use (various uses during pipeline fabrication process). Although some of the vessels listed in Table 5.7 may possess desalination equipment (distillation or reverse osmosis) to produce fresh water, it is assumed for the purposes of the ESIA Report that fresh water may be supplied by tankers. Bottled water may be provided for drinking purposes.

Table 5.7 Estimated Water Consumption during Construction

Water Type	Details	Maximum Consumption per day during Peak of Construction (cubic metres - m^3)
Freshwater	200 litres per person per day	240

5.5.3.8 Summary of Waste Generated during Construction

There are a number of activities during the Construction and Pre-Commissioning Phase that have the potential to generate waste. Table 5.8 indicates the waste types and approximately quantities anticipated to be generated. A more detailed breakdown of the waste generated during construction is presented in **Chapter 12 Waste Management**.

Table 5.8 Estimated Types of Waste Generated during Construction

Code	European Waste Catalogue (EWC) Description	Estimated Quantity
12 01	Wastes from Shaping (including forgoing, welding, pressing, drawing, turning, cutting and filing) and Surface Treatment of Metals and Plastics	120 – 1,200 tonnes
13 01*	Waste Hydraulic Oils	1 to 10 tonnes
13 02*	Waste Engine, Gear and Lubricating Oils	1 to 10 tonnes
13 04*	Bilge Oils	10 to 100 tonnes
13 07*	Wastes of Liquid Fuels	1,000 to 2,000 tonnes
15 01	Packaging	15 to 140 tonnes
15 02*	Absorbents, Filter Materials, Wiping Cloths and Protective Clothing	Less than 1 tonne
16 05	Chemicals and Gases in Containers	Less than 1 tonne
17 02	Wood, Glass and Plastic	Less than 1 tonne
17 09	Other Construction and Demolition Wastes	100 to 1,000 tonnes
18 01*	Wastes from Natal Care, Diagnosis, Treatment or Prevention of Disease in Humans	Less than 1 tonne
20 01*	Separately Controlled Fractions (except 15 01)	100 to 1,000 tonnes
20 03	Other Municipal Waste	100 to 1,000 tonnes

* Contains hazardous wastes

The estimated generation of sanitary waste (black water) and wash water (grey water) during construction is provided in Table 5.9.

Table 5.9 Estimated Volumes of Grey and Black Water Generated

Waste Type	Details	Average Quantity Produced per Day (m^3)
Wash (Grey) Water	180 litres per person per day	216
Sewage	12 litres per person per day	14.4

All vessel discharges and wastes will be compliant with International Convention for the Prevention of Pollution from Ships (MARPOL) and national regulations. Sewage (sanitary waste or black water) will be treated to applicable standards as set out in *MARPOL Annex IV* prior to discharge. Discharge of sewage into the sea is prohibited, except when:

"…the ship is discharging comminuted and disinfected sewage at a distance of more than three nautical miles from the nearest land, or sewage which is not comminuted or disinfected at a distance of more than 12 nautical miles from the nearest land, provided that in any case, the sewage that has been stored in holding tanks shall not be discharged instantaneously but at a moderate rate when the ship is en route and proceeding at not less than four knots; or the ship has in operation an approved sewage treatment plant."

There are no prohibitions under MARPOL on the discharge of wash (grey) water. All other liquid wastes such as sewage sludge, oily bilge water, tank sludges, untreated oily water and waste oil will be shipped to shore for disposal, or otherwise managed in accordance with the applicable MARPOL requirements.

Within 12 nautical miles of the coastline there will be no discharge of food wastes. Outside 12 nautical miles, vessel maceration units used that are designed to treat food wastes to applicable MARPOL standards for particle size will be used prior to discharge to sea. Discharge will only be permitted from vessels travelling at speeds in excess of four knots. Given that the pipe-lay vessels will not be travelling at this speed, they will be required to transfer their food wastes to another vessel for discharge at sea or transfer to ports in Russia or Bulgaria for disposal onshore. Non-putrescible galley waste will be collected and transported onshore to Russia or Bulgaria for disposal via licensed contractors.

Should any of the vessels use desalination equipment to produce freshwater, the waste brine solution will be discharged to sea. Brine from the distillation and reverse osmosis processes must not contain or come in contact with machinery or industrial equipment, toxic or hazardous materials, or wastes. If brine does become contaminated by such materials, the brine will be transferred to a support vessel and disposed of properly onshore in Russia or Bulgaria.

All wastes generated will be handled and disposed of in accordance with applicable Turkish national waste policy and MARPOL requirements. Waste disposal facilities for waste generated by the Project at sea that needs to be taken ashore for disposal will be located in Russia and/or Bulgaria. No waste generated by construction of the Project will be transported and disposed of onshore in Turkey. It should be noted, however, that no decision has been taken at this time as to which potential waste facility sites in Russia and Bulgaria will be used and will be subject to further investigation. Further information on waste generation and management is described in **Chapter 12 Waste Management**.

5.5.3.9 Summary of Emissions to Atmosphere

Table 5.10 presents the annual greenhouse gas (GHG) (i.e. CO_2) and non-GHG emissions predicted to be generated from the construction of all four pipelines, based on the expected vessels and number of days of operation outlined in Table 5.4. Further information on emissions to atmosphere is provided in **Chapter 7 Physical and Geophysical Environment**.

Table 5.10 Atmospheric Emissions from Construction Vessels for all 4 pipelines (tonnes)

Carbon Dioxide (CO_2)	Nitrogen Oxide (NO_X)	Carbon Monoxide (CO)	Particulate Matter (PM)	Sulphur Dioxide (SO_2)	Non-Methane Volatile Organic Compounds (NMVOC)
91,913	2,283	215	44	873	81

5.5.3.10 Summary of Total GHG Emissions to Atmosphere

Table 5.11 provides the total GHG emissions for the Project and the Russian and Bulgarian Sectors of the South Stream Offshore Pipeline. The total GHG emissions for the entire South Stream Offshore Pipeline are also shown. The methodology used to estimate these GHG emissions is contained within Appendix 7.1: Atmospheric Emissions of the South Stream Offshore Pipeline – Turkish Sector: Construction and Pre-Commissioning Phase.

Table 5.11 Total Greenhouse Gas Emissions during Construction and Pre-Commissioning Phase for all 4 pipelines (tonnes CO_2 equivalent)

Russian Sector	Turkish Sector	Bulgarian Sector	Total South Stream Offshore Pipeline System
674,853	94,061	1,003,787	1,772,701

5.6 Pre-Commissioning Phase

Pre-commissioning will follow Pipeline installation. Pipeline pre-commissioning activities typically involve hydrotesting, cleaning, gauging and drying. However, the pipelines within the Turkish Sector will not be hydrotested. Waiving of the hydrostatic test for the South Stream Offshore Pipeline presents various environmental and technical benefits, as follows:

- Costly and time consuming effects of pipeline flooding and dewatering operations are eliminated and any adverse environmental effects associated with the discharge of the test water after the hydrotest test has been completed will be avoided;
- The construction schedule is shortened thereby reducing the duration of disturbance and temporary land use requirements; and
- Absence of flooding, dewatering and hydrostatic testing minimises the volumes of water, fuel and chemicals required and associated emissions and discharges to the environment.

Hydrotesting has been thoroughly investigated and discussed with DNV (DNV is contracted by South Stream Transport for the Verification of Front End Engineering and Design (FEED) and pre-qualification test of line pipe, buckle arrestors, coating and anodes for the Project) during the FEED design stage in 2012. The hydrotest for the pipelines in more than 345 m water depth is allowed to be waived according to DNV-OS-F101 (2010), Section B204.

As a result of the receipt of the DNV waiver, the only pre-commissioning activities to be undertaken for the Project pipelines are cleaning, gauging and drying. These activities are undertaken using pipeline inspection gauges (PIGs) inserted at the Russian landfall facilities and received at the Bulgarian landfall facilities.

Cleaning, gauging and drying of the South Stream Offshore Pipeline will be undertaken between a temporary PIG launcher/receiver at the fence of the landfall facilities in Russia and a temporary PIG launcher/receiver located at the fence of the landfall facilities in Bulgaria, and will include the Turkish Sector. This cleaning, gauging and drying will be undertaken following completion of the pre-commissioning tests of the landfall facilities and pipelines to 30 m water depth in Russia and approximately 36 m water depth in Bulgaria, and completion of all pipeline tie-ins between the landfall facilities in Russia and Bulgaria. It should be noted that all wastes and discharges associated with cleaning, gauging and drying of the pipelines between Russia and Bulgaria will be collected and disposed of in Bulgaria and/or Russia.

Temporary PIG stations will be established at the two landfalls, and PIG trains will be deployed through the full length of the pipelines (including the Turkish Sector) to remove debris from the construction process. Pipelines will be dried using Monoethylene Glycol (MEG) deployed via the PIG trains.

The water, MEG and debris arising from the pigging process will be captured in temporary tanks located at the PIG launcher/receiver in Bulgaria, to allow the debris to separate from the water and MEG for local disposal.

Following drying, the pipelines will be purged with nitrogen prior to gas filling. Purging is to prevent the formation of a potentially explosive gas/air mixture during gas filling.

5.7 Commissioning

Commissioning will involve gas filling, quality testing to ensure the gas meets appropriate export specification, pressurisation to seasonal operational pressure and pressure and safety valve testing to ensure pipeline integrity and the correct operation of all metering and safety equipment and systems. Commissioning activities are anticipated to take approximately 14 days per pipeline (including 10 days for gas filling). Each pipeline will be commissioned separately as illustrated in the schedule in Table 5.3.

5.8 Operational Phase

5.8.1 South Stream Offshore Pipeline Operating Philosophy

The South Stream Offshore Pipeline will have a maximum operating pressure of approximately 284 bar at the inlet to the landfall facilities in Russia, falling to between 65 and 87 bar at the Bulgarian landfall. The maximum daily capacity of each pipeline at normal conditions will be 47.9 MMSCM per day and a maximum of 63 bcm of gas will be transported by all four pipelines each year. The pipelines will be operated seven days a week, 24 hours per day.

The South Stream Offshore Pipeline will operate on the principle of a constant gas inventory (i.e. there is always gas stored in the pipelines). Based on the daily capacity indicated above, this will equate to between 104 and 111 MMSCM. This range varies in relation to winter and summer operating conditions.

The flow, pressure and temperature of the gas in the South Stream Offshore Pipeline will be controlled by the Russkaya Compressor Station in Russia and the Receiving Terminal in Bulgaria. The four pipelines will be operated as a single system.

5.8.1.1 South Stream Offshore Pipeline Parameter Monitoring

Flow, inventory and pressure will be managed remotely. Inventory, pressure, temperature, flow, and gas composition (including water and hydrocarbon dew point) will be monitored at the landfall facilities and remotely in the Central Control Room (CCR) and a Back Up Control Room (BUCR) by continuous real time monitoring of process conditions via the Supervisory Control and Data Acquisition (SCADA) system. Automatic shutdown systems will be initiated if parameters deviate from defined limits, and emergency shut-down valves located at the landfall facilities will be deployed. Alarms will also be installed to detect changes in the gas pressures and temperatures. Vent systems will be deployed to depressurise the pipelines for routine maintenance. Leak detection systems will be capable of detecting leaks equivalent to 1 to 2% of throughput.

5.8.2 Maintenance

5.8.2.1 External Pipeline Surveillance

The external condition of the subsea pipeline, including the condition of the cathodic protection system, will be monitored on a regular basis as set out in Table 5.12 using ROV or Autonomous Underwater Vehicles (AUV) and inspection technologies including sonar scans to visual (camera) inspections.

An initial ROV subsea leak inspection survey will be carried out along the pipelines as soon as practicable once the pipelines become operational and sufficient gas flow rates, for the detection of leaks, are achieved.

Critical sections of the Pipeline route will be surveyed at more frequent intervals, initially on an annual basis and subsequently more or less frequently, depending on actual findings (e.g. growth of free span due to sediment dispersing from underneath the pipelines). Critical sections of the Pipeline route may include any areas where seabed anomalies may occur (based upon earlier inspections).

5.8.2.2 Internal Pipeline Surveillance

Following the completion of pipeline gauging during pre-commissioning, further internal inspections of the pipelines using PIGs are not expected to be required until approximately five years after initial start-up and operation. The frequency of testing can be increased or decreased depending on the results of previous inspection runs, survey information and regulatory requirements. The proposed frequency of internal pipeline inspections is shown in Table 5.13.

Table 5.12 Proposed External Inspection Surveys for Turkish Sector Pipelines

External Inspection	Inspection Method	Proposed Frequency of Inspection	Survey Duration per Pipeline
Critical Pipeline Sections Survey (if necessary)	ROV	Annually	Approximately 10 days (allows for operational downtime and weather standby etc.)
Entire Pipeline Route Survey	ROV	Before start up or within one year of operation commencing	Approximately 60 days (allows for operational downtime and weather standby etc.)
	AUV	Every five years thereafter	Approximately 23 days (allows for operational downtime and weather standby etc.)
Cathodic Protection Survey	ROV	Before start up or within one year of operation commencing After five years of operation Every ten years thereafter	Approximately 60 days (allows for operational downtime and weather standby etc.)

Table 5.13 Proposed Internal Pipeline Inspection Surveys

Internal Inspection	Inspection Method	Proposed Frequency of Inspection
Wall thickness measurement	Intelligent PIG	Before start up or within one year of operation commencing Every five years thereafter
Pipeline position	XYZ Mapping PIG	Before start up or within one year of operation commencing Every five years thereafter
Pipeline geometry	Gauging PIG	Before start up Prior to running calliper or intelligent pigs
	Calliper PIG	Before start up Every five years thereafter

Internal pipeline cleaning is not anticipated to be required due to the composition of the dry gas that will be transported through the pipelines. However, any cleaning that may be required will be undertaken using cleaning PIGs transported using gas. Gas flow rates in the Pipeline will be reduced to approximately 60% of the maximum flow rate during pigging activities. Furthermore, a Pipeline Integrity Management System (PIMS) will be developed to control on-going monitoring and maintenance during system operation, with a specific focus on corrosion control.

5.8.3 Emergency Pipeline Repair

Although the probability of failure of a properly designed and installed deep-water pipeline is negligible, South Stream Transport will employ an Emergency Pipeline Repair Strategy (EPRS) for the South Stream Offshore Pipeline to be utilised in the event of damage to any of the pipelines.

A key objective of the EPRS is to have a Repair Plan in place, which, reinstates the pipeline's integrity and ensures the earliest possible and safe commencement of gas throughput. The Repair Plan has been prepared to provide a high level overview into recommended repair procedures and the relevant hardware and tools.

In the unlikely event of a loss of pipeline integrity, there are parts where the external pressure around the pipeline (i.e. the pressure of the seawater) is greater than the pressure of the gas within the pipeline, specifically along approximately one third of the (western) extent of the pipeline in the Turkish EEZ.

For different types of damage, different types of repair and re-commissioning methods are applicable. Preparation of a pipeline for repair will be aimed at minimising or avoiding any impact on pipeline integrity, therefore avoiding water ingress. If water ingress is inevitable, or has already occurred, then dewatering and replacing salt or contaminated water with chemically treated water will be essential to stabilise the pipeline condition and to minimise corrosion whilst a case specific repair plan is developed and executed. The preferred approach will be to isolate the damaged area (using plugs if pigging is feasible) and create a safe work environment for repair. Prior to re-commissioning a repaired pipeline, the pipeline must be cleaned, dewatered and/or conditioned to ensure the pipeline is clean, without defect and free of water. After a repair is made, the pipeline will be commissioned through pigging and drying and then gas can be re-introduced into the pipeline, thereafter resuming normal operating conditions.

The unplanned events and potential associated damage, which may occur to the pipelines, are described in more detail in **Chapter 13 Unplanned Events.**

5.8.4 Operational Safety Zone

Article 60, Paragraph 5 of the United Nations Convention on the Law of the Sea (UNCLOS) provides for the agreement of safety zones around installations on the sea bed. As indicated in Section 5.2, it is proposed that the pipelines will be laid within a 420 m wide corridor, in agreement with the relevant Turkish authorities. This corridor accommodates the four pipelines and an operational safety zone, either side of the outermost pipelines, and precludes any third party seabed activities within this zone across the entire pipeline route in the Turkish EEZ.

5.9 Pipeline Design Safety and Risk Assessment

An integrated Health, Safety, Security and Environment – Integrated Management System (HSSE-IMS) has been developed in accordance with Good International Industry Practise (GIIP) and in line with the requirements of ISO 14001:2004 (environmental management system) and OHSAS 18001:2007 (health & safety management system), as well as the Environmental and Social Management System requirements of the Project standards (principally the Equator Principles (EPs) and the International Finance Corporation (IFC) Performance Standards). The main objective of the HSSE-IMS is to provide a robust framework for meeting the Project's Health, Safety, Security and Environment (HSSE) objectives during the entire Project lifecycle. The following section describes the approach to safety issues, a key component of the HSSE-IMS relating to the installation and operation of the South Stream Offshore Pipeline.

Safety is a key priority for the Project during construction, installation and operation. Accordingly, a Safety Management Plan will be prepared in order to reduce all risks to "as low as reasonably practicable" (ALARP).

Design hazards have been identified and assessed using internationally recognized tools throughout the FEED process. These tools include:

- Hazard Identification (HAZID);
- Environmental Impact Identification (ENVIID);
- Quantified Risk Assessment (QRA);
- Hazard and Operability (HAZOP);
- Hazard Construction (HAZCON); and
- Bowtie Analysis.

HAZID is a tool for safety hazard analysis used at an early stage of the Project to inform the FEED study. Risk workshops and HAZID studies have been held covering different aspects of the Project. The risks that have been identified have been addressed through design measures aimed at reducing either the likelihood or the consequences (or both) of the risks. Such measures have been developed during FEED and will be further developed during the detailed design phase of the Project. The HAZID is updated as the design evolves and develops, and when key design decisions are made and/or technology is selected. The risks identified as a result of the workshops and studies have been assessed qualitatively and this assessment will be followed by an overall risk assessment that will cover design, construction, installation, operations and simultaneous operations (SIMOPS), as required.

ENVIID is a tool for environmental impact identification and analysis used at an early stage of the Project to inform the FEED study. The ENVIID process aids the FEED study in identifying any significant impacts of the Project and the associated design controls and mitigation measures to be implemented into the design to remove or reduce the impact.

QRA is a tool for calculating the individual and societal/group risks from major accidents or adverse events. QRA is used to establish the potential consequences of catastrophic events, such as fires, explosions and gas releases.

HAZOP is a tool for the identification of process hazards in the design and operation of a facility or infrastructure. The HAZOP process comprises the systematic application of combinations of parameters (e.g. flow, pressure, temperature) and guide words (e.g. no, more, less) to produce deviations (no flow, less pressure) from the design intent or intended operational mode of the installation. Credible causes of these deviations are identified for each process section (node) and consequences of the deviations are assessed. The assessment consists of an examination of the pipeline design to determine whether the safety measures included in the design are sufficient to ensure that the pipelines are safe to operate, even under extreme or unusual conditions.

HAZCON is a safety study to identify and assess hazards before start of construction works. HAZCON 1 is generally carried out early in the project, prior to construction, to identify major hazards to client and contractor personnel, site visitors or the general public. HAZCON 2 is carried out to provide a detailed assessment of construction hazards, based on a significant completion of engineering design, engineering drawings, construction implementation plan, and details of the marine spread.

Bowtie analysis is part of the identification and management of key risks, and is used to identify risk controls, their effectiveness and corrective actions required. Before defining where to focus effort within the analysis, key risk areas are identified via other risk assessments and risk registers. The understanding of key risks highlights areas for which Bowtie analysis will be developed.

During the FEED process, design approaches and methods that minimise risk to personnel (construction, installation and operations personnel) have been developed based on the results of the various risk assessment studies.

A FEED/Technical Risk Register is used to record all significant design HSSE risks, as well as technical risks related to construction and operations identified by the FEED study. The FEED/Technical Risk Register is established, managed and maintained by South Stream Transport, utilising inputs related to FEED risks from the FEED contractor, and forms part of the overall Project Risk Register.

Major accident hazards (MAHs) during construction, installation and operation of the Project, in relation to users of the Black Sea (i.e. fishing industry) are addressed in **Chapter 13 Unplanned Events**. Plans for dealing with the effects on Black Sea marine users of construction, installation and operation of the Project such as increased marine traffic, transportation of hazardous substances, waste water discharge, solid waste disposal etc. will be managed by South Stream Transport and their respective contractors through a number of CMPs and Operational Management Plans (OMPs). Further information on the various Project CMPs and OMPs to be implemented can be seen in **Chapter 16 Environmental and Social Management**.

5.10 Labour

5.10.1 Construction Phase

The number of workers that will be employed during the construction of the Project are not known at this stage. This information will become available when the detailed design of the Project has been completed. However, based on the anticipated construction vessel spread and deployment, the workforce is expected to be up to approximately 1,100 during the peak of construction activity.

The majority of the construction work force required will be highly skilled and are anticipated to come from outside Turkey. Employees will work in rotations offshore and shift patterns, depending on their roles, when offshore. The largest workforce will be based with the pipe-lay vessel. No onshore residential accommodation will be provided by the Project. Employees are anticipated to commute between home and the port from which they will be transferred to the Project, whichever is appropriate at the time.

5.10.1.1 Hours of Working

For construction and installation of the pipelines, it is anticipated that work will be carried out 24 hours per day, seven days per week.

5.10.1.2 Worker Health and Safety

Occupational Health and Safety (OH&S) for procurement, construction, installation and operations will be managed by South Stream Transport and their respective contractors. Internationally recognised procedures to assure the OH&S of the workforce will be adopted along with the necessary equipment and training to make these effective.

The health risks to which workers are exposed are determined by a Health Risk Assessment (HRA). The HRA is the Hazards and Effects Management Process (HEMP) for health hazards, and identifies the health hazards and risks (physical, chemical, biological, ergonomic and psychological) in the workplace, and facilitates an occupational health needs analysis. The HRA determines if medical health surveillance is required for a job position that includes exposure to potentially harmful conditions or risks.

OH&S procedures to be adopted by the Project include:

- Fitness-to-work Assessment;
- Management procedures; and
- First aid and medical emergency response.

Further information on OH&S of the workforce is provided in Appendix 9.2: Occupational Health and Safety.

5.10.2 Operational Phase

There will be no full time workers employed for the Project during the Operational Phase of the Project other than a workforce stationed permanently at the CCR and BUCR to operate the South Stream Offshore Pipeline. The operational performance of the South Stream Offshore Pipeline (including the pipelines and landfall facilities in Russia and Bulgaria) will be monitored in real-time using SCADA from the CCR and BUCR in Amsterdam as described in Section 5.8.1.1.

5.11 Decommissioning

The expected service lifetime of the South Stream Offshore Pipeline is 50 years. The decommissioning program will be developed during the Operational Phase of the Project. It is likely that the technological options and preferred methods for decommissioning of such gas transportation systems as the South Stream Offshore Pipeline will be different in 50 years' time. The status of the South Stream Offshore Pipeline at the time of decommissioning will also impact on the chosen decommissioning methods.

Under all circumstances, decommissioning activities will be undertaken in accordance with the international and national legislation and regulations prevailing at that time, and in liaison with the relevant regulatory authorities.

A review, and relevant studies if necessary, will be undertaken during the Operational Phase to confirm that the planned decommissioning activities utilise GIIP and are the most appropriate to the prevailing circumstances. The review will outline management controls and demonstrate that the decommissioning activities will not cause unacceptable environmental and social impacts. The decommissioning activities will also require all relevant approvals and authorisations from the Turkish government departments responsible at the time.

5.11.1 Decommissioning of the Project

Current practices for the decommissioning of subsea pipelines involve either removing the Pipeline or leaving the Pipeline on the seabed after cleaning and filling it with water in combination with a program of planned monitoring to ensure safety for other users of the sea. The prevailing opinion is that leaving the Pipeline in place results in the least environmental impact as over time the pipelines will become integrated within the seabed environment and their removal would disturb the habitats that have generated in the vicinity of the pipelines. A summary of the activities involved with the two options are described below.

Leaving the pipelines on the seabed will typically involve the following types of activities:

- Filling the Pipeline with water;
- Pipeline cleaning by flushing with water and associated water displacement, collection and disposal;
- Sealing of the Pipeline ends; and
- Monitoring surveys following decommissioning.

Removal of the pipelines from the seabed will typically involve the following types of activities:

- Vessel operations similar in nature to those required for construction of the Pipeline;
- Seabed intervention works;
- Pipeline removal, recycling and disposal;
- Disturbance of the seabed as the Pipeline is recovered; and
- Logistics support offshore and onshore.

Factors to be considered when taking the decision on decommissioning methods for the Project include:

- The potential for re-use of the pipeline in connection with further developments will be considered before decommissioning, together with other existing projects (such as hydrocarbon storage, water outfall). If re-use is considered viable, suitable and sufficient maintenance of the pipeline will be investigated and ensured;
- All feasible decommissioning options shall be considered and a comparative assessment made;
- Any removal or partial removal of a pipeline shall be performed in such a way as to minimise the potential for any significant adverse effects on the marine environment;
- Any decision that a pipeline may be left in place should have regard to the likely deterioration of the material involved and its present and possible future effect on the marine environment; and
- Account shall be taken of other users of the sea.

Where it is proposed that a pipeline should be decommissioned by leaving it on the seabed for natural degradation (referred to as in situ decommissioning), either wholly or in part, the decommissioning program will be supported by a suitable study that addresses the degree of past and likely future burial or exposure of the Pipeline and any potential effect on the marine environment and other users of the sea. The study will include the survey history of the Pipeline, using appropriate data to confirm the current status of the Pipeline, including the extent and depth of burial, trenching, spanning and exposure.

Determination of any potential effect on the marine environment at the time of decommissioning will be based upon scientific evidence. The factors to be taken into account will include the effect on water quality and geological and hydrographical characteristics, the presence of endangered or threatened species, fishery resources and the potential for pollution or contamination by residual products from, or deterioration of, the Pipeline.

The above serves as an example of general principles that should be applied during the decommissioning options decision-making process. It is foreseen that more directly applicable international or national guidelines are likely to be developed before the end of the lifetime of the Project (approximately 50 years) and that these will specify additional options that may need to be considered.

5.11.2 Decommissioning Planning

It is envisaged that the process of developing detailed decommissioning management plans may be staged, initially outlining potential options and studies required for discussion with the regulatory authorities, and finally leading to agreed plans prior to the commencement of decommissioning. The plans are expected to include methods and activities associated with the decommissioning of the offshore pipelines, including the transportation and final disposal or re-use strategy for Project components and wastes. Completion criteria can be detailed in the management plans and determined in consultation with the respective national and local authorities.

Documentation or processes addressing the issues outlined below would further support the implementation of detailed decommissioning management documentation:

- Incident reporting, recording and investigation;
- Chemical and hazardous substance management;
- Waste management;
- Health and safety; and
- Spill contingency.

5.12 Management of Change Process

During the detailed design, Construction and Pre-commissioning and Operational Phases of the Project, there may be a requirement to amend design elements or processes which results in a deviation from that presented in this chapter. The Project has a management of change process to manage and track any such amendments, and to:

- Assess their potential consequences with respect to environmental and social impact; and
- In cases where a significant impact is likely to arise as a consequence of the amendment or change, to inform and consult with relevant parties on the nature of the impact and on proposed mitigation measures, where practical and appropriate.

All design changes will be added to a register of changes, which will summarise the change, the assessment, and the justification for South Stream Transport's actions.

The management of change process will be incorporated into the HSSE management of change procedure, which is an integral part of the HSSE-IMS described in more detail in **Chapter 16 Environmental and Social Management**.

Chapter 6: Stakeholder Engagement

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6 Stakeholder Engagement

6.1 Introduction

This chapter describes the South Stream Transport approach to stakeholder engagement, its purpose and the regulatory context in which it occurs. It provides information about engagement activities undertaken to date and those that are planned for the future. This chapter also summarises the comments that have been made by stakeholders to date and how these comments are addressed within the relevant chapters of this Environmental and Social Impact Assessment (ESIA) Report.

In this chapter, the national Environmental Impact Assessment (EIA) stakeholder engagement process will also be referred to as this sets important context at the Turkish national level and in doing this, shows how South Stream Transport has not only complied with national legislation, but also with Good International Industry Practice (GIIP). Although the national EIA and the ESIA process have been run separately in parallel, engagement activities for both processes are described in this chapter, as South Stream Transport will consider comments from stakeholders from both processes while completing the ESIA process.

This chapter is structured as follows:

- *Section 6.2* describes the national and international framework upon which the stakeholder engagement programme has been developed;
- *Section 6.3* describes the foundation of the stakeholder engagement programme, as well as the supporting documents and processes;
- *Section 6.4* outlines the stakeholder engagement activities for each phase of the Project lifecycle; and
- *Section 6.5* summarises comments, questions and recommendations received to date.

Stakeholder engagement (including dialogue, consultation and the disclosure of information) is a key element of project planning, development and implementation. Effective stakeholder engagement assists good design, builds relationships with local communities, and reduces the potential for delays through the early identification of risks and issues. South Stream Transport is committed to a transparent and respectful dialogue with stakeholders throughout the life of the Project.

The engagement approach for the Project includes a range of activities designed to consult stakeholders, using methods which take into account the varied interests that stakeholders may have in the Project as well as their location, language, culture, their access to information and the different opportunities to participate (e.g. through statutory consultation processes as well as through the ESIA process). The Project's approach to stakeholder engagement includes making best efforts to ensure stakeholders are provided with adequate, timely and culturally appropriate information about the Project, the ESIA and consultation process. It also provides opportunities for stakeholders to ask questions, make comments and suggestions and raise any concerns that they may have. The Project's approach to stakeholder engagement has been developed to align with the national legislative requirements and international standards applicable to the Project, which are summarised in **Chapter 2 Policy, Regulatory and Administrative Framework** and described in Section 6.2.

Stakeholder engagement is an important element of the ESIA process in that it enables the ESIA Report to be informed by the interests and concerns of stakeholders, and provides opportunities for stakeholders to have those interests and concerns considered in decisions that may affect them. Effective engagement also helps to establish a relationship between stakeholders and South Stream Transport, which is based on trust and respect.

South Stream Transport has taken these principles into account in the planning and implementation of stakeholder engagement activities for the Project (Section 6.3).

TERMS TO KNOW

Consultation: The process of sharing information, ideas and concerns in a two-way dialogue between project proponents and stakeholders, allowing stakeholders to express their views and for these to be considered in the decisions about project planning and implementation.

Disclosure: The process of making information available to stakeholders. Includes the publication of reports or documentation (in digital and/or paper formats), and announcements related to the disclosure process.

Grievance: Formal complaint by individuals, groups or organisations who feel they have been adversely affected by Project-related activities.

Grievance Procedure: Process of recording and addressing grievances so that they can be tracked through to a resolution.

Mitigation: Measures developed through the ESIA process to prevent, avoid and reduce adverse impacts. Can also include measures to enhance beneficial impacts.

Stakeholder: Any individual, group or organisation potentially affected by a project, interested in, or with influence over, a project.

Stakeholder Engagement Plan: A Stakeholder Engagement Plan (SEP) forms part of the ESIA documentation and provides a plan and implementation strategy to guide stakeholder engagement throughout the project lifecycle.

6.2 Regulatory Context

This section describes the regulatory framework that applies to the Project. The Project's approach to stakeholder engagement considers both regulatory requirements and principles of GIIP, and seeks to:

- Meet the regulatory requirements of Turkey for public consultation and disclosure during the EIA process (described in Section 6.2.1);
- Align with international standards and guidelines for financing (and GIIP), as related to Environmental and Social Impact Assessment, that provide a framework for public consultation and disclosure during the ESIA process (described in Section 6.2.2); and

- Align with international conventions and protocols relevant to stakeholder engagement for the Project (described in Section 6.2.3).

The national EIA and international ESIA processes are illustrated in Figure 6.1. Consultation and disclosure requirements for the Turkish EIA process have several features in common with stakeholder engagement processes for international ESIA's. Both are based on the principle that those who may be affected by a project should be consulted.

South Stream Transport seeks to align the two processes, avoid duplication and ensure that where possible and permissible, the processes inform each other. The regulatory framework is summarised in **Chapter 2 Policy, Regulatory and Administrative Framework** and the aspects of it that relate to stakeholder consultation are described in further detail in this section (Section 6.2).

6.2.1 National Requirements

Consultation and disclosure requirements for the Turkish EIA process are outlined in the Turkish EIA Regulation (Ref. 6.1), which entered into force on 7 February 1993 and was revised on 23 June 1997 and 6 June 2002. The latest revision to comply with the European Union (EU) Directives entered into force on 7 February 1993 and was revised on 23 June 1997 and 6 June 2002 85/337/EEC and 97/11/EC (Ref. 6.2 and Ref. 6.3). It was published on 17 July 2008.

In common with the international ESIA process, public engagement is a requirement of the EIA process, to enable stakeholders who may have an interest in, or who are affected by the Project, to participate in the process and comment on the Project. All stakeholder feedback from EIA public engagement activities and relevant feedback gathered from statutory authorities during the EIA process is incorporated into this ESIA Report.

Public consultation is a mandatory part of the EIA process, led by the Ministry of Environment and Urbanisation (MoEU), involving four elements:

- *Application* – this includes the submission of the EIA Application File (EIAAF), review by the MoEU and establishment of the Review and Evaluation Committee (REC);
- *Scoping* – following the review period, the EIAAF is disclosed to the public and the MoEU holds a Public Participation meeting/s where information about the proposed Project and the EIA process, including a preliminary assessment of potential environmental and social impacts, is presented to the public, who are invited to ask questions and provide comments. A Scope and Special Format Determination (SSFD) meeting is held, attended by the REC, and the contents of the EIA Report are discussed including stakeholder feedback from the Public Participation meeting. The Special Format (i.e. the EIA Report table of contents) is determined;
- *Draft EIA* – submission of the draft EIA Report to the MoEU for review, followed by the commencement of the Review and Evaluation process. The draft EIA Report is disclosed to the public (through announcements on the MoEU website) and stakeholders have the opportunity to provide comments within a timeframe announced by the MoEU and comments received from stakeholders are considered by the MoEU and REC. A Review and

Evaluation meeting is held with the MoEU and REC to provide feedback for consideration in the final EIA Report; and

- *Final EIA* – comments received during the Draft EIA Stage are reflected in the EIA Report as necessary. The final EIA Report is then submitted to the MoEU, who publish the report online for a period of ten business days, after which an 'EIA Positive' or 'EIA Negative' decision is made by the MoEU.

6.2.2 Standards and Guidelines for Financing

In addition to the EIA requirements described above, the Project is being developed in accordance with international standards and guidelines for financing and GIIP. In relation to ESIA and more specifically, stakeholder engagement, the applicable standards are:

- The Organisation for Economic Cooperation and Development (OECD) Common Approaches to Environmental and Social Due Diligence (Ref. 6.4);
- The Equator Principles III (Ref. 6.5; Ref 6.6);
- Japan Bank for International Cooperation (JBIC) Environmental and Social Considerations Required for Funded Projects (Ref. 6.7); and
- The International Finance Corporation (IFC) Performance Standards (PS) (Ref. 6.8).

All the standards and guidelines listed above require compliance with applicable national legislation, including laws implementing national obligations under international law.

Details of these international standards and guidelines as they apply to stakeholder engagement are provided below in Sections □to 6.2.2.4.

6.2.2.1 OECD Common Approaches

As detailed in **Chapter 2 Policy, Regulatory and Administrative Framework**, the Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence (the 'Common Approaches') of the OECD (Ref. 6.4) provide guidance for considering environmental and social risks in decisions to offer official support for export credits.

In relation to stakeholder engagement, the "Common Approaches" recommend that:

- ESIA Reports and related information should be made available to affected communities in a language accessible to them for at least 30 days; and
- OECD member countries should encourage protection and respect for human rights and foster transparency, predictability and responsibility in decision-making by encouraging disclosure of ESIA information.

Turkey is a member country of the OECD and ratified the Convention on the Organisation for Economic Co-operation and Development on 2 August 1961 (Ref. 6.9). Of the South Stream Offshore Pipeline host countries (i.e. Turkey, Bulgaria and Russia); only Turkey is a member of the OECD.

Figure 6.1 National EIA and International ESIA Processes

National EIA Process

Application

- Preparation of EIA Application File (EIAAF) outlining scope of EIA Report
- Review by Ministry of Environment and Urbanisation (MoEU) and establishment of Review and Evaluation Committee (REC)

Completed: July 2013

↓

Scoping

- EIAAF disclosed and Public Participation meeting held
- Scope and Special Format Determination (SSFD) meeting held attended by the REC and contents of the EIA Report discussed including feedback from Public Participation meeting
- Special Format (i.e. EIA Report table of contents) is determined

Completed: July 2013

↓

Draft EIA

- Submission of EIA Report to MoEU and review by MoEU
- Commencement of the Review and Evaluation Process
- EIA disclosed and stakeholders has opportunity to submit comments
- Review and Evaluation meeting for final EIA Report

Completed: November 2013

↓

Final EIA

- Update of final EIA Report by Project Owner and submission to MoEU for "EIA +/-" decision and environmental permit

International ESIA Process

Notification

- Project notification including meetings with authorities

Completed: September 2012

↓

Scoping

- Identification of key ESIA issues
- Disclosure of ESIA Scoping Report
- Consultations on Scoping Report

Completed: August 2013

↓

Draft ESIA

- Disclosure of draft ESIA Report (this Report) for public review and comment
- Consultations on the Draft ESIA Report

↓

Final ESIA

- Publication of ESIA Report
- Preparation and application of detailed construction and operation environmental and social management plans

6.2.2.2 Equator Principles

The Equator Principles (EPs) include guidance for stakeholder engagement in Principle 5: Stakeholder Engagement. For certain projects[1], the EPs require that structured and culturally appropriate consultation is undertaken with stakeholders (including affected communities; Ref. 6.5 and Ref. 6.6). It should also facilitate their informed participation and be able to demonstrate how the concerns of affected communities have been considered in project decision-making.

6.2.2.3 Japan Bank for International Cooperation

The focus of the Japan Bank for International Cooperation (JBIC) (Ref. 6.7) Environmental and Social Considerations Required for Funded Projects (**Chapter 2 Policy, Regulatory and Administrative Framework**) is generally aligned with that of the IFC Performance Standards. The purpose, according to the guideline, is to demonstrate that project proponents are undertaking appropriate environmental and social considerations, through various measures, so as to prevent or minimise the impact on the environment and local communities which may be caused by the projects for which JBIC provides funding, and not to bring about unacceptable effects.

Specific to Stakeholder Engagement, and in line with IFC PSs described in Section 6.2.2.4, JBIC requires that projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which the project is planned. For projects with a potentially large environmental impact, sufficient consultations with stakeholders, such as local residents, must be conducted via disclosure of information from an early stage where alternative proposals for the project plans may be examined. The outcome of such consultations must be incorporated into the contents of the project plan; and appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor, and ethnic minorities, all of whom are susceptible to environmental and social impact and who may have little access to the decision-making process within society.

6.2.2.4 IFC Performance Standards

The IFC Performance Standards (PS) apply to private sector projects seeking financing from international financial institutions (Ref. 6.8), and also underpin many other financing guidelines (including the Equator Principles and the OECD Common Approaches). IFC PS1—Assessment and Management of Environmental and Social Risks and Impacts—sets out guidance for stakeholder engagement as part of project development.

IFC PS1 states that project sponsors should promote and provide means for adequate engagement with communities affected by a project, on issues that could potentially affect

[1] Category A and, as appropriate, Category B projects located in non-OECD countries, and those located in OECD countries not designated as High-Income, as defined by the World Bank Development Indicators Database. Category A projects are defined as those that have potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible or unprecedented. Category B projects are defined as having limited adverse risks. The Project is considered a Category A project.

them. It also states that relevant information about environmental and social issues should be disclosed and disseminated and that communications (including questions, comments, suggestions and grievances) from affected individuals, groups, communities and other stakeholders should be responded to and appropriately managed.

IFC PS1 also calls for the development and implementation of an Environmental and Social Assessment and Management System (ESMS) and a Stakeholder Engagement Plan (SEP). It focuses on the need to tailor engagement according to the expected scale and type of impacts and to make it appropriate to communities that may be affected by a project, as well as other stakeholders. This includes allowing disadvantaged and vulnerable groups to participate effectively.

In relation to information disclosure, IFC PS1 requires project proponents to provide affected communities with access to relevant and understandable information about the project and the ESIA process and to provide them with opportunities to express their views on project risks, impacts and mitigation measures, and for the project proponent to consider and respond to these.

The requirement for a Grievance Procedure is also detailed in IFC PS1. A Grievance Procedure should be designed to receive and facilitate resolution of community grievances arising from project activities. IFC PS1 also calls for periodic reports to be made to affected communities about issues of concern, including those identified through the consultation process or Grievance Procedure.

6.2.3 International Conventions

6.2.3.1 Aarhus Convention

The Convention on Access to Information, to Public Participation in the Decision Making Process and the Administration of Justice concerning Environmental Matters (the Aarhus Convention, adopted in 1998, Ref. 6.10) also includes provisions that relate to stakeholder engagement. It establishes public rights of access to environmental information and aims to promote public participation in decision making about environmental matters. Of the three host countries of the South Stream Offshore Pipeline, Bulgaria is the only one that has ratified the Aarhus Convention.

6.2.3.2 Espoo Convention

The United Nations Convention on EIA in a Transboundary Context (Espoo Convention, 1991; Ref. 6.11), sets out the obligations of signatory countries to assess the environmental impact of certain activities at an early stage of planning and lays down their general obligation to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries.

The Convention entered into force on 10 September 1997. Of the three host countries for the Project, only Bulgaria has ratified the Convention. Consultation related to Espoo is described in the ESIA Report for the South Stream Offshore Pipeline – Bulgarian Sector.

6.3 Approach to Stakeholder Engagement

South Stream Transport's approach to stakeholder engagement is designed to comply with Turkish legislation and to be aligned with international standards and guidelines as described in Section 6.2. Accordingly, it provides a mechanism for stakeholders to be engaged during all phases of the Project. Within each phase of the Project, a range of engagement activities will be undertaken to address the needs of different stakeholders and stakeholder groups.

The main elements of the approach to stakeholder engagement are described in this section. Section 6.3.1 describes the Stakeholder Engagement Plan (SEP), which provides a framework for past, current and future engagement activities. The SEP is the mechanism by which the principles and processes for stakeholder engagement, outlined in this chapter, are implemented. Section 6.3.2 describes the process by which various stakeholders have been (and continue to be) identified. Section 6.3.3 discusses the ways in which stakeholders can provide feedback to South Stream Transport about the Project, and Section 6.3.4 presents the Stakeholder and Consultation Database (SCD), which is South Stream Transport's central mechanism for managing and coordinating feedback received throughout the stakeholder engagement process. Finally, Section 6.3.5 introduces the Grievance Procedure for the Project.

6.3.1 Stakeholder Engagement Plan

South Stream Transport's SEP for Turkey provides a stakeholder engagement framework for all phases of the Project, including the Construction and Pre-commissioning, Operational and Decommissioning Phases. The SEP is a 'living' document and is progressively updated as the Project moves through the various phases of planning and implementation. Further updates will be issued around key Project milestones, such as the disclosure of the ESIA Report, and the start of construction activities.

The SEP describes the way in which South Stream Transport:

- Identifies stakeholders;
- Develops and maintains positive relationships with stakeholders;
- Provides culturally appropriate, adequate and timely information about the Project and the EIA/ESIA process to stakeholders;
- Provides suitable opportunities for stakeholders to express their opinions and concerns in relation to the EIA/ESIA and Project development;
- Enables compliance with Turkish regulations and alignment with international standards and guidelines for financing;
- Ensures that Project decisions consider stakeholder priorities, views and concerns and that these are reflected in the EIA/ESIA and Project management decisions where appropriate; and
- Will engage with stakeholders to establish and maintain dialogue.

The SEP is published in English and Turkish on the South Stream Transport website. The next update to the SEP will include more detailed information on the planned ESIA disclosure and consultation activities. The latest version of the SEP is always available on the South Stream Transport website at www.south-stream-offshore.com.

6.3.2 Stakeholder Identification

It is important to identify the Project's stakeholders and understand how they may be affected, or perceive that they may be affected, so that engagement can be tailored to inform them and appropriately address their views and concerns.

Stakeholders with an interest in the Project have been identified in several ways. These include:

- Drawing on the local knowledge of in-country environmental and social consultants;
- Feedback from consultations with stakeholders held to date;
- Desktop research including reviews of previous ESIAs for relevant (by type or location) previous projects; and
- Scoping of anticipated impacts and receptors.

In addition, stakeholder engagement activities also help to identify and engage additional stakeholders and stakeholder groups.

When planning engagement activities, it can be helpful to group stakeholders based on common interests and characteristics. As such, South Stream Transport uses a number of "stakeholder categories" to help structure engagement activities for stakeholders of the Project. Stakeholder categories in the Turkish Sector include:

- Fisheries and other marine area users;
- Residents of Black Sea coastal communities;
- Government authorities (national, regional and local);
- Inter-governmental organisations;
- Non-governmental organisations (NGOs);
- Businesses and business associations;
- Academic and scientific organisations; and
- Media.

These stakeholder categories are described in Table 6.1 including a summary of the anticipated interest of these groups with respect to the Project (e.g. potential impacts, benefits, concerns) and how they have been engaged to date. Further detail on stakeholder engagement activities and stakeholder issues and concerns is provided in Section 6.4 and Section 6.5, while Appendix B of the SEP provides a full list of all identified stakeholders in Turkey.

Table 6.1 Stakeholder Categories and Identification

Interest in the Project	Stakeholders Identified	Summary of Engagement to Date
Fisheries and Other Marine Area Users		
Fishers and fisheries organisations may be interested in potential Project impacts on fishing activities and livelihoods, including access to fishing areas and changes in fish health, migration, and catch volumes. They could also be concerned about unplanned events (e.g. fuel spills) and how these events could affect fish health.	Fisheries cooperatives in Trabzon, Samsun and Sinop. The Central Union of Fisheries Cooperative (in Ankara).	South Stream Transport engaged with the Central Union of Fisheries Cooperatives in Ankara, as well as fisheries cooperatives in the East Black Sea fishing region (as this is the most productive region in terms of catch volumes – **Chapter 9 Socio-Economics**) during the Scoping Stage. These groups were also interviewed regarding their fishing activities and interests as part of baseline fisheries study. Further meetings were also held with the fisheries cooperatives in Trabzon and Samsun in May 2014 to provide them with Project updates and to discuss aspects of ESIA disclosure planning. Consultation to date has established that their main issue of concern relates to potential impacts on commercial species that migrate through the Project Area, particularly anchovy. As most fishing activity is concentrated in Turkey's coastal waters (whilst the Project is more than 110 km from shore), fisheries organisations have not expressed any concerns relating to access to fishing grounds.
Shipping and offshore oil-and-gas exploration companies also have an interest in accessing and using the marine area, although potential impacts on these companies were considered but have been ruled out (as described in **Chapter 9 Socio-Economics**).	Turkish Petroleum Corporation (TPAO).	Due to the fact that there are no anticipated impacts on shipping, no targeted engagement has been undertaken with this group. Coordination and engagement with TPAO has been ongoing as the Project crosses a licence block held by TPAO. TPAO is also a competent authority in the EIA review process.

Continued…

Interest in the Project	Stakeholders Identified	Summary of Engagement to Date
Residents of Black Sea Coastal Communities		
Although Project activities will be short term and will occur more than 110 km from the coast, it is possible that residents of the Black Sea coastal communities may be concerned about potential impacts on Turkey's coastline or coastal waters and, in turn, on community values such as beach use, tourism and the health of the marine ecosystem.	Residents of Trabzon, Samsun and Sinop.	The publication of the Scoping Report was announced in Samsun, Sinop and Trabzon inviting stakeholders to comment on the Report. A comment box was also set up in Sinop to allow stakeholders to review printed copies of the Report and submit comments. Only five comments were received during this period, all of which were submitted through the Sinop comment box. Questions related to the potential impact of an unplanned event on the marine environment and coastline. The MoEU chose Sinop as the location for a public meeting as part of the EIA process. Attendance was low, and the limited public interest in the Project to date may be attributed to the distance of the Project from Turkey's coastline.
Government Authorities		
Turkish authorities have an interest in the national EIA and permitting procedures, particularly in terms of ensuring compliance with Turkish regulations. In addition to their regulatory role, government departments have specific interests which may be affected by the Project (e.g. environment, marine navigation).	Turkish national government including the MoEU, Ministry of Foreign Affairs (MoFA), and the naval and armed forces. Provincial government office in Sinop and associated directorates.	National and regional government authorities have been informed and consulted as part of the ESIA process, although formal engagement with the authorities is covered by the national EIA process. Engagement with various governmental departments responsible for topics such as environment, culture, tourism, transportation, safety, fisheries, archaeology and natural resources has been ongoing throughout the EIA, ESIA and permitting processes.

Continued…

Interest in the Project	Stakeholders Identified	Summary of Engagement to Date
Inter-Governmental Organisations		
Inter-governmental organisations (i.e. those whose scope covers the interests of more than one nation) related to the protection of the Black Sea may be interested in the potential impacts of the Project on the marine environment.	The Permanent Secretariat of the Commission on the Protection of the Black Sea Against Pollution (also known as the Black Sea Commission).	The Convention on the Black Sea Against Pollution (Bucharest Convention) has been ratified by all the Black Sea countries and the Black Sea Commission was established to address issues of marine pollution and the protection of the marine environment. A meeting was held with the Permanent Secretariat of the Black Sea Commission in November 2012 to introduce the Project. Since this introduction, South Stream Transport has provided further information and updates to the Permanent Secretariat. The Permanent Secretariat has indicated that it will distribute Project information to the other members of the Black Sea Commission.
Non-Governmental Organisations (NGOs)		
NGO's interests in the Project may range from protection of the Black Sea ecology, to archaeological assets, to potential impacts on tourism and other industries. NGOs are often interested in reviewing and commenting on EIA and ESIA documents, particularly in regard to the identification of environmental and social impacts and the ways that these impacts will be mitigated and managed.	A number of international, national and regional NGOs (based in Istanbul, Ankara, Trabzon and Samsun), including NGOs with environmental and cultural heritage interests.	NGOs were engaged during the Scoping Stage with invitations to review and comment on the Scoping Report, and to participate in meetings. NGOs identified to date have included those with a particular interest in the marine ecology and environmental protection of the Black Sea, as well as the protection of cultural heritage assets. Of the NGOs engaged to date, only the Turkish Marine Protection Association (TURMEPA) and the Nature Conservation Society have provided feedback regarding the Project.

Continued…

Interest in the Project	Stakeholders Identified	Summary of Engagement to Date
Business and Business Associations		
Local businesses may be interested in potential business generation and procurement opportunities related to the Project. However, no onshore facilities are envisaged in Turkey, nor will Turkish ports be used, thus limiting the potential scope for interest in the Project among business and business associations.	Chambers of Commerce and Industry in Trabzon and Sinop.	The Chambers of Commerce and Industry were engaged during the Scoping Stage to establish any potential for perceived impacts or interest in the Project among this stakeholder group. However, there was no indication as to potential beneficial or adverse Project impacts.
Academic and Scientific Organisations		
Academic and research organisations may be interested in data from the Project's numerous marine surveys, as well as the potential effects on the marine environment or ecology and mitigation measures.	A number of marine research institutes and university departments with a particular interest in the Black Sea based in Istanbul, Ankara, Sinop and Trabzon.	Marine research institutes and university departments with a particular interest in issues pertaining to the Black Sea were engaged during the Scoping Stage. Engagement has indicated that these stakeholders are primarily interested in the potential effects of unplanned events on the marine environment.
Media		
Journalists and other representatives of the media are often interested in ensuring that clear and transparent information about the Project is communicated to the national population. Interested in general Project information including updates on the EIA and ESIA process.	Turkish media at national, regional and local levels.	Engagement with the media has occurred through press releases and announcements during key disclosure events, such as the publication of EIA and ESIA documentation.

Complete.

6.3.2.1 Coastal Communities

As detailed in Section 6.2.2, international standards and guidelines state that appropriate consultation should be undertaken with 'affected communities'. In the Turkish Sector, there are no onshore activities and all construction and operational activities will occur more than 110 km from the Turkish coastline. Therefore, no affected communities as defined by IFC PS1 have been identified.

However, South Stream Transport identified (in collaboration with the MoEU) three communities along the Eastern Turkish Black Sea coast where stakeholders may have an interest in the Project:

- Trabzon is an important fishing town, accounting for 20% of the total fish production in the Black Sea (Ref. 6.12);
- Samsun is also identified as an important fishing town; and
- Sinop is the closest land point to the Project, and as such was selected by the MoEU as the location for EIA stakeholder engagement. It is also considered as the epicentre for coastal fishing in the Turkish Black Sea region.

By consulting with these communities, the Project seeks to engage with marine area users who are most likely to be interested in, or affected by, the offshore works associated with the Project.

As discussed in **Chapter 9 Socio-Economics**, the Western Black Sea fishing region is much less productive than the East Black Sea fishing region. Therefore, this is not an area of focus for stakeholder engagement activities.

6.3.2.2 Vulnerable Groups

Stakeholder identification and engagement also seeks to identify any potentially vulnerable or disadvantaged individuals and groups in local communities. Vulnerable groups are those who may be differently or disproportionately affected by the Project, or whose situation may mean that special care is needed to engage them in consultation and disclosure activities (e.g. in terms of language, literacy, technology, etc.).

Using guidance provided in IFC PS1, small-scale and artisanal fishers are the only potentially vulnerable group that has been identified with respect to the Turkish Sector. This group could potentially be differently affected by Project impacts because they are likely to have fewer financial resources, including savings and/or access to credit, which in turn could make them vulnerable to economic fluctuations if their fishing activities or harvests were to be adversely affected by the Project (including by potential unplanned events such as a fuel spill).

Potential Project impacts on small-scale and artisanal fishers have been considered in **Chapter 9 Socio-Economics**. However, it is important to note that the socio-economic impacts of the Project are limited due to the fact that the Project is located more than 110 km from the coast. There is no expected impact on small-scale and artisanal fisheries.

South Stream Transport has also considered the needs of all potentially interested stakeholders, including those for whom special care in consultation may be needed, through the stakeholder engagement process. Efforts have been made to disclose information in a variety of ways so as to be accessible to all groups, regardless of socio-economic or other status. For example, printed copies of reports were provided in central Sinop, in addition to on the internet; announcements have been made in local and national newspapers. All documents have been provided in Turkish. Additionally, at the community meeting held in Sinop to discuss the Scoping Report, a shuttle service was provided to transport interested stakeholders to and from the meeting (as it was held at a venue outside of central Sinop at the discretion of the MoEU).

6.3.3 Receiving Feedback from Stakeholders

South Stream Transport is committed to maintaining an open and respectful dialogue with all stakeholders, supported by the activities and principles of the SEP. Throughout the life of the Project, stakeholders have access to various means and opportunities to submit feedback to South Stream Transport. Feedback may include:

- Questions;
- Comments;
- Concerns;
- Requests;
- Complaints or grievances; and
- Suggestions and recommendations.

Stakeholder engagement activities comprise both 'active' and 'receptive' consultation. Active engagement includes meetings and structured comment periods to support report disclosure where South Stream Transport is actively soliciting feedback about the Project. Complementary to these active periods of disclosure and consultation, South Stream Transport is receptive to feedback, whereby stakeholders may contact the Project at any time (e.g. by email, post, telephone, or in person) to provide their views and ask questions. Feedback may be submitted by any individual or group (e.g. companies, organisations, societies, collectives), either verbally or in writing.

All input received from stakeholders is managed through the Stakeholder and Consultation Database (SCD; Section 6.3.4); through this platform, South Stream Transport centrally stores, analyses and manages comments from stakeholders. If a grievance is communicated to South Stream Transport, through any means, the communication is documented in the SCD, and the Grievance Procedure (Section 6.3.5) is initiated.

6.3.4 Stakeholder and Consultation Database

South Stream Transport's Stakeholder and Consultation Database (SCD) has been developed to ensure that all stakeholder communications are documented, that all feedback is recorded and that all resulting actions are tracked and addressed[2]. The SCD also provides a history of engagement with a particular stakeholder, thus helping South Stream Transport build meaningful relationships with stakeholders by understanding their concerns and past involvement with the Project.

The SCD is used to record and analyse feedback from stakeholders and, in turn, this analysis informs the development of Project design, the identification and management of impacts and the development of the Environmental and Social Management System (**Chapter 16 Environmental and Social Management**). Throughout the life of the Project, the SCD will be a valuable tool to coordinate information about stakeholders and stakeholder concerns in relation to the Project.

6.3.5 Grievance Procedure

A grievance is a complaint (i.e. an expression of dissatisfaction) stemming from an incident or impact (real or perceived) related to South Stream Transport's business activities. Complaints may stem from commonly occurring and relatively minor problems, or more serious one-off events, or entrenched or repeated problems that may lead to resentment, discontent or unrest.

A Grievance Procedure is the process by which a grievance is received, recorded and managed so that it can be tracked from its original submission through to a resolution. An effective Grievance Procedure is an important aspect of stakeholder engagement, and is a core component of the approach to stakeholder engagement outlined in the standards and guidelines for financing (Section 6.2.2). The process must be fair, accessible, transparent and properly documented.

The Grievance Procedure for the South Stream Offshore Pipeline will guide the management of grievances throughout the Project lifecycle, from before the start of construction, throughout the operational life of the Project, and into the Decommissioning Phase. The Grievance Procedure describes the process by which a grievance is documented, investigated, and resolved in coordination with the affected stakeholders. It will be implemented by South Stream Transport in partnership with its contractors and will ensure that grievances are brought to the attention of the appropriate Project staff and addressed in an appropriate and timely way.

The Grievance Procedure interfaces with the SCD and the general receipt and management of feedback from stakeholders. All communications with stakeholders will be respectfully considered by South Stream Transport, and responses will be provided where appropriate. Where a potential grievance is identified, the Grievance Procedure will be implemented in addition to standard stakeholder engagement procedures, although the two processes will be closely integrated.

[2] To preserve the confidentiality of personal data, the contents of the stakeholder database will not be disclosed to external parties, other than specific individuals or organisations that have a legitimate Project need to access this data and that have entered into a confidentiality agreement with South Stream Transport (e.g. select contractors of South Stream Transport).

Further information regarding the implementation of the Grievance Procedure is provided in the SEP.

6.4 Stakeholder Engagement by Project Phase

Stakeholder engagement activities are an integral part of the Project lifecycle: from the initial notification when the Project is proposed, to the scoping of potential impacts, the EIA and ESIA studies, and throughout the Construction and Pre-commissioning, Operational and Decommissioning Phases of the Project.

The different phases of the Project each require stakeholder engagement that is tailored in terms of its objectives and intensity, as well as the forms of engagement used. In Turkey, stakeholder engagement for the Project commenced at the beginning of the Development Phase; the Project is currently in this phase, which includes the EIA and ESIA studies. A summary of completed and planned engagement activities for the Project is provided in Figure 6.2.

Although the guidelines for stakeholder engagement under the EIA and ESIA processes differ, the Project has aligned these processes where possible. As such, the activities for both processes are described in this section.

A discussion of stakeholder feedback obtained through these activities including a short summary of the comments, suggestions and concerns raised by stakeholders to date, and how they have been addressed as part of the ESIA process is provided in Section 6.5.

6.4.1 Development Phase

6.4.1.1 Overview

At the time of writing, the Project is currently in the Development Phase, which includes both the development of engineering and design, as well as the EIA, ESIA and related studies. The Development Phase is an important period of stakeholder engagement as it provides an initial introduction with many stakeholders, and can provide valuable feedback for Project design, baseline studies, impact assessment, and mitigation and management planning. Stakeholder engagement during this phase aims to:

- Source and validate relevant environmental, socio-economic and cultural heritage data;
- Further understand the views and concerns of stakeholders about the Project, its impacts and possible mitigation, management and monitoring measures; and
- Discuss the outcomes of the EIA and ESIA processes, including anticipated impacts and their significance, and mitigation and management measures.

In terms of stakeholder engagement, the Development Phase includes the following activities:

- **Notification** of the Project and the commencement of the EIA and ESIA processes. With respect to stakeholder engagement in Turkey, this included introductory meetings with the Project's regulators, the Turkish MoEU and the Turkish Ministry of Foreign Affairs (MoFA) in

Figure 6.2 Stakeholder Engagement by Project Phase

PROJECT PHASE	ACTIVITIES	ENGAGEMENT OBJECTIVES
Development	Project Notification • Preliminary engagement with national authorities including notification of South Stream Transport's intention to undertake an EIA and an ESIA. • Preparation and submission of EIA Application File (EIAAF)	• Stakeholders, including regulatory authorities and the public, are aware of the proposed Project • Start to build and maintain relationships between South Stream Transport and stakeholder groups • Stakeholders are informed about the design and location of the project, and anticipated impacts • Stakeholders can comment on the scope and content of the EIA and ESIA, and provide input into studies
	Scoping Stage • Ongoing stakeholder engagement to support baseline studies, assessment of impacts, and mitigation and management strategies, and Project planning • EIA Application File • Disclosure of EIAAF on MoEU website • Public Participation Meeting with stakeholders and Public • ESIA Scoping Report • Disclosure of the Scoping Report for review and comment by MoEU • Public announcement of Scoping Report disclosure and comment period by MoEU • Consultation meetings with key stakeholders and Public	
	EIA and ESIA • Ongoing stakeholder engagement to support baseline studies, assessment of impacts, and mitigation and management strategies, and Project planning • EIA Report • Disclosure of the EIA Report for review and comment by MoEU • Public announcement of EIA Report disclosure and comment period • Meetings with authorities • ESIA Report • Disclosure of ESIA Report for review and comment • Public announcement of ESIA Report disclosure and comment period • Meetings with stakeholders • Response to all comments received	• Stakeholders are informed about the Project and anticipated impacts • Stakeholders have input into baseline studies, identification of impacts, mitigation and management measures • Stakeholders' interests and concerns are considered in the EIA and ESIA, and decision-making processes • Stakeholders have an opportunity to review—and to question and comment on—the EIA and ESIA
Construction and Pre-Commissioning (approx. 4 years)	Construction and Pre-Commissioning Activities • Ongoing disclosure of information relating to Project development, including the timing and progress of construction activities • Implementation of a Grievance Procedure and communication to stakeholders	• Stakeholders are kept informed about the Project and receive advance notification about activities that may affect them • Stakeholders can submit questions, comments and grievances
Operational (approx. 50 years)	Commissioning and Full Operational Activities • Continue to update stakeholders, particularly any changes or non-routine activities • Continued implementation of the Grievance Procedure	
Decommissioning	Decommissioning Activities • Inform stakeholders about planned decommissioning activities and schedule • Continued implementation of the Grievance Procedure	

June and September 2012, and submission of an EIA Application File (EIAAF) in May 2013. These stakeholder activities are described in Section 6.4.1.2;

- The **Scoping** process included disclosure and consultation related to the national EIAAF and the international ESIA Scoping Report (publicly disclosed in July 2013) and associated consultation. These activities were completed in July and August 2013 and are described in Section 6.4.1.3;
- The **EIA Report** process included disclosure and consultation related to the draft EIA Report. These activities are described in Section 6.4.1.6; and
- The **ESIA Report** process includes disclosure and consultation related to this Report, in accordance with the standards and guidelines for financing. Planned activities are described in Section 6.4.1.8.

Additional stakeholder engagement activities related to baseline data collection are described in Section 6.4.1.4 and the inter-governmental agency of the Black Sea Commission in Section 6.4.1.7.

6.4.1.2 Completed Activities – Notification

Introductory meetings were held with the MoEU on 11 June 2012 and with the MoFA on 6 September 2012, to inform them about the Project and to notify them of the intention to conduct an EIA and ESIA, and to establish permitting requirements for the Project[3]. The official EIA process began with the submission of the EIAAF in May 2013.

6.4.1.3 Completed Activities – Scoping Process

During the Scoping process, South Stream Transport sought to provide stakeholders with clear information about the Project and its potential impacts and to allow them to provide feedback on the scope of, and approach to, the EIA and ESIA, including the key issues to be addressed as part of both processes. The engagement process during the Development Phase also served to source and validate relevant environmental, socio-economic and cultural heritage data and to understand the views and concerns of stakeholders about the Project, its impacts and possible mitigation, management and monitoring measures. Feedback from these activities informed the EIA and ESIA process and Project design.

Consultation on the Content and Format of the EIA Report

The public engagement process officially commenced on 5 June 2013, when the MoEU published an announcement on their website[4], to inform stakeholders that the EIAAF had been disclosed and was available for review and that comments, views and recommendations could

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[3] Note however, that the first communication with MoFA regarding the Project was undertaken at intergovernmental level, between MoFA and the Russian Ministry of Foreign Affairs. A 'Permit' letter outlining the conditions and requirements the Project must fulfil was issued to the Russian Federation Embassy on 28 December 2011. This is included in Appendix 6.1: Engagement Activities to Date.

[4] Available from http://www.csb.gov.tr/db/ced/editordosya/karadenizTRmayis2013.pdf

be submitted to the MoEU. A similar announcement was made on 12 June 2013 by the Sinop Provincial Directorate of Environment and Urbanisation (PDEU) on their website[5], once the MoEU had confirmed Sinop to be the location for a public meeting ('Public Participation meeting') on the EIAAF.

The Public Participation meeting was held in Sinop at the Vira Hotel on 2 July 2013 at 10 am under the chairmanship of the PDEU and with the participation of representatives of the MoEU and South Stream Transport (Figure 6.3). The MoEU invited relevant authorities and organisations to attend the meeting. The meeting was advertised in one national and one local newspaper[6] on 21 June 2013 ten days prior to the meeting as legally required by the EIA process. Transport arrangements were made to enable other stakeholders and the general public to participate in the meeting.

Figure 6.3 Presentation and Panel at Public Participation Meeting in Sinop

Public turnout to the meeting was low, which can be attributed to the distance of the Project from the Turkish coastline (minimum 110 km) and the limited impacts envisaged, resulting in relatively low levels of interest among the general public and NGOs.

Following the presentation, stakeholders were invited to ask questions, to which representatives of South Stream Transport provided answers (Figure 6.4). All questions, comments and

[5] Available from http://www.csb.gov.tr/iller/sinop/index.php?Sayfa=duyurudetay&Id=2642

[6] The national paper was the "Hurriyet" and the local was the "Bizim Karadeniz", the date of publication of both was 21 June 2013.

recommendations raised during the Public Participation meeting and via email and postal correspondence were collected by the MoEU for consideration with regard to the scope and contents (i.e. the Special Format) of the EIA Report.

Figure 6.4 Project Panel at Public Participation Meeting in Sinop

Comments received during the Public Participation meeting are considered in this ESIA Report and are shown in Appendix 6.1: Comments Received during the Development Phase.

Following the Public Participation meeting in Sinop, the EIA SSFD Meeting was held on 4 July 2013 by the MoEU and the REC comprising various Turkish authorities with jurisdiction over aspects of the Project. The purpose of the SSFD meeting was to discuss, with South Stream Transport present, the scope and content of the EIA, and any requirements which should be taken into consideration in the EIA process or EIA Report. Although this meeting was primarily about setting the format for the EIA Report, some of the comments raised are also relevant to the ESIA Report and have therefore been considered and are presented in Appendix 6.1.

As some of the REC members were not present during the SSFD Meeting, or did not provide formal feedback, additional meetings were held with relevant REC members and correspondence exchanged between August and November 2013, in order to receive feedback on the scope and contents of the EIA Report.

Disclosure of the ESIA Scoping Report

To ensure the Scoping Report was accessible to all stakeholder groups, efforts were made to disclose information in a variety of ways. All interested stakeholders had the opportunity to submit comments on the Scoping Report, whilst some specific stakeholders were invited to attend meetings to discuss the Project and the Scoping Report.

The Scoping Report, which included a non-technical summary (NTS), was disclosed on 17 July 2013 and the consultation period ran until 19 August 2013. Disclosure of the Scoping Report included:

- Publication of the Scoping Report and NTS, in English and Turkish, on the South Stream Transport website at http://www.south-stream-offshore.com/esia on 17 July 2013;
- A public announcement published in national, regional and local newspapers[7] including details of the Project and South Stream Transport, the ESIA and how comments on the Scoping Report could be submitted (i.e. by email, post, or comment box) until 19 August 2013. An example of this announcement is provided in Figure 6.5; and
- Direct distribution of printed and bound copies of the Scoping Report and NTS to identified stakeholders by post and email.

The Scoping Report was made publicly available for review and comment for a period of 30 days; during this period, stakeholders had the opportunity to review and comment on the report, the Project, and the proposed scope and content of the ESIA Report.

A comment box was installed in Sinop on 17 July 2013 until 19 August 2013 in the Sinop Muhtar's office[8] where the public were invited to review a hard copy of the report and submit comments by posting into the box (Figure 6.5). Sinop was chosen as a location to host a comment box in order to give any interested stakeholders who were unable to participate in the EIA Public Participation meeting an additional opportunity to submit comments on the Project.

Through the various channels, comments were submitted by post, email, comment box or in person. The issues raised during this consultation period (Appendix 6.1) have been considered in this ESIA Report. The disclosure of the Scoping Report is summarised in Table 6.2.

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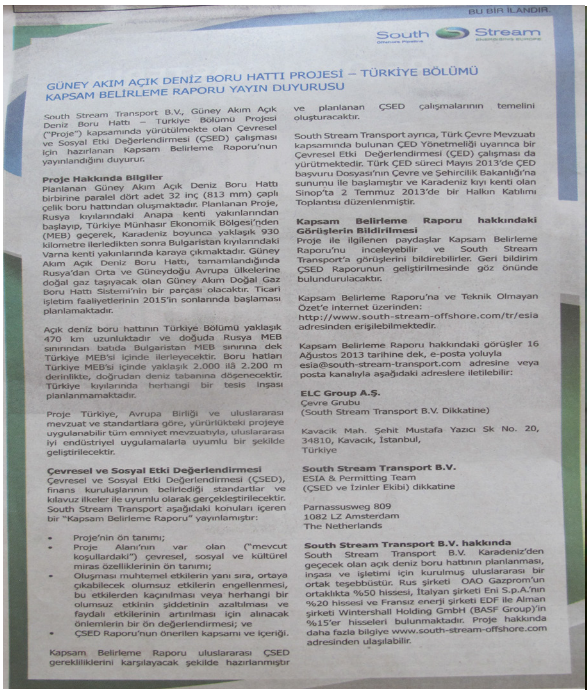
[7] The national newspaper was "Hürriyet" (Istanbul), the regional newspapers were "Samsun Haber Gazetesi" and "Trabzon – Karadeniz", and the local newspaper was "Sinop Bizim Karadeniz" (Sinop). Disclosure in "Hürriyet" and "Samsun Haber Gazetesi" on 17 July 2013 and in "Sinop Bizim Karadeniz" and "Trabzon – Karadeniz" on 18 July 2013.

[8] A Muhtar is the elected village head in villages of Turkey. In cities, likewise, each quarter has a muhtar, but with a slightly different status.

Figure 6.5 Public Announcement in "Hürriyet" on 17 July 2013 and Comment Box in Sinop with Public Announcement, Instructions, Hard Copy Reports and Comment Forms



BU BİR İLANDIR.

South Stream Offshore Pipeline ENERGISING EUROPE

GÜNEY AKIM AÇIK DENİZ BORU HATTI PROJESİ – TÜRKİYE BÖLÜMÜ
KAPSAM BELİRLEME RAPORU YAYIN DUYURUSU

South Stream Transport B.V., Güney Akım Açık Deniz Boru Hattı – Türkiye Bölümü Projesi ("Proje") kapsamında yürütülmekte olan Çevresel ve Sosyal Etki Değerlendirmesi (ÇSED) çalışması için hazırlanan Kapsam Belirleme Raporu'nun yayınlandığını duyurur.

Proje Hakkında Bilgiler
Planlanan Güney Akım Açık Deniz Boru Hattı birbirine paralel dört adet 32 inç (813 mm) çaplı çelik boru hattından oluşmaktadır. Planlanan Proje, Rusya kıyılarındaki Anapa kenti yakınlarından başlayıp, Türkiye Münhasır Ekonomik Bölgesi'nden (MEB) geçerek, Karadeniz boyunca yaklaşık 930 kilometre ilerledikten sonra Bulgaristan kıyılarındaki Varna kenti yakınlarında karaya çıkmaktadır. Güney Akım Açık Deniz Boru Hattı, tamamlandığında Rusya'dan Orta ve Güneydoğu Avrupa ülkelerine doğal gaz taşıyacak olan Güney Akım Doğal Gaz Boru Hattı Sistemi'nin bir parçası olacaktır. Ticari işletim faaliyetlerinin 2015'in sonlarında başlaması planlamaktadır.

Açık deniz boru hattının Türkiye Bölümü yaklaşık 470 km uzunluktadır ve doğuda Rusya MEB sınırından batıda Bulgaristan MEB sınırına dek Türkiye MEB'si içinde ilerleyecektir. Boru hatları Türkiye MEB'si içinde yaklaşık 2.000 ilâ 2.200 m derinlikte, doğrudan deniz tabanına döşenecektir. Türkiye kıyılarında herhangi bir tesis inşası planlanmamaktadır.

Proje Türkiye, Avrupa Birliği ve uluslararası mevzuat ve standartlara göre, yürürlükteki projeye uygulanabilir tüm emniyet mevzuatıyla, uluslararası iyi endüstriyel uygulamalarla uyumlu bir şekilde geliştirilecektir.

Çevresel ve Sosyal Etki Değerlendirmesi
Çevresel ve Sosyal Etki Değerlendirmesi (ÇSED), finans kuruluşlarının belirlediği standartlar ve kılavuz ilkeler ile uyumlu olarak gerçekleştirilecektir. South Stream Transport aşağıdaki konuları içeren bir "Kapsam Belirleme Raporu" yayınlamıştır:

- Proje'nin ön tanımı;
- Proje Alanı'nın var olan ("mevcut koşullardaki") çevresel, sosyal ve kültürel miras özelliklerinin ön tanımı;
- Oluşması muhtemel etkilerin yanı sıra, ortaya çıkabilecek olumsuz etkilerin engellenmesi, bu etkilerden kaçınılması veya herhangi bir olumsuz etkinin şiddetinin azaltılması ve faydalı etkilerinin artırılması için alınacak önlemlerin bir ön değerlendirmesi; ve
- ÇSED Raporu'nun önerilen kapsamı ve içeriği.

Kapsam Belirleme Raporu uluslararası ÇSED gerekliliklerini karşılayacak şekilde hazırlanmıştır ve planlanan ÇSED çalışmalarının temelini oluşturacaktır.

South Stream Transport ayrıca, Türk Çevre Mevzuatı kapsamında bulunan ÇED Yönetmeliği uyarınca bir Çevresel Etki Değerlendirmesi (ÇED) çalışması da yürütmektedir. Türk ÇED süreci Mayıs 2013'de ÇED başvuru Dosyası'nın Çevre ve Şehircilik Bakanlığı'na sunumu ile başlamıştır ve Karadeniz kıyı kenti olan Sinop'ta 2 Temmuz 2013'de bir Halkın Katılımı Toplantısı düzenlenmiştir.

Kapsam Belirleme Raporu hakkındaki Görüşlerin Bildirilmesi
Proje ile ilgilenen paydaşlar Kapsam Belirleme Raporu'nu inceleyebilir ve South Stream Transport'a görüşlerini bildirebilirler. Geri bildirim ÇSED Raporunun geliştirilmesinde göz önünde bulundurulacaktır.

Kapsam Belirleme Raporu'na ve Teknik Olmayan Özet'e internet üzerinden: http://www.south-stream-offshore.com/tr/esia adresinden erişilebilmektedir.

Kapsam Belirleme Raporu hakkındaki görüşler 16 Ağustos 2013 tarihine dek, e-posta yoluyla esia@south-stream-transport.com adresine veya posta kanalıyla aşağıdaki adreslere iletilebilir:

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South Stream Transport B.V. hakkında
South Stream Transport B.V. Karadeniz'den geçecek olan açık deniz boru hattının planlanması, inşası ve işletimi için kurulmuş uluslararası bir ortak teşebbüstür. Rus şirketi OAO Gazprom'un ortaklıkta %50 hissesi, İtalyan şirketi Eni S.p.A.'nın %20 hissesi ve Fransız enerji şirketi EDF ile Alman şirketi Wintershall Holding GmbH (BASF Group)'in %15'er hisseleri bulunmaktadır. Proje hakkında daha fazla bilgiye www.south-stream-offshore.com adresinden ulaşılabilir.

Table 6.2 Disclosure of Scoping Report (including NTS)

Stakeholder Group	Means of Disclosure
All stakeholders and members of the public with internet access	South Stream Transport website in Turkish and English
Community of Sinop	Printed and bound copies made available in Turkish in Sinop at the Sinop Muhtar's Office with comment forms and comment box
Fishing cooperatives in Ankara, Sinop, Samsun and Trabzon	Hard paper copies in Turkish posted or emailed to the head of the cooperative who then shared with members
National, regional and local NGOs and marine-focused academic and scientific research organisations in Istanbul, Ankara, Sinop, Samsun and Trabzon	Digital copies in Turkish sent by email
Business and business associations in Trabzon and Sinop	Digital copies in Turkish sent by email
National Turkish Authorities	Hard paper copy and CD posted to MoEU and MoFA

Scoping Consultation Meetings

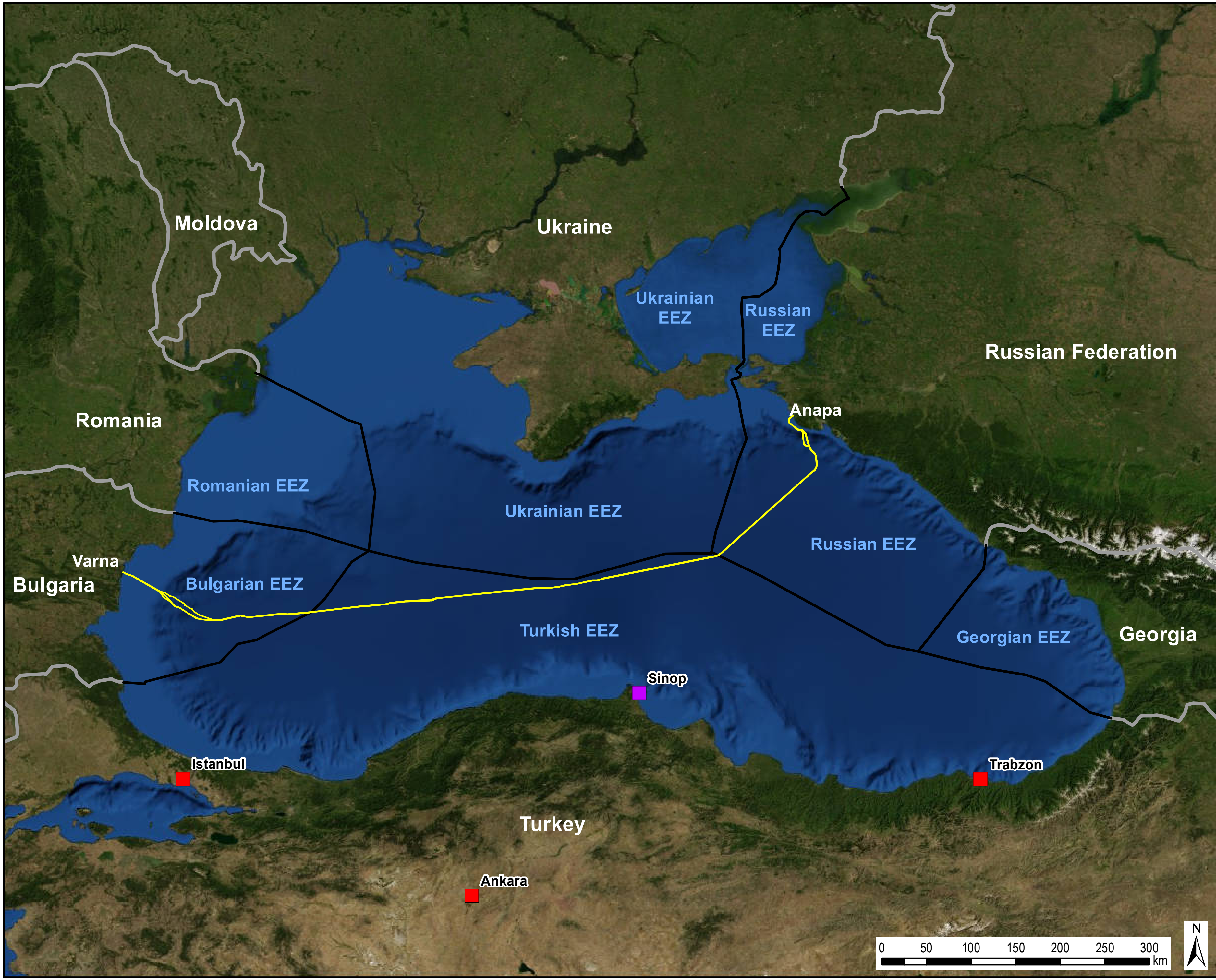
As the Project is more than 110 km offshore and impacts are marine-related, the impacts on Black Sea coastal communities and stakeholders are expected to be minimal. A targeted engagement programme involved identifying key stakeholders who could have an interest in the Project, in both the business centres (i.e. Istanbul and Ankara) and along the Black Sea coast. The locations where meetings were held for the EIA and where meetings were held for the ESIA are shown in Figure 6.6.

National NGOs, research institutes, business associations and fishing cooperatives with a specific focus on the Black Sea region and/or marine environments were identified as stakeholders to engage for the ESIA. At a local level, as a public meeting had already taken place on 2 July in Sinop for the EIA and attendance was low, it was not considered necessary to hold another meeting in Sinop for the ESIA Scoping Report disclosure. Instead, Trabzon, which accounts for 20% of the total fish production in Turkey (Ref. 6.12), was identified as an important town to visit and engage with key marine research institutes and fisheries cooperatives.

In total, four roundtable meetings were held in Istanbul, Ankara and Trabzon in July and August 2013. Invitation letters were sent to stakeholders with the full Scoping Report and NTS by email and post on 12 July 2013, just over two weeks prior to the meetings taking place, to allow time for stakeholders to review the materials prior to the meetings. The meetings are described below and are listed in Table 6.3. The details of invitees and attendees are contained in Appendix 6.2.

Table 6.3 Scoping Consultation Meetings

Meeting	Stakeholders Invited	Date	Attendance	Location
1. Roundtable Meeting	National NGOs and marine research institutes	30 July 2013	6 invited, 2 attended	Point Hotel Barbaros, Istanbul
2. Roundtable Meeting	National NGOs, marine research institutes and the Central Fisheries Cooperatives Union	31 July 2013	7 invited, 4 attended	Movenpick Hotel, Ankara
3. Roundtable Meeting	Marine research institutes and business associations	1 August 2013	5 invited, 3 attended	Zorlu Grand Hotel, Trabzon
4. Roundtable Meeting	East Black Sea Fisheries Cooperatives Union	1 August 2013	Head of Union and 21 affiliate cooperatives invited, 3 representatives of the main union attended	Fisheries cooperative premises, Trabzon



LEGEND

- Location of EIA public participation meeting
- Location of stakeholder engagement consultations
- Exclusive Economic Zone boundary
- Country Boundaries

Turkish Sector of the South Stream Offshore Pipeline

- Proposed offshore pipelines

Projection: Lambert Conformal Conic

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — South Stream ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: STAKEHOLDER ENGAGEMENT CONSULTATIONS IN TURKEY

Drawn	Checked	Approved	Date
AH	RW	MW	04/06/2014

URS Internal Project No.	Scale @ A4
46369082	1:5,500,000

URS Infrastructure & Environment UK Limited
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Drawing Number: Figure 6.6

Rev:

Plot Date: 04 Jun 2014
File Name: I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Tukey ESIA\Chapter 6\Figure 6.6 Stakeholder engagement consultations in Turkey.mxd

Three out of the four meetings were held in private hotel meeting rooms located in central locations in Istanbul, Ankara and Trabzon to ensure accessibility to stakeholders. The exception was the meeting with the East Black Sea Fisheries Cooperatives Union in Trabzon, which was held on their own premises as it was more accessible to its members. South Stream Transport decided to hold a separate meeting the East Black Sea Fisheries Cooperatives Union, instead of combining with the meeting with marine research institutes and the Trabzon Chamber of Commerce and Industry, as it was considered that their interests and questions concerning the Project could differ and holding two meetings would ensure that engagement was tailored to the interests of the stakeholders.

Representatives of South Stream Transport presented information about the Project, the Scoping Report and the ESIA process, followed by a 'Question and Answer' session (Figure 6.7). The meetings were organised to facilitate the exchange of information and opinions, and allowed representatives of South Stream Transport to answer questions and to listen to stakeholder views and concerns related to the ESIA process, anticipated Project impacts and proposed mitigation measures.

Figure 6.7 Roundtable Meeting in Istanbul

At all four meetings (Figure 6.8 and Figure 6.9), visual and printed materials were made available to support the presentations and discussion, including additional copies of the Scoping Report and the NTS, as well as leaflets describing the Project and the ESIA process.

Figure 6.8 Presentation, Panel and Project Information Display at Roundtable Meeting in Istanbul

Figure 6.9 Roundtable Meeting in Ankara

There were also visual displays illustrating various aspects of the Project and the ESIA process. Translation was provided (Turkish and English) where necessary.

Representatives of the various stakeholder groups were invited to provide comments and suggestions both in the meeting itself and afterwards by filling out a Comment Form or submitting comments via the Project ESIA email address or by post. Participants also had the opportunity to speak individually with representatives of South Stream Transport after the question and answer sessions were finished.

Details of all discussions were documented by South Stream Transport and informed later stages of the EIA and ESIA, planning and design.

Overall, the meetings were positive, with stakeholders willing to contribute constructively and provide their feedback in a dialogue with the Project. However, the turnout to the meetings was low which can be attributed to the distance of the Project from the Turkish coastline and the relatively limited impacts envisaged, resulting in low levels of interest among stakeholders.

The most frequently raised comment by stakeholders was related to impacts on fish, particularly migratory species of commercial importance to Turkish fisheries. The issue of safety, and the response plans in place to deal with an unplanned event such as a gas leak or vessel collision, was also raised. Other comments related to impacts on the marine environment and environmental protection, and the stakeholder engagement and ESIA process in general.

The comments made in these discussions are described in Section 6.5 and Appendix 6.1 shows where they are discussed in this ESIA Report.

In addition to the ESIA public consultation activities, courtesy hard copies of the Scoping Report and NTS were submitted to the MoEU and MoFA for review and they were invited to comment in writing. Representatives of South Stream Transport were available to meet with the authorities if they wished to discuss the Report directly. However, no comments or meeting requests were received.

6.4.1.4 Completed Activities – Interim ESIA Consultations

Project updates were sent to stakeholders who participated in the Scoping meetings in May 2014. In addition, meetings were held with the East Black Sea Fisheries Cooperative Union (based in Trabzon) and the Samsun Union of Fisheries Cooperatives to provide them with an update on the Project, disclose the findings of the Fisheries Study (see Appendix 9.1), and discuss their preferences regarding the disclosure of the ESIA Report and associated consultations. The Sinop Union of Fisheries Cooperatives were also consulted by phone call during this time to elicit their preferences for the ESIA Report disclosure.

6.4.1.5 Completed Activities – Data Collection Meetings

Representatives from South Stream Transport also held meetings with the Turkish authorities to provide updates on the Project, discuss technical issues and gather baseline data and information to input into the EIA and ESIA reports. Although feedback from these meetings related mainly to the EIA process, the comments relevant to the ESIA are summarised in Section 6.5 and a full list of comments is provided in Appendix 6.1.

Further to the feedback received during the Scoping process, efforts were also made to contact fishing cooperatives unions and marine research institutes to gather further information and data on Turkish fishing activity in and around the Project Area. This engagement was undertaken primarily by email and phone. Further information on Turkish fishing was also received during the interim ESIA consultation meetings with fisheries in Trabzon and Samsun in May 2014.

6.4.1.6 Completed Activities – National EIA Report

The draft EIA Report was submitted to the MoEU on 28 November 2013 in accordance with Turkish EIA requirements. The MoEU and Sinop PDEU disclosed the draft EIA Report on 19 December 2013 and announced the commencement of the 'review and evaluation process'. Under the Turkish EIA requirements, further Public Participation meetings on the draft EIA Report are not required, unless specified by the MoEU. Due to the lack of public interest to date, public consultation on the draft EIA Report was limited to website disclosure.

The draft EIA Report was published on the MoEU's website (http://www.csb.gov.tr) and printed copies were available for review on request and the Sinop PDEU office. Stakeholders could review the EIA Report and submit comments up to the time of the EIA Review and Evaluation meeting. The MoEU are responsible for collecting all comments received during this period to be considered at the Review and Evaluation meeting and incorporated into the EIA Report by the Project Proponent where necessary. However, the Project understands that no additional comments were received from the public during this period.

The EIA Review and Evaluation meeting was held on 8 January 2014. The majority of the REC members' opinions considered the draft EIA Report to be satisfactory in terms of the assessment and proposed mitigation measures. South Stream Transport was requested to provide more data from the marine surveys carried out in 2011 and 2012, and reach an agreement on the crossing of oil and gas exploration blocks, before submitting the final EIA Report. It was determined that a second EIA Review and Evaluation meeting was not necessary.

The final EIA Report was submitted to the MoEU on 9 May 2014 and was published via the website of the MoEU and Sinop PDEU. Stakeholders will have the opportunity to review the final report and submit any final comments to the MoEU or PDEU prior to the approval of the EIA Report.

6.4.1.7 Completed Activities – Black Sea Commission

In November 2012, an introductory meeting was held with the Permanent Secretariat of the Commission on the Protection of the Black Sea Against Pollution in Istanbul to inform them about the South Stream Offshore Pipeline. This meeting discussed the EIA/ESIA process of the entire South Stream Offshore Pipeline as well as transboundary aspects, particularly in relation to relevant Conventions, such as Espoo and Aarhus.

At the request of the Permanent Secretariat, South Stream Transport sent a follow up letter and presentation to the Permanent Secretariat in November 2012 containing further information about the South Stream Offshore Pipeline to be distributed to members of the Black Sea Commission during its Annual Meeting in the same month. South Stream Transport has provided courtesy updates to the Permanent Secretariat at regular intervals regarding the status of the EIA and ESIA processes in each of the affected countries (Appendix 6.2: Engagement Activities to Date).

6.4.1.8 Planned Activities – ESIA Disclosure and Consultation

The consultation programme for this draft ESIA Report has considered the combined outcomes of both EIA and ESIA engagement activities to date. An overview of the draft ESIA Report engagement programme is presented below, whilst the SEP contains more detailed information on the engagement programme. The SEP is available on the South Stream Transport website, and copies will also be made available for review during the ESIA disclosure period.

The focus of further engagement activities during the ESIA process is to ensure that stakeholders are provided with the opportunity to:

- Access clear and appropriate information (i.e. non-technical, local language) information on the Project and its potential impacts;
- Provide feedback on the content of the ESIA including the assessment of impacts, and the proposed mitigation, management and monitoring measures; and
- Provide input regarding plans for future engagement activities, including preferences for methods, materials and schedule.

Whereas the legal provisions for public consultation and disclosure for the national EIA process end following the 'review and evaluation process' of the draft EIA Report, for the international ESIA process, engagement goes beyond ESIA Report disclosure and consultation and continues during the Construction and Pre-Commissioning, Operational and Decommissioning Phases of the Project. This reflects the recognition that relationships with stakeholders are on-going throughout the life of a project and on-going engagement will ensure that stakeholders are consulted about activities that may affect them at any stage of a project.

This draft ESIA Report has been publicly disclosed, along with an NTS of the Report. These documents are available online at www.south-stream-offshore.com, along with information about upcoming stakeholder engagement activities and the ways in which stakeholders can provide comments on the Project and the ESIA Report. Announcements have been made through local and national media. Documents and announcements have also been provided directly to the key stakeholders identified to date.

Alternatively, interested stakeholders can contact South Stream Transport to request a copy of the ESIA Report, NTS, or other information via the communication channels shown in Table 6.4.

Stakeholders have the opportunity to comment in writing and to attend public meetings in Istanbul, Ankara and Trabzon to discuss the Project, the draft ESIA Report and related documentation. The public meetings will allow stakeholders to express their views and ideas about the Project and the ESIA to representatives of South Stream Transport and the ESIA consultants, as well as to provide additional information or suggestions to assist the ESIA process. A public meeting is not planned for Sinop, as stakeholder interest in the Project in this location has thus far been low.

Table 6.4 Contact Information

South Stream Transport B.V.	**Email**: esia@south-stream-transport.com
	Website: www.south-stream-offshore.com
	Phone: +31 (20) 262 4500
	Fax: +31(20)524 1237
	Post: ESIA & Permitting Team, Parnassusweg 809, 1082 LZ, Amsterdam, Netherlands

Fisheries in Trabzon and Samsun have indicated that they have sufficient information about the Project and its potential impacts, therefore do not consider additional consultations on the ESIA Report to be necessary. Copies of the ESIA Report and NTS, have been provided to the cooperatives to distribute among their members as well as appropriate means of providing feedback on the Project, and additional consultation meetings will be scheduled upon their request. Similarly, ESIA documentation has been provided to fisheries cooperatives in Sinop and they have indicated that they may request a separate ESIA consultation after reviewing the report.

Comments received on the draft ESIA Report will be taken into consideration in the preparation of the final ESIA Report. The final ESIA Report will be disclosed on the South Stream Transport website and will inform later phases of the Project.

6.4.2 Construction and Pre-Commissioning, Operational and Decommissioning Phases

Stakeholder engagement will continue over the life of the Project throughout the Construction and Pre-commissioning, Operational and Decommissioning Phases. With an operational life of 50 years, South Stream Transport is committed to maintaining relationships and communications with stakeholders over this time.

Once the ESIA process is complete, subject to the necessary approvals and permissions, the Project moves to the next phase: Construction and Pre-Commissioning. During this phase, and in subsequent phases, the emphasis of engagement shifts to focus on consultation and disclosure about activities that are ongoing or about to take place, and receiving feedback from stakeholders about ongoing activities.

Engagement activities will include published announcements and updates about the progress of the Project. The Grievance Procedure will also be a key element of the Construction and Pre-Commissioning Phase and later phases of the Project. Plans for ongoing stakeholder engagement are described in more detail in the SEP, which will be updated as the Project progresses. Engagement activities will be adjusted to reflect evolving stakeholder preferences and concerns over the life of the Project.

6.5 Stakeholder Comments and Suggestions

6.5.1 Overview

This section summarises the comments and suggestions received from stakeholders during the EIA and ESIA consultation processes to date and how these comments have been considered and responded to in this ESIA Report. The feedback received has been divided into that from:

1. The competent authorities i.e. Turkish national, regional and local government, primarily gathered during meetings related to the EIA process and summarised in Section 6.5.2; and
2. The public and non-governmental stakeholders (e.g. fisheries and marine area users, NGOs, Inter-governmental organisations, fisheries unions and cooperatives, academic and scientific organisations) engaged primarily through the ESIA process and summarised in Section 6.5.3.

A full list of the comments received is provided in Appendix 6.1.

6.5.2 Competent Authorities

Throughout the course of the Project, South Stream Transport has maintained a continual and open dialogue with the Turkish authorities.

The two key stages of engagement with Turkish competent authorities were the EIA SSFD meeting in July 2013 and the EIA Report Review and Evaluation meeting in January 2014. In addition, a number of introductory meetings were held with competent authorities to introduce the Project and to discuss aspects of procedures relating to the EIA and permitting processes. Ongoing engagement has also occurred with members of the EIA REC to receive information and data primarily for the EIA Report, but which also acted as input for this ESIA Report.

Of the engagement with competent authorities to date, the most frequently cited topics have concerned:

- The protection of cultural heritage objects (CHOs; namely, shipwrecks) in the Turkish EEZ;
- Ensuring that the Project does not affect commercial fishing activity;
- Ensuring that appropriate measures are taken to ensure navigational health and safety, and to respond to emergency or unplanned events (e.g. a spill or gas leak);
- Appropriate coordination with authorities responsible for oil and gas exploration in the Turkish Black Sea; and
- Appropriate measures to manage waste generated by the Project.

The key comments, of relevance to the ESIA processes, are summarised in Table 6.5, along with an explanation of how the Project has considered and responded[9] to each comment. Further details are provided in the relevant chapters of the ESIA Report.

Table 6.5 Comments Received from Competent Authorities

Comments	Consideration and Response
Approval and Authority Involvement	
Clarifications regarding the sharing of survey data with Turkish authorities and scientific institutions.	All survey data accrued by the Project has been shared with the MoFA, who are authorised to share this data with the relevant Turkish authorities and institutions. The same procedure will apply to any future survey data that is gathered.
Cultural Heritage	
The Project must avoid damage to any identified CHOs. Turkish authorities must be informed immediately of potential CHOs identified during survey or pipe-laying activities.	The Project has notified the MoFA and the Ministry of Culture and Tourism (MoCT) of all potential CHOs identified within the 2 km survey corridor in the Turkish EEZ, and provided the relevant data to this effect. The Project has committed to avoiding all known CHOs by 150 m thus limiting any potential for adverse impacts on these objects. This avoidance strategy has been communicated to the MoFA and MoCT. The MoCT had recommended an avoidance buffer of 100 m from known CHOs. Should any previously unknown CHO be encountered during construction, the Project will implement the Project chance find procedure and inform the relevant Turkish authorities. Further details can be found in **Chapter 10 Cultural Heritage**.
Design and Schedule	
What is the duration of the construction phase in the Turkish EEZ?	Construction activities are planned to run from early 2015 to mid-2017 in the Turkish Sector. The timeline for construction can be found in **Chapter 5 Project Description**. This timeline has been communicated to the Turkish authorities and has also been contained in the EIAAF, Scoping Report and EIA documentation. The relevant Turkish authorities will be informed of any changes in the construction timeline.

Continued…

[9] Note that the responses provided are intended to be technically correct at the time of writing. Due to the evolution of Project planning, design and schedule, this may not be the same as the response that was provided at the time the question or concern was raised.

Comments	Consideration and Response
How will the pipelines be laid and will any equipment or materials be used to stabilise the pipeline on the bottom of the seabed.	The pipelines will be laid directly on the seabed. The pipe-lay technique is described in **Chapter 5 Project Description** where it is also confirmed that no excavation or filling (seabed intervention) will be required in the Turkish Sector. This information has been communicated to the Turkish authorities and has also been contained in the EIA documentation.
What would happen in the event of a gas leak, and how will such a leak be detected?	The pipelines will be continually monitored, in real time, from the landfall facilities in Russia and Bulgaria and at a control room in Amsterdam. In the unlikely event of a leak, the pipeline would be shut down immediately. The ESIA includes an assessment of potential impacts associated with unplanned events such as a gas leak in **Chapter 13 Unplanned Events**. This information has been communicated to the Turkish authorities and has also been contained in the EIAAF, Scoping Report and EIA documentation.
What is the procedure for undertaking repair work to the Pipeline?	Although the probability of failure of a properly designed and installed deep-water pipeline is negligible, South Stream Transport will employ an Emergency Pipeline Repair Strategy (EPRS) for the South Stream Offshore Pipeline to be utilised in the event of damage to any of the pipelines. Further information can be found in **Chapter 5 Project Description**.
Environmental Protection (Marine)	
The Project must undertake an assessment into the potential impacts on pelagic migratory fish species, and impacts on commercial fishing activities in the Turkish Black Sea.	South Stream Transport has assessed impacts on Turkish fishing activity. An international specialist company from the UK conducted a fisheries study for the Project. Local fishing workers, Turkish fisheries experts and the Turkish Ministry of Food, Agriculture and Livestock have been consulted during the ESIA process to assess fishing and migratory issues. The fisheries study examined the migratory routes of commercially important fish species. Of these, only the anchovy was known to migrate through the Project Area. No significant impacts are expected on fish migrations or fishing activity in the Turkish EEZ. Further detail can be found in Appendix 9.1 Fisheries Study and in **Chapter 9 Socio-Economics**. This information has been communicated to the Turkish authorities and has also been contained in the EIA documentation.

Continued…

Comments	Consideration and Response
Compensatory measures should be in place for any pollution caused within the Turkish EEZ, or any pollution related to transboundary incidents from the Russian and Bulgarian Sectors of the South Stream Offshore Pipeline.	In the unlikely event of a significant pollution incident within the Turkish EEZ, or related transboundary impacts, which are a direct result of the construction and operational activities of the South Stream Offshore Pipeline, necessary actions will be taken to compensate any damages in Turkey's maritime jurisdiction, covering the Turkish EEZ, territorial waters and coast, in coordination with the relevant authorities. A commitment to this effect has been included in the EIA Report. Further information on the mitigation and management plans to minimise the potential for such events, and respond to them should they occur, can be found in **Chapter 13 Unplanned Events** and **Chapter 16 Environmental and Social Management.**
Owing to the special status of the Black Sea marine environment, the Project must ensure that waste is managed in accordance with applicable national and international regulations.	Project vessels will comply with MARPOL requirements and national regulations. This has been discussed and approved with the relevant Turkish authorities during the EIA process and has also been contained in the EIAAF, Scoping Report and EIA documentation. Further information on waste management can be found in **Chapter 12 Waste Management.**
The Project should undertake monitoring throughout the lifetime of the Project to manage potential impacts on the environment.	Monitoring requirements for the Project are specified in the technical chapters of this ESIA Report. Monitoring requirements for the Project were also discussed and agreed with the MoEU as part of the EIA process, and are included in the EIA documentation.
Health and Safety	
Emergency Response Plan must be prepared by the Project, in coordination with relevant Turkish authorities.	Emergency Response Plans (ERPs) will be prepared for the Project by the construction contractor. South Stream Transport will ensure that contractors' ERPs are integrated with other Project response plans, including South Stream Transport's overarching Emergency Preparedness and Response Plan. An Emergency Response Plan and Risk Assessment is also being prepared by a licensed Turkish institution as requested by the MoEU and forms part of the EIA approval process. This plan will feed into the Project's overarching Emergency Preparedness and Response Plan. Further information can be found in **Chapter 13 Unplanned Events** and **Chapter 16 Environmental and Social Management**.

Continued…

Comments	Consideration and Response
Advance coordination of activities with relevant authorities to take necessary measures regarding safety of lives, goods, navigation and environment prior to the start of construction activities.	Ongoing engagement has been undertaken with relevant maritime authorities including the Ministry of Transport, Maritime Affairs and Communications, Turkish Coast Guard, and Turkish Naval Forces to inform them of Project activities and receive feedback to inform necessary navigational measures and procedures. Such engagement will continue up to and during the construction period. Regular notifications will be issued to relevant maritime authorities informing them of the location of the construction spread.
Project Location, Routing and Alternatives	
What is the reason for routing the Pipeline through the Turkish EEZ?	The proposed Pipeline route in Turkey was influenced by the selected locations of the landfalls in Russia and Bulgaria and the location of continental slope crossings. The route from Anapa (Russia) to Varna (Bulgaria) via the Turkish EEZ proved to be the most viable based on commercial, environmental, socio-economic and technical criteria. No significant engineering, environmental or social constraints were identified in Turkish waters and as such direct line routes were initially adopted within the preferred corridor. The routing through the Turkish EEZ is also subject to two bilateral agreements between the Turkish Government and the Russian Government. These agreements specify the conditions to be met for the construction of the Project. Further information can be found in **Chapter 2 Policy, Regulatory and Administrative Framework** and **Chapter 4 Analysis of Alternatives**.
There are areas within the Black Sea where unexploded ordnance are dropped. These areas are known by the military forces of the countries surrounding the Black Sea. Although these areas are not within the South Stream Transport Project Area, the Project should remain aware of these areas and avoid them during construction.	The Project has engaged with relevant marine authorities in Turkey concerning military areas and dumping grounds for unexploded ordinance. South Stream Transport will carry out a unexploded ordinance (UXO) survey along the route in the Turkish EEZ well in advance of pipe-laying, to confirm that there are no UXOs along the Project route. A UXO clearance plan (if required) will be developed by South Stream Transport in close conjunction with the relevant authorities at the appropriate time.

Continued…

Comments	Consideration and Response
Issues related to the crossing of oil and gas license blocks, in particular potential hindrances this may pose to potential exploration or drilling activities.	Turkish Petroleum Corporation (TPAO) is responsible for oil and gas license blocks through which the Project passes, and has been engaged throughout the EIA and ESIA processes. In response to concerns raised by TPAO regarding the width of the pipeline route, route optimization has been undertaken to reduce the overall width of the Project footprint to 420 m, which includes the four pipelines and a safety zone either side of the outermost pipelines, in order to comply with TPAO's requests in this regard.
The interface between the Project and potential military exercise areas during construction should be evaluated. South Stream Transport should be informed of exercise periods and provide notifications to relevant parties for marine/navigation safety.	The Project is known to cross a designated military exercise area. Notifications of pipe-lay vessel movements will be regularly issued to the relevant Turkish authorities during construction, and this commitment is captured in the EIA documentation.

Complete.

6.5.3 Public and Other Non-Governmental Stakeholders

This section summarises the feedback received from the public and other non-governmental stakeholders (e.g. marine area users including fisheries, NGOs, inter-governmental organisations, academic and scientific organisations) who were invited to provide comments during:

1. The EIA Application File disclosure and consultation period, including the Public Participation Meeting[10]; and
2. The ESIA Scoping Report disclosure and consultation period.

Feedback from the public and non-governmental stakeholders during the EIAAF disclosure and consultation period was minimal and included four comments raised at the Public Participation Meeting in Sinop. Feedback during the Scoping Report disclosure and consultation period was received through a series of roundtable meetings and in writing. Whilst stakeholders also had the opportunity to provide comments and suggestions outside of these official periods by contacting South Stream Transport or its consultants by telephone, email or post, no further public comments have been received to date.

The most common topics raised included the following:

- Potential impact of the Project on fish (such as anchovy), and seasonal migration patterns in particular, and the potential impact on fisheries;

[10] No public comments were received by the MoEU or PDEU as part of the national EIA process.

- Questions regarding the safety of the Pipeline and the risks of unplanned events such as gas leaks of vessel collisions, as well as the safety measures that would be put in; and
- Questions about potential impacts on the marine environment, unplanned events, and environmental protection.

Stakeholder feedback is summarised in Table 6.6, which contains a summary of the main comments, issues and questions raised by stakeholders and how these have been considered and responded[11] to by the Project. A full list of all comments raised is provided in Appendix 6.1.

Table 6.6 Summary of Public and Other Stakeholder Comments

Comments	Consideration and Response
Environmental Protection (Marine)	
Fishery organisations are especially dependent on catch in the Black Sea region and highlighted the importance of the migratory routes of certain commercially important fish species. Questions about the planned construction schedule, and whether this will impact on the anchovy migration period and Turkish fishing activity.	South Stream Transport has assessed potential impacts on Turkish fishing activity. An international specialist company from the UK prepared a separate fisheries study for the Project which can be found in Appendix 9.1 of this ESIA Report. Local fishing cooperatives, Turkish fisheries experts and the Turkish Ministry of Food, Agriculture and Livestock have been consulted during the ESIA process to assess fishing and migratory issues. The potential interaction between the construction schedule and the migration of anchovies across the Project area has been considered in the EIA and ESIA Reports. This included an assessment of the potential impact of underwater noise on anchovy migration. No significant impact on fish migrations, or fisheries activities, in the Turkish EEZ is expected. Impacts on fishing are assessed in **Chapter 9 Socio-Economics**, while impacts on fish are assessed in **Chapter 8 Biological Environment.** The conclusions of the fishing study have also been communicated in the EIA documentation.

Continued…

[11] Responses to comments or questions raised at meetings were provided to the stakeholder at the time. The responses provided below are intended to be technically correct at the time of writing. Due to the evolution of Project planning, design and schedule, this may not be the same as the response that was provided at the time the question or concern was raised.

Comments	Consideration and Response
Need to consider potential impacts from invasive species entering the Black Sea and the management of the discharge of Project ballast waters into the Black Sea. Questions about where the pipes and pipe-laying vessels will come from, and if the vessels are coming from outside the Black Sea, will they empty ballast water into the Black Sea.	Given the historic issues with invasive species within the Black Sea, South Stream Transport understands that the issue of ballast water management is of high importance to this region. The issue of ballast water discharges has been discussed in the EIAAF, Scoping Report and EIA documentation. Project vessels will voluntarily adopt the International Maritime Organisation (IMO) Ballast Water Convention and will have a ballast water management plan as part of the environmental and social management plans drafted for the Project. Further information is contained in **Chapter 13 Unplanned Events**.
Question about disturbance to seabed sediments from pipe-laying and whether this could potentially impact the marine environment.	Sediment characterisation surveys were conducted in 2011. The depth and low concentration of heavy metals and contaminants, as well as the distance from ecological receptors, means that South Stream Transport does not expect a significant impact on water or sediment quality. Pipes will be laid directly onto the seabed and there will be no seabed intervention in Turkey. Any dispersed sediments during pipe-laying will not travel far as the water currents at this depth are weak, causing the sediments to settle back onto the seabed. Further information is contained in **Chapter 7 Physical and Geophysical Environment**, and is also included in the EIA documentation.
Questions about impacts on the marine environment and marine species in the event of an unplanned gas leak or oil spill. A comment was made that the density of gas is lower than water, therefore, in the event of gas leak, surface marine life (e.g. plankton, fish) would be impacted.	The likelihood of such events occurring is remote. In the event that such incidents occur, the design controls and mitigation measures in place will ensure that the potential consequences would be limited, temporary and localised, therefore would not significantly impact any ecological species present in the water column. Further detail is provided in **Chapter 13 Unplanned Events**.
Health and Safety	
Concerns about potential Project-related gas leaks and accidents, and the risk this may pose to the coastal populations. Questions about how the Project would respond to unplanned events and what plans and procedures were in place to manage these situations.	Although the likelihood of occurrence is very small plans will be in place to avoid and respond to accidents and other unplanned events. No significant impacts on the Turkish coastline are expected due to the distance of the Project from the Turkish coastline (over 110 km). The risk of unplanned events, their consequences, and the mitigation and management plans the Project will have in place to avoid or respond to these events is discussed in **Chapter 13 Unplanned Events**.

Continued…

Comments	Consideration and Response
Questions about safety and security measures to minimise risk, and how the pipeline would be maintained over time.	South Stream Transport has committed to designing, building and operating the pipeline according to strict quality and safety standards. The pipeline will be built in accordance with pipeline industry standards, notably those of Det Norske Veritas (DNV), and European Standards (EN) for additional guidance where necessary. The pipelines will be continually monitored, in real time, from the landfall facilities in Russia and Bulgaria and at a control room in Amsterdam. There will also be regular visual inspections underwater using a Remotely Operated Vehicle (ROV). In the unlikely event of a leak, the pipeline would be shut down immediately. The ESIA includes an assessment of potential impacts associated with unplanned events such as a gas leak. Emergency Response Plans will also be implemented. Further information can be found in **Chapter 5 Project Description** and **Chapter 13 Unplanned Events**.
How much gas would escape in the event of a leak?	In certain regions in the Project Area, the operating pressure of the pipeline will be lower than the surrounding water pressure; as such, instead of gas release in the event of an accident, water will actually ingress into the pipeline. In sections where the gas pressure is higher than the ambient pressure, any released gas will be dispersed over a wide area by the time it reaches the surface where it will then be released into the atmosphere. Any escape of gas will be short-lived as the pipelines will be continuously monitored and will be shut down in the event of a rupture. No significant impact on health, safety, or the environment is expected. These issues are assessed in **Chapter 13 Unplanned Events**.
Concerns about the risk of vessel collisions and the dangers of a ship sinking and causing damage to the pipeline, as the Black Sea is a busy shipping route.	The baseline has identified that the Project Area is crossed by a number shipping routes. South Stream will work with the relevant maritime authorities to ensure other vessels are aware of the location of and restrictions around the construction spread. The collision risk analysis carried out for the Project has concluded that the probability of a collision during construction is extremely low. **Chapter 13 Unplanned Events** has also determined that the likelihood of a ship sinking and damaging the pipeline is remote.

Continued…

Comments	Consideration and Response
Questions relating to other safety components of the Project's design, such as whether there were valves or 'shutdown points' along the Turkish Sector.	There will be no valves in the Turkish sector; however the entire offshore section of the Pipeline can be shut off from closing valves at the landfalls (in Russia and Bulgaria) should an incident occur. Further details on the pipelines safety components can be found in **Chapter 5 Project Description**.
Fish will be attracted to the lights used by the pipe-laying vessel during the night. Large commercial fishing vessels may follow the fish to the source of light as it will increase their catch and so may surround the pipe-laying vessel. This may pose a health or safety risk, so fishing vessels should be informed about construction activities.	A proposed navigational safety exclusion zone of 2 km radius will be established around the pipe-laying vessel during construction. This will be communicated to all relevant maritime authorities, including the Turkish Coast Guard, and regular notifications on the pipe-lay vessels position will also be issued to the Turkish authorities. Consultations with fisheries in May 2014 indicated that these notifications procedures will be sufficient to ensure that no vessels attempt to breach the exclusion zone, as fishing vessels will be notified of restrictions by the Turkish Coast Guard. Prior to construction start in Turkish waters, the Project will engage with fisheries and vessel operators as appropriate to provide information directly in addition to the official measures to ensure that they are aware of Project activities and the navigational safety measures being taken. Further information on navigational safety measures is provided in **Chapter 5 Project Description**, and **Chapter 13 Unplanned Events**.
EIA/ESIA Processes and Reports	
Request that South Stream Transport share the data from the marine surveys that have been conducted along the Pipeline route.	South Stream Transport recognises the potential value of the marine survey data collected to date to Turkish stakeholders, in particular the scientific community. South Stream Transport has and will continue to share data from surveys with the competent authorities. A robust baseline is provided within the ESIA and EIA reports, which includes majority of the survey data available. Any recent studies and assessment undertaken for the Project during the preparation of the EIA and ESIA Reports have been provided in the appendices for further information.

Continued...

Comments	Consideration and Response
The Project was asked whether all the commitments in the draft EIA Report would be fulfilled by South Stream Transport.	The EIA and ESIA reports have been prepared according to national and international requirements respectively. These reports make various commitments to mitigate impacts. All commitments will be captured in the Project's Environmental and Social Management Plan. Monitoring will also be undertaken to verify the effectiveness of the mitigation measures and management plans in minimising Project impacts. Further information is provided in **Chapter 16 Environmental and Social Management**.
The methodology for baseline data collection and sampling is an important part of the impact assessments and analysis, especially for the area of biodiversity. Stakeholder input should be incorporated into this process.	The sampling methodology and criteria for assessing the baseline conditions within the Project Area have been provided in the technical chapters within this ESIA Report. Where relevant, stakeholder input has guided and been incorporated into baseline studies and impact assessments. With specific reference to biodiversity, the ESIA has identified the Black Sea as a critical habitat for certain seabirds and cetaceans, therefore there is an additional requirement for biodiversity monitoring/research. A Biodiversity Action Plan (BAP) will be developed which will seek to achieve net biodiversity gains by identifying additional opportunities to protect and conserve biodiversity. The implication of this for the Project's monitoring programme, particularly for birds and mammals, is that it must be appropriately designed to enhance scientific knowledge and thereby improve conservation measures for those species of conservation concern. The scope of such programmes will be developed in consultation with relevant parties to ensure the maximum benefit is delivered. Further information is contained in **Chapter 8 Biological Environment** and **Chapter 16 Environmental and Social Management**.
Stakeholder Engagement	
The Project should engage with stakeholders and relevant organisations, above and beyond the Turkish legal minimum requirements.	South Stream Transport has carried out stakeholder engagement in accordance national and international requirements. Engagement activities to date, and planned, go beyond the minimum legal requirements in Turkey. Stakeholder engagement activities are described in this chapter (**Chapter 6 Stakeholder Engagement**).

Continued...

Comments	Consideration and Response
The Project should continue to engage with fisheries so that they are aware of Project activities.	The Project has engaged with fisheries throughout the ESIA process to collect baseline information and feedback on potential Project impacts. Further engagement will occur around the disclosure of this ESIA Report to ensure that fisheries are made aware of the Project and have another opportunity to comment on the assessment of impacts and proposed mitigation and management measures that will be implemented. Beyond the ESIA process, the Project will engage with fishery groups through appropriate platforms to inform them of upcoming construction activities, as well as Project activities that have been completed, and provide advance warning of any anticipated changes. Fishery groups have suggested (May 2014) that such engagement could take place at the regular national symposiums on fishing, as well as via other means to be agreed directly with individual groups. Further information on planned future engagement activities is contained in the Stakeholder Engagement Plan for the Turkish Sector which can be found at www.south-stream-offshore.com.
Noise and Vibration	
Underwater noise and vibration from pipe-laying vessels could impact marine species. Noise, vibration and light from construction vessels may impact on the migration of anchovies.	In response to stakeholder concerns about the impact of underwater noise on marine species, South Stream Transport have commissioned a separate underwater noise modelling assessment (Appendix 8.1: Underwater Noise Assessment) to evaluate the potential level of underwater noise and vibration generated and whether this will impact marine species in the Black Sea. The assessment of impact and proposed mitigation measures relating to underwater noise and lighting impacts on marine species can be found in **Chapter 8 Biological Environment**.

Continued...

Comments	Consideration and Response
Social	
It was noted that whilst the Project is unlikely to impact aquaculture as most spawning cages are located within 1 km from the Turkish coast, there is a possibility of impacts from construction support vessels passing nearby, or in the event of a gas leakage or oil spill.	No Turkish ports will be used so impacts on coastal aquaculture are not anticipated. The potential for spills to impact Turkish coastal waters is considered unlikely, and is discussed in **Chapter 13 Unplanned Events** and the oil spill modelling appendix (Appendix 13.1: Maritime Risk Assessment and Oil Spill Modelling).
Although fishing does not occur in the Project Area, Atlantic bonito has recently been caught close to the Project Area so it is possible fishing might take place in this area again in the future.	As most fishing activity occurs in Turkey's coastal waters, it is unlikely the Project will impact commercial fishing activity given the distance of the Project from the Turkish coast (minimum 110 km). This conclusion has been verified by the Project's engagement with local fisheries workers, fishing cooperatives and unions, fisheries experts and the General Directorate of Fisheries and Aquaculture under the Ministry of Food, Agriculture and Livestock. Further information can be found in **Chapter 9 Socio-Economics**.
The Project should consider potential impacts on subsea cables in the Turkish EEZ.	There are no known planned or existing subsea cables which would intersect with the Project Area. This has been verified with Turkish authorities.
What environmental and social investment programmes are being considered by the Project?	South Stream Transport has a Community Investment Programme (CIP) for the overall South Stream Offshore Pipeline. The initiatives of this programme will be developed with stakeholders and have not yet been defined.
Expectation that the Project will reduce unemployment in the local area.	No facilities will be constructed by South Stream Transport in Turkey and no Turkish ports will be used. The majority of the offshore construction work force required will be highly skilled and specialised, and are anticipated to come from outside Turkey. Personnel employed during offshore construction will be managed by the offshore construction contractor.

Continued…

Comments	Consideration and Response
Transboundary Impacts	
A new branch of anchovy migration has developed in the last 3-4 years, starting from Bulgaria and migrating through the Western Black Sea coast into Turkey. This in-migration starts in February, and a lot of Turkish fishing vessels travel to the Western Black Sea region to catch anchovy during this period. If construction activities in Bulgaria disrupt the anchovy in-migration to Turkey, this impact on Turkish anchovy catches.	The fisheries study undertaken has assessed the impacts on fish and fisheries in Turkey, Bulgaria, and Russia, including potential transboundary impacts. The study has concluded that there are no significant impacts on anchovy migration from construction and operation of the South Stream Offshore Pipeline in the Bulgarian Sector, therefore no impacts on catch in the Turkish Sector are anticipated. The conclusions of the fisheries study were shared with the fisheries co-operatives in Trabzon and Samsun in May 2014. Both co-operatives stated that the conclusions concurred with their own views on the potential impacts of the Project on fishing. South Stream Transport will continue to engage with Turkish fisheries to ensure that the actual level of impact of Project activities is not greater than predicted in this ESIA Report. Further information on impacts on fisheries and proposed mitigation and management measures are included in **Chapter 9 Socio-Economics** and **Appendix 9.1 Fishing Study**.

Complete.

6.6 Conclusions

Comments received from stakeholders to date, whether verbally or in writing (and irrespective of whether or not the primary purpose of the meeting was to seek comments on the scope of the ESIA Report), have been considered and addressed, where relevant, in this ESIA Report. Comments from stakeholders have informed the baseline studies, the identification and assessment of impacts, and the definition of mitigation and management measures.

Some comments raised by stakeholders highlighted the need for additional areas of study, which the Project has incorporated, demonstrating how stakeholders have informed the EIA and ESIA processes. For example, stakeholder concerns about the potential impact of the Project on fish (especially anchovy) and seasonal migration patterns resulted in additional fisheries studies. Appendix 9.1: Fisheries Study, reviewed the main commercially important fish species in Turkey, their migration routes, spawning grounds and feeding areas. An underwater noise assessment (Appendix 8.1) was also undertaken to support the assessment of impacts on fish species in the Black Sea.

The Project is committed to ongoing stakeholder engagement and welcomes feedback and comments from stakeholders over the life of the Project. The Stakeholder Engagement Plan will be periodically updated as the Project progresses through, and beyond, construction.

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Ref. 6.10	Convention on Access to Information, to Public Participation in the Decision Making Process and the Administration of Justice concerning Environmental Matters (Aarhus Convention). 1998. http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf. Accessed on 7 October 2013.
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Chapter 7: Physical and Geophysical Environment

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7 Physical and Geophysical Environment

7.1 Introduction

This chapter considers the Project's impacts on the physical environment within the Turkish Exclusive Economic Zone (EEZ) of the Black Sea. It identifies physical receptors within the Turkish EEZ (Section 7.2) and provides a description of the baseline conditions (Sections 7.4 and 7.5). Potential impacts on physical receptors associated with the Construction and Pre-Commissioning, Operational and Decommissioning Phases were considered unlikely to be significant and as such have been scoped out of an impact assessment. Information on the rationale for scoping out impacts to physical receptors is given in Section 7.2.

7.2 Scoping

The scope of the physical environment impact assessment for the Project was defined through a process that identified physical receptors and potentially significant impacts related to the Project. Baseline information which informed the scoping process largely drew on information gathered from studies undertaken for the South Stream Offshore Pipeline, including feasibility, engineering and environmental surveys carried out in 2011 to 2012 (Section 7.4). Key steps in the scoping process for the physical environment comprised the following:

- The Project's Front End Engineering and Design (FEED) was reviewed to identify activities with the potential to significantly affect marine physical receptors;
- Physical receptors within the Project Area were identified through a process of secondary data review and surveys undertaken for the Project (Section 7.4) and professional expertise;
- A review of relevant national and international legislative requirements and lender requirements to ensure legislative and policy compliance; and
- An Environmental Issues Identification (ENVIID) was undertaken to assist in the identification of impacts and receptors. During the ENVIID process, each activity was examined to understand how activities were expected to interact with physical receptors, which receptors would be impacted and the nature (positive or negative) of the likely impact. The outcome of the ENVIID was an ENVIID register which identified the various elements of the Project and their interaction or potential impact on sensitive physical receptors.

The following five physical receptors were considered in this chapter:

- Geological processes;
- Hydrodynamic processes;
- Sediment quality;
- Air quality; and
- Water quality.

The Project involves a wide range of activities that could have the potential to impact the physical environment, primarily during the Construction and Pre-commissioning Phase. The relevant activities are summarised in Table 7.1. Decommissioning activities are not known at this time. Good International Industry Practice (GIIP) is usually to leave marine pipelines in situ, which would have impacts indistinguishable from those set out for the Operational Phase. However, for the purposes of this ESIA Report, wholesale pipe removal is also considered, pending a decommissioning assessment to be carried out at a future date.

Table 7.1 Project Activities in the Turkish Marine Environment

Phase	Activity
Construction and Pre-Commissioning	Mobilisation of vessels to and from site and vessel movements within the construction spread (including dynamic positioning).
	Vessel routine operations (including propulsion, cooling water, water maker, bilges and ballast).
	Delivery of pipe and other supplies, as well as crew changes.
	Night time working.
	Laying the pipe on the seabed.
Operation	Physical presence of the Pipeline.
	Pipeline inspection (including ROV surveys etc.) and maintenance that will involve some vessel movements and associated generation of small quantities of wastes associated with routine vessel operations.
Decommissioning (Option 1)	Pipeline cleaning by flushing with water and associated water displacement and disposal.
	Filling pipe with seawater and sealing.
	Vessel operations associated with inspection surveys.
Decommissioning (Option 2)	Lifting of Pipeline from the seabed.
	Seabed intervention, including excavation of buried pipe.
	Associated vessel operations.

The Project has been designed to avoid, minimise or reduce a number of impacts at source through the development of a set of design controls which are set out in Table 7.2. The controls included in Table 7.2 relate to the Construction and Pre-Commissioning, Operational and Decommissioning Phases.

Table 7.2 Design Controls

Design Controls
Water Quality
All vessel discharges and wastes will be compliant with the International Convention for the Prevention of Pollution From Ships (MARPOL) and national regulations, cognisant of the Black Sea's status as an International Maritime Organisation (IMO) special area with respect to garbage and wastes containing hydrocarbons. For information on the regulations governing the discharges of waste and wastewater adopted by the Project refer to **Chapter 12 Waste Management**.
An integrated Waste Management Plan will be drawn up by contractors to ensure wastes are minimised at source, recycled / re-used where possible and otherwise managed responsibly. Adherence to vessel-specific Waste Management Plans which will include provisions for segregating waste on board, having secure areas for storage of hazardous waste and recycling / reuse where practicable.
All bunkering activities will be undertaken in accordance with the Vessels and Marine Transport activity-specific Construction Management Plan (CMP), which will be developed as part of South Stream Transport's Construction Phase Environmental and Social Management Plan (ESMP). The CMP will contain activity-specific requirements, to be met by both South Stream Transport and the appointed contractors (and sub-contractors).
Air Quality
Adherence to national and international legislation regarding fuels.
Systematic monitoring of the condition and the adjustment of the fuel systems of ship equipment.
The main ship engines must be certified in compliance with MARPOL, and priority is given to the equipment which ensures compliance with environmental standards and air protection requirements.
Starting and operating according to manufacturer's recommendations and implanting a schedule of mandatory maintenance to ensure that equipment is functioning properly to minimise emissions.
Maintenance services will monitor the malfunctions of internal combustion engine fuel systems and diagnosing them for the permissible level of harmful substance emissions released into the atmosphere.
As Carbon Dioxide equivalent (CO_2e)* emissions are expected to exceed 25,000 tonnes per year during construction of the South Stream Offshore Pipeline, an inventory of emissions based on actual plant or fuel usage, in order to calculate tonnes emissions per year, will be maintained during construction activities**.

* Equivalent CO2 (CO2e) is the concentration of CO2 that would cause the same level of radiative forcing as a given type and concentration of greenhouse gas.
** International Finance Corporation (IFC) Performance Standard 2012 states that "for projects that are expected to or currently produce more than 25,000 tonnes of CO2-equivalent annually, the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary"

Given the scope of Project Activities (Table 7.1) to be undertaken in the Turkish EEZ, they are unlikely to have any impact on geological and hydrodynamic processes, air and water quality. Therefore an impact assessment, following the methodology given in **Chapter 3 Impact Assessment Methodology**, was not undertaken. As such information on the baseline conditions for these topics has been provided for information only. The rationale for scoping these topics out prior to the impact assessment stage was based on the following:

- Geological processes:
  - There is no scope for Project activities to impact geological processes as there is no seabed intervention. The only activity on the seabed is the placement of pipelines which has no scope to impact geological processes.
- Hydrodynamic processes:
  - The Project activities that could potentially impact hydrodynamic processes (currents, tides, waves) are limited to the physical presence of the pipelines on the seabed. Current speeds at 2,000 metres (m) depth (in which the Project lies) are low (Section 7.5.2.4) and the pipelines will be partially buried as they sink into the soft clayey mud sediments known to occur in the Project Area (Section 7.5.3.5). As such, the potential for Project activities to cause changes in the baseline conditions is limited;
  - The impact would cover a limited area around the pipelines; and
  - In addition, there are no sensitive benthic ecological receptors in the vicinity of the pipelines (**Chapter 8 Biological Environment**) for any changes to hydrodynamic processes to impact.
- Sediment quality:
  - The Project activities that could impact sediment quality include waste / wastewater discharges. All waste discharges from vessels would occur at or near the sea surface (around 2,000 m distance from seabed sediments). Changes in water quality from vessel activities will be localised to the sea surface and around the vessel spread. Any changes are likely to be short-lived as discharges are rapidly diluted and dispersed throughout the water column. As such, there is no potential for Project Activities to cause changes in the baseline conditions of seabed sediment quality;
  - The impact would cover a limited area around the construction vessel for waste discharges and around the pipelines for sediment re-suspension; and
  - There is also potential for re-suspension of sediments from remotely operated vehicle (ROV) use during surveys and the placement of the pipelines on the seabed to impact sediment quality. As the sediments are clayey and will result in limited re-suspension, there are no ecological receptors in the vicinity (**Chapter 8 Biological Environment**), and sediments at that depth are considered unlikely to be contaminated (Section 7.5.3.5), there is no scope for impacts from Project activities on sediment quality.
- Air quality:
  - Construction activities in the Turkish Sector will occur at a distance of at least 110 km from the nearest onshore air quality receptors. The considerable distance from the Project Area to the nearest air quality sensitive receptors (the town of Sinop on the

Turkish mainland) means that pollutants would disperse to the point that the impact on ambient air quality limit values at receptors on land would be **Not Significant** (refer to *impact significance* terminology in **Chapter 3 Impact Assessment Methodology**);

- The area for any modelling assessment of vessel emissions would not include the offshore environment, due to the absence of air quality limit values for assessing impacts upon seawater, marine birds and mammals or other marine biology. A navigation safety exclusion zone of 2 km radius would also be in place centred on the pipe-lay vessel during construction works, which would have the added benefit of avoiding short-term impacts to other marine users from emissions associated with construction vessels;
- The emission source is temporary (approximately 170 days per pipeline). It is also mobile so the impact on a given (stationary) receptor over the course of a year could be considered **Not Significant**;
- Although there is no impact assessment for air quality, a number of design controls measures have been adopted to help minimise any impacts (Table 7.2); and
- The atmospheric emissions have been calculated per pipeline for the Construction Phase of the Project (i.e. the Turkish sector) and are presented in Table 7.3; and

Table 7.3 Atmospheric Emissions from Construction Vessels per Pipeline (tonnes)

Carbon Dioxide (CO_2)	Nitrogen Oxide (NO_X)	Carbon Monoxide (CO)	Particulate Matter (PM)	Sulphur Dioxide (SO_2)	Non-Methane Volatile Organic Compounds (NMVOC)
91,913	2,283	215	44	873	81

- Greenhouse gas (GHG) emissions during the Construction and Pre-Commissioning Phase for the South Stream Offshore Pipeline (Russian, Turkish and Bulgarian sectors) were calculated and are provided in Appendix 7.1 and summarised in **Chapter 5 Project Description** and in Table 7.4. Emissions factors were applied to peak and factored annual fuel consumption to quantify emissions of pollutant averaged out over a year for the long term. CO_2e assumes a greenhouse gas potential of 21 for CH_4, 310 for N_2O and 1 for CO_2. For more information on the methodology used to calculate the GHG, refer to Appendix 7.1: Atmospheric Emissions from the South Stream Offshore Pipeline – Turkish Sector; Construction and Pre-Commissioning Phase.

Table 7.4 Total Greenhouse Gas Emissions during Construction and Pre-Commissioning Phase for all 4 pipelines (tonnes CO_2e)

Russian Sector	Turkish Sector	Bulgarian Sector	Total South Stream Offshore Pipeline System
674,853	94,061	1,003,787	1,772,701

- Water quality:
  - Changes in sediment quality or disturbance of sediments can impact water quality. As stated above, there is no scope for impacts from Project Activities on sediment quality. The Project Activities that could potentially cause disturbance of seabed sediments are ROV use during surveys and the physical presence of pipelines on the seabed. The re-suspension of sediments from these activities could cause changes in deep sea water quality. However, as stated in Section 7.5.3.5, the seabed sediments within the Survey Area at these depths are not considered contaminated;
  - Changes in water quality from vessel activities such as from waste or wastewater discharges will be localised to the sea surface and around the vessel spread. Any changes are likely to be short-lived as discharges are rapidly diluted and dispersed throughout the water column;
  - Changes in water quality have more relevance for indirect impacts on ecological receptors. The indirect impacts of water quality on marine ecology are discussed in **Chapter 8 Biological Environment**;
  - The impact area would cover a limited area around the construction vessel for waste discharges and around the pipelines for sediment re-suspension;
  - Given the above, it could therefore be assumed that the impact area from water quality impacts is localised and Project activities are likely to be **Not Significant** (refer to *impact significance* terminology in **Chapter 3 Impact Assessment Methodology**); and
  - Although there is no impact assessment for water quality, a number of design controls have been adopted to help minimise any impacts (Table 7.2).

As such, no impact assessment was carried out for the physical environment.

7.3 Spatial and Temporal Boundaries

The Project Area is some 470 km in length and 2 km in width, extending along an east west orientation across the north of the Turkish EEZ. Information on Project Area is given in **Chapter 1 Introduction**.

The Study Area for this chapter is defined as the entire abyssal plain of the Black Sea encompassing the Turkish EEZ as physical features of the Black Sea are wide reaching and linked with the features of the entire abyssal plain Black Sea environment.

The Survey Area(s) refers to the area(s) in which surveys were undertaken for the Project during the feasibility and development stages in 2011 and 2012 (Section 7.4). The extents of the Survey Area(s) vary for some receptors and are shown in 7.4.1 to 7.4.4.

7.4 Baseline Data

Secondary data (i.e. data from third parties not specifically acquired for the Project, including literature reviews etc.) and existing primary data (i.e. data acquired specifically for this Project through dedicated surveys) were reviewed prior to scoping. Following this, a data gap analysis was conducted and surveys to collect additional primary data were specified.

The majority of the baseline information used to support this chapter comes from primary data such as the results of marine surveys specifically conducted for the Project in 2011 (Ref. 7.1), and in 2012 (Ref. 7.2). Details of the survey scopes are given in Section 7.4.1 to Section 7.4.4.

7.4.1 Methodology and Data

In order to provide context for the assessment of environmental impacts (discussed in subsequent chapters), baseline information on the physical environment of the region has been collected.

Secondary (i.e. existing data based on desk-based research) and primary data regarding the relevant baseline characteristics have been identified and assessed. Primary data was collected during field surveys. Data on the surveys and methodologies for data collection is given in Section 7.4.4. Information on secondary data used is given in Section 7.4.2.

7.4.2 Secondary Data

Where possible, this assessment is based on primary data. Secondary data were also consulted to inform the baseline of this chapter, as described below:

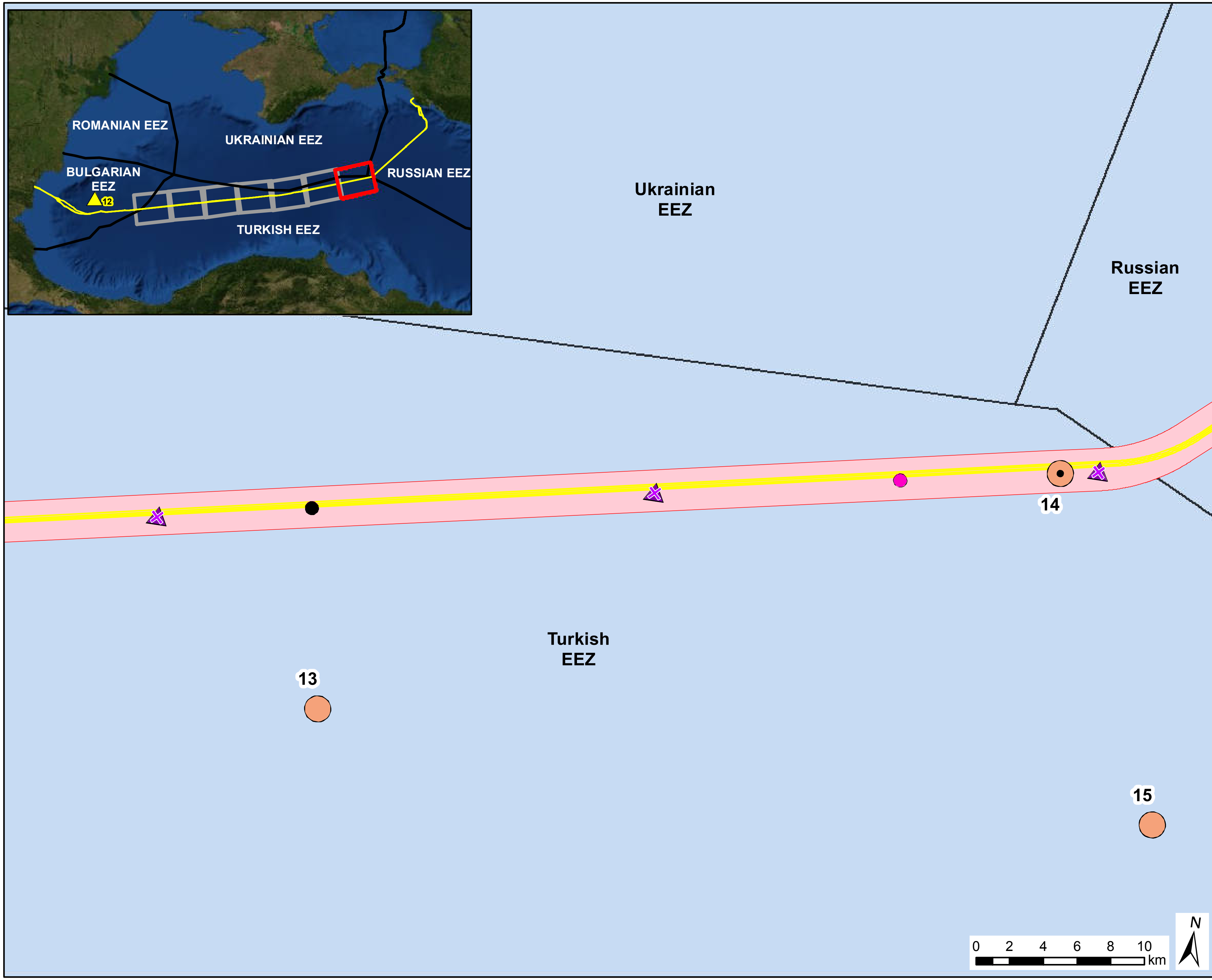
- The 2011 survey reports (Ref. 7.1) included a thorough review of published scientific literature that has been incorporated into this baseline as appropriate;
- Other recent published scientific literature was identified through a British Library data search;
- The Black Sea Meteorological Atlas, prepared by the Turkish Naval Force in 1991 which includes the meteorological conditions of the Black Sea (Ref. 7.3); and
- Meteorological modelling was one of the tools used to identify the meteorological features of the Project Area. The second version of the Climate Forecast System (CFS), i.e. software developed by National Climatic Data Centre (NCDC), was used to generate high resolution historical data in the Project Area (Ref. 7.4).

7.4.3 Data Gaps

As part of the data collection exercise, a gap analysis was conducted to identify any areas where existing baseline data were insufficiently detailed to allow for a robust assessment. However, the data collected from the primary survey data and secondary sources was considered sufficient for the identification of a robust baseline.

7.4.4 Primary Data / Baseline Surveys

A summary of all survey data collected for the Project is given in Table 7.5 and shown in Figure 7.1 to Figure 7.7.



LEGEND

- Marine geophysical / geotechnical Survey & Analysis of geological anomalies
- Metocean Surveys

Marine Sediment Surveys

- Chemical Sampling Locations
- CPT Sampling Locations
- Gravity Core Sampling Locations
- Box Core Sampling Locations
- Piston Core Sampling Locations

Marine Oceanography / Hydrochemistry Surveys

- 1 Water quality sampling locations
- 1 Sediment sampling locations
- 1 Oceanography/ hydrochemistry surveys

Turkish Sector of South Stream Offshore Pipeline

- Proposed offshore pipelines
- Exclusive Economic Zones
- Isobaths

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Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: SURVEY AREA FOR PHYSICAL ENVIRONMENT

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JM	CP	MW	10/09/2013

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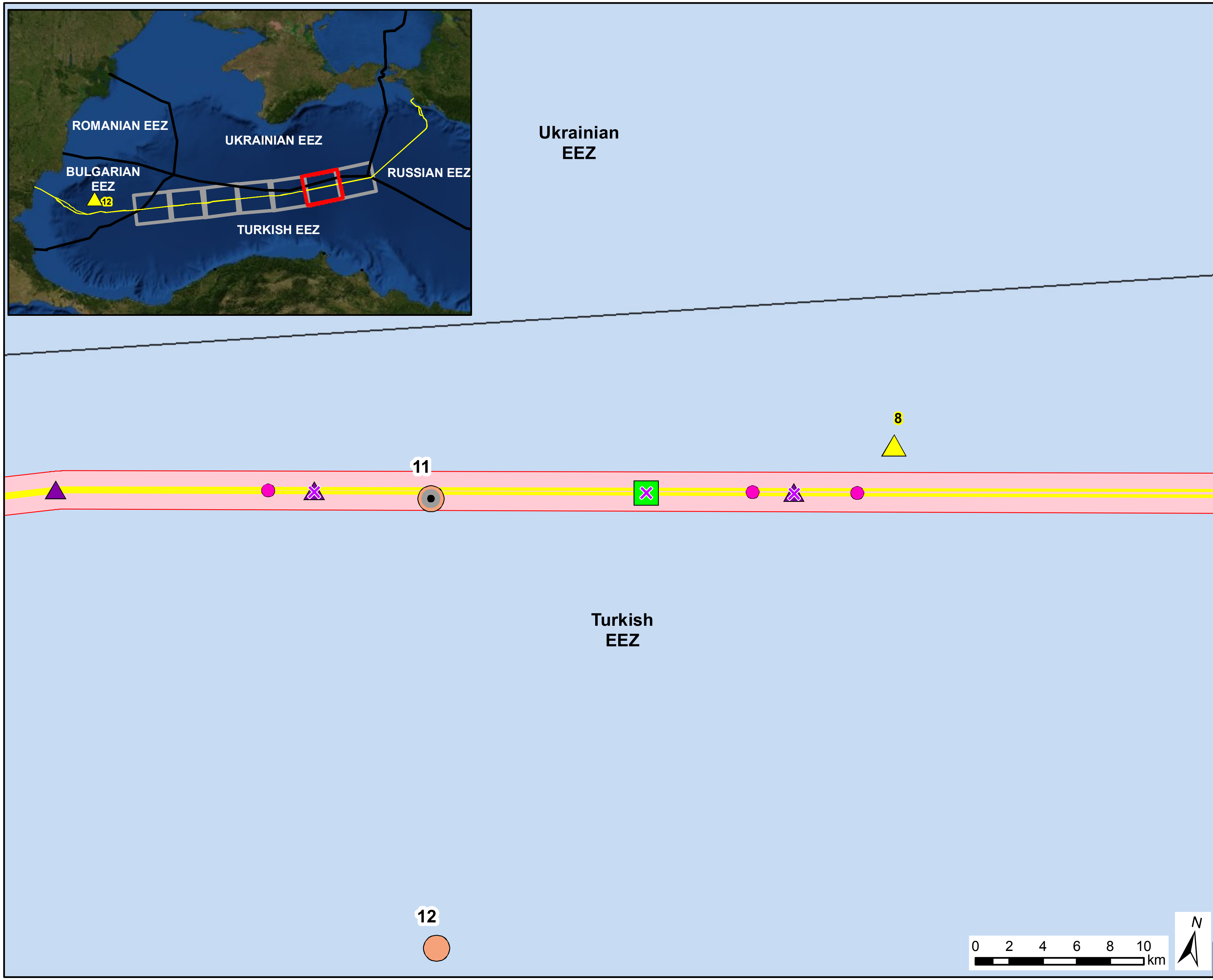

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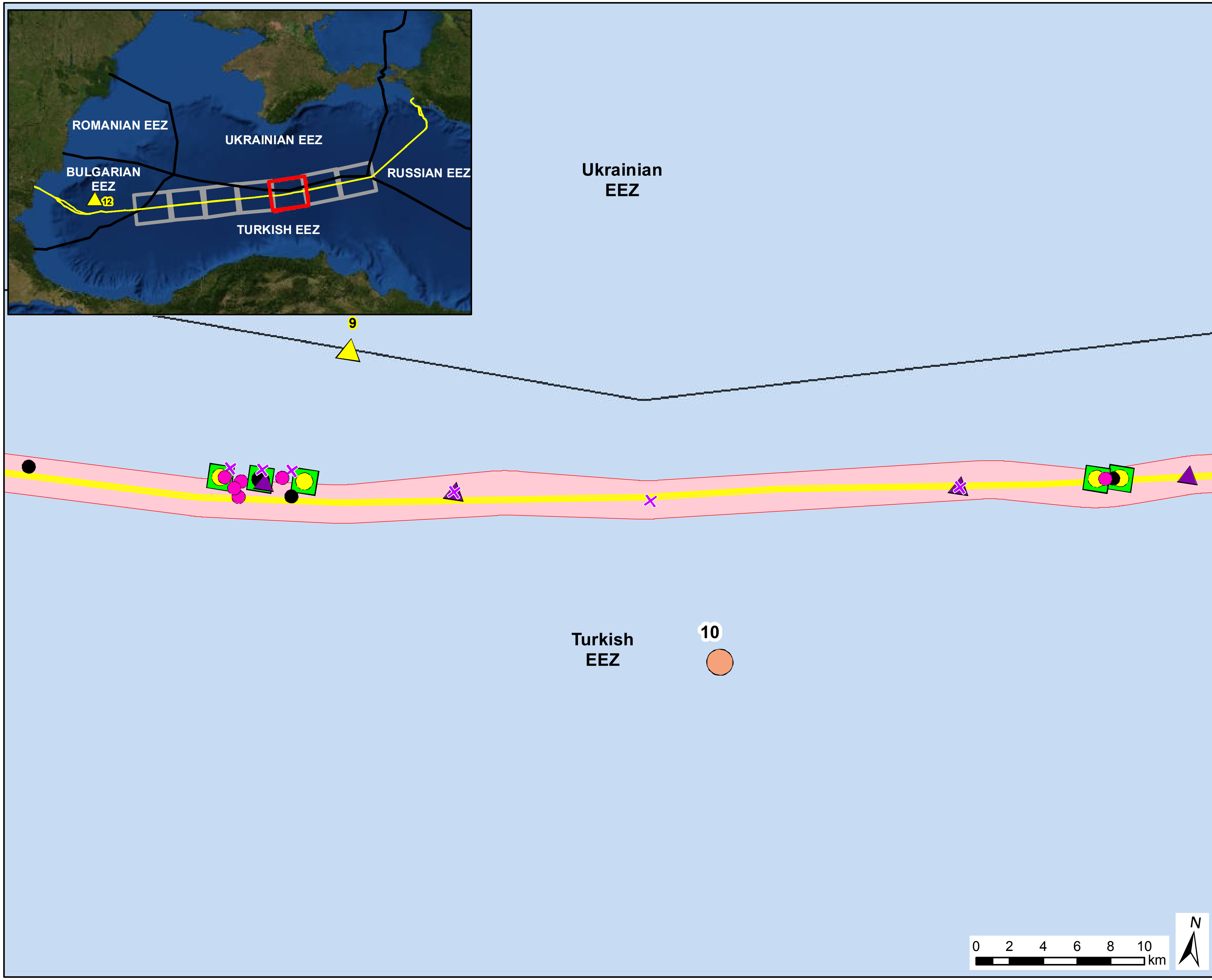

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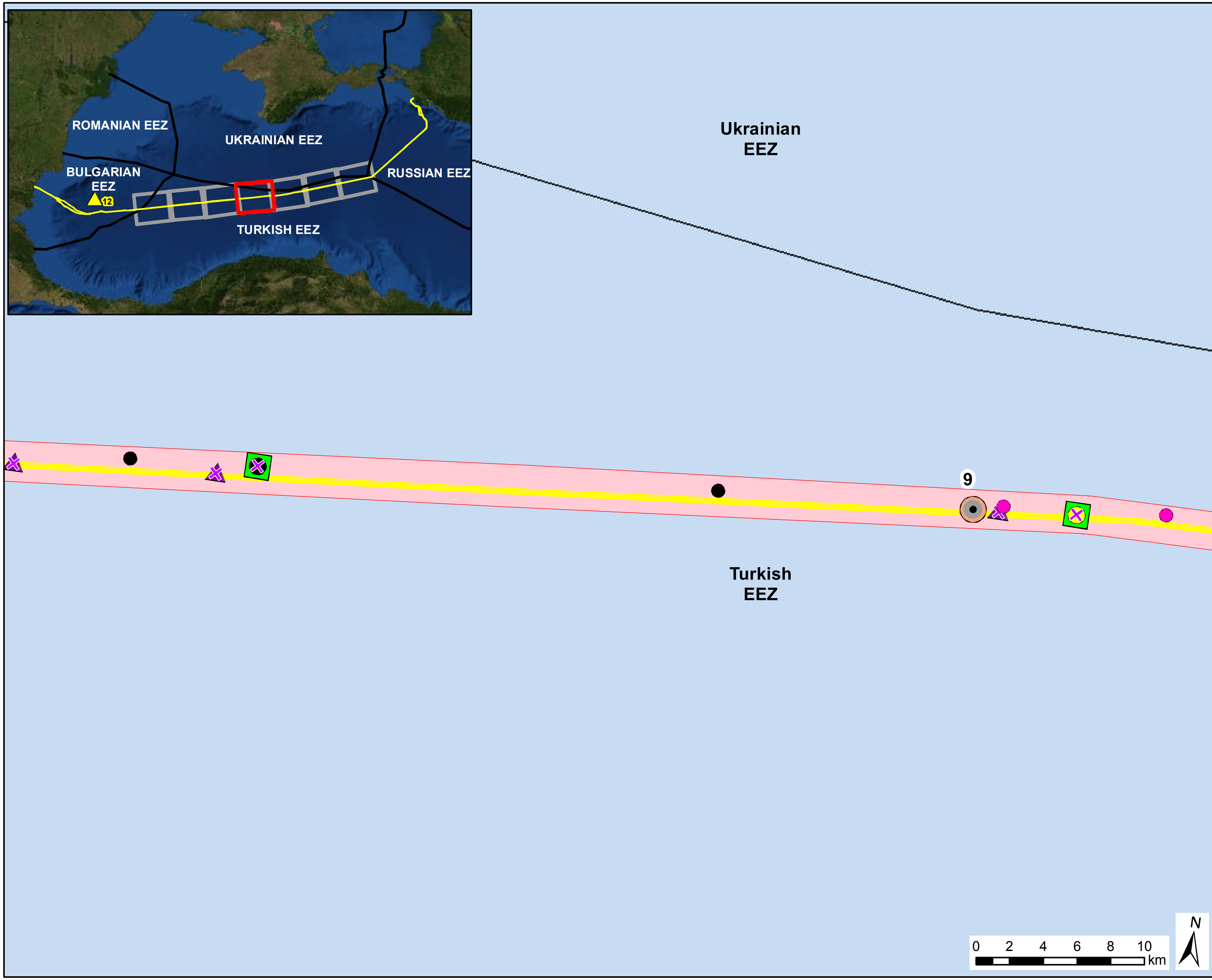

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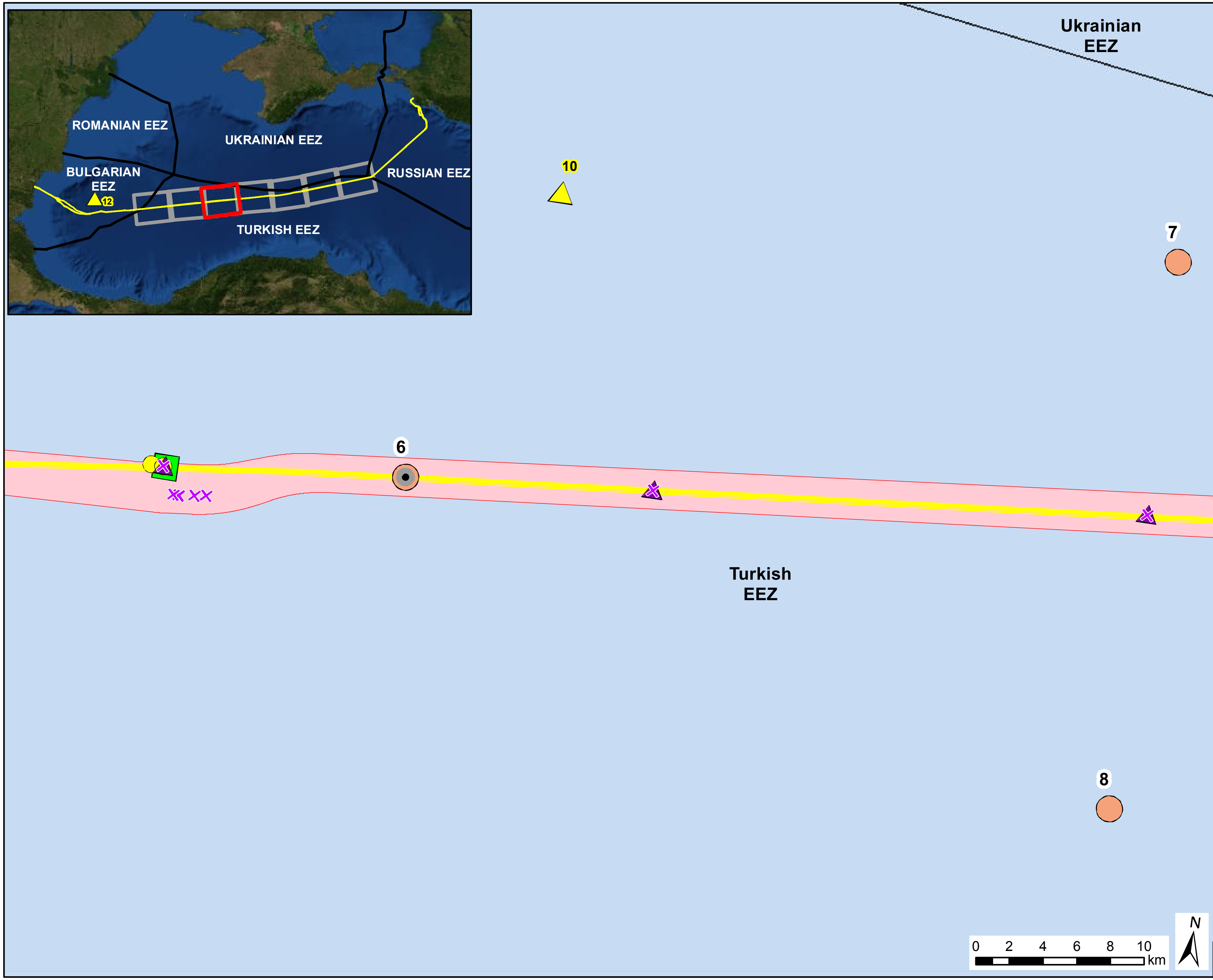

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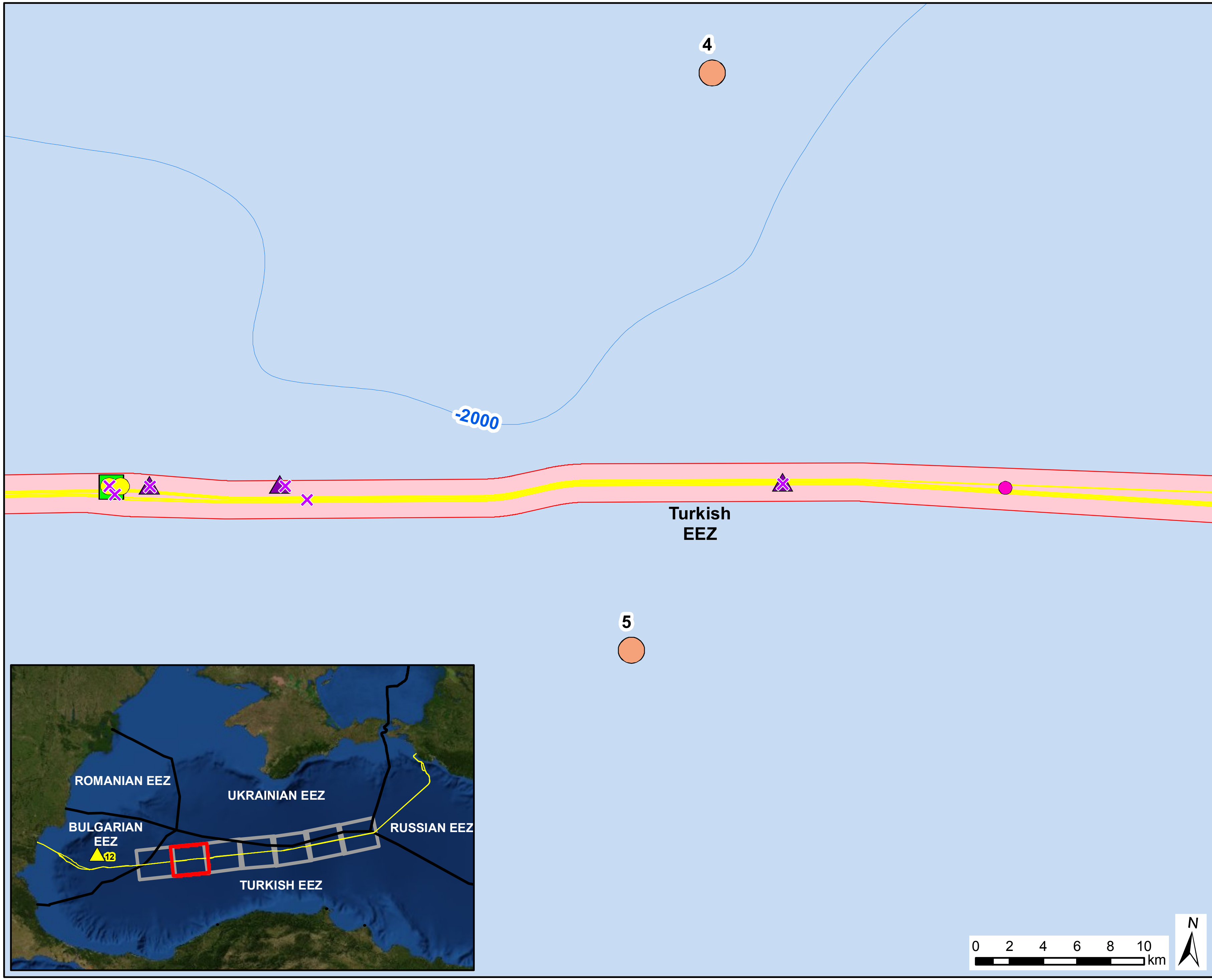

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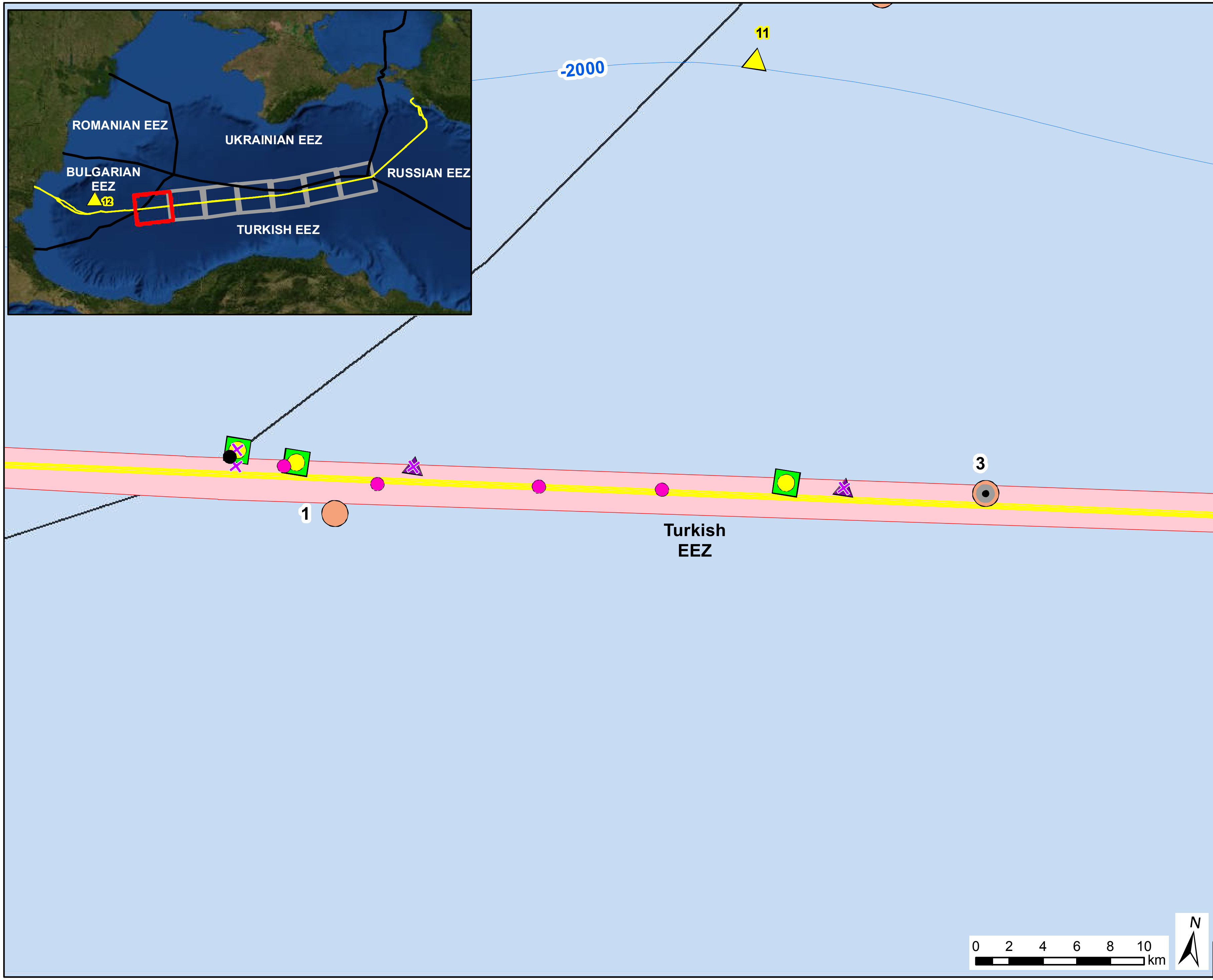

LEGEND

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Table 7.5 Summary of all Physical Surveys

Survey	Month, Year	Type of Survey
Metocean Surveys	May to Dec 2011	Oceanography (wave height, temperature, salinity, sea levels).
Marine Oceanography / Hydrochemistry Surveys	Sep to Oct 2011	Hydrochemistry, water and sediment quality.
Marine Geophysical / Geotechnical Survey	Sep to Oct 2011	Multi beam echo sounder, side scan sonar and sub bottom profiler.
Marine Sediment Surveys	Sep to Oct 2011	Sediment characteristics.
Analysis of Geological Anomalies	Sep 2012	Investigating unknown sonar contacts and/or geological anomalies.

7.4.4.1 Metocean Surveys

Five Autonomous Buoy Stations (ABS) were placed to collect Metocean data within the Survey Area (ABS 8 to 12). The Metocean data collection program, over the period from May 2011 to December 2011, is summarised in Table 7.6. Data for the Survey Area was collected using Recording Current Meter 9 Light Weight (RCM 9 LW), Recording Current Meter 9 Intermediate Water (RCM 9 IW), Recording Current Meter Seaguard (RCM Seaguard) with current, temperature and salinity sensors (Ref. 7.1).

Measurement and sampling were conducted using conductivity-temperature-depth (CTD)-complex "Sea-Bird" ("SBE 911 plus"), equipped with sensors for temperature, electro-conductivity and pressure, with the rosette "SBE 32 carousel" (12 5-litre bathometers) (Ref. 7.1). The temperature and salinity data obtained were processed using software from the manufacturer of the probe. Analysis of samples was either conducted onboard or forwarded to accredited laboratories.

Table 7.6 Metocean Data Collection

ABS	Location (WGS-84) Depth, m	Start of Observations	Service at the 3rd Stage	Quantity of days	Volume of Data Collected	Observed Parameters
8	43°17.22′ N 35°12.12′ E 2,150 m	23 May 2011	30 Nov 2011	191	100%	Current velocity and direction, sea level, water temperature and salinity

Continued...

ABS	Location (WGS-84) Depth, m	Start of Observations	Service at the 3rd Stage	Quantity of days	Volume of Data Collected	Observed Parameters
9	43°08.80′ N 33°57.60′ E 2,175 m				0%*	
10	43°06.36′ N 32°26.82′ E 2,055 m	19 May 2011	1 Dec 2011	196	100%	Current velocity and direction, sea level, water temperature and salinity
11	43°02.86′ N 30°54.93′ E 2,025 m	19 May 2011	2 Nov 2011	197	100%	Current velocity and direction, sea level, water temperature and salinity
12	42°58.26′ N 29°24.83′ E 1,968 m	20 May 2011	2 Dec 2011	195	100%	Current velocity and direction, sea level, water temperature and salinity

* ABS – 9 was lost and therefore no data could be collected.

Complete.

7.4.4.2 Marine Oceanography / Hydrochemistry Surveys

The oceanographic / hydrochemistry survey was conducted in September to October 2011, to assess hydro-chemical and water contamination. Water samples were collected at 15 locations in the Survey Area in 2011 (Figure 7.1). The studies included collection and analysis of 51 samples collected at:

- Twelve stations (No 1, 2, 4 to 8, 10 to 13 and 15) along the surface (0 m), pycnocline (approximately 150 m depth) and hydrogen sulphide boundary layer (approximately 200 m depth); and
- Three stations (No 3, 9 and 14) along the surface (0 m), pycnocline layer (approximately 150 m), hydrogen sulphide boundary layer (approximately 200 m depth), at a depth of 1,000 m and the seabed (approximately 2,000 m depth).

The hydro-chemical testing included Dissolved Oxygen, Ammonium Nitrogen ($N\text{-}NH_4$), pH, Biochemical Oxygen Demand (BOD5), Phosphate ($PO_4\text{-}P$), Total and Organic Phosphorus, Nitrite ($N\text{-}NO_2$), Nitrate ($N\text{-}NO_3$), Total and Organic Nitrogen, Silicate (Si), Hydrogen Sulphide (H_2S) and Alkalinity. Testing was undertaken at:

- Two stations (No 6 and 11) along the surface (0 m), pycnocline (approximately 150 m depth) and hydrogen sulphide layer (approximately 200 m depth); and

- Three stations (No 3, 9 and 14) along the surface (0 m), pycnocline layer (approximately 150 m), hydrogen sulphide boundary layer (approximately 200 m depth), depth of 1,000 m and the seabed (approximately 2,000 m depth).

The list of tested components included: petroleum hydrocarbons, AS (anionic surfactants), organochlorine pesticides, phenols, suspended substances, manganese, arsenic, iron, mercury, nickel, lead, cadmium, zinc, chromium, copper, selenium and molybdenum. Analysis of samples was conducted at accredited laboratories.

7.4.4.3 Marine Geophysical / Geotechnical Survey

Engineering surveys were conducted during the Development Phase of the Project. The survey conducted in autumn 2011 in the Survey Area (Figure 7.1 to Figure 7.7) aimed to identify bottom topography features; evaluate the seabed morphology and subsurface geology and detect potential hazard objects and bottom topography features.

The measuring and sampling instruments included:

- Sound Velocity Profiler (SVP);
- Multi-Beam Echo Sounder (MBES);
- Single-Beam Echo Sounder (SBES);
- Sub-bottom Profiling (SBP);
- High-Frequency Sub-bottom Profiling (HF SBP);
- Low-Frequency Sub-bottom Profiling (LF SBP);
- Side-Scan Sonar (SSS);
- Autonomic underwater vehicle (AUV) and remotely operated vehicles (ROV); and
- Cone Penetration Test (CPT), piston and grab samplers.

7.4.4.4 Marine Sediment Surveys

Sediments were collected in 2011 from four stations (3, 6, 9 and 11) and tested for grain size, organic content and pH. Sediments were also collected using corers which were tested for anionic surfactants (AS), manganese, arsenic, iron, mercury, nickel, lead, cadmium, zinc, chromium, copper, selenium and molybdenum, petroleum hydrocarbons and phenol concentrations at all stations. Two hundred and forty six (246) sediment samples taken from sediment depths of between 0 to 7 m were tested for the above parameters.

7.4.4.5 Analysis of Geophysical Anomalies

In 2012, sonar anomalies identified within the 2 km wide Project Area underwent further investigation using ROV as part of a geotechnical survey of the Survey Area. Anomalies identified from analysis of SSS data were targeted by ROVs for subsequent visual investigation.

7.4.5 Data Assumptions and Limitations

In order to carry out this assessment, certain assumptions have been made regarding the input data, and it is acknowledged that some of the data used in this ESIA Report have attendant limitations:

- The assessment is based on FEED and a project description that continues to be refined. Nonetheless, the key design parameters are understood and the ESIA Report is based on these, with additional mitigations specified as appropriate; and
- Environmental standards may evolve during the lifetime of the Project. It is not possible to predict such changes but reference to Good International Industry Practice (GIIP) minimises the effect of this uncertainty.

7.5 Baseline Characteristics

7.5.1 Meteorological Conditions

The climate of the Black Sea is generally characterised as being continental with some pronounced seasonal temperature variations. In winter, the Black Sea is under the influence of both low pressure weather systems moving from Europe with winds from the west and high pressure weather systems with winds from the northeast from Siberia. In summer, the region is under the influence of high pressure weather systems from North Africa, as well as low pressure systems travelling from Europe (Ref. 7.1).

The average January air temperature over the central portion of the Black Sea is around 8°C decreasing towards the north, east and west, whilst average air temperatures in July reach around 24°C. Temperatures at the far north and south extremities of the Black Sea can vary significantly from those experienced at the centre (Ref. 7.1).

The wind regime is cyclic, with light breezes from May to September being replaced in winter by cold north easterly winds that often reach gale force. The predominant direction of the spring and summer winds is from the west and south-west as well as from the south. Of note is that the greatest number of days with strong winds in summer reaches only three to five. In autumn and winter the winds predominately blow from the northern, north-eastern and eastern areas. The maximum speed of up to 40 metres per second (m/s), with the largest number of days of strong winds (October to March), equal to 12 to 15 (Ref. 7.1).

The Project runs through the Turkish EEZ without the use of any onshore facilities in Turkey. There are no records that have been collected by the Turkish State Meteorological Service along the Project Area. Meteorological models and literature surveys were used to identify the meteorological characteristics.

Meteorological modelling using the second version of the Climate Forecast System (CFS) was used to generate high resolution historical data in the Project Area (Ref 7.4). Three locations along the route were simulated for this ESIA Report. The locations were chosen as the endpoints (borders of the EEZ) and the midpoint. The point coordinates are in Table 7.7.

Table 7.7 Coordinates of the Points where Meteorological Data were Simulated

Point No	Location	Coordinates
1	Eastern Endpoint (Russian EEZ Border)	30°35'57.6"E, 42°49'16.9"N
2	Midpoint	36°16'23.8"E, 43°24'0.6"N
3	Western Endpoint (Bulgarian EEZ Border)	33°24'0.20"E, 43° 9'25.44"N

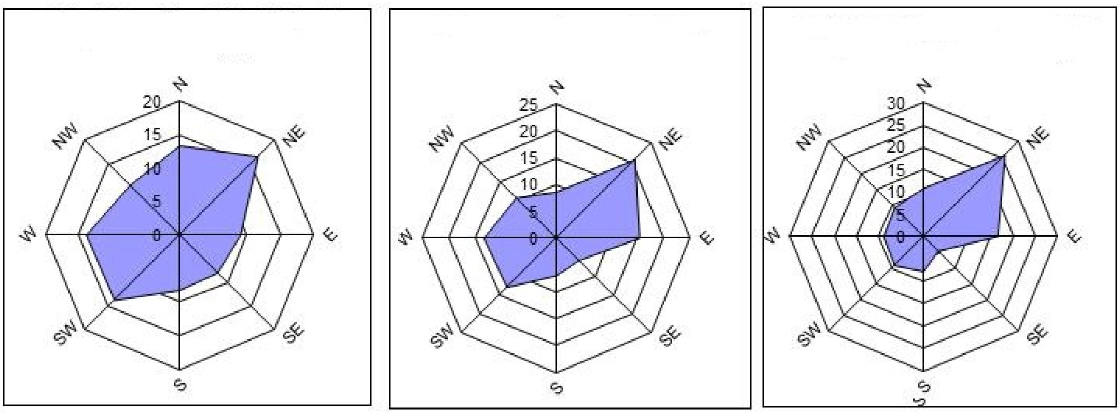
The modelling results predict the annual average atmospheric pressure along the Project Area to be 1,017.41 hPa, 1,017.58 hPa, and 1,017.25 hPa at the Eastern, Mid and Western points, respectively (Ref. 7.4). The annual average temperature from the modelling (Ref. 7.4) was calculated to be 15.61 °C, 15.47 °C and 15.65 °C at the Eastern, Mid and Western points, respectively. The average temperature values along the Project Area are given in Table 7.8.

Table 7.8 Average Temperature Values along the Project Area

Region	Jan.	Feb.	Mar	April	May	June	July	Aug	Sep.	Oct.	Nov.	Dec.	Annual
East	6.1	6.4	8.3	13.1	17.5	21.0	24.7	24.2	21.6	17.7	13.0	13.8	15.61
Mid	5.5	6.7	8.7	13.2	17.4	20.3	25.1	24.2	21.0	17.6	12.7	13.3	15.47
West	5.7	6.1	9.0	13.5	17.4	20.7	24.7	25.0	21.4	18.1	12.9	13.3	15.65

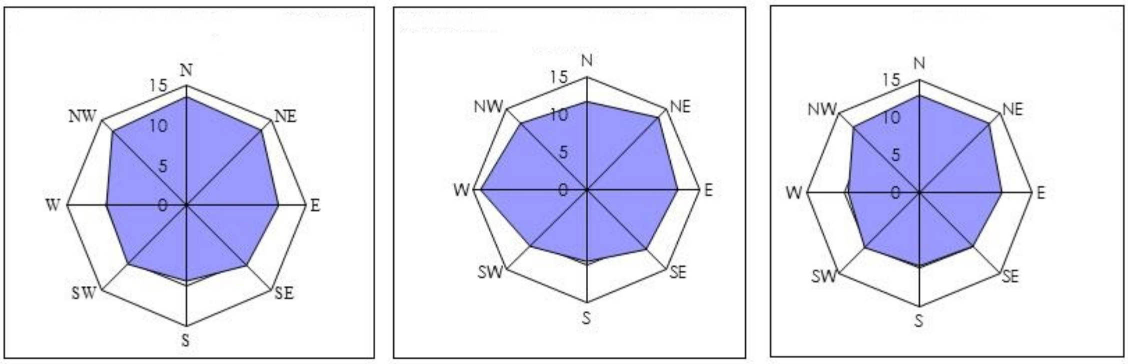
Long-term wind frequency data information was obtained from the Black Sea Meteorological Atlas prepared by Turkish Naval Force (Ref. 7.3). Wind blowing frequencies in all directions on the Eastern, Mid and Western Points of the Project Area are given in Figure 7.8.

Figure 7.8 Diagram of Long-Term Wind Blowing Directional Frequencies for East, Mid and West Regions (%)



The average long-term wind speed values in all directions according to the Black Sea Meteorological Atlas (Ref. 7.3) are shown in Figure 7.9.

Figure 7.9 Diagram of Long Term Average Wind Speeds for all Wind Directions East, Mid and West Regions



7.5.2 Oceanography

7.5.2.1 Bathymetry

The Black Sea is a semi-enclosed sea connected to the shallow (10 to 20 m deep) Sea of Azov through the Kerch Straits and to the Mediterranean Sea through the Bosporus Strait, the Marmara Sea and the Dardanelles Strait.

Black Sea bathymetry is characterised by a relatively narrow coastal shelf running along the perimeter of a very deep and relatively flat interior basin. The northwest area is the only area with a coastal shelf of any significant extent. Here the sedimentary discharge plains of the Danube, Dnieper, Dniester, and Yuzhny (South) Bug Rivers extend a considerable distance offshore (Ref. 7.5).

Water depth within the Project Area varies from 2,025 to 2,199 m. The eastern part of the Survey Area is the deepest and is essentially flat. The western part has more irregular bathymetry, resulting from a complex series of channel levee systems that cross this area. This forms an elevated ridge that rises about 50 m above the main abyssal plain and represents the distal part of the Danube Fan.

The overall bathymetry in the Black Sea can be seen in Figure 7.10. An exaggerated bathymetric profile of the Survey Area is given in Figure 7.11.

Figure 7.10 Bathymetry of the Black Sea

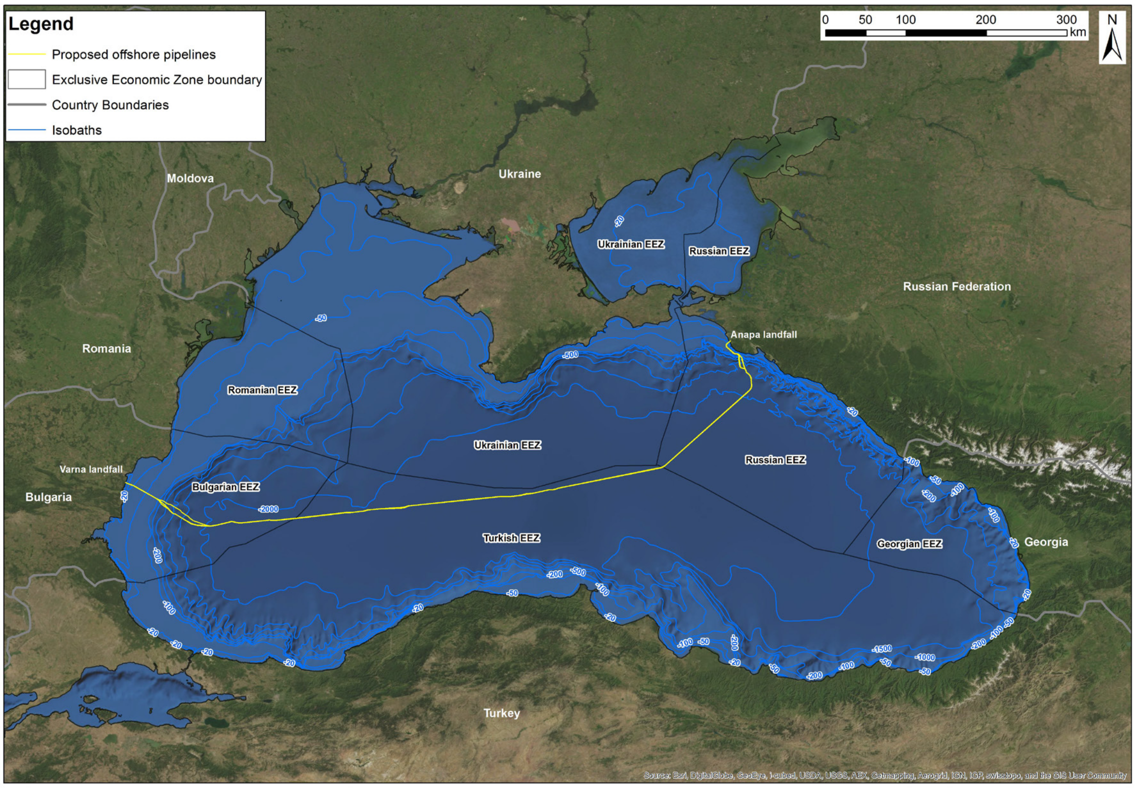
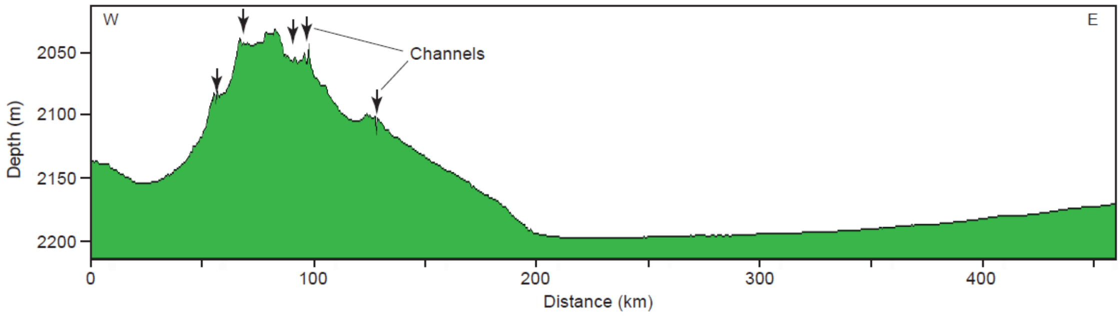


Figure 7.11 Highly Exaggerated Bathymetric Profile along the Project Area



Source: Ref. 7.1

7.5.2.2 Sea Level Variation

The Black Sea is practically non-tidal with a maximum range of no more than 10 centimetres (cm). Short-term sea level variations are associated with varying meteorological conditions and can result in localised sea level surges of up to 20 cm.

Much more significant sea level variations have, however, occurred in pre-historic times, associated with the tectonic events that led to the opening of the Bosphorus Strait. It is now believed that up to 5,000 to 6,000 B.C the Black Sea was a fresh water lake with a surface elevation approximately 30 m below the current levels. Flooding may have occurred as a sudden event associated with large scale seismic activity in the Bosphorus area or gradually, as a result of oscillations in the elevation of the Bosphorus that may have started as early as 30,000 years ago (Ref. 7.1).

Changes in water levels in the Black Sea are thus primarily caused by one or more of the following factors:

- Inter-annual fluctuations in the sea level;
- Seasonal fluctuation as a result of seasonal atmospheric dynamics (e.g. temperature, wind, rainfall and storms);
- River flows;
- Spatial changes in the atmospheric pressure; and
- Natural temporal and spatial variability in dynamics of the water column.

Metocean data collected along the Survey Area in 2011 (Ref. 7.1) is summarised in Table 7.9 and indicates that there is very little time or distance variation as the results were similar.

Table 7.9 Sea Level Measurements

ABS	Observational Period	Maximum Observed	Minimum Observed	Range of Sea Level Variation
8	23 May to 30 Nov 2011	0.13	-0.15	0.28
10	19 May to 2 Nov 2011	0.42	-0.38	0.8
11	19 May to 2 Nov 2011	0.13	-0.29	0.42

7.5.2.3 Wave Climate and Storm Surges

In the Turkish EEZ, there are favourable conditions for the development of storm waves i.e. a large surface area, great depth and a weak irregularity of the coast. Throughout the summer the frequency of wave height of less than 1 m is 60 to 70%. In winter, the frequency of these waves is reduced to 20 to 30%. Wave height of 2 to 3 m is most often observed in winter with their frequency during this period reaching 20% whereas in the rest of the year this does not exceed 15%. Wave heights of 6 m or more are rare and their frequency does not exceed 1% (occurring in December to February). In the coastal regime, waving is very volatile and depends on the characteristics of a particular area. Storms are more common during the cold season, when their frequency is 10%. The frequency of calm periods in summer is up to 10 days (Table 7.10).

Table 7.10 Wave Height Frequency

Wave Height (m)	Winter	Spring	Summer	Autumn
Less than 1	27	45	70	42
1 to 2	43	40	24	42
2 to 3	20	12	5	12
3 to 6	9	3	1	4
6 to 11	1	0	0	0
Over 11	0	0	0	0

Short-term sea level variations are also associated with varying meteorological conditions and can result in localised sea level surges of up to 1 m.

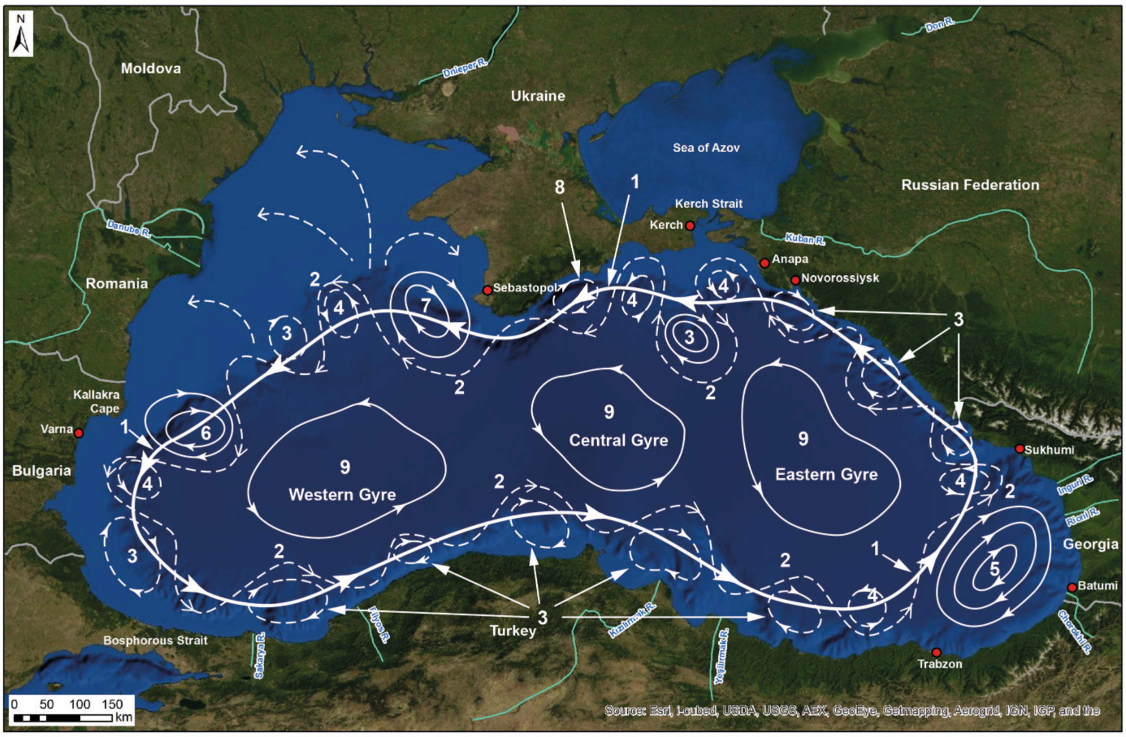
The frequency of storm surges in the Black Sea is lower than that in other regions of the world's oceans (Ref. 7.6). The gently sloping continental slope open to winds and waves is subject to storm surges and it is estimated that typical storm durations vary between 50 and 150 hours with an average duration of 95 hours (Ref. 7.7). Extreme storms have quite a short growth phase with an average duration of 61 hours. Hence, the typical storm pattern is characterised with fast growth, a rather durable energetic development phase and relatively prolonged decay.

7.5.2.4 Currents

The Main Black Sea Current (MBSC) affects the whole basin in one cyclonic (counter clockwise) circular motion. The Rim Current is a cyclonic current that follows the continental slope and is a prominent feature in the upper layer circulation in the Black Sea. A diagram of the MBSC is shown in Figure 7.12.

Current speeds in the core of the MBSC typically flow at 0.3 to 0.6 m/s depending on synoptic, seasonal and inter-annual variability. The upper layer waters of the Black Sea are characterised by a predominantly cyclonic, strongly time-dependent and spatially-structured basin wide circulation. The interior circulation comprises several sub-basin scale gyres; each of them involving a series of cyclonic eddies. They evolve continuously by interactions among each other, as well as with meanders, and filaments of the Rim Current. The Rim Current structure is accompanied by coastal-trapped waves with an embedded train of eddies and meanders propagating cyclonically around the basin (Ref. 7.7 and Ref. 7.8). Over the annual time scale, westward propagating Rossby waves further contribute complexity to the basin wide circulation system (Ref. 7.9).

Figure 7.12 Schematic Diagram of Currents in the Black Sea



Key:

1: mean position of the cyclonic Rim Current jet current
2: Rim Current meanders
3: anticyclonic coastal eddies
4: cyclonic eddies
5: Batumi anticyclonic eddy
6: Kaliakra anticyclonic eddy
7: Sebastopol anticyclonic eddy
8: Crimea anticyclonic eddy
9: quasi-stationary cyclonic gyres

Source: Ref. 7.10

The most notable features of the circulation system, as schematically presented in Figure 7.12 include (Ref. 7.10):

- The meandering Rim Current system cyclonically encircling the basin;
- Two cyclonic sub-basin scale gyres comprising four or more gyres within the interior;
- The Bosphorus, Sakarya, Sinop, Kizilirmak, Batumi, Sukhumi, Caucasus, Kerch, Crimea, Sevastopol, Danube, Constantsa, and Kaliakra anticyclonic eddies on the coastal side of the Rim Current zone;
- Bifurcation of the Rim Current near the southern tip of the Crimea; one branch flowing south-westward along the topographic slope zone, and the other branch deflecting first north-westward into the shelf and then contributing to the southerly inner shelf current system;
- Convergence of these two branches of the original Rim Current system near the south-western coast; and
- Presence of a large anti-cyclonic eddy within the northern part of the north-western shelf.

According to the Acoustic Doppler Current Profiler measurements (Ref. 7.11), the Rim Current jet has a speed of 0.5 to 1 m/s within the upper layer, and about 0.1 to 0.2 m/s within the water depths of 150 to 300 m.

Within the Survey Area, mean current values were estimated to be close to 0.2 m/s near the seabed. This was supported by the review of primary ROV data as bottom currents were noticeably absent on all ROV footage of the Survey Area. In most cases, sediment flocculations disturbed from the seabed simply hang in the water column without appreciable movement (Ref. 7.12).

7.5.2.5 Water Temperature and Salinity

Seawater temperature results indicate that the temperature is almost constant near the seabed in the Survey Area and varied between 9.10 and 9.12 ^{o}C along the measurement points (Ref. 7.1). In the surface layer, temperatures ranged from 21.2 to 22.7°C in the surface layer while showing a sharp decrease to 8 to 9°C at depths from 15 to 20 m. These values did not exceed 8.5°C in the anoxic layer beginning at a depth of 80 to 100 m and showed a slight increase up 9.1°C at depths of about 2,000 m (Ref. 7.1).

Salinity values are constant at 18 practical salinity units (PSU) to a depth of 30 m following which a pronounced increase to values of 21 PSU at depths of 80 to 100 m. A smoother increase in salinity is observed from a depth of 200 to 1000 m. Salinity values on the seabed were on average 22 PSU (Ref. 7.1).

7.5.2.6 Water Density

During the year, water density changes as a function of salinity and temperature. The Black Sea stratification within the upper 100 m varies up to a density (Sigma-t (σt)) of approximately 5 kilograms per cubic metre (kg/m^3). The pycnocline corresponding to the density (σt) of 16.2 kg/m^3 is observed at 150 m water depth within the interior cyclonic zone and may extend to 200 m within coastal anticyclones. The intermediate and deep water masses below a permanent halocline (a strong, vertical salinity gradient) at water depths of 100 to 150 m possess almost vertically uniform characteristics defined by temperatures of approximately 9 ^{o}C, salinity of 22 PSU and density (σt) of 17.0 kg /m^3 (Ref. 7.13). The abyssal plain possesses almost vertically uniform characteristics below 200 m within the range of values of temperature, salinity and density values of approximately of 8.9 to 9.1 ^{o}C, 22 to 22.5 PSU, and 17 to 17.3 kg/m^3 respectively. The deepest part of the water column involves homogeneous water mass formed by convective mixing due to the bottom geothermal heat flux during the last several thousands of years (Ref. 7.14).

7.5.2.7 Water Quality

The water quality of the Black Sea, particularly the western part, declined significantly during the 1970s due to excessive nutrient enrichment from river discharge. Currently, lower levels of nutrient loading are being reported. However, values are still considerably higher than those observed before the 1960s (Ref. 7.9).

The saline stratification of the Black Sea, combined with its significant maximum depths, generates conditions that are absent of oxygen (anoxic). The Black Sea is therefore considered the world's largest anoxic basin. Waters with low oxygen (hypoxic) or entirely anoxic conditions are typically incapable of sustaining permanent populations of species dependant on aerobic respiration i.e. respiration requiring oxygen. Consequently, the potential for significant marine life occurring at depths of greater than approximately 150 m within the Black Sea is limited. Any marine life is also likely to be limited to those organisms capable of anaerobic respiration[1]. Anaerobic respiration typically produces hydrogen sulphide (H_2S) and Methane (CH_4) as a by-product. Concentrations of H_2S are known to increase with depth in the Black Sea. Such conditions are prohibitive to many life forms whilst creating conditions conducive to the preservation of organic and inorganic materials. These conditions are also the reason for the high preservation potential of Cultural Heritage Objects (CHOs) (Ref. 7.9) as discussed in **Chapter 10 Cultural Heritage**.

Understanding the characteristics of marine water quality in the Black Sea requires an appreciation of the importance of stratification with depth. The upper sea layer experiences seasonal and annual variation in hydro-physical and hydro-chemical characteristics under the influence of external climatic factors. Its lower boundary is a deep pycnocline, below which influence of the external factors does not normally extend and hydro-chemical conditions are relatively stable (Ref. 7.1).

The survey was conducted in autumn 2011 to assess hydro-chemical and water contamination and samples were collected at 15 locations in the Survey Area (Figure 7.1 to Figure 7.7). The survey results indicated the following:

- Suspended solids concentrations were relatively low when compared to historical data from the Black Sea (Ref. 7.1);
- The concentration of inorganic pollutants and organochlorine pesticides was below the detection limit; and
- Relatively high concentrations[2] of mineral oil, anionic surfactants and phenols were present indicating anthropogenic impact on water quality.

The Following information is taken from survey results gathered from 2011 surveys (Ref. 7.1):

Oxygen

Recorded dissolved oxygen concentrations varied from 8.3 to 9.8 milligrams per cubic decimeter mg/dm^3 at the surface (0 m). The values varied between 9.0 to 9.82 mg/dm^3 at 40 to 50 m falling to 0.1 to 0.2 mg/dm^3 at water depths of 80 to 100 m. Below 150 to 200 m, conditions became anoxic (devoid of oxygen) (Ref. 7.1).

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[1] Anaerobic respiration is respiration without oxygen, such as by chemosynthetic life instead of photosynthetic life.

[2] Assessed using Russian standards. "*Water quality standards for fishery water bodies, including maximum permissible concentrations of harmful substances for fishery water bodies*". Approved by the Order of the Federal Agency for Fisheries No. 20 of January 18, 2010.

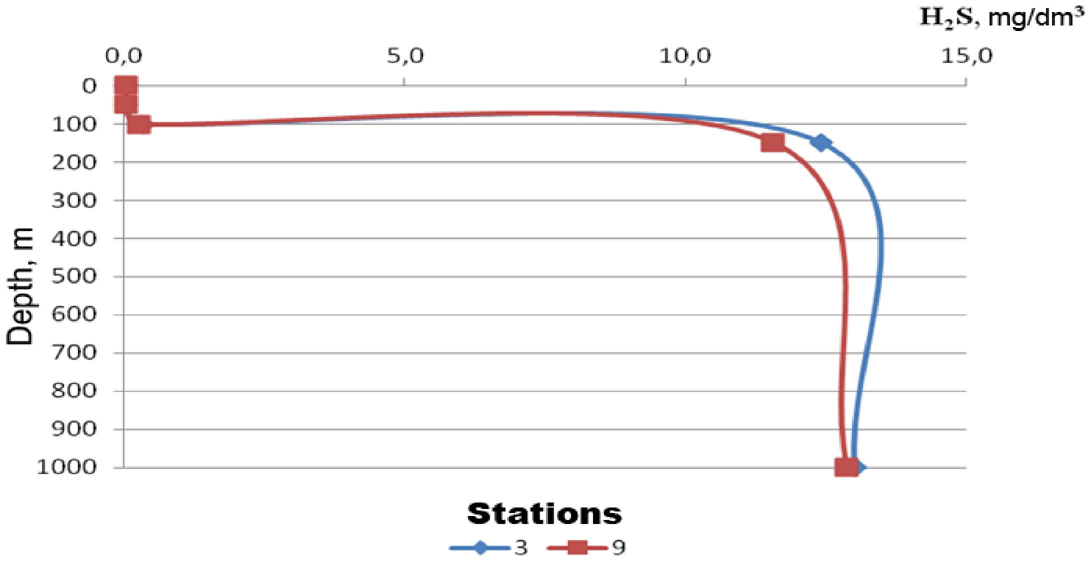
Hydrogen Sulphide

The content of H_2S varied from its absence on the surface (<0.05 mg/dm^3) to a gradual rise to 11.4 to 12.9 mg/dm^3 near the seabed. The sharp increase in the values of H_2S began at a depth of approximately 100 to 150 m, where the values averaged 10.5 mg/dm^3 (Figure 7.13) (Ref. 7.1).

pH

The values of pH ranged from 7.14 to 8.39. The pH was greater at 30 to 40 m water depth than at the surface at most stations with a decrease in pH with depth noted at all stations. The sharp decrease in the pH values associated with the anoxic layer can be seen in Figure 7.14.

Figure 7.13 The Distribution of Hydrogen Sulphide (mg/dm^3) in the Water Column



Organic Matter

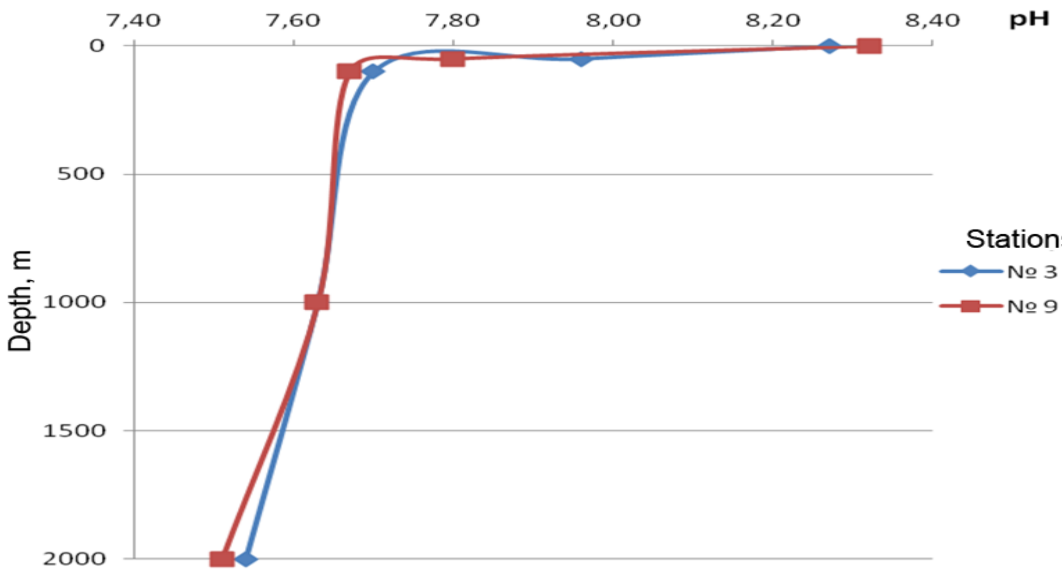
BOD

In autumn 2011, measurements of the biochemical oxygen demand (BOD5) were undertaken to provide indirect measurements of organic matter in the water (Ref. 7.1). BOD5 values ranged from 0.5 to 1.9 mg O_2/dm^3. The lowest values in the surface layer (0 m) were recorded at three stations (1, 9, 11) at below the detection limit (<0.5 mg O_2/dm^3). The highest values were observed above the pycnocline at 1.9 mg O_2/dm^3 and fell to between 0.8 to 1.1 mg O_2/dm^3 at approximately 2,000 m water depth.

Nitrogen

The concentrations of nitrate nitrogen were below detection limit (<5 µg/dm^3) at almost all stations and at most depths sampled. The exceptions were Station 3 (9 µg/dm^3 at 49 m depth), Station 6, (11 µg/dm^3 at 0 m) and Station 9 (6 and 7 µg/dm^3 at 150 m and 200 m) (Ref. 7.1).

Figure 7.14 Distribution of pH in the Water Column



Nitrite nitrogen (N-NO_2) values were generally low at the surface (0 m) and below detection limit (<0.5 µg/dm^3) at six stations (1, 2, 4, 5, 6, 9). The values increased at 50 to 100 m water depth and ranged from 0.6 to 6.3 µg/dm^3. These values decreased to 0.6 to 2.4 µg/dm^3 depths of 100 to 120 m (Ref. 7.1).

Ammonia nitrogen (N-NH_4^+) ranged from 19 to 66 µg/dm^3 at 0 m water depth with an average concentration of 40 µg/dm^3. Most stations showed an increase in the layer above the pycnocline (above 150 m water depth) to an average of 53 µg/dm^3. Ammonia nitrogen averaged 100 µg/dm^3 below 200 m water depth. The concentration reached values from 558 to 913 µg/dm^3 at a depth of approximately 2,000 m.

The content of organic nitrogen (N_{org}) throughout the water column was below the detection limit (<250 µg/dm^3). Total nitrogen (N_{tot}) was below the detection limit (<250 µg/dm^3) at the surface (0 m) and below 200 m. High values were recorded only at depths of 2,000 m (from 773 to 1096 µg/dm^3).

Phosphate phosphorus (P-PO_4) was practically absent (<5 µg/dm^3) at the surface (0 m) with the exception of two stations (9, 15). The values increased between 6 and 14 µg/dm^3 between 50 to 150 m water depth with the highest concentrations recorded below 200 m water depth of between 108 and 201 µg/dm^3.

Organic phosphorus values ranged between 7 to 64 µg/dm^3 in the surface layer and increased to between 8 to 73 µg/dm^3 with an average grade of 35 µg/dm^3 at a depth of 40 to 50 m. Values reached an average of 343 µg/dm^3 below 200 m and increased to an average of 618 µg/dm^3 at 2,000 m depths. Total phosphorus ranged from 8 to 69 µg/dm^3, with an average of 53 µg/dm^3 in the surface (0 m). These values increased to an average of 40 µg/dm^3 around 50 to 150 m water depth and 476 µg/dm^3 below 200 m. The average values recorded at 2,000 m water depth were 835 µg/dm^3.

Sea Water Contamination

Lead concentrations were mostly below the limit of detection (<0.002 mg/dm^3) or exceeded it slightly. Values of 0.032 mg/dm^3 and 0.005 mg/dm^3 were recorded at a depth of 35 m at Station 11 and a depth of 1,970 m at Station 14. The content of dissolved iron in seawater was slightly above detection limits and ranged from <0.01 to 0.039 mg/dm^3, with an average of 0.024 mg/dm^3. The manganese content ranged from 0.0017 to 0.240 mg/dm^3, with an average grade of 0.11 mg/dm^3. There was an increase in concentration with depth starting from the depths of 100-110 m. The highest concentrations of manganese were observed at depths of around 2,000 m at Stations 3, 9 and 14. The distribution of manganese in the water layer was uniform throughout the Survey Area (Ref. 7.1).

Concentrations of mercury, cadmium, copper, chromium, selenium, arsenic, molybdenum and cadmium were below the detection limit in all samples. The content of nickel and zinc were also below the detection limit in all samples, except for the sample obtained in the bottom layer at Station 14 (Ref. 7.1).

The content of petroleum products in the waters of the Survey Area was quite high and ranged from <0.02 to 0.73 mg/dm^3, with an average of 0.34 mg/dm^3. The content of anionic surfactants (AS) showed levels ranging between from 0.15 to 0.59 mg/dm^3 (Ref. 7.1). Arsenic concentration decreased to an average of 0.19 to 0.2 mg/dm^3 with increasing depth but with a depth of 150 to 200 m once again increased to 0.25 to 0.4 mg/dm^3. The phenol content ranged from 0.002 to 0.015 mg/dm^3 (Ref. 7.1).

As for pesticides, the content of dichlorodiphenyltrichloroethane (DDT) and its breakdown products in the Survey Area waters throughout the water column was below the detection limit (<0.001 µg/dm^3) and hexachlorocyclohexane (HCH) pesticides were also not detected (<0.001 µg/dm^3) (Ref. 7.1).

The following conclusions can be drawn from the chemical properties tested in the Survey Area (Ref. 7.1):

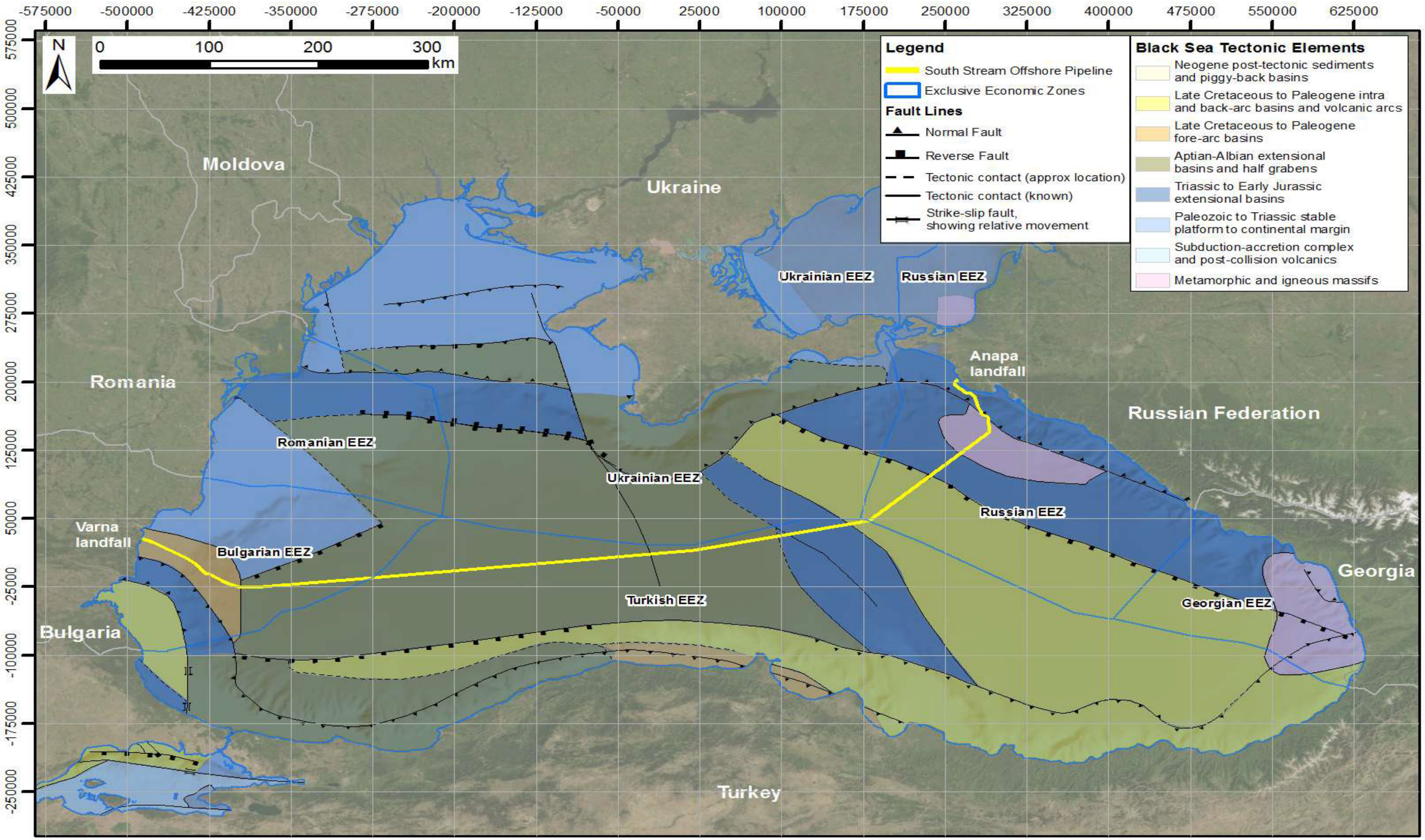
- The concentration of inorganic pollutants in most samples was below the detection limit which would indicate un-impacted environmental conditions of marine waters;
- Relatively high concentrations of mineral oil, anionic surfactants and phenols were observed which would indicates adverse anthropogenic impact on the waters of the Black Sea; and
- Organochlorine pesticides – DDT and HCH – were below the detection limit of the analysis methods used.

7.5.3 Geophysical Environment

7.5.3.1 Tectonic Settling and Geology

The Black Sea abyssal plain is framed by folded structures to the north, northeast, south, and southwest; to the northwest it forms an elevated platform, which is part of the Black Sea shelf between the Balkan Peninsula coast and the Crimea. The tectonic map of the Black Sea Region is shown in Figure 7.15 (Ref. 7.15).

Figure 7.15 Tectonic Map of the Black Sea Region



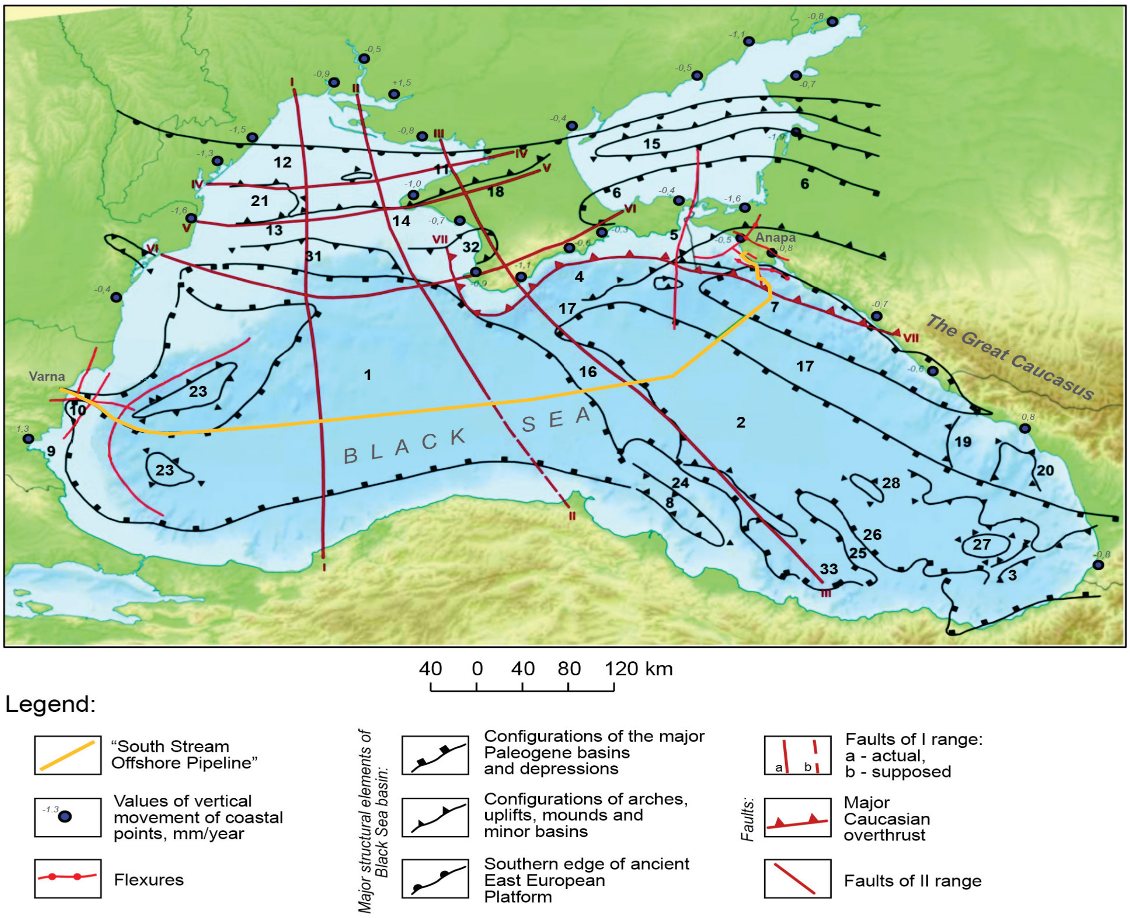
Source: Ref. 7.15

7.5.3.2 Seismicity

The seismic activity in the Black Sea is relatively weak and in its central parts it is negligible. On the coast of Turkey however moderate earthquakes have been recorded. There are two important seismic belts around the Black Sea: northern Turkey (the North Anatolian fault) and the Caucasus region (Ref. 7.16).

There are several hundred meters of Mesozoic sediments within the Eastern Black Sea abyssal plain (Ref. 7.15). These sediments are faulted and with the bedrock they form inclined blocks that underlay almost the entire basin. Seismic data indicates that Cenozoic sediments in the Eastern Black Sea basin are almost undisturbed by fault dislocations (Figure 7.16).

Figure 7.16 Black Sea Structural and Tectonic Classification Scheme



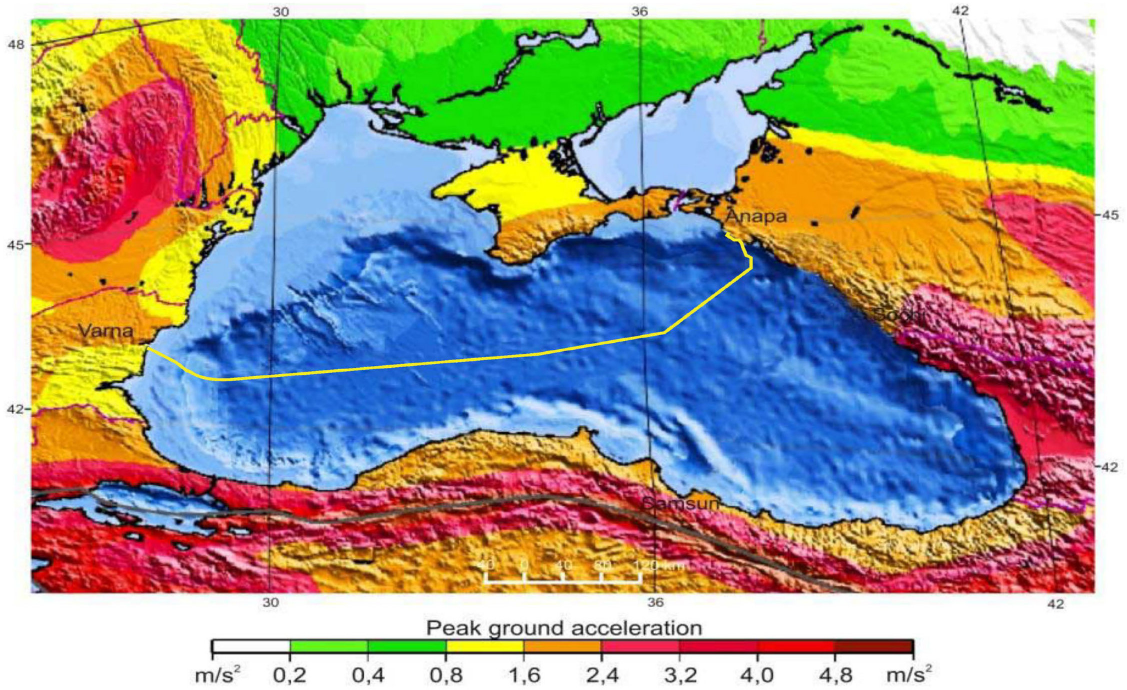
Source: Ref. 7.16

A baseline seismicity assessment based on a probabilistic analysis was conducted as part of the seismic hazard estimation. The results showed that the 1,000 years recurrence interval peak ground accelerations change between Anapa to Varna from 0.33 to 0.28g m/s^2. Other features associated with geohazards include mud volcanoes and tension fractures (Ref. 7.1).

7.5.3.3 Geohazards

Figure 7.17 shows seismic hazard map developed within the Global Seismic Hazard Assessment Project (GSHAP) for the Black Sea region (Ref. 7.17). The peak horizontal acceleration (PGA)[3] values are 0.10g m/s^2 or less within the abyssal plain for recurrence interval of 1,000 years.

Figure 7.17 Fragment of Seismic Hazard Map, Constructed within the International Project GSHAP, for the Areas Surrounding the Black Sea region



Note: the South Stream Offshore Pipeline is shown in yellow. **Source**: Ref. 7.17

Mud Volcanoes

Mud volcanism is a manifestation of the release of natural gas on the seafloor from the deep sedimentary strata. Mud volcanoes of two main types are distinguished in the Black Sea: those along the periphery of the basin (Bulgaria, Kerch-Taman region) and those associated with fluidised sediment flow connected to ruptures on domes of gently sloping symmetrical anticlines in the central part of the Black Sea. Natural gas seeps on the bottom of the Black Sea are widespread on the continental margins and abyssal plain. Gas seeps on the abyssal plain are mainly associated with biogenic methane and are related to mud volcanoes and tectonic faults. A characteristic feature of some areas of the slope of the Black Sea (Bulgaria, Ukraine, and Turkey) is a high gas saturation of recent sediments and gas releases in the form of plumes (Figure 7.18).

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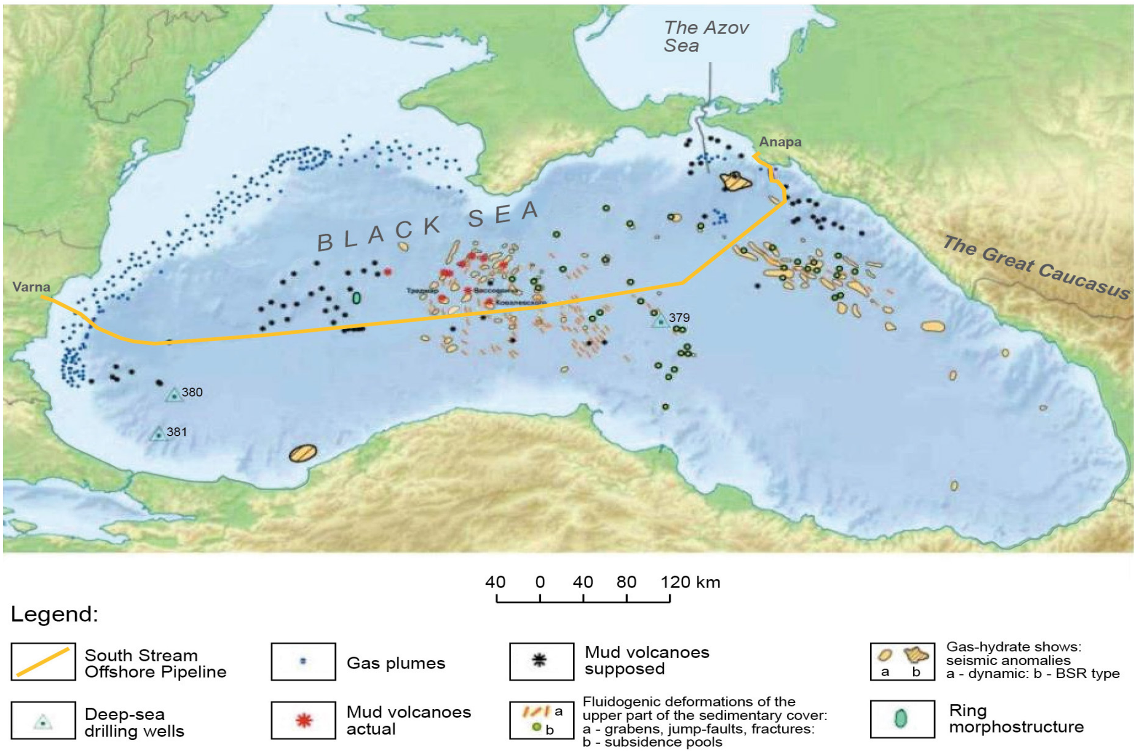
[3] A measure of earthquake acceleration on the ground

Figure 7.18 Mud Volcanism Features in the Black Sea



Source: Ref. 7.1

During geotechnical surveys in 2011, the abyssal plain revealed a significant number of deformations related to the rise of hydrocarbon fluids. No mud volcanoes were observed in the Survey Area (Ref. 7.1). Rather they are represented by dislocations, small faults, small subsidence troughs and craters on the tops of very gentle anticlinal uplifts. The area of deformation distribution is the same as the area of mud volcanoes, gas-saturated sediments and gas-hydrates. Development of landslide processes in the abyssal plain has not been detected and is not expected due to minor slopes of the seabed surface (Ref. 7.1).

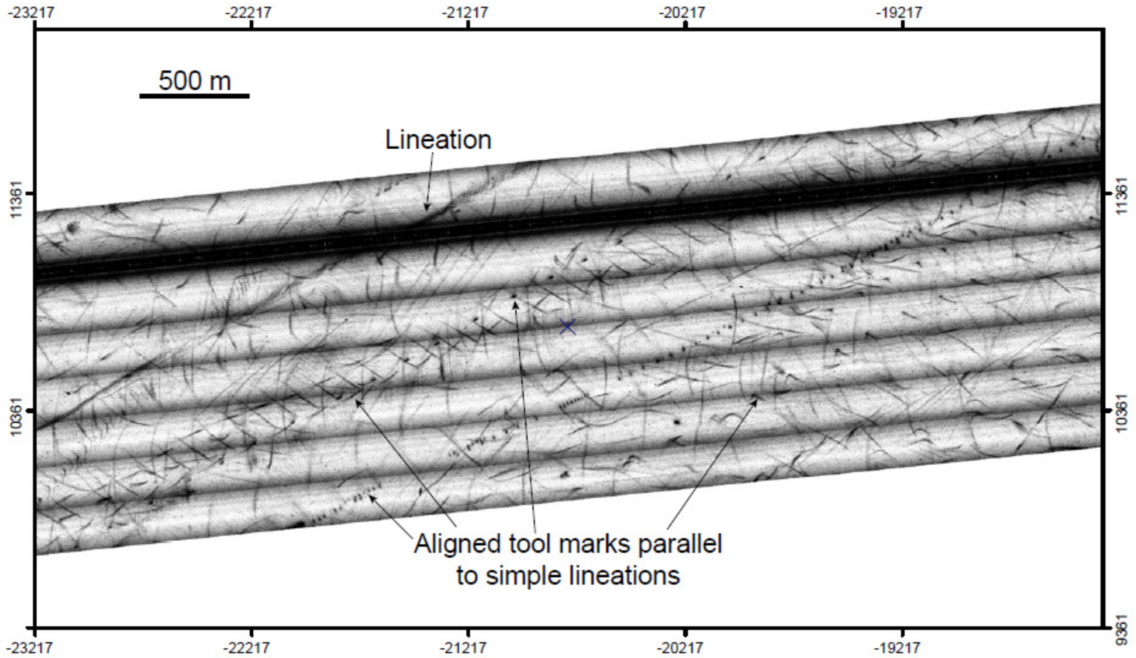
7.5.3.4 Geomorphology

During 2011 geotechnical surveys (Ref. 7.1), the deepest, eastern part of the abyssal plain was observed to lack any large-scale features but, side scan sonar (SSS) data showed abundant linear and irregular fine-scale markings (Figure 7.19), interpreted as marks caused by objects such as trees carried along by bottom currents and gouging the seabed (Ref. 7.12).

They mainly trend northeast to southwest and SSS data also showed numerous small high backscatter targets that are typically scattered randomly but can on occasion form aggregated groups (Figure 7.20).

Analysis of the 2011 survey data (Ref. 7.12) shows that the seabed in the west of the Survey Area rises gently onto the flank of the channel levee area. SSS data also showed the lower part of the levee complex flank to be covered by sediment waves.

Figure 7.19 Side Scan Sonar Image of Survey Area Showing Marks



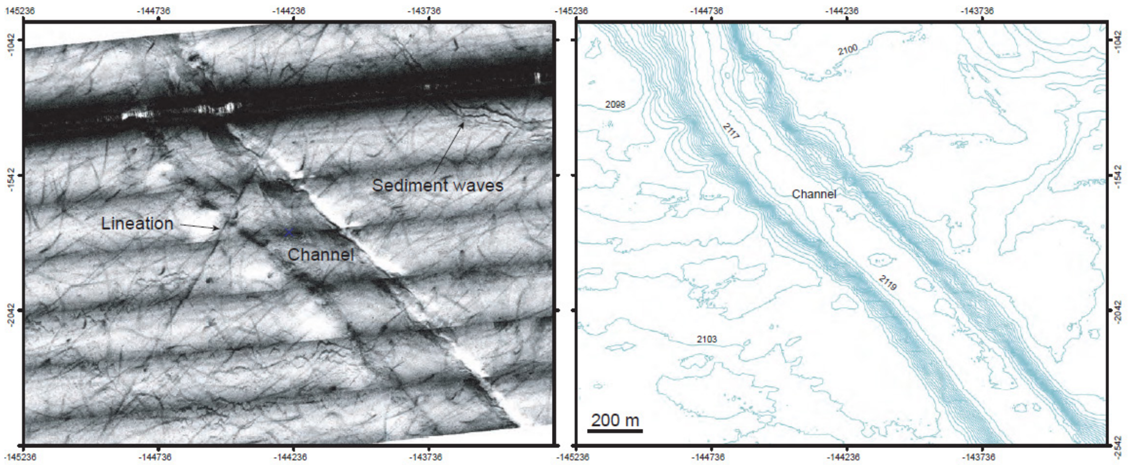
Note: that these features have no bathymetric expression, suggesting that they are relatively old features buried by later sedimentation.

Source: Ref. 7.12

These are oriented approximately east-west, perpendicular to the adjacent channels and to the levee slope. They are interpreted as sediment waves built by unconfined turbidity currents. Their location is consistent with turbidity flows moving south in the deep to the east of the levee, but pinned against the levee flank by Coriolis force. This interpretation is also supported by the occurrence of backscatter banding, oriented almost north to south that is the typical signature of sediment deposited by turbidity currents (Ref. 7.12).

Six channels crossing the Survey Area can be identified in bathymetry data (Ref. 7.12). Most of these have rather indistinct signatures on SSS data and are clearly partly buried. They can thus be inferred to be inactive (not subject to sediment flows, turbidity currents, moving through the canyon), although this needs to be confirmed by analysis of sediment cores. The easternmost channel, however, has a relatively sharp appearance on bathymetry and SSS data, as well as a clear backscatter contrast between channel floor and flanking levee (Figure 7.21). It is thus inferred to be the youngest channel in the overall channel levee complex, although recent activity cannot be confirmed or ruled out. This channel shows flanking features that could be interpreted either as terraces, or as channel wall failures. However, the position of these features, just downstream of bends in the channel and on the inside channel wall, supports their interpretation as terraces (Ref. 7.12).

Figure 7.20 Side Scan Sonar Image (left) and Bathymetry (right) showing part of a channel on the Distal Danube fan



Source: Ref. 7.12

7.5.3.5 Marine Sediments

Sedimentation in the abyssal plain of the Black Sea is very slow and consists of clay-silt size[4] planktonic detritus (mainly consisting of calcium carbonate and organic matter) mixed with minor quantities of clay size terrigenous sediments. Given the organic nature of the majority of the detritus, organic decay ooze can often be found, often separated from the inorganic fraction of the sediment and forming discreet layers within the sediment column (Ref. 7.1). The upper 1 m of the seabed within the Turkish Sector is summarised as follows (Ref. 7.1):

- Uppermost layer is approximately 0.3 m thick and comprising the remains of phytoplankton (coccolith) deposits and greenish-grey clay;
- Intermediate layer, approximately 0.4 m thick and comprising dark-grey organic rich decay ooze, jelly-like in substance; and
- Lower layer approximately 0.3 m thick and comprising alternative layers of ooze, with silt and sand, with colours ranging from grey and browns to black spots (due to the presence of iron sulphite aggregates).

The sediments can be divided into shallow and deep water sediments compositional-genetic type classification. The deep-water sediments in the Black Sea are listed below and shown on Figure 7.22

- Carbonate-free terrigenous sediments;
- Carbonate-poor organogenic- terrigenous muds;

[4] Particle size refers to the diameter of individual grains of sediment. In this case, the clay to silt size range is between 0.0039 mm to 0.0625 mm.

- Carbonate-poor, organogenic-terrigenous, finely dispersed;
- Carbonate-bearing, organogenic-terrigenous, finely dispersed Coccolith muds;
- Carbonate-rich (locally carbonate-bearing), finely dispersed Coccolith muds rich in organic matter; and
- Modern sediments of considerable diversity with predominance of carbon-poor organogenic-terrigenic muds.

Sediments collected in 2011 at Stations 3, 6, 9 and 11 (Figure 7.1) also included testing for grain size, organic content and pH. The results of the fractional size analysis were converted into four key factions: gravel (10 to 1 mm), sand (1 to 0.1 mm), silt (0.1 to 0.01 mm) and pelite (less than 0.01 mm) (Ref. 7.1). A diagram showing the distribution of particle size of sediments on the main fractions is shown in Figure 7.23.

Sediment Contamination

Surveys in the area have identified the presence of contaminants in the marine sediments including petroleum hydrocarbons, phenols, anionic surfactants and heavy metals. Concentrations were typically highest near the coast, particularly in the vicinity of the main towns. In addition, some heavy metals (e.g. iron, manganese) are naturally present in relatively high concentrations in the marine sediments in deep waters owing to the prevailing redox environment. The level of seabed pollution depends on many factors including the lithological type of the deposit, particle sizes, the depth of the sea, the properties of the polluting substances (pollutants) and the level of their arrival from the coast, hydrological conditions, the system of currents, etc.

The top layer of sediment (about 0.3 m) is of interest since the pipelines will be placed directly on top of this layer. Testing for water content, density, Atterberg limits (tests which identify the consistency and behaviour of sediment), particle size distribution, organic matter and carbonate content were conducted for classification of properties and sediments at various sampling locations in the Turkish EEZ. Sediments in the Survey Area are considered generally uncontaminated, though elevated levels[5] of anionic surfactants, cadmium (Cd), and in one sample, nickel (Ni) were observed (Ref. 7.1). However, any elevated levels of heavy metal concentrations observed in samples from this depth are not likely to have a significant impact on the ecosystem of the Black Sea (Ref. 7.1). The surveys (Ref. 7.1) also indicated that petroleum hydrocarbon concentrations were at levels under the target levels[5] (Ref. 7.19) and that phenol concentrations at all stations were below the detection limit (<0.1 milligrams per kilogram (mg / kg)). The following conclusions were drawn from the sediment analysis:

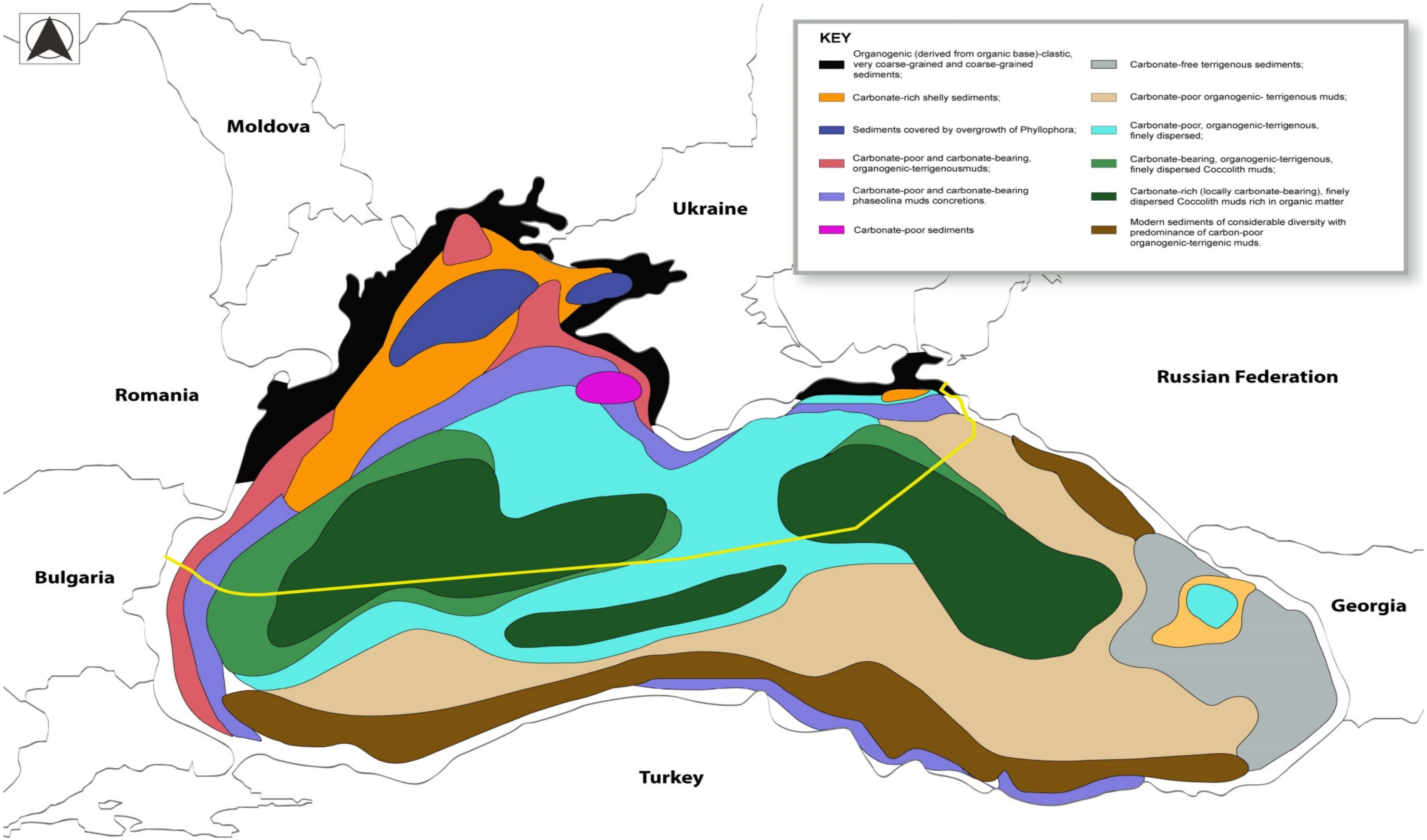
- Two hundred and thirty four (234) samples were classified as clayey sediments and the remainder of the samples (12 samples) were classified as sandy sediments;
- Considerable organic content (6.8 to 66.2%) was revealed in the samples;

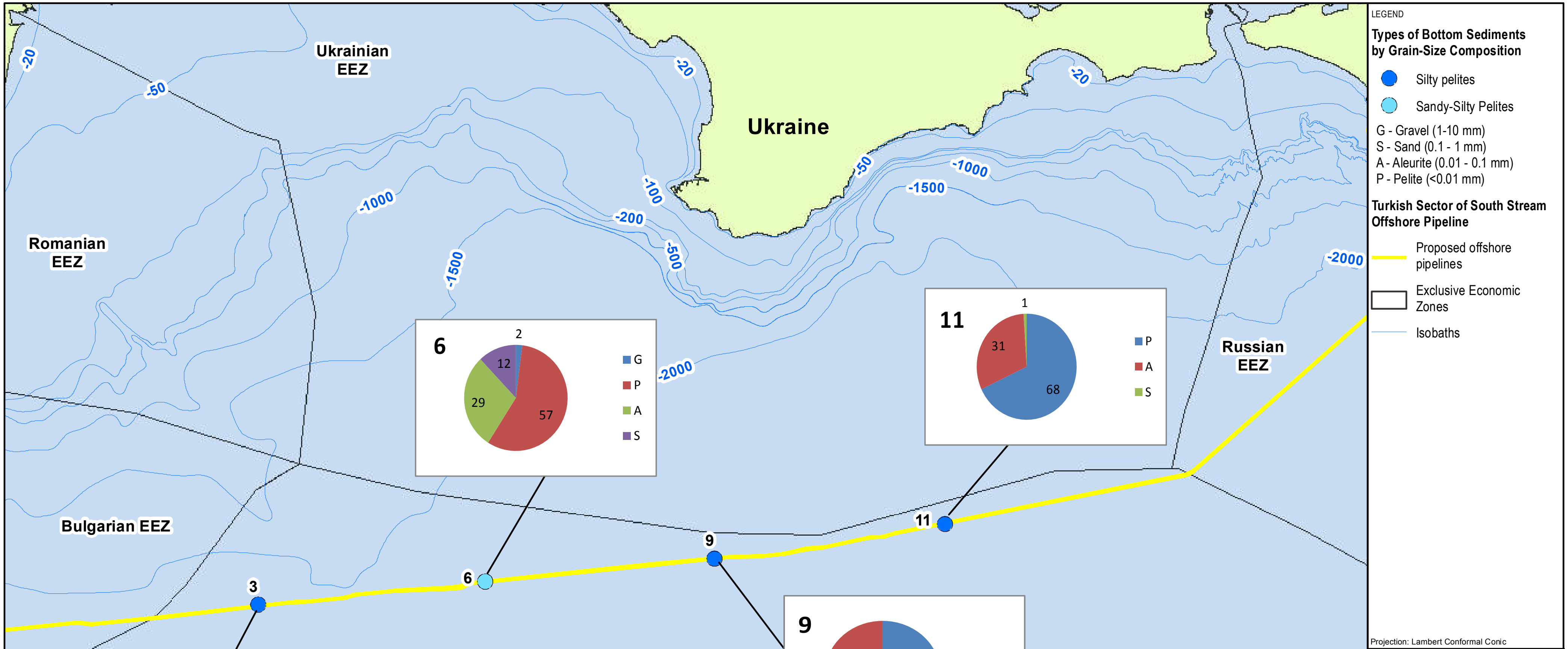
[5] Dutch Target and Intervention Values, 2000 - Circular on target values and intervention values for soil remediation. Sediment analysis was conducted by Russian laboratories. As the content of pollutants in bottom sediments was not regulated by Russian documentation, the Dutch Standards were used as a reference document.

- Approximately 60% of the sediments belong to the OH group (organic clays with high plasticity), 25% – to CH group (clayey sediments with high plasticity) and the rest belonging to groups SM (silty sand) and ML (silt); classified in accordance with American Society for Testing and Materials (ASTM);
- Approximately 80% of the tested sediments have alkaline properties (pH>7) and the remaining 20% have acid properties (pH<7);
- The main part of the tested sediments appeared to be slightly over consolidated with over consolidation ratio (OCR) varied between 0.4 and 2.7; and
- The sediments have high deformability, low strength and low permeability.

Sediment samples collected at four locations in 2011 revealed that the majority consist of clayey fine grained sediments (Ref. 7.1), with the clay fraction of all samples being greater than 57% which is similar to that observed from the 246 samples taken above in the same area (within the Survey Area). The geochemical assessment was conducted on the samples and results are presented in Figure 7.24. These results are in line with previously published sediment sampling results in the Black Sea (Ref. 7.9).

Figure 7.22 Generic Types of Modern Black Sea Sediments





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
GRAIN SIZE DISTRIBUTION OF SEDIMENTS

Drawn	Checked	Approved	Date
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Figure 7.23
Rev

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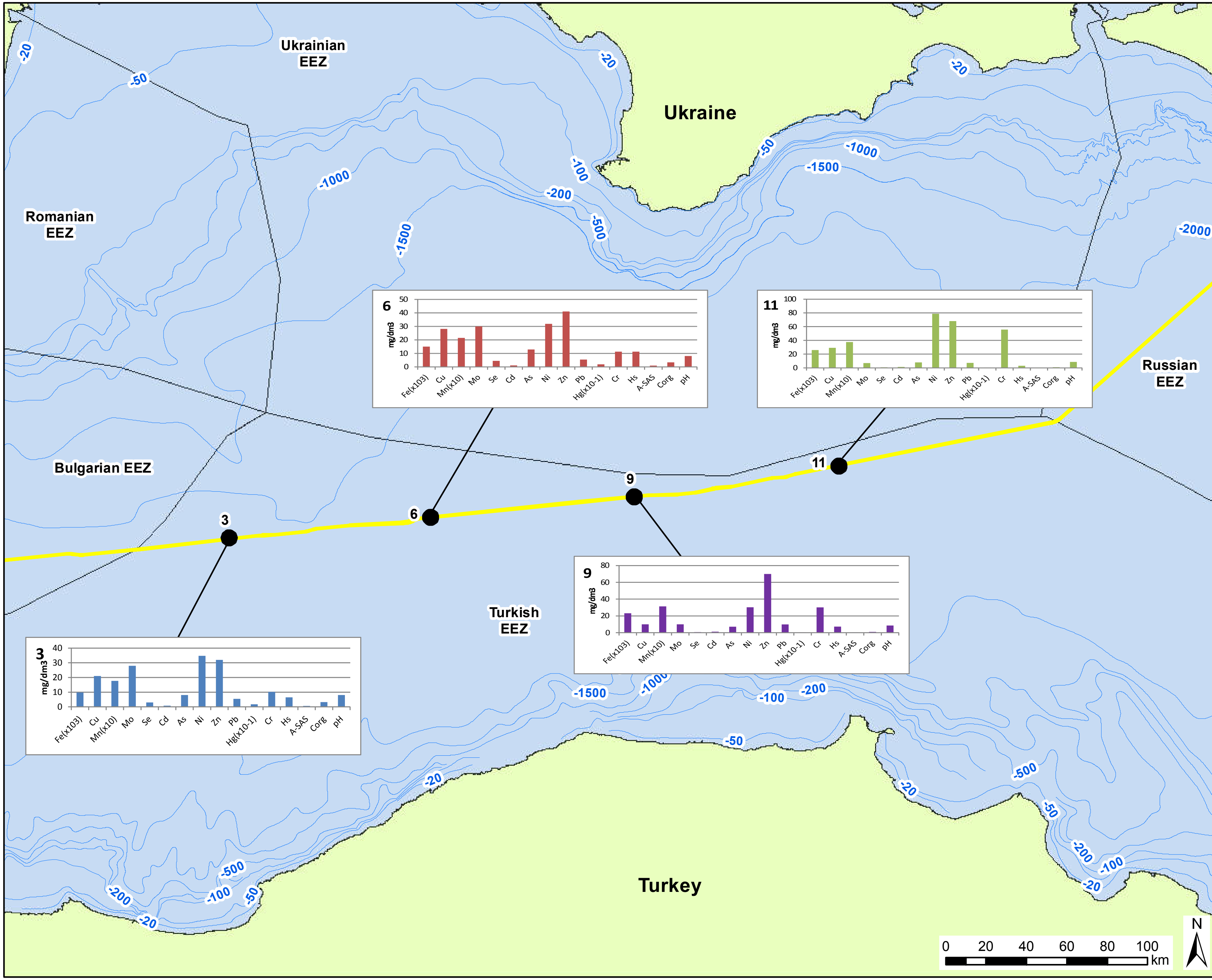

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Sampling stations and their numbers

Content of Iron (Fe), Copper (Cu), Manganese (Mn), Molybdenum (Mo), Selenium (Se), Cadmium (Cd), Arsenic (As), Nickel (Ni), Zinc (Zn), Lead (Pb), Mercury (Hg), Chrome (Cr), Petroleum Hydrocarbons (HC), Anion-Active Surface-Active Substances (A_SAS), Organic Carbon (Corg), mg/kg, pH value(bottom sediments)*

* values not shown at diagrams were under detection limit

Turkish Sector of South Stream Offshore Pipeline

Proposed offshore pipelines

Exclusive Economic Zones

Isobaths

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7.6 Impact Assessment

As discussed in Section 7.2, there is no impact assessment conducted for the receptors of the physical environment.

7.7 Unplanned Events

The oil spill modelling summarised in **Chapter 13 Unplanned Events** states that the fuels in question, if spilt, would evaporate to a significant degree with the remainder being naturally dispersed by wave action within a few days of being spilled. As such, impacts to water quality are expected to be short-term and **Not Significant**. No other physical receptors are likely to be impacted by an unplanned event.

7.8 Cumulative Impacts Assessment

Given that there are no residual impacts on physical receptors, there is no scope for cumulative impacts and the physical environment was not considered in **Chapter 14 Cumulative Impact Assessment**.

7.9 Conclusions

The baseline conditions in the Black Sea have recorded increased salinity and H_2S concentrations with depth. Anoxic conditions are observed below 150 to 200 m water depth. Water quality samples recorded relatively low concentrations of suspended solids and concentrations of inorganic pollutants, and organochlorine pesticides were below detection limits. However, high concentrations of mineral oil, anionic surfactants and phenols were present indicating anthropogenic impact on water quality.

The Black Sea neighbouring countries are seismically active, however, faults within the abyssal plain of the Turkish Sector are almost undisturbed by fault dislocations. Sediments in the Survey Area are predominately clayey and contain a considerable amount of organic content (6.8 to 66.2%). Sediments were predominately uncontaminated although elevated levels of anionic surfactants, cadmium (Cd), and nickel (Ni) were observed in some samples. However, any elevated levels of heavy metal concentrations observed in samples from this depth are not likely to have significant impacts on the ecosystem of the Black Sea.

In summary, it is considered that all physical receptors in the Turkish EEZ can be scoped out of any impact assessment. Given the scope of the Project activities and design controls, there is unlikely to be an impact on sediment quality, geological and hydrodynamic processes, air quality and water quality.

Indirect impacts of water quality on the marine ecological environment are discussed in **Chapter 8 Biological Environment**.

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Chapter 8: Biological Environment

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Figures

8 Biological Environment

8.1 Introduction

This chapter presents an assessment of the Project's impacts on marine biology within waters in the Turkish Exclusive Economic Zone (EEZ) of the Black Sea. The assessment considers impacts arising during the Construction and Pre-Commissioning, Operational and Decommissioning Phases. It is during construction that the majority of impacts are predicted to arise; vessel movements and physical placement of the pipeline on the seabed have the potential to disturb species, particularly as a result of noise from vessels impacting fish and cetaceans. An assessment of the potential impact on marine biological receptors from unplanned or emergency events is provided in **Chapter 13 Unplanned Events**.

Within the Turkish EEZ, faunal groups of particular interest, either due to their value or vulnerability, include a variety of commercial fish species (notably anchovy), marine mammals and birds; some species of conservation interest exist in the area. Plankton is also vital to the functioning of the marine food web and is also considered important. These are discussed further in Section 8.5.

This chapter provides a description of the baseline conditions, assessment methodology, regulatory framework, the design controls adopted by the Project, and mitigation measures required to avoid, minimise, repair or offset any significant adverse impacts of the Project's activities and the likely residual impacts assessed after these measures have been employed. The potential for cumulative impacts with other projects in the surrounding area is also considered.

8.2 Scoping

The scope of the impact assessment described in this chapter was defined through a process that identified ecological receptors and potentially significant impacts related to the Project. Baseline information which informed the scoping process largely drew on information gathered from studies undertaken for the South Stream Offshore Pipeline, including feasibility, engineering and environmental surveys carried out between 2009 to 2013 (see Section 8.4.4). Key steps in the scoping process for marine ecology comprised the following:

- The Project's Front End Engineering and Design (FEED) was reviewed to identify activities with the potential to significantly affect ecological receptors;
- Ecological receptors within the Project Area were identified through a process of secondary data review and surveys undertaken for the Project (as described in Sections 8.4.2 and 8.4.4) and professional expertise;
- A review of relevant national and international legislative requirements and lender requirements to ensure legislative and policy compliance; and
- An Environmental Issues Identification (ENVIID) was undertaken to assist in the identification of impacts and receptors. During the ENVIID process, each activity was examined to understand how activities were expected to interact with ecological receptors,

which receptors would be impacted and the nature (beneficial or adverse) of the likely impact. The outcome of the ENVIID was an ENVIID register which identified the various elements of the Project and their interaction or potential impact on sensitive ecological receptors.

The biological environment in which the Project is proposed contains many potential receptors and is therefore an important consideration in the ESIA process. Possible receptors are diverse and include a wide variety of organisms. For the purpose of this assessment, marine biota is broadly grouped into the following topics: plankton, fish, birds and marine mammals. In addition, the habitats that these organisms inhabit and the ecological processes of these habitats are considered as receptors. Species of conservation interest and any potential critical habitats, are discussed in terms of their importance and the potential impact that the Project may have on them.

The potential occurrence of species of conservation value (listed as Vulnerable or above) was identified using the following sources:

- International Union for Conservation of Nature (IUCN) Red List (Ref. 8.1);
- Red Data Book of the Black Sea – Black Sea Environment Programme (Ref. 8.2); and
- Red Data Book Black Sea, Turkey – Turkish Marine Research Foundation (Ref. 8.3).

8.3 Spatial and Temporal Boundaries

8.3.1 Project Phases

This chapter has appraised the potential for the activities during the construction, operation and decommissioning to have significant effects on receptors if not properly mitigated. Decommissioning is considered in less detail, because it will be the subject of a dedicated assessment near the end of the Project's life, allowing for the incorporation of prevailing technology and Good International Industry Practice (GIIP) at that time.

8.3.2 Project Boundaries

The Project Area is some 470 km in length and 2 km in width, extending along an east west orientation across the north of the Turkish EEZ from the Russia and Turkey EEZ boundary to the Turkey and Bulgaria EEZ boundary. No excavation of or filling over the seabed is anticipated. There will be no landfall facilities within the Turkish Sector. Information on the Project Area is given in **Chapter 1 Introduction**.

The Study Area, and Zone of Influence, for the biological environment has been defined so that it encompasses the area in which impacts are likely to occur in order to define a robust baseline against which to undertake the impact assessment. The Study Area for the biological environment is therefore defined as the central Black Sea encompassing the abyssal plain.

The Survey Areas refer to the locations in which surveys were conducted for the Project during the feasibility and design stages between 2009 and 2011. The locations of and information related to these surveys are shown in Figure 8.1 and Table 8.1. The Survey Areas are defined under the topic headings in Section 8.5 of plankton, benthic, fish, seabirds and marine mammals.

8.4 Baseline Data

The majority of the baseline information used to support this Chapter comes from the results of marine surveys specifically conducted for the Project in 2009 and 2011 (Ref. 8.4). However, secondary data sources (e.g. published literature) were also consulted to provide background information.

8.4.1 Methodology and Data

Secondary data (i.e. data from third parties not specifically acquired for the Project, including literature reviews, etc.) and existing primary data (i.e. data acquired specifically for the Project through dedicated surveys) were reviewed prior to scoping. Following this, a data gap analysis was conducted and studies and surveys to collect additional primary data were specified. This is discussed in Section 8.4.2 to 8.4.4.

8.4.2 Secondary Data

Where possible, this assessment is based on primary data. However, a number of secondary data sources were consulted to inform the baseline of this chapter, as described below:

- Survey reports (Ref. 8.4) produced by Peter Gaz for the South Stream Offshore Pipeline included a review of published scientific literature that has been incorporated into this baseline as appropriate;
- Recently published scientific literature which was identified through a British Library data search;
- The Red Data Book of the Black Sea was consulted in order to identify the potential presence of species within the Study Area (Ref. 8.2) as well as international conventions such as the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS) (Ref. 8.5); and
- Information on fish and historic changes in the Black Sea flora and fauna are found in the Black Sea Commission "State of the Environment" reports (Ref. 8.6 to 8.9).

8.4.3 Data Gaps

After a review of the data including 2009 and 2011 survey results and available literature, several data gaps were identified. These included data gaps relating to fish and migration and benthic habitats. The data gaps were addressed through primary data gathering and baseline surveys as discussed in Section 8.4.4.

8.4.4 Primary Data and Baseline Surveys

A series of marine surveys was conducted between 2009 and 2011 to collect data on marine ecological receptors that might be impacted by the Project.

Table 8.1 Marine Ecology Surveys (2009 and 2011)

Receptor	Sampling method	Jun 2009	Sep to Oct 2011
Phytoplankton	Niskin bottle.*	10 stations at 3 depths: Surface: 0 m; Mid-water: between 5 to 50 m; and Bottom: between 60 to 120 m.	15 stations at 3 depths: Surface: 0 m; mid-water: between 5 to 50 m; and Bottom: between 60 to 120 m.
Primary Production	Light-and-dark-bottle method.** Light intensity at depth measured with a Secchi disk.†		
Zooplankton	Towed Juday net, 0.5 metres per second (m/s) speed. Mesh size of 180 µm.		
Ichthyoplankton	Horizontal hauling (at the surface) in the course of the turning circle of the vessel for 10 minutes at a speed of 2.5 knots. Vertical hauling (from 150 m to 0 m). When the net reached the desired depth, it was hauled at a speed of no more than 1.25 m/s.	10 stations	15 Stations

Continued…

Receptor	Sampling method	Jun 2009	Sep to Oct 2011
Birds and marine mammals	Observations were carried out visually, in the day-time. The observations were conducted along transects by the snapshot method (Gould, Forsell, 1989 in Ref. 8.4) in a forward and perpendicular direction from one side of the vessel and a visual plot 300 x 300 m was selected, within which all bird were counted within 10 to 15 seconds. The main attention was given to flying birds. During the time remaining until the end of the 300 m section, it was viewed again, as some birds sitting on the water could be underestimated in the count. Inspection was carried out with the naked eye; binocular (15x) was used if necessary to identify birds to species level. At the stations, birds were counted only at the first appearance in a radius of 300 m around the vessel. Birds accompanying the vessel were counted only at the first occurrence. The bird species, gender and age were determined as possible.	5 stations; and 6 transects.	12 stations; and 11 transects.
Marine mammals	Specific observations of species and populations of marine mammals were carried out on stations and transects along with bird-watching, in the daytime from the upper deck of the vessel.	5 stations; and 6 transects.	12 stations; and 11 transects.

* A Niskin Bottle can be opened at both ends and the open bottle is lowered into the ocean on a wire from a Research Vessel until it reaches a certain depth and then the bottle is closed.
** A method used to determine the extent of Photosynthesis in an aquatic Ecosystem. Duplicate portions of a water sample are collected. One portion is incubated in a clear bottle, and the other is incubated in a dark, light-impermeable bottle. Following incubation for a prescribed time period, the net uptake of carbon dioxide in each is measured and compared.
† The Secchi disc is mounted on a pole or line, and lowered slowly down in the water. The depth at which the pattern on the disk is no longer visible is taken as a measure of the transparency of the water.

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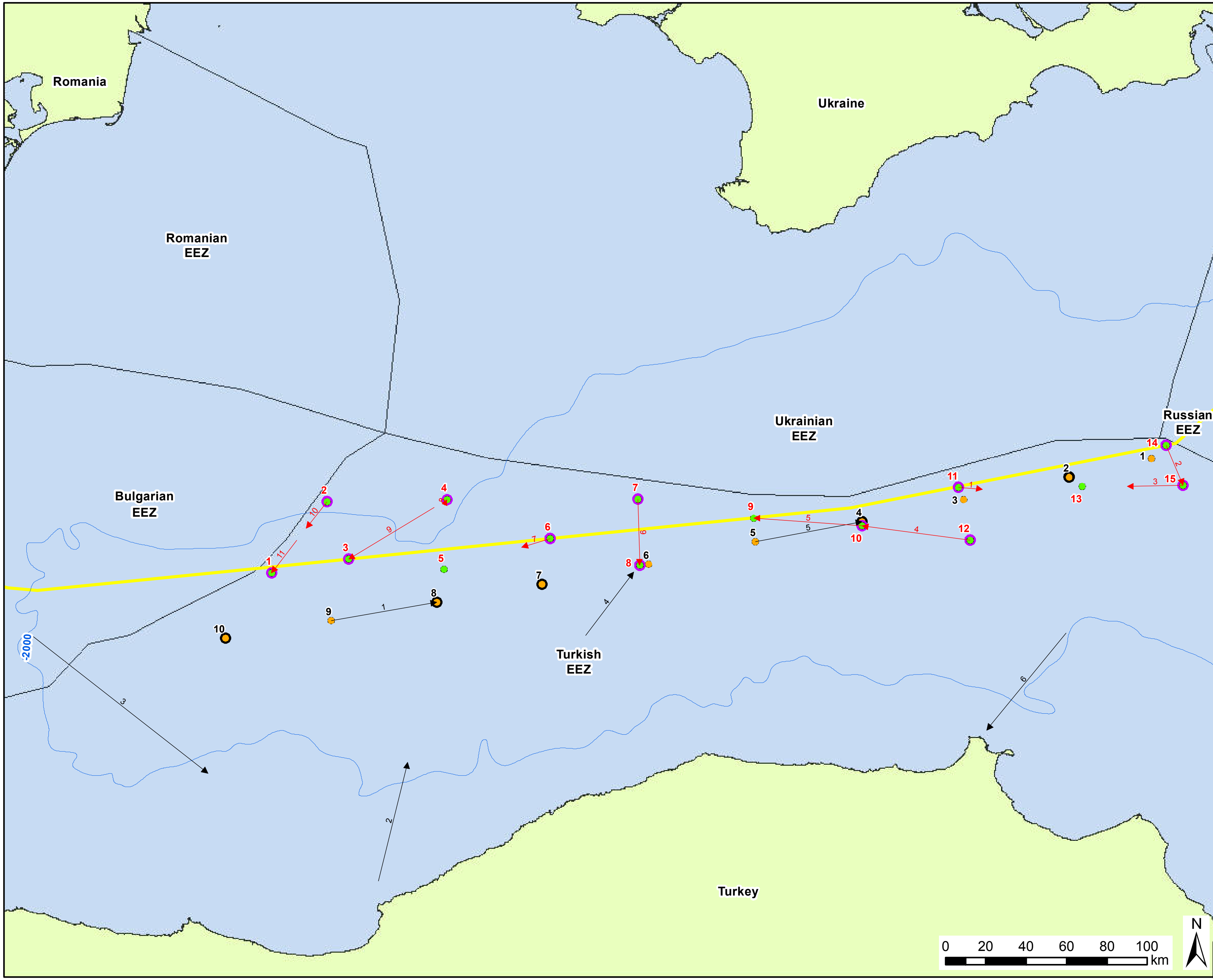

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2010 Peter Gaz Survey Locations

Plankton sampling locations

Seabirds & marine mammals sampling location

Transects for bird and mammal surveys

2009 Peter Gaz Survey Locations

Plankton Stations

Bird and Mammal Stations

Bird and Mammal Transects

Turkish Sector of the South Stream Offshore Pipeline

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These surveys collected ecological and physico-chemical data over a wide area and during several seasons. These surveys served to establish the broad environmental parameters of the Project Area, albeit at relatively low resolution.

Table 8.1 lists the marine ecology surveys undertaken in 2009 and 2011. The survey methods used for each species are discussed under the relevant topic headings. The survey sampling stations are shown in Figure 8.1.

Following a gap analysis of the data, additional analysis and studies were commissioned by South Stream Transport in 2013, namely:

- Expert analysis of Remotely Operated Vehicle (ROV) footage and side-scan sonar data collected from the pipeline route in 2011 to investigate the nature of the benthic environment and the potential presence of any microbial habitats (Ref. 8.10); and
- An in-depth review of fisheries data and interviews with fisheries stakeholders to establish information about the fish species likely to be using the waters of the Project Area (Ref. 8.11, Appendix 9.1: Fishing Study).

The key findings of these studies are presented within this ESIA chapter.

8.4.5 Data Assumptions and Limitations

In order to carry out this assessment, certain assumptions have been made regarding the input data, and it is acknowledged that some of the data used in the ESIA Report have attendant limitations:

- The assessment is based on a Project description that may be refined during detailed design. Nonetheless, the key design parameters are understood and the ESIA Report is based on these, with additional mitigations specified as appropriate. Design changes which impact results of this ESIA Report are captured in the management of change process discussed in **Chapter 5 Project Description**;
- The environmental standards may evolve during the lifetime of the Project. It is not possible to predict such changes but reference to GIIP minimises the effect of this uncertainty;
- It has not been possible to provide definitive temporal trends in the baseline due to the differences in season of the various surveys undertaken;
- The description of the deep sea environment is based on acoustic data interpretation with supporting bathymetry and profile data together with ROV data along the pipeline route and this makes it subjective to a degree. However, given the absence of potentially biogenic deep sea features in the Turkish Sector, this is not considered a risk to the assessment; and

The ecology of birds, particularly seabirds, and marine mammals in the central Black Sea is not well understood (in terms of accurate details on migration, breeding etc.). Surveys undertaken for the Project give data on distribution but cannot provide this level of detail.

8.5 Baseline Characteristics

8.5.1 Black Sea Overview

The Black Sea is a semi-enclosed basin and the world's most isolated sea from any of the major world oceans. It has connections to the Mediterranean Sea through the Bosphorus Strait and the Dardanelles Strait and with the Sea of Azov in the northeast through the Kerch Strait.

There are two layers of water with different salinity in the Black Sea. An upper brackish layer, with an average salinity of 17‰, results from the massive freshwater influx from rivers including the Danube, Dnieper and Don via the Sea of Azov. Below this is a layer of higher salinity seawater (20-30‰), originating from the Mediterranean. This stratification, which creates a distinct and permanent pycnocline[1] around 150 to 200 m water depth, limits the vertical exchange of water between the surface and deeper waters creating a unique chemical and biological environment.

The upper water layers of the Black Sea provide a thin aerobic biotic layer. In undisturbed conditions Black Sea faunal biodiversity in this biotic layer is approximately one third that of the Mediterranean Sea because of the low salinity. However, total biomass and productivity of the Black Sea are much higher than the Mediterranean Sea because of the high input of riverine nutrients.

The lower water layer however, which accounts for as much as 87% of the Black Sea volume, is highly anoxic with high levels of hydrogen sulphide (H_2S). As these concentrations increase rapidly past 150 to 200 m water depth due to the restricted ventilation, the diversity and abundance of benthic fauna and flora decrease rapidly with increasing depth. The seabed of the deeper parts of the Black Sea is therefore unlikely to support significant macro or meiofaunal communities due to the anoxic environment (Ref. 8.12). Some protozoa and bacteria are known to inhabit the benthos and deep-sea waters. For example, in the deep anoxic shelf of the north-western Black Sea, in waters deeper than 200 m, numerous gas seeps are populated by methanotrophic microbial mats that can form tall reef-like structures (Ref. 8.13). These have, however, only been observed in the north-western area of the Black Sea. Further details are given in **Chapter 7 Physical and Geophysical Environment**.

The seabed of the Black Sea is divided into the shelf, the continental slope and the abyssal plain. The Project Area is located entirely within the abyssal plain. Importantly, the Black Sea has a very large catchment area to surface area ratio and a densely populated coastal zone, making it highly vulnerable to pressure from land based human activity. Rapid economic development and a lack of adequate management of marine resources in the later decades of the 20th century have resulted in major environmental and ecological changes in the Black Sea ecosystem.

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[1] A pycnocline is the layer where the density gradient is greatest within a body of water. Formation of pycnocline may result from changes in salinity or temperature.

Eutrophication due to excessive nitrogen from land based sources has caused a number of adverse processes that have changed the diversity and distribution of flora and fauna throughout the Black Sea ecosystem. Eutrophication has given rise to massive increases in primary production and a shift in the abundance and composition of phytoplankton species in the Black Sea. Larger and more frequent algal blooms have increased the flux of organic matter to the seabed inducing a sharp decline of dissolved oxygen and a silting of benthic communities in many coastal areas. Increased incidence of harmful algal blooms (red tides) is reported to have caused the death of many fish (Ref. 8.14).

There have been changes in zooplankton, with the loss for example of some species and a shift from larger to smaller species of crustacean. There have also been sharp increases in the number of gelatinous species such as jellyfish, although the most drastic change in the zooplankton communities has resulted from the invasion of the ctenophore, *Mnemiopsis leidyi*. This species is a voracious predator of copepods, which are important prey items for larval and juvenile fish (Ref. 8.15), and is a direct predator of fish eggs and larvae. This situation persisted until 1997 to 1998, with another accidental introduction of the ctenophore *Beroe ovata* (Ref. 8.16). This species is the main predator of *M. leidyi* and subsequently the zooplankton community began to recover both in species composition and abundance (Ref. 8.12). The effects of these invasions are only recently showing signs of reversal.

Whilst these changes have been most pronounced in coastal waters there have been some changes in species composition in waters in the centre of the Black Sea (Ref. 8.4). Since the early 2000s the governments of the Black Sea coastal states have adopted a basin wide approach to pollution reduction and towards the strategic goal of restoring the ecological status of the Black Sea similar to that observed in the 1960's. Pollution pressure from land based sources, although still intense, shows a decreasing trend, and some improvements in ecological status have recently been observed. For example, some species that had disappeared are now found to be recovering and the number and intensity of algal blooms is reported to be lower for all areas.

8.5.2 Plankton

8.5.2.1 Background and Literature Review

Plankton forms the basis of marine food webs and is therefore essential to the structure and functioning of marine ecosystems. As phytoplankton are photosynthetic, they are generally confined to the euphotic zone of the open sea (the water layer exposed to sufficient sunlight for photosynthesis to occur). This zone is typically up to 200 m deep in the open ocean, but is only approximately 50 m deep in the Black Sea. Vertical distribution of plankton in the Black Sea is also influenced by the rapid decrease in oxygen below the pycnocline (Ref. 8.6).

Significant changes in the phytoplankton community were observed within the Black Sea between 1985 and 1994. The existing seasonal succession pattern of a spring diatom bloom followed by blooms of dinoflagellates and then phytoflagellates was disrupted, with a reduction in the diatom component of the spring bloom. This fundamental shift in the community structure of phytoplankton still persists. The reasons for this are not clearly understood, but a variety of natural and anthropogenic causes have been postulated, including a cold period from

1985 to 1994 (Ref. 8.12), hot summers and early warming of the surface layer (Ref. 8.4), damming of the Danube River, a reduction in silicate inputs (Ref. 8.14) and a reduction in inorganic nutrients allowing coccolithophorids to more successfully compete with diatoms (Ref. 8.4).

A large phytoplankton biomass provides a supply of food for the species of phytoplankton feeding zooplankton. In recent years there has been a sharp increase in the abundance of *Noctiluca scintillans, infusoria* such as *Mesodinium rubrum, scyphozoan* jellyfish and copepods such as *Oithona minuta* and *Acartia clausi* (Ref. 8.15). Many of these species are likely to be present in the waters of the Turkish EEZ.

There is little information on the specific species composition of zooplankton in the central Black Sea as most studies have concentrated on coastal areas. However, it is known that many species common in coastal waters such as the copepods *Calanus exinus* and *Pseudocalanus elongatus*, the arrow worm *Sagitta setosa*, the jellyfish *Aurelia aurita* and ctenophores such as *Pleurobranchia rhodopis* and *Mnemiopsis leidyi* are all present in the central Black Sea.

The average zooplankton biomass in central areas is very similar to coastal areas, (excluding the north-western shelf) in comparison with many other seas, including the neighbouring Mediterranean Sea. This is due to a fairly intensive vertical-exchange above the pycnocline in central areas of the Black Sea and horizontal water-exchange between central and coastal areas (Ref. 8.17). There is however, considerably less variability in spatial and temporal abundance in open waters compared to the coast. The seasonal pattern in the open ocean is also different with a peak in the summer compared to spring and autumn in coastal areas. This is due to the differences in nutrient availability and hydrological conditions.

The effect of anthropogenic nutrients observed in the Black Sea in the 1970's and 1980's, including increased primary production and changing phytoplankton community composition, were limited to coastal and shelf waters. No changes in phytoplankton communities were observed in the central basin of the Black Sea until the mid-1980s, coinciding with an onset of regional cold climatic conditions. It is generally recognised that the phytoplankton regime shift observed in the central Black Sea is due to an increase in the bottom-up flux of nutrients into the euphotic layer during cold conditions and not the impact of anthropogenic nutrients. This effect is also observed in the occurrence of winter phytoplankton blooms in the central Black Sea (Mikaelyan et al., 2013 in Ref. 8.4). In general, however, the level of productivity in the central Black Sea is much lower than in coastal and shelf waters, a fact reflected in the lack of any major fisheries in the central basin. More information on fishing activity in the Turkish EEZ is provided in **Chapter 9 Socio-Economics**.

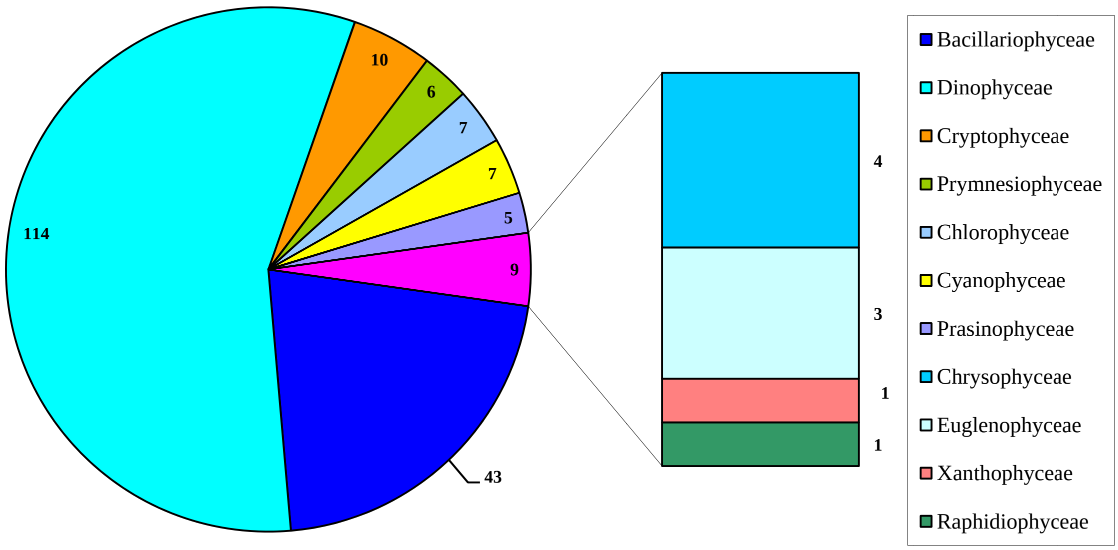
Due to the man-made and natural factors mentioned above, phytoplankton blooms changed from being isolated incidents to becoming annual or inter-annual events. The diatom *Skeletonema costatum* for instance typically undergoes a population explosion in the spring, when the number of cells may reach 1 x 10^8 cells per litre (cells/l), whereas in the 1960s the maximum did not exceed 1.8 x 10^6 cells/l (Ref. 8.15). Initially, some authors believed that these phytoplankton blooms were a positive event, because they produced an increase in biological productivity which in turn increased catches of anchovy and sprat (plankton feeding fish species). But there were other factors which may have been equally responsible for the increase in anchovy and sprat catches, namely: the reduction by that time of large pelagic predators (e.g. mackerel, bonito and bluefish), or the intensification of commercial fishing because of the greater number of fishing vessels and the use of trawls (refer to Section 8.5.4). It is likely that all of the above factors contributed to the temporary increase in the catches of small plankton-feeding fish (Ref. 8.15).

8.5.2.2 Plankton Survey

Phytoplankton

Overall, the 2009 and 2011 results are similar. Eighty three (83) species of planktonic algae were found, belonging to seven taxonomic groups observed in 2009, with dinoflagellates accounting for around 63% of all species. In 2009, dinoflagellates accounted for 56% of total species. The breakdown of the 201 species and 11 classes recorded in 2011 can be seen in Figure 8.2. Of interest is the presence of the potentially toxic algae genus Alexandrium (5 species) and the first recording in open waters of the species *Chaetoceros aequatorialis* and *Chaetoceros ceratosporum*.

Figure 8.2 Taxonomic Characteristics of Phytoplankton in the Area Surveyed in Sept and Oct 2011



Species diversity was highest in surface layers (65 to 95) and pycnocline layer (35 to 75) and lowest in waters below 100 m (13 to 28). Species composition was fairly uniform throughout the Survey Area as shown (over 70% similarity between stations). Abundance and biomass were both highly heterogeneous and highest in surface waters with diatoms and dinoflagellates accounting for 50% and 30% of the total respectively. Photosynthetic pigments were low, as indicated by high water transparency, and pigment ratios, highest at 40 to 50 m, indicative of diatom biomass dominance.

Zooplankton

The limited data available for zooplankton in the Central Black Sea shows a strong seasonal variability with biomass ranging from 2 to 4 g/m^2 in September to 16.5 g/m^2 in October. The surveys undertaken in 2009 recorded biomass values of between 2.2 and 6.8 g/m^2 and were dominated by copepods; other organisms included larvae of bivalves and polychaetes, chaetognaths (arrow worms), appendicularians (pelagic tunicates) and low numbers of ctenophores. Importantly, some individuals of the invasive ctenophores *Beroe ovata* and *Mnemiopsis leidyi* were also captured. Species composition of zooplankton in surveys undertaken in 2009 and 2011 showed a highly variable total abundance and biomass of zooplankton with between 75 to 2,040 individuals per m^3 and 13.5 to 43 miligrams per cubic metres (mg/m^3). This very patchy distribution is possibly linked to local water movements and currents and is similar to phytoplankton abundance described earlier (Ref. 8.4).

The autumn 2011 survey (Ref 8.1) showed zooplankton biomass in the range of 1.89 to 59.73 mg/m^3, a greater range than in 2009 and about half of that recorded in the Bulgarian sector of the Black Sea in September 2011. As in December 2009, the community was dominated by copepods (approximately 85% of total animals present of which 50 to 85% were *Calanus exinus*) with few large animals such as jellyfish and chaetognaths recorded but contributing most to biomass. A total of 27 taxa belonging to eight phyla were recorded including crustaceans, cnidaria, ctenophora, chaetognatha and chordate and the greatest diversity exhibited by Crustacea (14 taxa). Overall abundance and biomass distribution was similar to that recorded in 2009.

More detailed analysis of the autumn 2011 survey showed an overall dominance of cold water species (*Calanus euxinus, Pseudocalanus elongatus, Oithona similis*) and some eurythermic species (*Paracalanus parvus, Acartia clausi, Sagitta setosa, Oicopleura dioica*). Of note were a new invasive species (first discovered in large numbers in 2005 in Sevastopol Bay), *Oithona brevicornis* and the ecologically important dinoflagellate *Noctiluca scintillans* recorded in low numbers. A cluster analysis of the data showed composition as similar at all stations (most stations with a similarity of over 70%); similar distribution amongst phytoplankton reflects the relatively uniform habitat available in the waters of the central area of the Black Sea (Ref. 8.1).

Ichthyoplankton are discussed under the fish section (Section 8.5.4).

8.5.3 Benthos

8.5.3.1 Background and Literature Review

The benthic habitat of the Turkish EEZ is entirely within the Black Sea abyssal plain, where water depth varies between 2,000 and 2,200 m and the seabed is generally uniform muddy sediments. The benthic sediments are completely anoxic and high in H_2S concentrations and are unable to support the meio- and macrofauna that are observed in deep water habitats in other seas and oceans. However, microbial reefs associated with mud volcanoes or "gas seeps" are known to occur in waters deeper than 200 m but these have only been observed in some western areas of the Black Sea (Treude et al., 2005 in Ref. 8.4).

8.5.3.2 Abyssal Plain Study

A dedicated review of 2011 video and side-scan sonar survey data (Ref. 8.10), focussing on seabed features in the Survey Area. The benthic Survey Area consisted of a 1 km wide corridor either side of the centreline of the pipelines. Topography within the Project Area ranges from essentially flat (eastern section) to a complex of channel levee systems with an elevated ridge rising 50 m above the main abyssal plain. The detailed review revealed no carbonate mounds or mud volcanoes and no microbial mat communities of any kind were observed. Possible active pockmarks were observed at certain locations (**Chapter 7 Physical and Geophysical Environment**). The full study of the abyssal plain is presented in Appendix 8.2: Seabed Survey Report.

8.5.4 Fish

8.5.4.1 Background and Literature Review

Fish populations in the Black Sea have been drastically reduced as a consequence of eutrophication, overfishing and plankton reduction associated with the population boom of *Mnemiopsis leidyi*, as discussed in Section 8.5.1. Additionally, the number of fish species sharply decreases with the increase in water depth as waters become anoxic below approximately 150 m depth restricting the vertical distribution of organisms, as well as bottom-living fish species (Ref. 8.12). There are no bottom dwelling or demersal fish species within the Project Area because at the abyssal plain conditions are anoxic and high in H_2S concentration.

Sprat (*Sprattus sprattus*), Black Sea horse mackerel (*Trachurus mediterraneus ponticus*), and the European anchovy (*Engraulis encrasicolus*) populations all collapsed in the 1990’s, though recently there have been some signs of recovery. Populations of larger pelagic fish such as tuna (*Thunnus thynnus*), swordfish (*Xiphias gladius*), and chub and Atlantic mackerel (*Scomber colias* and *S.scombrus*) have also substantially declined (Ref. 8.7). Of these species, the chub and Atlantic mackerel and tuna are listed as endangered on a regional level in the Red Data Book of the Black Sea, Turkey and the swordfish is listed as critically endangered on a regional level (Ref. 8.3).

A recent review of the Turkish Black Sea fish fauna (Ref. 8.18) showed that Atlantic and Mediterranean species comprised 62% of the total species, 7% were cosmopolitan or commonly found around the world, 29% were endemic to the Black Sea and 2% were introduced species such as haarder or so-iuy mullet (*Liza haematocheilus*), barracuda (*Sphyraena obtusata*) and Atlantic salmon (*Salmo salar*).

The most common species likely to be present in the surface waters of the Turkish EEZ include sprat, anchovy, Black Sea garfish (*Belone belone euxini*), three-spined stickleback (*Gasterosteus aculeatus*), Black Sea pelagic pipefish (*Syngnathus schmidti*), golden grey mullet (*Liza aurata*), leaping mullet (*Liza saliens*), flathead mullet (*Mugil cephalus*), haarder or so-iuy mullet, bluefish (*Pomatomus saltatrix*), Black Sea horse mackerel, Atlantic bonito (*Sarda sarda*) and chub mackerel. Of these species, the Black Sea garfish and Black Sea pelagic pipefish are endemic whilst all other species are cosmopolitan. The Black Sea garfish is listed in the Red Data Book of the Black Sea (Ref. 8.2) as endangered whilst the chub mackerel is listed as endangered on the Red Data Book of the Black Sea, Turkey as endangered (Ref. 8.3).

Pelagic spawners, such as mullets, are usually only present offshore during the breeding season (summer) and generally frequent shallower waters (Ref. 8.18). There is very limited data on the occurrence of fish in the waters of the Central Black Sea. However, considering the lack of fisheries in these areas and the low levels of productivity of plankton, the density of fish is not likely to be particularly high and will be limited to pelagic species such as sprat, anchovy and horse mackerel.

8.5.4.2 Ichthyoplankton Survey and Fisheries Study

No dedicated fish surveys were undertaken for the Project. However, ichthyoplankton surveys were undertaken in 2009 and 2011 which, although not comparable to dedicated fish surveys, are considered a good indicator of fish species that may be present in the waters of the Turkish EEZ.

In December 2009, catches at the ten stations consisted of the eggs of one species; sprat (*Sprattus sprattus*). Sprat spawns from October to March in the northern shelf areas of the Black Sea, which coincides with the timing of the survey. Juvenile fish were represented by only one species; whiting (*Merlangius merlangus*), observed at two stations (Stations 4 and 7). Some by-catch in plankton nets included yearlings and adults of Black Sea pelagic fish species and are shown in Table 8.2. The Black Sea pelagic pipefish was the most numerous species caught during these trawls.

Table 8.2 Species Composition of Black Sea Pelagic Fish Species Caught in 10 Ichthyoplankton Trawls in the Project Area in December 2009

Latin name	Common name	IUCN Red List	Number of Individuals	Biological Status (stage of maturity of the gonads)
Engraulis encrasicolus	European anchovy	Not listed	2	Yearling
Gasterosteus aculeatus	Three spined stickleback	Least concern	4	Sexually mature individuals
Merlangius merlangus	Whiting	Not listed	2	Juveniles
Mugil cephalus	Striped (flathead) mullet	Least concern	1	Yearling
Sprattus sprattus	Sprat	Not listed	7	Sexually mature individual
Syngnathus schmidti	Black-Sea pelagic pipefish	Not listed	13	Sexually mature individuals

In the autumn 2011 (September to October) ichthyoplankton survey in the Turkish EEZ (Ref. 8.4), four species of fish were obtained using vertical and horizontal hauls from 15 stations. Eggs, larvae and juveniles of anchovy, sprat and Black Sea pelagic pipefish were observed in vertical hauls, and sprats, Black Sea pelagic pipefish and Black Sea horse mackerel in the horizontal hauls (Table 8.3 and Table 8.4).

Table 8.3 Composition, Frequency of Occurrence and Average Abundance of Ichthyoplankton from Vertical Hauls in the Turkish EEZ Central Black Sea September and October 2011

Species	Eggs		Larvae		Juveniles	
	No. of Stations	Average Abundance (ind/m^3)	No. of Stations	Average Abundance (ind/m^3)	No. of Stations	Average Abundance (ind/m^3)
Anchovy	2	0.0040	4	0.0120	0	0
Sprat	1	0.0015	1	0.0013	0	0
Black Sea pelagic pipefish	1	0.0667	0	0	1	0.0012
Black Sea horse mackerel	0	0	0	0	0	0
Average for survey	**-**	**0.0703**	**-**	**0.0135**	**-**	**0.0012**

Table 8.4 Composition, Frequency of Occurrence and Average Abundance of Ichthyoplankton from Horizontal Hauls in the Turkish EEZ Central Black Sea September and October 2011

Species	Eggs		Larvae		Juveniles	
	No. of Stations	Average Abundance (ind/m^3)	No. of Stations	Average Abundance (ind/m^3)	No. of Stations	Average Abundance (ind/m^3)
Anchovy	4	0.0011	13	0.0369	3	0.0009
Sprat	0	0	0	0	0	0
Black Sea pelagic pipefish	0	0	1	0.0005	1	0.0002
Black Sea horse mackerel	1	0.0002	0	<0.0001	1	0.0002
Average for survey	**-**	**0.0007**	**-**	**0.0277**	**-**	**0.0009**

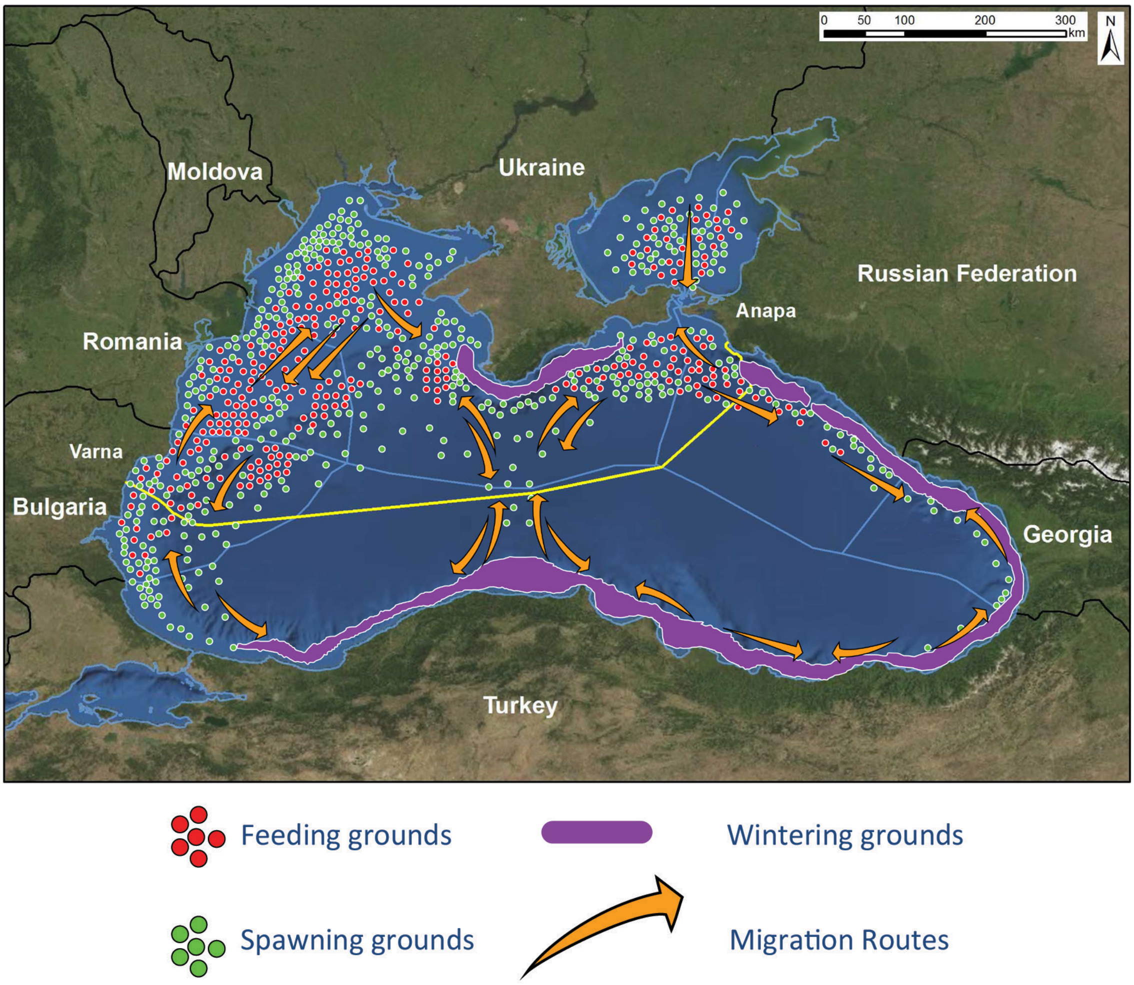
The distribution of these stages (eggs, larvae, juveniles), however, was very patchy with the stages of most species only observed at a few stations. Only the larvae of anchovy were widespread, being observed at 13 out of 15 stations sampled by horizontal hauls, albeit in low abundance. In these horizontal hauls anchovy larvae made up about 80% or more of the total abundance of ichthyoplankton (Ref. 8.4).

In the composition of ichthyoplankton, fish larvae dominated both in numbers and biomass. Eggs and larvae of anchovy were dominant. The results of the 2009 and 2011 surveys (Ref. 8.4) indicate that the abundance and biomass of the ichthyoplankton is low, particularly when compared to data from coastal regions (Ref. 8.4). Whilst the larvae of anchovy were the most abundant ichthyoplankton, and the most widespread, being observed in most of the areas sampled, abundance across the area was very low. The main spawning and feeding grounds for anchovy occur in the north-western and western continental shelf of the Black Sea, along the coastal waters of Bulgaria, Romania and Ukraine (Ref. 8.19). In addition to anchovy preference for shelf areas, the central Black Sea has much lower levels of productivity and consequently less availability of zooplankton prey for the developing larvae. Of all species caught in ichthyoplankton trawls, the Black Sea Pelagic Pipefish is the only species listed in the Red Data Book of the Black Sea, Turkey (Ref. 8.3).

The following information is taken from the Fishing Study provide in Appendix 9.1. Demersal fishing takes place along Turkey’s coastline in water depths of up to around 100 to 150 m, after which anoxic conditions prevent the occurrence of demersal species. Therefore, benthic or demersal species of fish will not occur within the Project Area and only pelagic species are likely to be found although the larvae of some demersal species may be found. The four small pelagic species of importance, both in terms of quantity caught and economic value, caught in Turkish waters of the Black Sea are European anchovy, sprat, Black Sea horse mackerel and Atlantic bonito with anchovy accounting for over 60% of the catch in Turkish waters. Other pelagic species such as bluefish, scad (*Decapterus macarellus*) and European pilchard are caught in quantities that represented less than 3% of the total catch in 2011 and are therefore considered less important for this ESIA Report (Ref. 8.11). The Fishing Study (Ref. 8.11) also considered the potential interaction of fish migration routes and spawning, feeding or wintering grounds with the Project activities. The migration route of the anchovy is of greatest relevance to the Project, as it crosses the Black Sea and passes through the Project Area. The migratory routes, spawning and feeding areas of other pelagic species in the Black Sea do not occur near the Project Area.

European anchovy are distributed throughout the Black Sea with the main spawning and feeding grounds along the coastal waters of Bulgaria, Romania, Ukraine and the Russian Federation (Ref 8.20). Spawning occurs between May and August over continental shelf areas (Ref. 8.21) with the main spawning areas on the north-western and western shelf of the Black Sea (Ref. 8.19). The main feeding and growth seasons are also in the summer months. They winter in the coastal waters of Turkey and Georgia. Anchovy display two seasonal migrations as shown in Figure 8.3.

Figure 8.3 Migratory Routes, Spawning Grounds and Feeding Grounds of Anchovy (*Engraulis encrasicolus*) in the Black Sea (Ref. 8.20, Ref. 8.21)



A southward migration occurs between October and November through the Black Sea and along coastal waters to the Turkish and Georgian coasts (Ref. 8.19 and Ref. 8.21). In the spring, anchovy migrate from southern coastal wintering grounds to spawning areas in the north-western Black Sea. These migration routes pass through the Black Sea from northern coasts to southern coasts, and back again, and therefore will pass through the Project Area. This migration corridor is thought to be approximately 125 km in width (Figure 8.3). However, the exact timings of these migrations are understood to vary year to year, and up-to-date information is not available. Other pelagic species which undergo migrations within the Black Sea include sprat, Black Sea horse mackerel and Atlantic bonito. However, these species do not migrate through the Project Area or the Turkish EEZ. A summary of the biology of the main migratory species in the Turkish EEZ is given in Table 8.5.

Table 8.5 Summary of Fish Species Likely to be Present in the Turkish EEZ

Species	Anchovy (*Engraulis encrasicholus*)	Sprat (*Sprattus sprattus*)	Black Sea horse mackerel (*Trachurus mediterraneus ponticus*)	Atlantic bonito (*Sarda Sarda*)
Demersal or pelagic	Pelagic	Pelagic	Pelagic	Pelagic
Preferred habitat	Coastal species, enters lagoons, estuaries and lakes for spawning.	Inshore, occasionally entering estuaries (especially juveniles).	Distributed across the whole Black Sea, usually near bottom in 50 to 100 m depths, also in surface waters.	Epipelagic, neritic, occasionally enters estuaries.
Spawning season	May to August, peaks middle of June to end of July.	Mainly spring and summer	Summer	May to July
Spawning characteristics	Mainly in northwest area but also to the South within Turkey's EEZ. Pelagic multiple spawners, temperature dependent. Females can spawn over 50 times per year.	Open sea, between depths of 10 to 20 m. Eggs pelagic, juveniles distributed over larger area near the surface, young drifting inshore.	Spawning success negatively correlated to sea surface temperature. Eggs pelagic.	Enter from Sea of Marmara to spawn. Eggs and larvae pelagic.
Effects of noise	Moderate: probable hearing specialists may affect migrations.	Highly sensitive to low frequency sounds.	Moderate: hearing specialists.	Moderate: possible hearing specialist

Continued…

Species	Anchovy (*Engraulis encrasicholus*)	Sprat (*Sprattus sprattus*)	Black Sea horse mackerel (*Trachurus mediterraneus ponticus*)	Atlantic bonito (*Sarda Sarda*)
Migration	October to November. Migrates through the Black Sea and along coasts from North western spawning and feeding grounds to wintering grounds along the Turkish and Georgian coasts. Reverse migration in the spring.	Seasonal migrations between winter feeding inshore and summer spawning offshore grounds.	Highly migratory species through Black Sea. Migrates north in mid-April, for reproduction and feeding. September to November migrates south along Bulgarian coast towards Anatolian and Caucasian coasts.	Highly migratory, enter Black Sea between April and August to spawn and feed, reverse migration on autumn. Juveniles migrate along southern coats of Black Sea and winter there.
Diet	One of the main consumers of zooplankton.	Feeds on planktonic crustaceans.	Other fish including sardine, anchovy and small crustaceans.	Cannibalistic, also feeds on small schooling fishes and invertebrates.
Notes	Most important stock in Turkish EEZ in terms of amount and value of annual landings. Important role as prey species. Tolerates high range of salinities.	Can tolerate wide range of salinities. Sprat fishing by pelagic trawls is only permitted along the Samsun Shelf.	All Black Sea horse mackerel treated as a unit stock but consists of four local sub-populations – south-western (Bosporic), northern (Crimean), eastern (Caucasian) and southern (Anatolian).	Preferred catch for most of the anchovy purse seiners due to high market value.

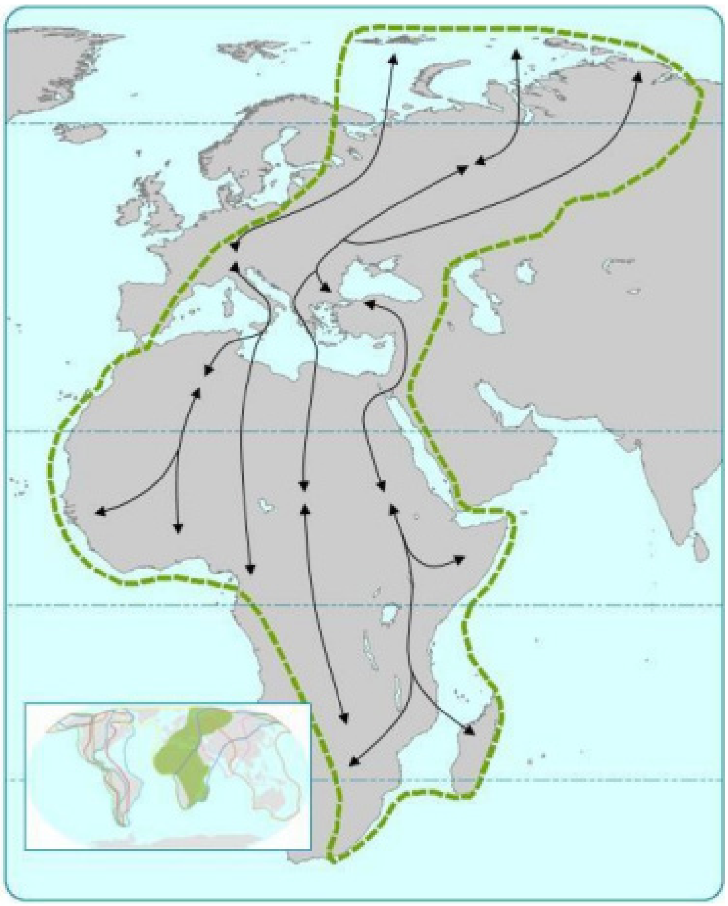
Complete.

8.5.5 Birds

8.5.5.1 Background and Literature Review

A number of migration routes stretching from the Arctic to South Africa occur around and over the Black Sea for birds that overwinter, nest and roost in coastal locations (Ref. 8.7). However, in the central Black Sea Turkish EEZ, there are no nesting sites and so the birds observed in this region are restricted to a small number of species that may be feeding or migrating through the area. The central Black Sea is outside the main Mediterranean/Black Sea Flyway migration route, which connects Europe with Africa. The Mediterranean / Black Sea Flyway is shown in green in Figure 8.4. This route is typical of many flyways, following mountain ranges and coastlines, sometimes rivers, often taking advantage of updrafts and other wind patterns to avoid geographical barriers such as large stretches of open water. Thus, the area is not important for large numbers of migrating birds although data on the occurrence of birds in the central Black Sea is scarce (Ref. 8.7).

Figure 8.4 Mediterranean / Black Sea Flyway



Note: the green dashed line denotes the Mediterranean / Black Sea Flyway with the main migration routes shown as black lines

Several species of seabird common along the Turkish coast were also observed offshore in the Survey Area including the Mediterranean shearwater, *Puffinus yelkouan* and several species of gull. Whilst most feeding takes places in coastal areas, there will be foraging offshore, such as when pelagic fish species like mullet are spawning in open waters. The little gull, *Larus minutus* and the Mediterranean Gull *Larus melanocephalus* may also be seen offshore as they make regular migrations between feeding and breeding grounds around the Black Sea.

The Mediterranean or Yelkouan shearwater (*Puffinus yelkouan*) was formerly considered a subspecies of the Manx Shearwater (*P. puffinus*). It is a gregarious species, nesting in burrows which are only visited at night to avoid predation by large gulls. It breeds on islands and coastal cliffs in the eastern and central Mediterranean in spring and early summer, after which the birds disperse throughout their range. This species may range widely, with birds ringed in Malta having been observed in the Black Sea. Increasing numbers have in fact been observed entering the Black Sea since the 1970's though there are no recent records of breeding birds there. Non-breeding birds are mostly present in the Black Sea from February to October, though some are present all year. This species has been reported to make large scale clockwise movements around the Black Sea, with flocks of up to 20,000 gathering in the north during summer months (Ref. 8.22).

The species is under some threat from coastal development in its breeding range as well as predation of eggs and young by rats and cats. Adult birds are frequently caught in long line fisheries, and may also suffer from depleted food stocks due to the overfishing of anchovy in some areas (Ref. 8.7). Genetic studies suggest that the Mediterranean Shearwater may have suffered a marked population decline historically and thus could be vulnerable to adverse effects of inbreeding (Ref. 8.23). It was formerly classified as a species of least concern by the IUCN but in 2012 this was changed to Vulnerable (Ref. 8.1).

The little gull can be found breeding in northern Scandinavia, the Baltic, western Russia and Siberia. Its distribution expands in winter to include most of the Mediterranean, Black Sea and Caspian Sea coastlines, as well as the Atlantic coast of Europe (Ref. 8.24). This species is fully migratory and usually arrives in its breeding areas from late-April to late-May and leaves in late-July (although its movements are poorly documented). The species is gregarious and breeds from late-June in mixed-species colonies and sub-colonies occasionally as large as 2,000 individuals, sometimes also in more solitary scattered pairs (Ref. 8.24). The little gull has an extremely large range, the population trend appears to be increasing and population's sizes are very large. As such this species is evaluated as least concern on the IUCN Red List (Ref. 8.1).

The Mediterranean gull breeds almost entirely in Europe. Most populations are fully migratory and travel along coastlines between their breeding and wintering areas, although some travel inland across Anatolia or follow major river valleys through Eastern and Central Europe (Ref. 8.22). Outside the breeding season the species becomes entirely coastal, favouring estuaries, harbours, saline lagoons and other sheltered waters. Mediterranean gulls migrate to breeding colonies at lagoons, estuaries and coastal saltmarshes from late-February to early-April, with most beginning to breed from early-May. A significant portion of the population also breeds on lakes and lowland marshes away from the coast (Ref. 8.22). It often breeds near but not among Sandwich terns (*Sterna sandvicensis*), or intermingling with black headed gulls (*Larus ridibundus*) (Ref. 8.4). The migration to the wintering grounds occurs from late June onwards through to autumn. The gulls breed in colonies, usually of less than 1,000 pairs and occasionally in single pairs amidst colonies of other species. Mediterranean gulls are susceptible to heavy losses as a result of tourist disturbance at breeding colonies. They may also be threatened by habitat loss resulting from coastal development and by marine pollution.

In addition to seabirds, there are a number of bird species recorded in the Survey Area which are not environmentally linked to the sea, or generally not found in the open sea. These include Black-necked grebe (*Podiceps nigricollis*), whooper swan (*Cygnus cygnus*), common starling (*Sturnus vulgaris*) and skylark (*Alauda arvensis*). The encounter with such birds away from the coast is largely due to climatic effects associated with the onset of winter. These birds have a tendency to stay on the northern Black Sea coast before the arrival of cold weather when they are forced to migrate to the southern coast. In addition, there are three birds of prey which have been recorded including the Peregrine falcon (*Falco peregrinus*), the Saker falcon (*Falco cherrug*) (respectively listed in the Red Data Book of the Black Sea as endangered and vulnerable) and the goshawk (*Accipiter gentilis*). During migration some birds fly across the Black Sea from south to north so that even in the heart of the Black Sea there can be found entirely terrestrial birds such as larks, starlings, corncrake and snipe.

The bird species which are known to be present at different times of the year in the central Black Sea region can be divided into the Groups shown in Table 8.6.

Table 8.6 Bird Species Groups in Black Sea Region (Ref. 8.4)

Group	Information
Loons and Grebes (Gaviiformes and Podicipediformes)	Fish eating and typically water birds. They mainly nest in freshwater habitats. Nests are often floating. In the region, they are found only during migration and wintering, from mid-October to mid-May.
Tube-nosed (Procellariformes)	Typical sea birds. Only one type is known in the region; the Mediterranean shearwater. Shearwaters nest in colonies on sea islands in burrows or crevices of rocks. They feed on small fish, crustaceans and shellfish.
Cormorants (Pelicaniformes)	They are typical water birds, but they do use the land. They nest in colonies in inland waters and on the coast. The nearest known nesting areas are the south-eastern part of the Sea of Azov. They are present in the region generally from November to April. They feed exclusively on fish.
Waders (Charadriiformes)	Ground-nesting birds that nest near water. They feed on small invertebrates. In the described area, most species can occur only during the migrations from September to late November and from early March to May.
Gulls (Charadriiformes)	This group includes ground-nesting colonial birds connected with different bodies of water. "Marine" gulls (e.g. the Caspian gull) are closely linked to marine waters and coasts. All species are found in marine waters primarily at non-breeding times. In the region, gulls are present in the region both during migration (from September to May) and in winter. Summer residence of some species is not connected with nesting and migrations. All gulls feed mainly on fish.

Continued…

Group	Information
Terns (Charadriiformes)	Ground-nesting colonial birds. The Caspian tern is among them and its environmental requirements are most similar to those of gulls. It nests on the sandy shores of lakes and seas and it mainly feed on fish. A significant portion of their diet is small fish. Small quantities of terns may be encountered in the region during migrations.

Complete.

Whilst representative species from all the bird groups in Table 8.6 are observed in Turkish coastal waters only a few species have been identified as nesting in the region. This is not within the Project Area. There are several Important Bird Areas (IBAs) where nesting species are found. The European shag (*Phalacrocorax aristotelis*), nests on the Şile coast, the Kűre Mountains and Akkuş Island and on the Kizilirmak Delta there are breeding populations of the black stork (*Ciconia nigra*), the great bittern (*Botaurus stellaris*) and the purple heron (*Ardea purpurea*). The squaco heron (*Ardeola ralloides*) nests in the Yeşilirmak Delta. Representatives of all groups are observed in IBAs on the Turkish coast. The eastern Turkish EEZ in the Black Sea has been proposed as a candidate IBA by Birdlife International numbers of Mediterranean shearwater meeting the threshold specified in Birdlife International's criterion A4iii (*Site known or thought to hold, on a regular basis, 20,000 waterbirds or 10,000 pairs of seabirds of one or more species*) (Ref. 8.25).

8.5.5.2 Birds Survey

Surveys were conducted in June 2009 in an area which included the entire Turkish Black Sea (EEZ and territorial waters) (Figure 8.1) and subsequently in September and October 2011. Observations were performed in the daytime from the survey vessel at stations and on transects between the stations; the snapshot method was used along these transects (Gould & Forsell, 1989 in Ref. 8.4). Observations were undertaken in a forward and perpendicular direction from one side of the vessel and a visual plot 300 x 300 m was selected, within which all birds were counted within 10 to 15 seconds. The main attention was given to flying birds. During the time remaining until the end of the 300 m section, transects were viewed again, as some birds sitting on the water could be underestimated in the time of the 'snapshot'. Inspections were carried out with the naked eye, although a binocular (15x) was used if needed to identify birds to species level.

At the stations, birds were accounted for only at the first appearance in a radius of 300 m around the vessel. Birds accompanying the vessel were accounted for only at the first occurrence. The bird species, gender and age were determined whenever possible.

In the summer 2009 surveys, 20 taxa were observed with 18 identified to species level. In total, 1,195 birds were seen: 299 at stations and 934 during transects (Table 8.7). During field studies conducted in autumn 2011 (Ref. 8.4), 30 taxa of birds were observed, 27 of which were identified to species level. In total, 339 individual birds were seen; including 156 recorded from observation stations and 183 from transect counts (Table 8.7).

Table 8.7 Abundance of Bird Species Observed During the 2009 and 2011 Surveys

Species Name	Common Name	Red Data Book Black Sea	IUCN Red List Category	Number Observed (Sep and Oct 2011)			Number Observed (Jun 2009)		
				Stations	Transects	Total	Stations	Transects	Total
Accipiter gentilis	Eurasian or northern goshawk	N/A	LC	1	-	1	-	-	-
Alauda arvensis	Eurasian Skylark	N/A	LC	-	-	-	3	2	5
Anas platyrhynchos	Mallard	N/A	LC	-	-	-	-	30	30
Anthus pratensis	Meadow Pipit	N/A	LC	-	-	-	7	-	7
Ardea cinerea	Grey heron	N/A	LC	-	11	11	-	-	-
Circus cyaneus	Northern Harrier	N/A	LC	-	-	-	1	-	1
Columba livia	Rock Pigeon	N/A	LC	-	-	-	-	2	2
Cygnus ygnus	Whooper Swan	N/A	LC	-	-	-	-	1	1
Delichon urbica	House Martin	N/A	N/A	7	3	10	-	-	-
Egretta alba	Great Egret	N/A	N/A	-	-	-	-	2	2

Continued…

Species Name	Common Name	Red Data Book Black Sea	IUCN Red List Category	Number Observed (Sep and Oct 2011)			Number Observed (Jun 2009)		
				Stations	Transects	Total	Stations	Transects	Total
Erithacus rubecula	European robin	N/A	LC	-	1	1	-	-	-
Falco cherrug	Saker falcon	VU	EN	-	1	1	-	-	-
Falco peregrinus	Peregrine falcon	EN	LC	2	-	2	-	-	-
Falco sp.	Falcon sp.	-	-	-	2	2	-	-	-
Ficedula parva	Red-breasted flycatcher	N/A	LC	4	-	4	-	-	-
Fringilla coelebs	Chaffinch	N/A	LC	1	-	1	-	-	-
Fulica atra	Eurasian Coot	N/A	LC	-	2	2	-	7	7
Gavia arctica	Black-throated loon	N/A	LC	1	1	2	11	50	61
Gavia sp.	Loon sp.	N/A	N/A	-	-	-	-	17	17
Hirundo rustica	Barn swallow	N/A	LC	32	1	33	-		
Larus cacchinans	Caspian Gull	N/A	N/A	20	23	43	178	273	451
Larus canus	Mew Gull	N/A	LC	-	-	-	2	3	5

Continued...

Species Name	Common Name	Red Data Book Black Sea	IUCN Red List Category	Number Observed (Sep and Oct 2011)			Number Observed (Jun 2009)		
				Stations	Transects	Total	Stations	Transects	Total
Larus fuscus	Lesser black-backed gull	N/A	LC	4	2	6	-	-	-
Larus minutus	Little gull	N/A	LC	12	97	109	-	1	1
Larus ridibundus	Black-headed Gull	N/A	L	--	-	-	4	2	6
Larus sp.	Gull	N/A	-	-	2	2	-	-	-
Motacilla flava	Western yellow wagtail	N/A	LC	2	-	2	-	-	-
Motacilla alba	White wagtail	N/A	LC	38	7	45	-	-	-
Phalacrocorax carbo	Common cormorant	N/A	LC	-	1	1	1	70	71
Phoenicurus phoenicurus	Common redstart	N/A	LC	2	2	4	-	-	-
Phylloscopus collybita	Chiffchaff	N/A	LC	3	-	3	-	-	-
Phylloscopus sp.	Warbler	N/A	All	1	1	2	-	-	-
Podiceps cristatus	Great-crested grebe	N/A	LC	3	-	3	-	9	9
Podiceps grisegena	Red-necked grebe	N/A	LC	-	1	1	-	-	-

Continued...

Species Name	Common Name	Red Data Book Black Sea	IUCN Red List Category	Number Observed (Sep and Oct 2011)			Number Observed (Jun 2009)		
				Stations	Transects	Total	Stations	Transects	Total
Podiceps nigricollis	Black-necked Grebe	N/A	LC	-	-	-	-	2	2
Podiceps sp.	Grebe Sp.	N/A	N/A	-	-	-	-	5	5
Puffinus yelkouan	Mediterranean Shearwater	VU	VU	14	19	33	45	452	459
Stercorarius parasiticus	Arctic skua	N/A	LC	3	6	9	-	-	-
Sterna sandvicensis	Sandwich tern	N/A	LC	3	-	3	-	-	-
Sturnus vulgaris	Common Starling	N/A	N/A	-	-	-	47	6	53
Sylvia atricapilla	Eurasian blackcap	N/A	LC	1	-	1	-	-	-
Sylvia curruca	Lesser whitethroat	N/A	LC	1	-	1	-	-	-
Turdus philomelos	Song thrush	N/A	LC	1	-	1	-	-	-
Total				**156**	**183**	**339**	**299**	**934**	**1,195**

IUCN Red List Category: NA no category yet, LC Least Concern, VU Vulnerable, EN Endangered, All, All categories for this genus (LC, VU, NT, EN). Red Data Book: N/A not listed, EN Endangered, VU Vulnerable

Complete.

The greater number of birds observed in summer 2009 is due to two species recorded in great numbers: the Mediterranean shearwater and the Caspian gull, which are resident species in the Black Sea. These two species accounted for 44% of all individuals observed during transects. Table 8.7 lists the birds observed during the 2009 survey and their conservation status.

The Project Area had very low numbers of birds during the autumn 2011 survey with an average density of only 0.96 individuals/km^2 and a maximum of 3.2 individuals/km^2. This was probably due to the low levels of productivity in the central Black Sea, the large distance from coastal feeding areas, that the migration period over the Black Sea is during the spring and the preference of most migrating birds to avoid large expanses of open sea. During the main migration period (April to May) bird observations in the central Black Sea may be higher (Ref. 8.4).

Seabirds were the most common birds observed, accounting for well over half (60.7%) of all birds seen. The most common species was the little gull (109 sightings), followed by the Caspian gull (43 sightings), and the Mediterranean shearwater (33 sightings) (Ref. 8.4).

The diversity of gulls in the Survey Area in 2011 was extremely low with only three species of the genus *Larus* observed: the little gull, the lesser black-backed gull, *Larus fuscus*, (Table 8.7) and the Caspian gull. The little gull is a typical pelagic species and the least dependent on coastal food sources. It is known that this species migrates towards the Black Sea, Bulgaria and Georgia, and so it can be assumed that the Black Sea is a fairly traditional migration corridor of this species (Yudin and Firsova, 2002 in Ref. 8.4). During the counts, little gulls were observed mainly in small groups from two to six individuals with some concentrations of more than ten birds, and single birds were also noted on several occasions.

Caspian gulls were present primarily as single individuals, sometimes in pairs, and in some cases up to five groups of individuals. About half of all Caspian gulls encountered were young birds of the first or second year. The density of populations of Caspian gulls was low, with a maximum of 0.53 individuals (ind.)/km^2 (Ref. 8.4). Photos of birds observed during surveys are shown in Figure 8.5.

Figure 8.5 Lesser Black-backed Gull (*Larus fuscus*) and the Black Throated Loon (*Gavia arctica*) Observed during Autumn 2011 Surveys

The Mediterranean shearwater was present in lower numbers in 2009 and 2011 (459 in 2009 versus 33 in 2011). The great density of this species in June is most likely associated with this species feeding in the Survey Area.

Of the 459 Mediterranean shearwater observed during the June 2009 survey, over 300 of these were identified in more coastal transects (Transect 2 and 6 on Figure 8.1).

Also observed in 2011 were the Arctic skua, sandwich terns and a small number of other gulls, all in very low numbers (Table 8.7). Such low density of seabirds is probably due to the unfavourable feeding conditions as also indicated by low levels of productivity and the absence of fisheries. The number of sandwich tern observed was also extremely low. This species is one of the most common seabirds in Turkish coastal areas (Ref. 8.4). During the entire observation period there were only three individuals of this species registered.

In conclusion, the abundance and diversity of birds recorded in the central Black Sea were low, particularly in the autumn of 2011. Higher numbers observed in June in 2009 may be due to seasonal changes due to prey availability but could also be due to year on year differences. The most commonly observed species, albeit still in relatively low abundance, were the Mediterranean shearwater and the Caspian gull. Two other birds species included in the Red Data Book of the Black Sea (Ref 8.2) were observed during the autumn 2011 survey: the peregrine falcon, which is listed as Endangered and the Saker falcon, which is listed as Vulnerable. In addition, these species are listed by IUCN Red List as endangered and of least concern respectively. The Mediterranean shearwater is also listed in the Red Data Book of the Black Sea, Turkey as vulnerable on a regional level (Ref. 8.3).

With regard to seabirds typically considered terrestrial, surveys undertaken in 2009 and 2011 registered 12 species of passerine birds, for a total of 108 individuals. Other birds regularly observed during 2011 include rural and urban swallows and white wagtails while small flycatchers, warblers and redstarts were scarce. A tentative list of birds considered as strictly non-seabird species is included in Table 8.8; importantly some of these, such as the Eurasian blackcap, *Sylvia curruca*, are associated with freshwater environments as well as being terrestrial.

Table 8.8 Non-Seabirds Observed During 2009 and 2011 Surveys

Species Name	Common Name	IUCN Red List	Red Data Book of the Black Sea
Accipiter gentilis	Eurasian or northern goshawk	LC	NE
Alauda arvensis	Eurasian Skylark	LC	NE
Anas platyrhynchos	Mallard	LC	NE
Anthus pratensis	Meadow Pipit	LC	NE
Ardea cinerea	Grey heron	LC	NE

Continued….

Species Name	Common Name	IUCN Red List	Red Data Book of the Black Sea
Circus cyaneus	Northern Harrier	LC	NE
Columba livia	Rock Pigeon	LC	NE
Cygnus cygnus	Whooper Swan	LC	NE
Delichon urbica	House Martin	LC	NE
Egretta alba	Great Erget	LC	NE
Erithacus rubecula	European robin	LC	NE
Falco cherrug	Saker falcon	EN	NE
Falco peregrinus	Peregrine falcon	LC	NE
Falco sp.	Falcon sp.	-	-
Ficedula parva	Red-breasted flycatcher	LC	NE
Hirundo rustica	Barn swallow	LC	NE
Motacilla flava	Western yellow wagtail	LC	NE
Motacilla alba	White wagtail	LC	NE
Phoenicurus phoenicurus	Common redstart	LC	NE
Phylloscopus collybita	Chiffchaff	LC	NE
Phylloscopus sp.	Warbler	-	-
Sturnus vulgaris	Common Starling	LC	NE
Sylvia atricapilla	Eurasian blackcap	LC	NE
Sylvia curruca	Lesser whitethroat	LC	NE
Turdus philomelos	Song thrush	LC	NE

NE Not Evaluated; LC Least Concern, EN Endangered.

Complete.

A small number of birds (just over 5% of total observations) that spend time in freshwater and coastal areas, but are not known to feed in the open sea, were recorded. These included loons, grebes, the common coot and the grey heron. Several of these species are known to migrate between breeding and feeding grounds, but this is mostly to coastal areas therefore they are uncommon visitors to the Central Black Sea (Ref. 8.4).

There were several other species of birds more commonly associated with inland habitats observed during the autumn 2011 survey. Some of these were in relatively high abundance, particularly relative to the abundance of seabirds. There were 45 sightings of the white wagtail, *Motacilla abla*, 33 of the barn swallow, *Hirundo rustica*, and ten of the house martin, *Delichon urbicum*. There were sporadic sightings of birds like the robin, chaffinch and chiffchaff, birds that may have been blown off course from their normal inland habitat. The grey heron (*Ardea cinerea*), was seen in 2011.

There were also three birds of prey observed during the survey: the peregrine (Falco peregrinus), Saker falcon (*Falco cherrug*) and goshawk (*Accipiter gentilis*). There was no available data on the migration of such birds of prey over the Black Sea, but this area is covered by the Mediterranean / Black Sea Flyway.

8.5.6 Marine Mammals

8.5.6.1 Background and Literature Review

Three species of cetacean (other than occasional vagrant specimens) are known to occur in the Black Sea and are represented by subspecies. These are the Black Sea harbour porpoise (*Phocoena phocoena relicta*), the Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*) and the Black Sea common dolphin (*Delphinus delphis ponticus*). They are listed in Table 8.9 along with their international and regional conservation status.

Table 8.9 Marine Mammal Species within the Black Sea

Species	IUCN Red List*	Black Sea Convention**	Red Data Book of the Black Sea†
Black Sea harbour porpoise (*Phocoena phocoena relicta*)	EN	E	EN
Black Sea common dolphin (*Delphinus delphis ponticus*)	VU	E	VU
Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*)	EN	E	EN

* VU – Vulnerable, EN – Endangered
** Species included in the Agreement on Conservation of Biodiversity and Landscapes of the Convention on the Protection of the Black Sea from Pollution (Ref. 8.26): E – Endangered,
† EN – Endangered, VU – Vulnerable

There is a considerable body of data on the marine mammals of the Black Sea including a basic summary by Kleinenberg published in 1956 (Ref. 8.4), several aerial surveys undertaken between 1967 and 1987, IUCN funded aircraft and ship based investigation on the status and distribution of cetaceans in the Black Sea presented at a working meeting in 2006 and the Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) website and a recent overview of the cetacean populations prepared by Birkun in 2008 (Ref. 8.5).

The Black Sea common dolphin is known to prefer the open sea but is sometimes spotted near shores if following shoals of pelagic fish. It has been recorded throughout the Black Sea including the Bosphorus Strait and the Sea of Marmara. Primary food sources include anchovy, sprat and pipefish. The abundance of common dolphins according to ACCOBAMS is shown below in Table 8.10.

Table 8.10 Abundance of Common Dolphin in the Black Sea (Ref. 8.5)

Area Surveyed Area / Length	Observation Type	Date	Abundance Assessment	Source
NW, N and NE parts of the Black Sea within the territorial waters of Russia and Ukraine, 31,780 km^2/ 2,230 km	Vessel registration	September-October 2003	5,376 (2,898 to 9,972; 95% CI*)	Birkun et al., 2004
SE part of the Black Sea within the territorial waters of Georgia, 2,320 km^2/211 km	Vessel registration	January 2005	9,708 (5,009 to 18,814; 95% CI*)	Birkun et al., 2006
The central part of the sea outside the territorial waters of Russia and Turkey, 31,200 km^2/660 km	Vessel registration	September-October 2005	4,779 (1,433 to 15,945; 95% CI*)	Krivokhizhin et al., 2006

* CI – Confidence Interval, A range of values so defined that there is a specified probability that the value of a parameter lies within it.

The greatest threats to common dolphins include outbreaks of disease (such as morbillivirus epizootic), reduction in fish prey abundance, water pollution, ctenophore outbreaks and pelagic trawls.

As for the common dolphin, the Black Sea bottlenose dolphin is considered a subspecies and is listed as endangered by the IUCN Red List. The total population is unknown but is believed to be a few thousands spread out across the whole of the Black Sea. Primary food items include flounder, stingray, mackerel, mullet and anchovy. Unlike the common dolphin, the Black Sea bottlenose prefer to stay in the shelf zone, but are occasionally found in the open sea. The most significant threats to this subspecies include by-catch in fishing nets and possibly parasitic infestations resulting in mass mortality events in 1990. The abundance of bottlenose dolphins according to ACCOBAMS (Ref. 8.5) is shown in Table 8.11. Much of the recorded distribution of this subspecies is on the northern and eastern shores of the Black Sea.

The Black Sea population of harbour porpoises, also a subspecies, is mainly located in coastal areas with water depths of less than 200 m where they feed on benthic and demersal species. They tend to be solitary animals but are sometimes seen in small groups. The exact size of the population is unknown. According to ACCOBAMS (Ref. 8.5), it may now be as high as 10 to 12 thousand individuals. Main threats to this species of dolphin include: mortality in bottom gill nets, injuries and anxiety, contamination of the environment (Black Sea harbour porpoises accumulate in the subcutaneous fat, higher concentrations of organochlorine pesticides than porpoises in other oceans as well as other Black Sea species of dolphins) and reduction in food resources as a result of overfishing of prey species and the invasion of the Black and Azov seas by the predatory ctenophore *M. Leiydi*. Other population limiting factors include diseases and abnormal weather conditions.

Table 8.11 Abundance of Bottlenose Dolphins in the Eastern Black Sea (Ref. 8.5)

Area Surveyed Area / Length	Observation Type	Date	Abundance Assessment	Source
The Kerch Strait, 890 km^2/353 km	Aerial registration	August 2002	88 (31–243; 95% CI*)	Birkun et al., 2003
The Kerch Strait, 862 km^2/310 km	Vessel registration	August 2003	127 (67 to 238; 95% CI*)	Birkun et al., 2004
NE Black Sea shelf, 7,960 km^2/791 km	Aerial registration	August 2002	823 (329 to 2,057; 95% CI*)	Birkun et al., 2003
NW, N and NE of the Black Sea within the territorial waters of Russia and Ukraine, 31,780 km^2/2,230 km	Vessel registration	September-October 2003	4,193 (2,527 to 6,956; 95% CI*)	Birkun et al., 2004
SE part of the Black Sea within the territorial waters of Georgia, 2,320 km^2/211 km	Vessel registration	January 2005	0	Birkun et al., 2006
SE part of the Black Sea within the territorial waters of Georgia, 2,320 km^2/211 km	Vessel registration	May 2005	0	Komakhidze, Goradze, 2005
SE part of the Black Sea within the territorial waters of Georgia, 2,320 km^2/211 km	Vessel registration	August 2005	0	Komakhidze, Goradze, 2005
The central part of the sea outside the territorial waters of Russia and Turkey, 31,200 km^2/660 km	Vessel registration	September-October 2005	0	Krivokhizhin et al., 2006

* Confidence interval

The harbour porpoise inhabits mainly shallow waters (0 to 200 m deep) over the continental shelf around the entire perimeter of the Black Sea, although they also occur quite far offshore in deep water. Sizeable groups have been observed in the central Black Sea over 200 km from the nearest coast in waters of over 2,000 m depth (Ref. 8.27). Common dolphins are distributed mainly offshore and visit shallow coastal waters following seasonal aggregations and regular mass migrations of their preferred prey, small pelagic fishes such as anchovy and sprat. Annual winter concentrations of anchovies in the south-eastern Black Sea and to a lesser degree, south of the Crimean peninsula, create favourable conditions for wintering concentrations of dolphins. Summer concentrations of sprats in the north-western, north-eastern and central Black Sea attract common dolphins to different feeding grounds in summer months (Ref. 8.27). Bottlenose dolphins are distributed across the Black Sea shelf and may occur far offshore. In the northern Black Sea they form scattered communities numbering tens of individuals to approximately 150 animals in different locations around the Crimean peninsula. Accumulations are also known to form close to the Turkish coast (Ref. 8.27).

8.5.6.2 Mammal Survey

Observations of marine mammals were carried out on stations and transects in June 2009 (Figure 8.1), coincident with seabird surveys. Results included a description of the observed marine mammal species and numbers and a summary of observed marine mammals along transects and at stations is reported in Table 8.12.

Table 8.12 Abundance of Marine Mammals Observed during Transect and Station Surveys – 2009

Transect / Station	Species	Number of Individuals
Transect		
1	Common dolphin	22
2	Common dolphin	13
3	Common dolphin	3
9	Common dolphin	10
Total		48
Station		
2	Common dolphin	2
7	Common dolphin	5
8	Common dolphin	2
Total		9

In 2009, only the common dolphin was recorded. The absence of other marine mammals may be due to a number of factors including:

- Bottlenose dolphins are quite rare in the open sea and do not always follow vessels;
- Harbour porpoises are a very inconspicuous species and typically can only be observed in calm weather. There are also known to be very few individuals in the central part of the Black Sea; and
- Survey Area is not a significant breeding or feeding area for all three species of dolphins.

The 2011 surveys recorded both the common dolphin and the bottlenose dolphin as shown in Table 8.13.

Table 8.13 Results of Observations Over Marine Mammals at Transects in Autumn 2011

Transect / Station	Species Name	Abundance, Individuals
Station		
10	Black Sea common dolphin	2
	Black Sea bottlenose dolphin	4
	Total	*6*
Transect		
2	Black Sea common dolphin	8
4	Black Sea bottlenose dolphin	2
5	Black Sea bottlenose dolphin	4
	Black Sea common dolphin or Black Sea bottlenose dolphin	1
9	Black Sea common dolphin	4
	Black Sea bottlenose dolphin	4
11	Black Sea common dolphin	5
	Black Sea common dolphin or Black Sea bottlenose dolphin	1
	Total	*29*

The total number of observations of both species was very low, with sightings at only one (Station 10) of the 15 stations and only five of the 15 transects surveyed. This suggests the occurrence of dolphins in the central Black Sea is both low and sporadic, which probably reflects low prey availability in this part of the Black Sea (Ref. 8.4). The distribution of cetaceans observed during the 2011 survey is shown in Figure 8.6.

The low numbers recorded are believed to be due to a number of factors including:

- Dolphin numbers are known to decrease with distance from shore; and
- Observations were made in the deepest parts of the Central Black Sea.

A comparison of the number of species and individuals observed in 2009 and 2011 is shown in Table 8.14. The total number of individuals is greater in 2009 than 2011. It could be due to better conditions in June than October for observing marine mammals. There is very little data on the seasonality of cetacean numbers in Turkish waters although migration patterns within the Black Sea are fairly well understood. All three Black Sea cetacean species move to feeding grounds for the winter. The common dolphin and harbour porpoise migrate south to feed in the coastal waters of Turkey and Georgia and the bottlenose dolphin migrates to the eastern part of the Black Sea.

Table 8.14 Summary of Species and Total Number of Marine Mammals in 2009 and 2011

Name	Summer 2009			Autumn 2011		
	At Stations	At Transects	Total	At Stations	At Transects	Total
Common dolphin	9	48	57	2	17	19
Bottlenose dolphin	-	-	-	4	10	14
Common or bottlenose dolphin	-	-	-	-	2	2
Total	**9**	**48**	**57**	**6**	**29**	**35**

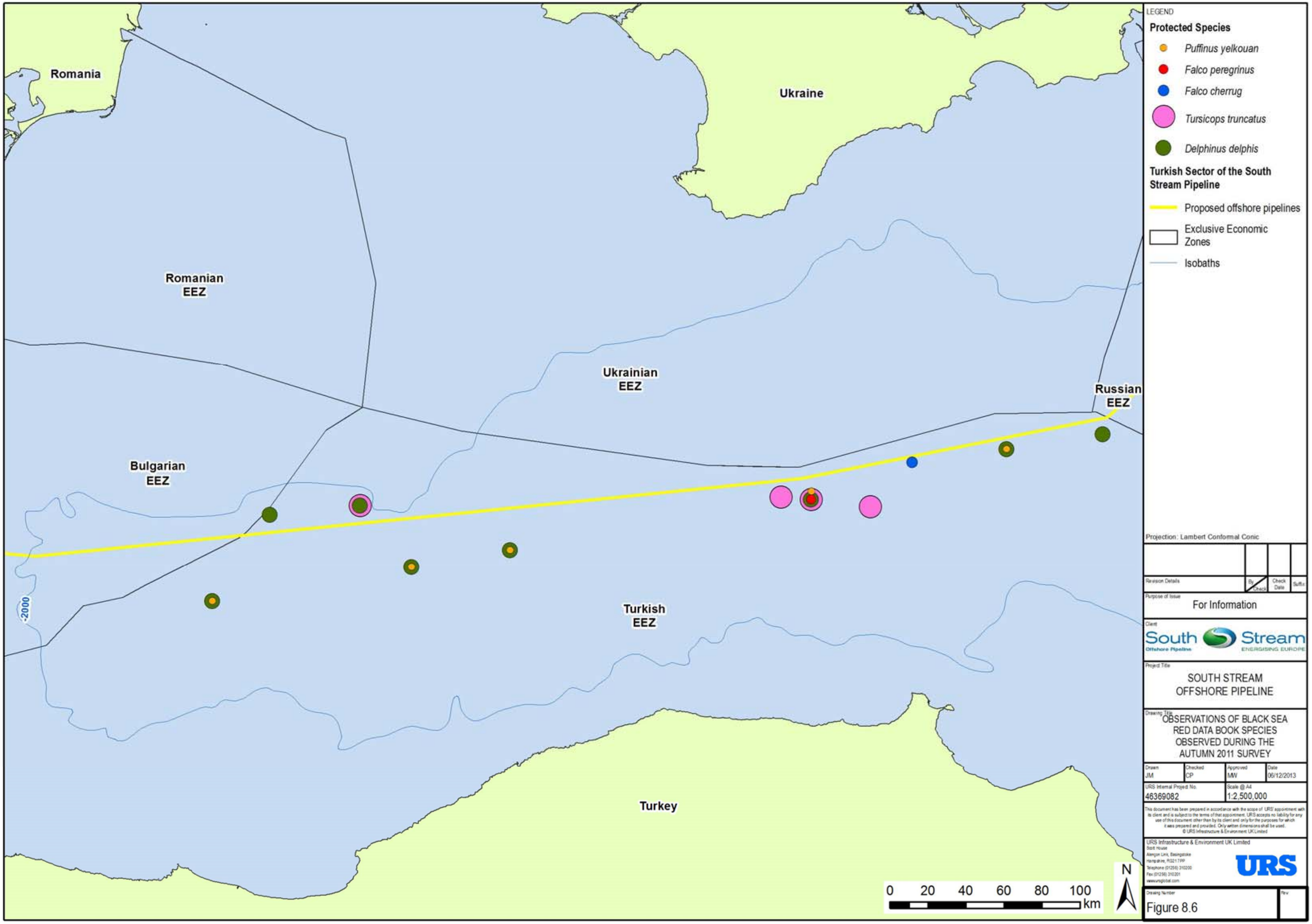
8.6 Species of Conservational Concern

A number of species of conservation concern which are included in the IUCN Red List (Ref. 8.1), the Red Data Book (RDB) of the Black Sea (Ref. 8.2) or the Red Data Book of the Black Sea, Turkey (Ref. 8.3) have been directly observed or are known to exist in the Survey Area are listed in Table 8.15.

Table 8.15 Species of Conservation Concern Potentially Occurring in Turkish Waters

Species	Status		
	IUCN (Ref. 8.1)	RDB Black Sea (Ref. 8.2)	RDB Black Sea, Turkey (Ref. 8.3)
Fish			
Atlantic Bluefin Tuna (*Thunnus thynnus*)	DD	EN	EN
Chub mackerel (*Scomber colias*)	LC	EN	EN
Mackerel (*Scomber scombrus*)	LC	EN	EN
Swordfish (*Xiphias gadius*)	LC	EN	CR
Black Sea garfish (*Belone belone euxini*)	NE	EN	NE
Mammals			
Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*)	EN	EN	EN
Black Sea common dolphin (*Delphinus delphis ponticus*)	VU	EN	VU
Black Sea harbour porpoise (*Phocoena phocoena relicta*)	EN	EN	EN
Birds			
Mediterranean shearwater (*Puffinus yelkouan*)	VU	NE	NE
Peregrine falcon (*Falco peregrinus*)	LC	EN	NE
Saker falcon (*Falco cherrug*)	EN	VU	NE

NE Not Evaluated; DD Data Deficient; LC Least Concern, NT Near Threatened; VU Vulnerable; EN Endangered; CE Critically Endangered.



Plot Date: 11 Apr 2014
File Name: I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Turkey ESIA\Chapter 8\Figure 8.6 Observations of Black Sea Red Data Book Species Observed During the Autumn 2011 Survey.mxd

8.7 Critical Habitat

8.7.1 Overview

The Project Area intersects critical habitat as defined by the IFC PS6[2]. It should be noted that the Project Area does not, *per se*, represent particular habitat that is not replicated elsewhere in the Turkish Black Sea; it is merely part of a wider zone that meets the requisite criteria. Further details of the determination of critical habitat are provided in IFC Guidance Note 6[3].

8.7.2 Discrete Management Units (DMUs)

The guidance note for IFC PS6, states that the determination of critical habitat should be based on a "discrete management unit" (DMU) which is an area that has a definable boundary (ecological or political) within which the biological communities have more in common with each other than they do with those outside the boundary.

One DMU was identified in the Study Area; the Open Sea DMU. The Project potentially affects both the seas surface and the seabed in all phases. Available data from a study of the deep sea basin show a relatively featureless seabed over a wide area. Because the deep sea benthos are microbial and non-motile and there are no species of concern; the seabed is not considered as part of the critical habitat assessment or Open Sea DMU.

In the case of the open waters of the Black Sea, where uniform conditions extend over a wide area and species are correspondingly widely dispersed (e.g. cetaceans and some fish species), the Open Sea DMU is very large and has both ecological and political boundaries. In this case, an Open Sea zone was defined as the Turkish EEZ of the Black Sea seaward of the 100 m isobath, where open water species range widely. Critical habitat is defined in Paragraphs 16 of IFC PS6 as areas with high biodiversity value. This includes areas that meet one or more of the following criteria:

- *Criterion 1*: Critically Endangered (CR) and/or Endangered (EN) species;
- *Criterion 2*: Endemic and/or restricted-range species;
- *Criterion 3*: Migratory and/or congregatory species;
- *Criterion 4*: Highly threatened and/or unique ecosystems; and
- *Criterion 5*: Key evolutionary processes.

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[2] IFC (2012) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

[3] IFC Guidance Notes are not Project standards for the South Stream Offshore Pipeline Project. They are described in Equator Principles III as follows: 'Guidance Notes accompany each Performance Standard. EPFIs [Equator Principles Financial Institutions] do not formally adopt the Guidance Notes however EPFIs and clients may find them useful points of reference when seeking further guidance on or interpreting the Performance Standards.'

The Project did not identify the Open Sea DMU as critical habitat for Criterion 2, 4 or 5 but did identify the Open Sea DMU as critical habitat for Criterion 1 and 3 as discussed in the following sections.

Critical habitat can also be defined as either Tier 1 or Tier 2. Tier 1 is considered more sensitive. No Tier 1 habitat has been identified in relation to the Project.

8.7.3 Critical Habitat for Endangered Species

The ESIA Report identifies globally, nationally and regionally critically endangered and endangered species present within Study Area. This has been completed with reference to the following:

- IUCN Red List of Threatened Species (Ref. 8.1);
- Black Sea Red Data Book (Ref. 8.2); and
- Red Data Book Black Sea, Turkey (Ref. 8.3).

For the purposes of screening for critical habitat, species listed as either endangered or critically endangered in any of the aforementioned lists have been included in the assessment. In addition, species likely to be present, but not directly observed in Project surveys, are included.

Black Sea bottlenose dolphins and harbour porpoises have been observed in the Project Area and it is likely (based on the guidance provided in IFC Guidance Note 6) that the open sea is Tier 2 critical habitat for these species, based on Criterion 1 which is defined as "Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species" and "habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing". The Tier 2 critical habitat classification may also be based on Criterion 2 which is defined as "Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment".

8.7.4 Critical Habitat for Migratory and Congregatory Species

Migratory and congregatory[4] fish species likely to be present in offshore Turkey include sprat (*Sprattus sprattus*), anchovy (*Engraulis encrasicolus*), Black Sea garfish (*Belone belone euxini*), bluefish (*Pomatomus saltatrix*), Black Sea horse mackerel (*Trachurus mediterraneus ponticus*), Atlantic bonito (*Sarda sarda*) and chub mackerel (*Scomber colias*).

All the above species have a very wide distribution, encompassing the Black Sea, Mediterranean and in some cases the adjacent Eastern Atlantic and are at the edge of their range in the Black Sea. Though accurate population data are unavailable, it is reasonable to assume that the open

[4] Tending to gather into a group

sea may contain more than 1% of the population of at least one of these species. It thus qualifies as Tier 2 critical Habitat based on criterion 3(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that *habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment.*

Because the area under consideration cannot be considered a "site" per se, application of International Bird Areas and Ramsar criteria is problematic. However, because flocks of Mediterranean shearwaters have been observed, the Open Sea DMU meets the 1% biogeographic population criterion for this species[5].

The threshold specified in Birdlife International's criterion A4iii (Site known or thought to hold, on a regular basis, 20,000 waterbirds or 10,000 pairs of seabirds of one or more species) may also be met thus a precautionary appraisal suggest the open sea is Tier 2 critical habitat for migratory seabirds.

Once again, it should be noted that this is largely a factor of the widely ranging nature of these fish and the necessarily large size of the open sea defined; the potential for impact to these species at a population level is negligible.

8.8 Impact Assessment

8.8.1 Impact Assessment Methodology

The overall assessment methodology is detailed in **Chapter 3 Impact Assessment Methodology,** whereby receptor sensitivity and impact magnitude are used to determine the overall significance of an impact. Specific criteria relating to the sensitivity of marine species and habitats and the magnitude of marine impacts are discussed in Section 8.8.1.1.

Impacts are presented in this section based on receptor type, to give a complete picture of the effects of the Project on a given habitat or species group. Mitigation has also been presented per receptor type to allow a clear perspective of how impacts to any given species or habitat can be managed to minimise or manage significant marine ecological impacts.

The process of identifying 'design controls' and 'mitigation measures' relevant to marine ecology has considered the mitigation hierarchy (**Chapter 3 Impact Assessment Methodology**), as specified in IFC PS1 and PS6, i.e. in which impacts are progressively avoided, minimised, and restored (or offset if necessary), with priority given to the actions which are earliest in the hierarchy. Offsetting is only considered if these measures do not result in a reasonable expectation of no net loss of biodiversity (or a net gain in respect of critical habitats).

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[5] IUCN quotes a global population of 15,300 to 30,500 pairs, meaning that a local population of 306 to 610 birds meets this criterion

For the Project, efforts were made to firstly avoid or prevent, then minimise or reduce adverse impacts, through the application of 'design controls'. Thereafter, 'mitigation measures' were identified to avoid, minimise or restore adverse impacts incapable of management by the application of design controls. Finally, consideration was given to offsetting or compensation in order to achieve 'no net loss' of biodiversity, or in the case of impacts affecting critical habitat 'net gains' in biodiversity, where significant residual adverse impacts remained after the application of design controls and mitigation measures. Note that, given the difficulty in predicting impacts on biodiversity over the long term, the Project will adopt a practice of adaptive management in which the nature and implementation of management and mitigation measures, and where necessary, offsetting or compensatory measures, are responsive to changing conditions and the results of monitoring.The Project involves a wide range of activities that have the potential to impact the marine environment, primarily during the construction. The relevant activities are summarised in Table 8.16.

Table 8.16 Project Activities in the Turkish Marine Environment

Phase	Activity
Construction and Pre-Commissioning	Mobilisation of vessels to and from Project Area and vessel movements within construction spread.
	Vessel routine operations (including propulsion, cooling water, water maker, bilges and ballast).
	Delivery of pipe and other supplies, as well as crew changes.
	Night time working.
	Dynamic positioning of pipe-lay vessel.
	Laying the pipe on seabed.
Operation	Physical presence of the Pipeline.
	Pipeline inspection (including ROV surveys etc.) and maintenance that will involve some vessel movements and associated generation of small quantities of wastes associated with routine vessel operations.
Decommissioning (Option 1)	Pipeline cleaning by flushing with water and associated water displacement and disposal.
	Filling pipe with seawater and sealing.
	Vessel operations associated with inspection surveys (similar to operation).
Decommissioning (Option 2)	Lifting of Pipeline from the seabed.
	Vessel operations associated with pipe removal (similar to construction).

8.8.1.1 Impact Assessment Criteria

Receptor Sensitivity

The assessment of receptor sensitivity includes consideration of ecological function. This is because there are species and communities that are important to the ecosystem that are neither rare nor protected by any designation (e.g. planktonic carbon fixation and nutrient cycling). This approach therefore includes consideration of fauna, ecological processes and nature conservation.

It should be noted that for the purposes of this ESIA Report, the concept of "sensitivity" is more closely related to receptor value (importance) than receptor vulnerability (resistance to change), though elements of both are considered in the criteria. Vulnerability considerations are also incorporated into the criteria for impact magnitude set out below. The marine environment encompasses a wide variety of ecological receptors as detailed in the baseline (Section 8.4). At the highest level, these can be divided into habitats and species, for which it is appropriate to derive separate assessment criteria. There is only one benthic habitat type in the Study Area:

- Deep-water soft substrate benthic habitats.

Species are broadly classified into the following groups (though consideration is given to individual species where they are of conservation concern or keystone species):

- Plankton;
- Fish;
- Birds; and
- Marine mammals.

Sensitivity criteria have been developed separately for habitats and species, as set out in Table 8.17 and Table 8.18 respectively.

Table 8.17 Receptor Sensitivity Criteria for Marine Habitats

Sensitivity	Description	Applicable Standards
High	A site, habitat or assemblage of species which has designated conservation status at an international and national scale; Areas of particular biodiversity importance, that may support populations of restricted range, endemic or endangered species, or is in itself unique or threatened*; Areas that support large populations (in a national or international context) of migratory species**; or Habitats that provide key ecosystem functions.	Designated areas or habitat under IUCN category Ia to IV (Habitat/Species Management Area and above)

Continued...

Sensitivity	Description	Applicable Standards
Moderate	A site, habitat or assemblage of species which has designated conservation status at a National scale; or 'Natural Habitat' IFC PS6 classification: Areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.	N/A
Low	Habitats occurring outside of any designation; or 'Modified Habitat' IFC PS6 classification: Areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.	N/A
Negligible	Habitats that are either appreciably degraded/disturbed by human activity or have high proportions of invasive/non-native species; or Do not support any key ecosystem functions.	N/A

* As listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species.
** These criteria are similar to those used in IFC PS6 to determine "Critical Habitat". It should be stressed however, that designation of critical habitat is not in itself a criterion, rather the result of applying conservation criteria. Either modified or natural habitats may be considered critical if they support the appropriate species or processes. A marine critical habitats appraisal has been carried out in parallel to this ESIA and summarised in this ESIA Report.

Complete.

Table 8.18 Receptor Sensitivity Criteria for Marine Species

Sensitivity	Description	Applicable Standards
High	A species population that has designated conservation status at an international scale; A species that is globally rare; or A keystone species fundamental to the functioning of the ecosystem.	Listed in IUCN red list (Vulnerable and above).
Moderate	A species population that has designated conservation status at a national or regional scale; A species common globally but rare locally; Important to ecosystem functions; or Under threat or population in decline.	Listed in Black Sea Red Data Book (Black Sea Environment Programme) categories 'Vulnerable' and above.

Continued...

Sensitivity	Description	Applicable Standards
Low	A species not protected by law; Not critical to other ecosystem functions (e.g. as prey to other species or as predator to potential pest species); or Common nationally.	N/A
Negligible	Common / abundant locally; or Not important to other ecosystem functions.	N/A

Complete.

Where possible, both international and national criteria and standards have been applied. It should further be noted that on occasion a receptor is assigned a sensitivity range. This is applied to allow the adoption of a precautionary approach to highlight specific potential vulnerabilities within a wider context (e.g. the presence of species of conservation interest in an assemblage that is otherwise less sensitive) but where the impacts can be managed by the same design control and mitigation measures.

Habitats

Very little is known about the offshore deep water seabed of the Black Sea abyssal plain. Anoxic conditions and the presence of hydrogen sulphide limit biodiversity on the seabed. Only sulphur metabolising bacteria and a single infaunal species of microscopic metazoan have been observed to survive in these conditions (Ref. 8.28). It is thought that sulphur metabolising bacterial communities are widespread in the deep sea, but the diversity and abundance of organisms in this habitat is not fully known. In some circumstances deep sea bacterial communities form reef structures or microbial mats, though such communities were not observed within the Project Area (Ref. 8.13) and in the Black Sea they are thought to be confined to the northwest shelf. The diversity and abundance of microscopic organisms in this habitat is not fully known but they are not important to ecosystem functions in the Black Sea because there is very little water exchange between the bottom waters and the surface where pelagic organisms are found. On the basis of available survey data, deep-water soft-substrate communities are considered of low sensitivity.

Species

Plankton's dispersed nature, very high numbers and relatively short generation time means their populations are highly resilient and generally considered of low sensitivity.

There is very limited data on the occurrence of **fish** in the waters of the central Black Sea, where the Project Area is located. Plankton surveys indicate the presence of pelagic species such as anchovy, sprat and horse mackerel but numbers recorded are very low. Anchovy may be present in higher numbers during seasonal migrations between the north and south coasts of the Black Sea. The low levels of productivity of plankton and absence of fisheries in the central Black Sea are indicative of the low density of fish in this region. Of the fish species potentially present in Turkish waters, tuna, chub mackerel, mackerel, swordfish and garfish are listed as species of concern (vulnerable or above) on national, regional and international inventories of conservation statuses. Species diversity and abundance is anticipated to be lower than in coastal waters. Only one species migrates regularly through the Project Area. The expected presence of some endangered species coupled with the low species abundances means that the sensitivity of fish communities in the Project Area is considered to be moderate.

For **birds**, whilst most feeding takes places in coastal areas, there will be some species foraging offshore when pelagic fish species like anchovy are migrating between the northern and southern coasts of the Black Sea. The most common birds seen in the Project Area were the Mediterranean shearwater, which has an IUCN status of Vulnerable and the Caspian gull. The little gull and the Mediterranean gull may also be seen offshore as they make regular migrations between feeding and breeding grounds around the Black Sea.

In addition to seabirds, there were a number of bird species recorded in the Survey Area that are environmentally not linked to the sea (i.e. are not dependant in the sea for food or shelter), or generally not found in the open sea. Whilst the main migration routes do not cross the central part of the Black Sea there are some birds that migrate from south to north so that even in the heart of the Black Sea some entirely terrestrial birds, such as larks and starlings were observed. During surveys two falcon species were observed; the peregrine falcon (*Falco peregrinus*) listed as Endangered in the Red Data Book of the Black Sea and the saker falcon (*Falco cherrug*) listed as Endangered in the IUCN Red List and Vulnerable in the Red Data Book of the Black Sea. The presence of low numbers of endangered and vulnerable species in the Survey Area for at least part of the year means their sensitivity as receptors is considered moderate to high.

Whilst highly mobile and generally able to avoid areas of adverse impact, the sensory acuity of **marine mammals** means they have the potential to be impacted by high levels of unnatural underwater sound. Two of the three cetacean species in the Black Sea can occur in offshore waters, namely bottlenose dolphin (*Tursiops truncatus ponticus*) and common dolphin (*Delphinus delphis ponticus*). Bottlenose dolphin are globally and regionally endangered whilst common dolphin are globally vulnerable and listed in the Black Sea (Bucharest) Convention Annex II. Both species are included in the Red Data Books of the Black Sea and the Black Sea, Turkey (Ref. 8.2 and 8.3). Because they are species of conservational concern of their protected status, marine mammals are considered highly sensitive receptors.

A summary of the receptors considered within this chapter and their associated sensitivity ranking is provided in Table 8.19.

Table 8.19 Marine Ecology Receptors

Receptor	Sensitivity Ranking
Habitats	
Soft substrate benthos	Low

Continued…

Receptor	Sensitivity Ranking
Species	
Plankton	Low
Fish	Moderate
Birds	Moderate to High
Marine mammals	High

Complete.

Impact Magnitude

Consistent with the approach outlined above, and in **Chapter 3 Impact Assessment Methodology** of this ESIA Report, common impact magnitude criteria have been developed for marine and terrestrial ecological receptors as shown in Table 8.20 and Table 8.21. As the magnitude of potential impacts upon habitats and species is difficult to quantify and is highly variable, these definitions have been developed based on professional judgement and experience in GIIP to provide case specific flexibility in the assessment of impacts. These criteria, as previously mentioned, include consideration of the degree of change as well as the ability of receptors to withstand that change. Furthermore, in assigning magnitude, environmental controls built into the design of the Project are considered.

Table 8.20 Marine Habitat – Impact Magnitude

Magnitude	Description
High	The Project may adversely affect the integrity of an area or region, by substantially changing, in the long term, its ecological features, structures and functions, across its whole area, that enable it to sustain the habitat, complex of habitats and/or population levels of species that makes it important.
Moderate	The area/region's integrity will not be adversely affected in the long term, but the project is likely to affect some, if not all, of the area's ecological features, structures and functions in the short or medium term. The area or region may be able to recover through natural regeneration and restoration.
Low	Neither of the above applies, but some minor impacts of limited extent, or to some elements of the area, are evident but easy to recover through natural regeneration.
Negligible	Indiscernible from natural variability.

Table 8.21 Marine Species – Impact Magnitude

Magnitude	Description
High	Impact on a species that affects an entire population causing a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations*, or when there is no possibility of recovery.
Moderate	Affects a portion of a population and may bring about a change in abundance and/or a reduction in the distribution over one or more generations*, but does not threaten the long-term integrity of that population or any population dependent on it.
Low	Affects a specific group of localized individuals within a population over a short time period (one generation or less), but does not affect other trophic levels or the population itself.
Negligible	Indiscernable from natural variability.

* These are generations of the animal/plant species under consideration not human generations.

Determining Impact Significance

As outlined in **Chapter 3 Impact Assessment Methodology** of this document, the significance matrix shown in Table 8.22 provides basic guidance for the determination of impact significance; however, the resulting significance level is also checked against the definitions in Table 8.23, interpreted on the basis of professional judgement and expertise, and adjusted if necessary.

Table 8.22 Impacts Significance Matrix

		Receptor Sensitivity (Vulnerability and Value)			
		Negligible	*Low*	*Moderate*	*High*
Impact Magnitude (Extent, Frequency, Reversibility, Duration)	*Negligible*	Not significant	Not significant	Not significant	Not significant / Low*
	Low	Not significant	Low	Low / Moderate†	Moderate
	Moderate	Not significant	Low / Moderate	Moderate	High
	High	Low	Moderate	High	High

* Allows technical discipline author to decide if impact significance is Not significant or Low
† Allows technical discipline author to decide if impact significance is Low or Moderate

Table 8.23 Impact Significance Definitions

Adverse Impacts	**High**	**Significant**. Impacts with a "**High**" significance are likely to disrupt the function and value of the resource/receptor, and may have broader systemic consequences (e.g. ecosystem or social well-being). These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
	Moderate	**Significant**. Impacts with a "**Moderate**" significance are likely to be noticeable and result in lasting changes to baseline conditions, which may cause hardship to or degradation of the resource/receptor, although the overall function and value of the resource/receptor is not disrupted. These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
	Low	**Detectable but not significant**. Impacts with a "**Low**" significance are expected to be noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause hardship, degradation, or impair the function and value of the resource/receptor. However, these impacts warrant the attention of decision-makers, and should be avoided or mitigated where practicable.
	Not significant	**Not Significant**. Any impacts are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

8.8.1.2 Modelling Undertaken

While no specific ecological modelling has been undertaken, this section draws on the results of acoustic modelling with respect to the impacts of underwater noise on fish and cetaceans. The noise modelling assessment is provided in Appendix 8.1.

8.8.2 Assessment of Potential Impacts: Construction and Pre-commissioning

8.8.2.1 Introduction

Compared to other Project phases, construction and pre-commissioning activities have the greatest scope to impact the marine environment and all the receptors discussed above may be impacted at some stage. However, the Project has been designed to reduce a number of impacts at source through the development of Project design controls which are set out in Table 8.24. Design controls have been categorised by potential impact from a given Project activity. These design controls attempted to firstly either avoid or minimise the risk of an impact considering the IFC mitigation hierarchy as discussed in **Chapter 3 Impact Assessment Methodology**. Potential construction and pre-commissioning impacts are assessed on this basis. Additional mitigation and monitoring measures are then identified that can further reduce impacts to as low as practicable, and the residual impact is assessed. The Project design controls included in Table 8.24 relate to the Construction & Pre-commissioning and Operational

Phases and have been included in the pre-mitigation impact assessment in Sections 8.8.2.2 and 8.8.3.2.

Table 8.24 Design Controls

Design Controls
All bunkering activities will be undertaken in accordance with the Vessels and Marine Transport activity-specific Construction Management Plan (CMP) which will be developed as part of South Stream Transport's ESMP. The CMP will contain activity-specific requirements, to be met by both South Stream Transport and the appointed contractors (and sub-contractors).
All vessel discharges and wastes will be compliant with the International Convention for the Prevention of Pollution From Ships (MARPOL), Bucharest Convention and national regulations, cognisant of the Black Sea's status as an International Maritime Organisation (IMO) special area with respect to garbage and wastes containing hydrocarbons. For information on the regulations governing the discharges of grey / black waste, sewage, garbage, bilge and oily water that will be adopted by the Project (**Chapter 12 Waste Management**).
An Integrated Waste Management Plan will be drawn up by contractors to ensure wastes are minimised at source, recycled /re-used where possible and otherwise managed responsibly. Adherence to vessel-specific Waste Management Plans which will include provisions for segregating waste on board, having secure areas for storage of hazardous waste and recycling / reuse where practicable.

8.8.2.2 Assessment of Potential Impacts (Pre-Mitigation)

Receptors and their associated sensitivity have been identified above. This section provides an assessment of potential impacts to these receptors using the impact magnitude and receptor sensitivity matrix discussed in **Chapter 3 Impact Assessment Methodology**. A summary of the impacts identified and their pre- and post-mitigation significance ranking is provided in Table 8.27 in Section 8.8.2.4.

Benthos

Vessel wastes can affect benthic communities by releasing organic matter to the water column that may settle and decompose on the seabed which can create anoxic conditions. However, in the deep areas of the Black Sea the water column and seabed, below 150 to 200 m water depth are completely anoxic and high in hydrogen sulphide (H_2S). Benthic communities are absent in the Project Area because of these natural conditions and any biology is limited to microbial organisms adapted to anoxic conditions. Impacts from vessel wastes will be of a negligible magnitude to a receptor of low sensitivity and so the impact is **Not Significant**.

Seabed disturbance, resulting in increased turbidity and resettlement of suspended solids, which can cause smothering, may occur through pipe-laying. However, there are very few marine ecological receptors on the floor of the abyssal plain, limited to microbial organisms capable of surviving in anoxic conditions. There was no indication of any structural microbial communities, such as those forming mats or reef structures on the seabed. Thus, pipe-laying is of negligible magnitude to a receptor of low sensitivity so that the resulting impact is assessed as **Not Significant**.

Vessel operations associated with pre-construction route surveys (using ROVs) etc. are negligible magnitude activities, to a receptor of low sensitivity that will have a **Not Significant** impact on the benthos.

Plankton

Vessel operations will generate waste that may affect plankton as follows:

- Cooling water discharges may cause localised changes in water quality relating to excess heat and the presence of biocides. This may cause thermal and/or chemical stress to biota in the immediate vicinity, though it will be a highly localised effect; and
- Vessel waste discharges may locally reduce light levels and affect phytoplankton photosynthesis. Suspended solids may also interfere with the filter feeding mechanisms of some zooplankton species and affect the behaviour of visual predators that eat zooplankton.

Vessel wastes will be managed in line with MARPOL and national regulations, thus these impacts are of negligible magnitude, as the extent of impact both spatial and on the planktonic population will be small, to a receptor of low sensitivity and are therefore assessed as **Not Significant**.

Seawater abstraction may result in the entrainment of plankton. These will be subject to physical stresses and may result in mortality. However, as only a very limited number of localised individuals will be affected, this is a short term, small extent impact and thus will be of negligible magnitude to a receptor of low sensitivity. The impact is thus **Not Significant**.

Light from night-time works may result in changes in the vertical distribution of plankton however, as this is highly localised and small in spatial extent, it will be of negligible magnitude to a receptor of low sensitivity. The impact is thus **Not Significant**.

Fish

Vessel operations have the following potential impacts on pelagic fish:

- As the Project will comply with MARPOL discharge controls, locally reduced dissolved oxygen levels in surface waters causing physiological stress, displacement and/or behavioural changes in fish is unlikely to arise. Conversely, kitchen wastes may attract some species to feed, though the scale of this impact is likely to be trivial; and
- Cooling water discharges may cause localised changes in water quality relating to excess heat and the presence of biocides. This may cause thermal and/or chemical stress to biota in the immediate vicinity, though it will be a short-term and highly localised impact.

These impacts will be highly localised and short-term and so vessel operations are considered to have negligible impacts on a moderate sensitivity receptor therefore any associated impact is **Not Significant** to fish.

Light from night-time works may affect fish, either by direct attraction or through alterations in the distribution of planktonic prey. Because of its highly localised and short-term nature, this is a negligible magnitude impact to a moderate sensitivity receptor; therefore any associated impact is **Not Significant** to fish.

Seawater abstraction may result in the entrainment of small fish, fish larvae and eggs. These will be subject to physical stresses and may result in mortality. However, as only a very limited number of localised individuals will be affected this is a short term negligible magnitude to a receptor of moderate sensitivity. The impact is thus **Not Significant.**

Noise and vibration will be generated by the passage of vessels and pipe-laying. Low levels of noise may also be generated during construction activities.

Fish may be either hearing specialists or hearing generalists; the former are usually species with swim bladders that are connected to the ear and are more sensitive to noise. Sprat and anchovy possess specialised gas ducts extending to the inner ear and are hearing specialists. Hearing generalist fish (such as tuna) are less sensitive both in terms of sound level and frequency range.

Acoustic impact analysis (Appendix 8.1) showed that sound levels generated by pipe-laying in the Black Sea are insufficient to cause mortality to fish. The approach used is based on criteria developed from hearing studies of fish exposed to airgun sounds. This is most commonly applied to pile driving injury range estimation but can be reasonably applied to continuous sound. Exposure to a few loud sounds is more damaging to fish that exposure to a larger number or longer duration of quieter sounds therefore, the use of the following criterion, 187 dB re µPa2, are precautionary when applied to exposure to continuous sound and yield very conservative estimates of effect range and area.

Modelling results show a theoretical maximum injury effect range of 0.4 km, corresponding to an effect area of 3.8 km^2. It should be noted that this is a very conservative estimate, as much vessel noise is high frequency and fish generally have no sensitivity to sound above these higher frequencies (with the exception of some fish specialised in hearing very high frequency sound, such as cod which are not present in the Black Sea). In addition, fish will move away from loud noises and their actual exposure in reality will be significantly less.

Weighted metrics, specifically the dB_{ht} technique, are based on the hearing sensitivity of the target species and the loudness of the noise as experienced by the animal. Using weighted thresholds, it was found that behavioural effects (given by the 75 dB_{ht} threshold) may be apparent in some hearing specialist fish, such as sprat, in some situations [6] (though not anchovy). Modelling has suggested that the pipe-lay vessel may generate noise impacts at a range of approximately 0.5 km (area of effect approximately 0.1 km^2). No impacts are predicted to hearing generalist species.

[6] Audiograms for sprat were not available for use in the modelling exercise and herring, a close relative, was used as an analogue. Given that anchovy are also closely related and no impacts are predicted based on the anchovy audiogram, the use of herring in the model may have resulted an over-estimation of impact ranges.

Migratory species, such as anchovy, could be impacted by either the physical presence of vessels or noise generation from vessels impacting migratory routes and/or patterns. Anchovy are the only species in the Black Sea known to migrate across the Project Area (Section 8.5.4.1). However, as the construction spread will only be moving at approximately 2.75 km per day it can be considered a stationary object and anchovy will be able to avoid this area. Migrating schools of fish are fast moving and their presence at a particular point is temporary. The main migration corridor could extend around 125 km (Ref. 8.11) in width through the Turkish EEZ and the main impact radius is 0.5 km in hearing specialists. This impact zone is transitory and is a very small part of the width of the anchovy migration corridor. Underwater noise is therefore unlikely to result in disorientation or cessation of migratory behaviour.

Because noise will affect a small group of individuals over a short time period the generation of noise is considered a low magnitude impact on a receptor of moderate sensitivity. The significance of the impact is thus, at most, of **Low** significance. Additional detail of the acoustic modelling is provided in Appendix 8.1.

Birds

A number of migration routes stretching from the Arctic to South Africa occur around and over the Black Sea for birds that overwinter, nest and roost in coastal locations. In the Turkish EEZ, there are no nesting sites and so the birds observed in this region are restricted to a small number of species that may be feeding or migrating through the area. The central Black Sea is outside the main Mediterranean/Black Sea Flyway (Figure 8.4) migration route, which connects Europe with Africa. It is not important for large numbers of migrating birds although data on the occurrence of birds in the central Black Sea is scarce.

Vessel movements during surveying and pipe-laying activities have the potential to temporarily disturb seabirds. However, these are highly mobile animals generally able to avoid areas of disturbance. Furthermore, the density of seabirds at sea in the central Black Sea area is generally low and birds tend to be present during migration and unlikely to be present on the sea surface in any significant number. Vessel movements could impact a small group of individuals during migration periods and impacts are highly localised to around the construction spread. This will thus be a negligible magnitude impact to a receptor of moderate to high sensitivity therefore any associated impact is **Not Significant** to birds.

Night-time works are required and they necessitate the use of floodlights. Light can affect migrating birds and cause mortality from bird strikes on highly illuminated offshore installations. The source of illumination (e.g. the pipe-laying vessel) will be transient at any given location and have limited scope to interact with night-flying birds. Because only a small number of localised individuals will be affected, this is considered a short-term negligible to low magnitude impact to a receptor of moderate to high sensitivity, resulting in impacts of **Moderate** significance.

Marine Mammals

Vessel movements during mobilisation, surveying and pipe-laying activities have the potential to temporarily disturb marine mammals. Collisions may also occur, though this is highly unlikely with small cetaceans. These are highly mobile animals with acute sensory perception and are generally able to avoid areas of disturbance and only a few individuals are likely to be affected, if any. This will therefore be a medium term, low magnitude impact to a high sensitivity receptor, leading to impacts of **Moderate** significance.

Cooling water discharges and other effluent streams from vessels may cause localised changes in water quality relating to excess heat and the presence of wastes. This may cause thermal and/or chemical stress to animals in the immediate vicinity, though it will be a highly localised effect and easily avoided by cetaceans. This is thus a negligible magnitude impact, as it is small scale, short term and unlikely to cause injury or mortality to a high sensitivity receptor, thus likely to be **Not Significant**.

Light from night-time works may affect marine mammals through alterations in the distribution of prey. Because of its highly localised nature and its potential to only impact a very limited number of individuals, this is a short term negligible magnitude impact to a high sensitivity receptor, likely to be **Not Significant**.

Noise from vessel movements and from the pipe-lay vessel can negatively impact marine mammals as it influences their ability to echolocate, communicate and can cause physical harm (through risk of disorientation leading to beaching, as well as in extreme cases, trauma to the auditory apparatus). Noise can cause certain cetacean species to vacate feeding areas, as it interferes with acoustic prey location.

A number of activities involve the generation of man-made sound underwater and this has the potential to impact cetaceans. The noise-generating activities associated with pipeline construction and pre-commissioning have been identified as:

- Pre-lay surveys;
- Vessel movements; and
- Pipe-laying.

Detailed noise modelling has been carried out to assess the potential impact of underwater noise on cetaceans. The noise modelling has included consideration of single sources, combined sources (from vessel spreads) as well as cumulative exposure over time (24 hours). The potential of noise to cause injury or behavioural alterations has been assessed and is summarised below. Full details are provided in Appendix 8.1.

In keeping with the latest scientific approaches, injury effects assessment has been based on the cumulative sound exposure level (SEL) over a period of 24 hours. The pipe-laying activity has been modelled including realistic motion of pipe-lay vessel and support vessels such as pipe carrier ships shuttling to resupply. Two sets of criteria are available and currently considered valid for the assessment of ranges to injury[7] from continuous noise: the Southall et al. criteria and the Finneran and Jenkins criteria (also referred to as the "US Navy criteria"):

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[7] Defined as the onset of permanent threshold Shift (PTS); i.e. the point at which hearing may become impaired and from which the animal cannot recover.

- The former uses a single threshold of 215 dB re µPa2-s SEL weighted according to the hearing class of the subjects using Type 1 weighting curves (M-weighting); and
- The latter uses variable thresholds and newer Type 2 weighting functions that take into account subjective loudness and some additional data collected since the Southall *et al.* study. For Mid Frequency Cetaceans (MFC) such as dolphins the threshold is 198 dB re µPa2-s SEL with Type 2 MFC weighting. For High Frequency cetaceans (HFC) such as porpoises the threshold is 187 dB re µPa2-s SEL with Type 2 HFC weighting.

The results of the SEL based assessment have been presented in terms of the modelled area exposed to cumulative levels above the threshold over a 24 hour period (area of effect), as well as a range of effect that provides a linear "width" of the footprint relative to the main pipe-lay vessel. Because of the irregular and elongated shape of the cumulative footprint along the pipe-lay route, the effect range cannot be computed as a radius for equivalent area and is instead measured from the swath width of the footprint with suitable consideration of its shape. The injury footprint of the activity is estimated to be very limited.

Various criteria are available to assess the potential impacts of underwater noise on cetacean behaviour. Traditionally, an un-weighted criterion for the onset of behavioural effects of 120 dB re µPa has been used, commonly referred to as the "Level B Harassment" criterion. This approach, in use in the USA since 1997, has several acknowledged shortcomings, most importantly that marine species vary widely in their sensitivity to sound, and especially to the frequency range which they hear. Thus this "one size fits all" criterion is considered inappropriate in some specific instances and the approach is currently under review by NOAA/NMFS[8]. It should not be totally ignored or dismissed out of hand however, due to its current widespread use. It is therefore included here for completeness and reference to common practice. It is also a criterion still cited as the only acceptable approach for the harbour porpoise by studies as recent as 2012 (Ref. 8.29) that explicitly exclude the use of weighted metrics criteria for that species because of its unique susceptibility and reaction to sound stimuli.

Weighted metrics behavioural criteria for species other than harbour porpoises could be considered, but their applicability in the case of continuous sounds such as those from vessels is not confirmed and the relatively high reaction thresholds that arise from their use would be difficult to defend by comparison with empirical evidence.

Audiogram based behavioural effect were chosen as the most defensible criteria given the availability of reliable audiograms for dolphins. There remains a degree of uncertainty in the use of audiogram referenced levels (dB relative to hearing threshold, or dB_{ht}) regarding which threshold to adopt for the onset of behavioural disturbance. A commonly used set of criteria are the fixed thresholds of 75 and 90 dB_{ht} for all species as onset of mild and pronounced

[8] National Oceanic and Atmospheric Administration / National Marine Fisheries Service: The new approach, currently undergoing peer review, is an attempt to create a more nuanced scientific set of criteria. It is likely to result in either an increase in the Level-B threshold, based on the understanding that animals will tend to avoid noise sources thereby educing their exposure, or to be related more closely to ambient noise levels in the marine environment. These new guidelines are due to be issued in the near future.

behavioural reactions respectively. However validity especially of the higher threshold has been questioned and evidence can be found for reaction at significantly lower levels. Taking the different elements into account, the 75 dB_{ht} threshold is considered a reasonably conservative and defensible estimator of the onset of behavioural disturbance in cetaceans and has been used for this assessment.

Based on audiogram weighted criteria, behavioural effect ranges for individual vessel operations are only estimated to be significant for dolphins and porpoises with effect ranges never exceeding 1.01 km for at any modelled location. It should also be noted that this range is based on the audiogram of the harbour porpoise which is more sensitive to noise than dolphins. As harbour porpoise are unlikely to be seen in great numbers in or near the Project Area (none were observed during 2009 to 2011 surveys), this can be considered precautionary. A summary of the predicted ranges and areas of effect is presented in Table 8.25.

Table 8.25 Predicted Behavioural Impact Ranges for Cetaceans Based on 75 dB_{ht}

Activity	Season	Bottlenose Dolphin		Harbour Porpoise	
		Range (km)	Area (km^2)	Range (km)	Area (km^2)
Pipe-Laying	February	0.5	0.06	0.4	0.2
	August	0.5	0.06	0.4	0.23
Crew Change	February	0.6	0.53	0.92	1.74
	August	0.64	0.61	1.01	2.26

In addition, cetaceans may be exposed to sonar noise during pipeline inspection. There are well accepted impact criteria for sonar sources that are based on the instantaneous root-mean-square sound pressure level metric (rms SPL). For injury, a generic (NMFS) standard threshold of 180 dB re 1 μPa un-weighted is commonly used. For behaviour effects, there are US Navy criteria specifically for sonar sources. Their criteria for mid-frequency and high-frequency cetaceans are based on Type I weighting of the SPL and do not provide a single threshold value but rather refer to a Behavioural Response Function (BRF) that assesses the probability of a behavioural impact from a given SPL. Accordingly, a reasonably precautionary 25% probability of response to a weighted SPL of 160 dB re dB re 1 μPa has been used as the principal criterion. However, as previously explained, harbour porpoises are excluded from this criterion due to the high susceptibility to disturbance of this species and the recommend NMFS standard threshold of 120 dB re 1 μPa un-weighted is used. In all cases, cetaceans would need to be closer than 10 m from the source for any possibility of injury. The longest range predicted impacts are approximately 120 m from the source. The ranges over which behavioural impact might be observed are summarised in Table 8.26.

The analysis shows that sound levels generated by pipe-laying are unlikely to cause mortality or injury to marine mammals. Noise may affect a group of localised individuals over a short time without affecting the overall population, thus the generation of noise is considered a medium term, low magnitude impact to a high sensitivity receptor, of **Moderate** significance. Additional details of the quantitative underwater noise assessment can be found in Appendix 8.1.

Table 8.26 Predicted Behavioural Impact Ranges for Sonar Source

Threshold	Season	Range (km)	Area (km^2)
Generic (NMFS) threshold (120 dB re 1 μPa rms SPL un-weighted) Porpoise	February	< 0.01	< 0.0001
	August	< 0.01	< 0.0001
Mid-Frequency cetacean behaviour threshold (160 dB re 1 μPa SPL) Dolphin	February	0.12	0.0005
	August	0.12	0.0005

8.8.2.3 Mitigation and Monitoring

The approach to mitigation is described above at section 8.8.1. Specific mitigation measures are discussed below and are grouped by each potential impact arising from the Project Activities in Table 8.16. It is important to note that impact categories may cover a broad range. For example a moderate impact could be relatively localised and affect a limited set of receptors, or approach the threshold of breaching a regulatory limit. Clearly to design an activity so that its effects only just avoid a major impact is not good practice thus the emphasis for mitigation is on demonstrating that the impact has been reduced to practical minimum, rather than necessarily be reduced purely in terms of its rating:

- Vessel speed will be reduced where seabirds on the water surface and/or marine mammals are known to be present, and vessels will not approach animals unless it is not possible to avoid doing so;
- Specific protocols for mammal and bird interactions will be drawn up in contractors' management plans and trained Marine Mammal Observers (MMO) will be present during pipe-laying operations to assist in managing such interactions on a case by case basis;
- Use modern vessels and plant and undertake regular maintenance checks;
- Vessel engine power will be "ramped" up where practicable, to allow cetaceans that may be nearby to move away from sources of loud underwater noise and vibration;
- Preparation of a Biodiversity Action Plan (BAP) and a Biodiversity Management Plan (BMP);
- Appropriate lighting design during night-time works will be implemented, including use of directed illumination, screens, shades, timers, actuators, etc. as required. Skyward and seaward light projection will be eliminated as far as safe and practicable, by removing unnecessary illumination, reduction of light intensity and shielding of light sources during the night, and in low visibility and bad weather conditions. This will apply particularly during the most active migration period for migrating birds (between the end of March and the end of May, as well as mid of September to the end of October) if mass strikes of birds with vessels and superstructures detected; and

- Intake screens for water abstraction will be used to prevent ingress of fish, including eggs and larvae and large invertebrates. The design of screens should be optimised to minimise injury and/or mortality.

Monitoring

Ecological monitoring is necessary to verify the predicted impacts of pipeline installation, to demonstrate the efficacy of mitigation and to document the recovery of impacted receptors from temporary impacts. Monitoring programmes will be designed to interface with surveys carried out for the Project, to ensure inter-comparability of pre and post-construction data. As indicated in Section 8.8.1, the Project will adopt a practice of adaptive management in which the nature and implementation of management and mitigation and management measures, and where necessary, offsetting or compensatory measures, are responsive to changing conditions and the results of monitoring.

A monitoring plan is required for the Turkish national EIA, as required by Turkish regulations, and will be confirmed with the relevant Turkish authorities. If impacts are detected during construction, additional post-construction monitoring may be developed by the Project, consistent with the adaptive management approach referred to above.

This ESIA Report has identified the following component for which monitoring will be required:

- *Seabirds and Marine Mammals*: Post construction survey of seabirds and marine mammals to record species abundance and distribution will be carried out from Project vessels deployed for routine external inspection surveys.

Biodiversity monitoring will be integrated into the Project's overall Environmental and Social Management System (ESMS). In this way, the results of the program can be clearly linked to management actions and the results used to evaluate the effectiveness of its mitigation strategy. This is in line with IFC PS1, which emphasises a "plan, do, check and act" management system. Further detail is provided in the Project's Environmental and Social Management Plan (ESMP) described further in **Chapter 16 Environmental and Social Management**.

In addition, because critical habitat has been identified for certain seabirds and cetaceans, there is an additional requirement for biodiversity monitoring/research. The Project's mitigation strategy will be designed to comply with IFC PS6 and to achieve net biodiversity gains. One of the common ways in which projects deliver biodiversity benefits is the use of offsets. However, in this instance, where a biodiversity offset is not part of the mitigation strategy (partly due to the absence of significant residual impacts, and partly due to the difficulty in securing a marine offset), net biodiversity gains will be obtained by identifying additional opportunities to protect and conserve biodiversity. The implication of this for the Project's monitoring programme, particularly for birds and mammals, is that it must be appropriately designed to enhance scientific knowledge and thereby improve conservation measures for those species of conservation concern. The scope of such programmes will be developed in consultation with relevant parties to ensure the maximum benefit is delivered.

The foregoing will be described in a Biodiversity Action Plan (BAP) which will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated.

8.8.2.4 Residual Impacts: Construction and Pre-Commissioning

The residual impacts of the Project construction and Pre-Commissioning are detailed in Table 8.27. As a result of the Design Controls discussed in Table 8.26 and the mitigation measures described above, the majority of residual impacts to marine ecological receptors have been assessed as either **Low** or **Not Significant**. Not significant impacts relate either to very localised and infrequent activities, or to those impacts that are within the limits of the natural variability of the system and thus effectively undetectable. These impacts, which are not considered further in this Section, comprise the following:

- Seawater abstraction for cooling water purposes will have no appreciable impact on sensitive receptors and is thus **Not Significant**;
- Any disturbance arising during inspection surveys etc. is of a very small spatial extent and duration and is thus **Not Significant**;
- Turbulence from dynamic positioning of vessels will be localised to such a degree that the impact will be **Not Significant**; and
- Disturbance and waste generation from a series of small scale, brief construction activities are **Not Significant**.

Lighting impacts on seabirds have been assessed as **Moderate** significance before mitigation. As indicated above, appropriate lighting design is a mitigation measure. The residual magnitude is assessed as **Low**.

Impacts of vessel movements causing disturbance to birds and mammals have been assessed as **Moderate** prior to mitigation. The use of trained MMO and development of specific protocols to minimise interactions will be implemented as mitigations and the residual magnitude is assessed as **Low**.

Because underwater noise is above background levels, it is considered a low magnitude (as opposed to negligible) impact. The impact to highly sensitive cetaceans from underwater noise has therefore been assessed as of Moderate significance before mitigation, based on strict application of the significance matrix (Table 8.22). Because noise cannot be attenuated to negligible levels, the residual impact on cetaceans, after mitigation is still of Moderate significance according to the matrix. However, this is not compatible with the definition of "moderate impacts" in Table 8.23, i.e. *"result in lasting changes to baseline conditions, which may cause hardship to or degradation of the resource/receptor, although the overall function and value of the resource/receptor is not disrupted*." As previously described, modelling of the acoustic impact of the construction spread has shown that sound is unlikely to cause mortality or injury to marine mammals and will only affect a group of localised individuals over a short time without affecting the overall population. This degree of impact is consistent with the definition of **Low** significance because though changes are detectable, they are very short term (no more than a few days duration) and "*not expected to cause hardship, degradation, or impair the function and value of the resource/receptor."*

A summary of residual impacts showing receptor sensitivity, impact magnitude, proposed mitigation and impact significance is given in Table 8.27.

Table 8.27 Assessment of Impacts: Construction and Pre-Commissioning Phase

Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Mobilisation of vessels to and from Project Area and vessel movements within construction spread. Delivery of pipe and other supplies by supply vessel, including crew changes. Vessel routine operations (including propulsion, cooling water, water maker). Night time works. Pre-lay / as-built surveys. Laying the pipe on seabed.	Vessel wastes / discharges could indirectly impacts species by decreasing water quality. Light from night-time works can attract species. Seawater abstraction can cause entrainment of species.	Plankton	Low	Negligible	**Not Significant**	None required	-
		Fish	Moderate	Negligible	**Not Significant**		-
		Mammals	High	Negligible	**Not Significant**		-
	ROV operations associated with pre-construction route surveys.	Benthos	Low	Negligible	**Not Significant**	None required	-

Continued…

Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Mobilisation of vessels to and from Project Area and vessel movements within construction spread. Delivery of pipe and other supplies by supply vessel, including crew changes. Vessel routine operations (including propulsion, cooling water, water maker). Night time works. Pre-lay / as-built surveys. Laying the pipe on seabed.	Physical disturbance of animals at sea surface (as distinct from acoustic effects) and possible collision risk.	Birds	Moderate to high	Low	**Moderate**	Trained MMO and specific protocols for mammal and bird interactions in the contractors' management plans. Will include: • Minimise unnecessary vessel movements. • Reduce vessel speed where mammals may be present. • Avoid aggregations of birds and mammals.	**Low,** direct, short term
		Mammals	High	Low	**Moderate**		**Low,** direct, short term
	Birds (particularly those that migrate at night) may be attracted to lights and suffer damage as a result of collisions with vessels.	Birds	Moderate to high	Negligible to Low	**Moderate**	Remove unnecessary illumination, reduce light intensity and shield light sources during the most active migration period for birds.	**Low,** direct, short term

Continued...

Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Mobilisation of vessels to and from Project Area and vessel movements within construction spread. Delivery of pipe and other supplies by supply vessel, including crew changes. Vessel routine operations (including propulsion, cooling water, water maker). Night time works. Pre-lay / as-built surveys. Laying the pipe on seabed.	Noise may cause behavioural changes over a limited area.	Fish	Moderate	Low	**Low**	Trained MMO and specific protocols for mammal and bird interactions in the contractors' management plans. Will include: • Minimise unnecessary vessel movements. • Reduce vessel speed where mammals may be present. • Avoid aggregations of birds and mammals. • Vessel engine power will be "ramped" up where practicable.	**Low** direct, short term
	Noise may cause low level behavioural changes over a wide area. Possible injury in direct proximity to activity.	Marine Mammals	High	Low	**Moderate**		**Low** direct, short term (see text in Section 8.8.2.4)

Complete.

8.8.3 Assessment of Potential Impacts: Operational Phase

8.8.3.1 Introduction

Because the scope of activities associated with the operational and commissioning impacts is small in comparison with the Construction Phase, the number of receptors is limited to those that might be affected by the continued presence of the pipeline on the seabed or be disturbed by inspection and maintenance activities.

Inspection activities may generate small amounts of ship wastes as described in Section 8.8.2.2 though to a lesser degree. All vessel discharges and wastes will be compliant with MARPOL and national regulations thus will have a negligible impact and are not considered further.

8.8.3.2 Assessment of Potential Impacts (Pre-Mitigation)

Benthic Habitats

The pipeline will provide hard substrata on the seabed but in the absence of any biology apart from microbial life the presence of a pipeline will not have any impact on the benthos. This is therefore considered a negligible magnitude resulting in a **Not Significant** impact.

Plankton

Impacts from operation will be more limited in extent and frequency than during construction as vessel activities will be limited to once every one to five years. As such, impacts are anticipated to be of negligible magnitude and **Not Significant** to plankton.

Fish

Pipeline inspection and maintenance will involve some vessel movements including vessel noise. The limited frequency and extent of such activities means that any interaction with fish will be minimal. This therefore considered a negligible magnitude impact and **Not Significant** to fish.

Seabirds

Pipeline inspection and maintenance will involve some vessel movements. The limited frequency and extent of such activities means that any interaction with seabirds will be minimal. This therefore considered a negligible magnitude resulting in a **Not Significant** impact.

Marine Mammals

The movement of vessels (including vessel noise) associated with pipeline inspection and maintenance is a **negligible** magnitude impact and **Not Significant** to marine mammals.

8.8.3.3 Mitigation and Monitoring

Although no significant impacts are anticipated, maintenance vessels will adopt the following minimisation measures, following the IFC mitigation hierarchy outlined in **Chapter 3 Impact**

Assessment Methodology, for management for vessel movements and operations etc. during inspection and maintenance, specifically:

- Vessel movements during inspection and maintenance will be kept to a practical minimum to minimise disturbance to marine mammals and seabirds; and
- Vessels will not approach animals unless it is not possible to avoid doing so.

8.8.3.4 Residual Impacts: Operational Phase

The limited scope of operational and commissioning impacts compared to those identified for the Construction and Pre-Commissioning Phase means that residual impacts are expected to be **Not Significant**. The potential operational impacts, their mitigation and residual impacts are summarised in Table 8.28.

8.8.4 Assessment of Potential Impacts: Decommissioning Phase

Decommissioning of the South Stream Offshore Pipeline will be carried out according to prevailing international and national legislation and regulations and best practices regarding environmental and other potential impacts.

A review, and relevant studies if necessary, will be undertaken during the Operational Phase to confirm that the planned decommissioning activities utilise GIIP and are the most appropriate to the prevailing circumstances. The review will outline management controls and demonstrate that the decommissioning activities will not cause unacceptable environmental and social impacts. The decommissioning activities will also require all relevant approvals and authorisations from the Turkish government departments responsible at the time.

Essentially two options are available; namely in situ decommissioning or pipe removal:

- In situ decommissioning involves cleaning the pipeline and filling it with seawater. The receptors that might be impacted are thus the same as those for the operational Pipeline; or
- Removal of the pipeline is essentially a similar operation to pipe-laying, but in reverse. The receptors and degree of impact will thus be similar to those identified for the construction phase.

Impacts that may be associated with decommissioning will be assessed as part of the process of developing detailed decommissioning management plans and are not assessed in this ESIA Report.

A detailed scope for appropriate monitoring will be developed at the time of decommissioning, taking into account prevailing environmental conditions, GIIP and available technology.

Table 8.28 Assessment of Impacts: Operational Phase

Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact significance	Summary of Mitigation Measures	Residual Impact significance
Maintenance and repair to pipelines (including span correction, etc.)	Vessel wastes and discharges could indirectly impacts species by decreasing water quality.	Plankton	Low	Negligible	**Not significant**	None Required	-
	ROV operations associated with maintenance.	Benthos	Low	Negligible	**Not Significant**	None Required	-
	Noise may cause behavioural changes over a limited area.	Fish	Moderate	Negligible	**Not Significant**	None Required	-
	Physical disturbance of animals at sea surface and possible collision risk.	Birds	Moderate to high	Negligible	**Not Significant**	None Required	-
	Noise may cause low level behavioural changes over a wide area.	Marine Mammals	High	Negligible	**Not Significant**	None Required	-

8.9 Unplanned Events

During the Construction and Pre-Commissioning Phase of the Project, unplanned events in the marine environment may occur as a result of maritime accidents involving one or more vessels. The resultant effects of these unplanned events will be limited to accidental pollution incidents involving fuel and oils. This in turn might lead to impacts (unmitigated) of moderate magnitude on receptors of low and moderate sensitivity, leading to impacts of moderate, possibly high significance, depending on the receptor affected. The probability of an accident leading to a pollution incident ranges from unlikely to extremely remote. Further, incident response measures would be deployed which would limit the magnitude of impact, and thereby the resulting significance.

Vessel operations have the potential to inadvertently introduce invasive alien species, either in ballast water, on the biofilm inside ballast tanks or carried as fouling organisms on the hull. Historically, some introductions of alien species have had extreme ecological consequences, either directly through the introduction of benthic predators such as *Rapana venosa* or through system wide perturbations as exemplified by the invasion of the planktonic ctenophore *Mnemiopsis leidyi*. In other instances, such as the introduction of the bivalve *Anadara inaequivalvis*, the effects have been less severe and in the case of *Beroe ovata*, have in fact served to redress some of the ecological the perturbations caused by *M.leidyi*. Despite its low probability of occurrence, the possibility of population or community-wide effects on the ecology of the sea makes this a potential impact of high significance.

During the Operational Phase of the Project unplanned events at sea may occur as a result of accidental leakages of natural gas from the subsea pipeline. This could be incurred by third-party vessel interaction with the pipeline by events including sinking, grounding and anchor or dropped object (such as a container) damage to the pipeline.

In the event of an uncontrolled gas release from the pipeline, the gas flow will be shut off as soon as practicable. For approximately one third of the pipeline in the Project Area gas will not leak from the pipelines. This occurs where the external pressure around the pipeline (i.e. the pressure of the seawater) is greater than the pressure of the gas within the pipeline. Any gas released from the remainder of the damaged sub-sea pipeline would rise through the water column as a plume of gas bubbles. On reaching the sea surface, the gas would disperse into the air. No marine ecology receptors are anticipated to be affected by the accidental release of gas.

Chapter 13 Unplanned Events discusses the impact assessment and potential mitigation measures associated with these events.

8.10 Cumulative Impacts Assessment

As is set out in **Chapter 14 Cumulative Impacts**, the Turkish Petroleum Corporation (TPAO) has confirmed that there are no existing oil and gas explorational drilling or development activities occurring within or near to the Project Area. However, TPAO advised of two possible oil and gas exploration and production projects which may be brought forward over the next three years, namely the Tuna Prospect, in the northwest of License Area 3921 and the Sile Prospect in License Area 3920. There is also the potential for cumulative impacts from the South Stream Offshore Pipeline – Russian and Bulgarian Sectors.

Given that these two TPAO prospects are at a very early stage of evaluation, there is no information on the extent of development (e.g. extent of seismic surveys or number and extent of well heads), and consequently little on which to base an assessment of the potential for cumulative impacts. TPAO has indicated however that if oil or gas is discovered in the 'Tuna Prospect' license area 3921, it could be necessary to construct a pipeline(s) to carry the hydrocarbons south, thus intersecting the Project Area during the Operational Phase of the Project.

There is the potential for noise from seismic surveys to interact with noise from Project vessels. Noise impacts for the Project are experienced out to a distance of 1 km for mammals and around 0.5 km for fish. Seismic activity can impact fish and mammals more significantly than vessel noise however, as the extent, type and frequency of the TPAO seismic surveys is not known, no quantitative assessment can be undertaken.

In terms of cumulative impacts between different sectors (Russia, Turkey and Bulgaria) of the South Stream Offshore Pipeline, these are unlikely given that the construction spreads will be around 500 km apart and noise impacts in the form of mild avoidance behaviour of fish or mammals (which are the furthest reaching associated with activities) will not extend more than 1 km from the vessel.

Further details on the cumulative schemes are given in **Chapter 14 Cumulative Impact Assessment**.

8.11 Conclusions

The Construction and Pre-Commissioning Phase of the Project has the greatest potential to impact marine ecological receptors. With the exception of impacts on marine mammals as a result of noise emissions, all residual impacts have been assessed as **Low** significance or **Not Significant** through the adoption of design controls and the implementation of mitigation measures.

The impacts on cetaceans from underwater noise were initially assessed as of **Moderate** significance after mitigation. However, such significance is not compatible with the definition of "moderate impacts" as applied throughout the Project and therefore expert judgement has been applied, in line with **Chapter 3 Impact Assessment Methodology**. The resulting impacts, after mitigation, are consistent with the definition of "low significance" and it is even arguable that noise emissions from the construction spread would result in negligible impacts because they would not cause "*noticeable changes to baseline".* However, it is considered precautionary, and thus appropriate, to rank the significance of the impact as **Low** and not negligible.

Similarly, the impacts associated with the Operations Phase have been assessed as being **Not Significant**.

While it is not possible to fully assess decommissioning impacts at this stage, it is possible to contrast two broad strategies; in situ abandonment and pipe recovery. The former generates impacts broadly similar to those of the Operational Phase, while the latter generates impacts broadly similar to the Construction and Pre-Commissioning Phase, and are thus amenable to similar mitigation strategies.

Because the Project footprint has been shown to intersect critical habitats, the Project Standards require that the following be demonstrated (as stated in Paragraph 17 of PS6 of the IFC Performance Standards):

1. *No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical.* Because of the scale of the Project and the wide distribution range of species such as dolphins and porpoises, any pipeline in the Black Sea would intersect critical habitat and thus there is no alternative available.
2. *The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values.* The ESIA Report demonstrates that marine ecological impacts are of low significance, with no reduction in biodiversity (beyond very localised and temporary impacts and not to critical habitat features) or any substantial change to ecological processes.
3. *The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time.* The ESIA Report demonstrates no population level impact to protected or rare species.
4. *A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.* The Project has committed to a programme of ecological monitoring and focused research that will include the features pertinent to critical habitats. Given that the potential impacts of the Project are Low, then implementation of monitoring and research programmes represents a biodiversity benefit, by strengthening the scientific basis on which conservation programmes may be based, thereby enhancing their value. The project's mitigation strategy will be described in a Biodiversity Action Plan and will be designed to achieve net gains9 of those biodiversity values for which the critical habitat was designated.

[9] PS6 states that Net gains are additional conservation outcomes that can be achieved for the biodiversity values for which the critical habitat was designated.

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Chapter 9: Socio-Economic

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9 Socio-Economics

9.1 Introduction

This chapter presents an analysis of the potential socio-economic impacts resulting from the construction, pre-commissioning, operation and decommissioning of the Project. In addition, mitigation measures designed to reduce, remediate or avoid potential impacts are described, and the residual impacts (i.e. impacts after mitigation measures are implemented) presented.

9.1.1 Structure of Socio-Economic Chapter

Section 9.2 draws on the project description (Chapter 5), the Scoping Stage and the stakeholder engagement process to identify potential impacts. Section 9.3 details the approach taken for the socio-economic baseline and impact assessment with regard to the spatial boundaries and defines the zone of influence for socio-economic impacts.

Section 9.4 and Section 9.5 provide quantitative and qualitative baseline data commencing with a description of the data sources used in the baseline and followed by baseline summaries related to population and demography, economy, and the regional fisheries industry.

Section 9.6 reports on the impact assessment in relation to socio-economic receptors during all Project phases from construction to decommissioning. This section presents the impact assessment at the pre-mitigation stage before presenting (if required) suggested mitigation measures and the potential residual socio-economic impacts that would result.

Section 9.8 and Section 9.9 cross refer to **Chapter 13 Unplanned Events** and **Chapter 14 Cumulative Impact Assessment**, which consider potential impacts on socio-economic receptors. Section 9.11, provides a summary of the key findings of this assessment.

9.1.2 Human Rights Due Diligence

Prior to concluding this chapter, Section 9.10 covers the Human Rights Due Diligence process that has been undertaken to complement the socio-economic impact assessment. This section explains the due diligence process that has been followed, before examining human rights issues in respect of general policies and procedures, labour and working conditions, supplier engagement, and security provision.

9.1.3 Health Impacts

The potential for health impacts has been considered following standards and guidelines for financing such as International Finance Corporation (IFC) Performance Standard (PS) 2. As the Project will not affect any communities, no assessment of community health and safety impacts has been undertaken. Occupational health and safety considerations for the workforce are addressed in Appendix 9.2: Occupational Health and Safety.

9.1.4 Relationship to other Chapters

This socio-economic chapter has taken into account the findings **Chapter 7 Physical and Geophysical Environment** and **Chapter 8 Biological Environment** to inform and evidence the assessment of socio-economic impacts. The findings of this chapter are also supported by the Fisheries Study in Appendix 9.1: Fishing Study.

9.2 Scoping

9.2.1 Impacts Identified During Scoping

A scoping exercise was undertaken in 2013 and resulted in the disclosure of a Scoping Report (Ref. 9.1) in July 2013, followed by stakeholder consultation. The aims of the scoping process were twofold: to identify the potential Project-related impacts and to seek feedback from stakeholders on the Scoping Report and identify any additional issues to be considered.

The Scoping Report identified receptors with the potential to be affected by the Project's activities. It also identified potential impacts in relation to the economy, such as fisheries businesses, marine users, commercial shipping and other vessel operators, and oil and gas exploration companies.

As stated in the Scoping Report, the Project is located offshore with no facilities located on land in Turkey. It is therefore considered that there will be no impacts to local communities or on public health as a result of construction activities.

Further, since the disclosure of the Scoping Report, it has been confirmed within **Chapter 5 Project Description** that there will be no logistics base or marshalling yard in Turkey and no requirement to use Turkish ports for waste disposal or fuelling. As such, no impacts or benefits on local communities or economy associated with the use of Turkish ports are expected to arise.

In the Scoping Report, it was stated that impacts on communities or the economy during the Operational Phase were not anticipated. However, during the stakeholder engagement process, the Turkish Petroleum Corporation (TPAO) noted that the Project Area passed through areas licensed for oil and gas exploration and development (Figure 9.5). The issue is considered in Section 9.6.3.1.

Stakeholder consultation also identified some specific concerns that had not been covered in the Scoping Report. Concerns that were raised included the potential for impacts on Turkish fisheries, safety concerns for workers and potential safety risks to Turkish coastal communities from unplanned gas leaks, explosions and accidents, the potential for adverse impacts on the environment and the Project's approach to environmental protection, amongst other issues. These concerns are discussed in **Chapter 6 Stakeholder Engagement**.

9.2.2 Post-Scoping Stage Revisions

Following the Scoping Stage, refinement of the project description and further investigation of the baseline conditions within the Study Area (defined in Section 9.3.2), it has been concluded that there will be no significant impact in relation to a number of areas and thus they have not been assessed in detail. The impacts that have been screened out, and the rationale for excluding them, are listed in Table 9.1.

Table 9.1 Potential Impacts and Risks Screened Out of the Assessment

Potential Impact or Risk	Rationale
General	
Adverse or beneficial impacts on indigenous people during construction and operation	Given the location of the Project (a minimum of 110 km from the Turkish Black Sea coastline) indigenous peoples as defined by IFC PS7 have not been identified.
Construction and Pre-Commissioning Phase	
Increased risk of collision of vessels as a result of Project related maritime traffic	The construction spread (pipe-laying and supporting vessels) will move at very low speeds, around 2.5 km a day. This means that they can be considered stationary objects rather than ordinary vessels and other vessels can be notified of their daily position to minimise the risk of vessel collisions. The probability and implications of vessel collisions has been scoped out of the socio-economic impact assessment; it has been considered however as part of the Maritime Risk Assessment, which is presented in **Chapter 13 Unplanned Events** in terms of spills arising from collisions.
Impact on shipping and other vessel operators	The Project Area is crossed by a number shipping routes and may also be utilised by large commercial fishing vessels during anchovy season. However, due to the small area occupied by the construction spread (and the associated restrictions on navigation in the vicinity of the construction spread, as described in **Chapter 5 Project Description**) and the movement of the spread at approximately 2.5 km per day, it is expected that shipping routes or fishing vessels will not be affected as the pipe-laying spread can easily be avoided.
Risk of disruption to subsea cables	The Project does not intersect with any known subsea cables in the Turkish Exclusive Economic Zone (EEZ).
Impact on military areas	The Turkish Naval Forces carry out military exercises and fire training off the Turkish coast. During consultation, the Turkish Armed Forces have identified a firing training exercise area that intersects with the Project Area (Ref. 9.2). The precise location has not been disclosed. However, during the Construction and Pre-Commissioning Phase the impact on Navy military exercises will be temporary and localised. The Project will engage with the relevant Turkish authorities before and during construction to avoid interference with any military exercises undertaken in the Turkish EEZ during construction. Maritime authorities have also confirmed that the coordinates of the Project during construction will be marked on maps and notified to all relevant agencies to avoid exercises taking place in the Project Area. It is therefore considered there would not be an impact on the Navy and their military exercises associated with the construction of the Project.

9.3 Socio-Economic Spatial Boundaries

The Project is entirely within the Black Sea, more than 110 km from Turkey's Black Sea coastline at the closest point (the town of Sinop). Figure 9.1 shows the geographic context of the Project in relation to the boundaries of the Turkish EEZ and to Turkey.

9.3.1 Project Area

The Project Area is some 470 km in length and 2 km in width, extending along an east west orientation across the north of the Turkish EEZ. Its length is defined by the distance between the points where the four pipelines cross from the Russia and Turkey EEZ boundary to the Turkey and Bulgaria EEZ boundary. Its width is defined by the width of the initial proposed corridor in which the pipelines would be laid, which was informed by the Front End Engineering Design (FEED).

Since FEED, South Stream Transport has discussed the dimensions of the Project footprint with the relevant Turkish authorities. The Project footprint is defined as the area on the seabed encompassing the four pipelines and a safety zone either side of the outermost pipelines which precludes any third party seabed activities within this zone. As a result of these consultations, it is proposed that the pipelines will be laid within a 420 m width corridor, in agreement with the relevant Turkish authorities. The corridor accommodates the four pipelines and operational Safety Zone either side of the outermost pipelines.

9.3.2 Study Area and Zone of Influence

Socio-economic data has been collected in order to understand the potential for any socio-economic impacts. This has included both the Project Area and the Zone of Influence in relation to the potential socio-economic impacts under consideration.

For Turkey, any socio-economic impacts, if they occurred, would occur at a national or regional level as the physical location of the Project is over 110 km from the Turkish mainland (at Sinop) and within the Turkish EEZ. As no impacts are expected on local communities or economies given this location, there are no impacts anticipated at the provincial or local scale.

The Zone of Influence, and Study Area, extends beyond the Project Area in accordance with the potential social and economic impacts of the Project, such as potential impacts on fishing, oil and gas exploration zones and marine navigation. Accordingly, impacts on social and economic receptors are assessed in relation to various zones of influence, according to the type of impact. Economic impacts, for example, if they occurred, would be experienced at a national or regional level.

9.4 Methodology and Data

Data and information for the relevant baseline characteristics have been identified and considered to inform the assessment of potential socio-economic impacts. These have primarily been collected and presented at the national and provincial levels.

LEGEND

South Stream Offshore Pipeline Project

Exclusive Economic Zones

Cities

Turkish Provincial Boundaries

Country Boundaries

Projection: Lambert Conformal Conic

Purpose of Issue: For Information

Client: South Stream (Offshore Pipeline; Energising Europe)

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: LOCATION OF THE TURKISH SECTOR OF THE PROJECT

Drawn	Checked	Approved	Date
JM	VS	MW	03/06/2014

URS Internal Project No.	Scale @ A4
46369082	1:5,500,000

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Drawing Number: Figure 9.1

Rev

Plot Date: 03 Jun 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Tukey ESIA\Chapter 9\Figure 9.1 Location of the Turkish Sector of the Project.mxd

Although data is available at the regional level, the two Turkish regions bordering the Black Sea, Black Sea Region and Marmara Region, both include inland (non-coastal provinces) and for this reason, data gathering has prioritised collecting data at the provincial level over the regional level.

The data and information included within this assessment in relation to these potential socio-economic impacts have been obtained from a range of sources including secondary sources (i.e., existing data including census statistics, government or academic reports, etc.) and primary sources (i.e. new data collected through interviews and stakeholder engagement activities, as described in **Chapter 6 Stakeholder Engagement**).

Where possible the baseline characteristics section has presented data for the national and provincial levels to allow for comparison between the two. Where data is not available at either national or regional level, it is indicated.

9.4.1 Data Sources

The aim of the baseline data collection work was to obtain the required data to enable an informed and realistic assessment of the anticipated socio-economic impacts of the Project. Specifically, this information identifies and describes the current socio-economic characteristics and key trends, providing a baseline against which socio-economic impacts can be predicted, monitored and evaluated during construction, operation and decommissioning.

In Turkey, good quality social and economic statistics for national level indicators are collected and held by the Turkish Statistical Institute (TUIK). Data on regional and provincial level administrative units is also available for certain social and economic indicators. However, in the case of provincial level data, certain data sets have not been published since 2001, when TUIK discontinued publishing certain data on a provincial basis. The extent of the data that is available has been determined by contacting and visiting national government bodies and agencies.

Some socio-economic data, including for the provincial level: Gross Domestic Product (GDP) per capita (current prices) and GDP by economic activity, were not available as they are not recorded at the provincial or regional level. However, this has not compromised the impact assessment, as it was either not critical to the analysis or it was possible to obtain the data required to inform this chapter.

Primary data collection, consisting of interviews with relevant stakeholders, was conducted to supplement the secondary data.

The following sections set out the secondary (existing) data that has been obtained, the data gaps that exist and the primary data research that has been undertaken to supplement the available secondary data.

Secondary Data

Secondary data and information was obtained from relevant national bodies and agencies. This data was obtained from publically available databases and by contacting government authorities with written requests for access to data. The TUIK website was a key source used to obtain secondary data.

Data Gaps

After the above information was compiled, analysis revealed a number of data gaps that needed to be filled in respect of the following themes:

- Some data was not available after 2001 at the provincial level;
- Information on fishing in the Project Area;
- Total regional and local gross regional product (GRP) and Gross Value Added (GVA) broken down by economic sector (e.g. fishing as percentage of regional or local economy);
- Oil and gas or minerals exploration and extraction across Turkish waters and the Turkish EEZ within the Black Sea, e.g. exploration license zones, future activities (up to 5 years) of exploration companies, and exclusion zone distance;
- Shipping routes, vessel movements and shipping traffic volumes at national, regional and local levels (e.g. shipped volumes, number of shipping movements by vessel type including tanker, dry cargo, fishing fleet, passenger and military); and
- Governing/policing of Turkish waters, including shipping control, e.g. activities of the Turkish Coast Guard (maritime security authority) or other naval or marine police or security service within the Project Area.

These data gaps were the focus of subsequent primary research, the details of which are set out below.

Primary Data Collection

In light of the data gaps that emerged from the review of secondary data, a data collection exercise was undertaken with the aim of obtaining additional secondary data by way of direct enquiries. It sought to gather qualitative and quantitative primary data to supplement the secondary data gaps as well as to ground-truth the statistical information available from secondary data sources.

Primary data was collected during stakeholder meetings with national government authorities and fisheries organisations held in 2013, including:

- Ministry of Energy and Natural Resources;
- Ministry of Transport, Maritime Affairs and Communication;
- Ministry of Food, Agriculture and Livestock;
- Turkish Petroleum Corporation (TPAO);
- Department for Navigation, Hydrography and Oceanography of the Turkish Naval Forces;
- Ministry of Interior: Turkish Armed Forces, Coast Guard Command of the Black Sea;
- Central Union of Fisheries Cooperatives; and
- East Black Sea Fisheries Cooperatives Union.

Many of the stakeholder questions and concerns to date relate to the potential for impacts on fishing and fisheries (**Chapter 6 Stakeholder Engagement**). Consequently, a supplemental Fishing Study was conducted, and further data on fish and fisheries was requested by the Project from the following stakeholders:

- Turkish Ministry of Food, Agriculture and Livestock: General Directorate of Fisheries and Aquatic Products;
- Sinop Directorate of Food, Agriculture and Livestock;
- Karadeniz Technical University – Faculty of Marine Sciences;
- Middle East Technical University – Faculty of Marine Sciences;
- Central Union of Fisheries Cooperatives (SUR-KOOP); and
- Karadeniz Technical University – Department of Aquaculture products.

In addition, in May 2014 meetings were held with the East Black Sea Fisheries Cooperative Union and the Samsun Union of Fisheries Cooperatives to provide them with an update on the Project, and disclose the findings of the Fisheries Study (see Appendix 9.1). In addition, arrangements for future engagement activities were discussed, including for the ESIA Report and for communicating information to fishers regarding location of the pipe-laying spread during construction activities.

9.4.2 Data Assumptions and Limitations

Limitations

The following limitations apply to the data contained within this baseline:

- Where possible, a minimum of five years data has been obtained. In some cases, it has not been possible to obtain a full five years of trend series data; and
- In certain circumstances, data is not always available; however, where possible, efforts have been made to obtain qualitative data in lieu of quantitative data.

It is considered that the above limitations do not compromise the integrity of the assessments made within this chapter.

Assumptions

The following assumptions have been made in relation to issues that influence the impact assessment:

- The majority of the construction workforce required will be highly skilled and as such, it is anticipated that the contractor will bring its own specialised workforce that will be lodged on the vessels on which they work;
- There will be no landfall facilities or marshalling yards in Turkey; and
- The Project will not use Turkish ports.

9.5 Socio-Economic Baseline

This section provides a summary of the baseline methodology (including data sources and limitations), and describes the baseline socio-economic characteristics of the Black Sea coastal region. The section is structured as follows:

- Section 9.5.1: Geographic, Political and Historical Context;
- Section 9.5.2: Administrative Framework;
- Section 9.5.3: Population and Demography;
- Section 9.5.4: Economy;
- Section 9.5.5: Marine Users and Exploration Rights;
- Section 0: Vulnerable Groups; and
- Section 0: Baseline Summary and Key Conclusions.

9.5.1 Geographic, Political and Historical Context

9.5.1.1 Geographic Context

The South Stream Offshore Pipeline will extend across the Black Sea from the Russian coast near Anapa, through the Turkish EEZ, to the coast of Bulgaria near Varna. The Black Sea is bordered by several countries including, running clockwise from the Russian landfall of the South Stream Offshore Pipeline, Russia, Georgia, Turkey, Bulgaria, Romania and Ukraine.

9.5.1.2 Historical Context

The modern Republic of Turkey was created in the 1920s, and is a secular republic. Kemal Ataturk is seen as the founder of the nation. It holds a strategically important location, between Europe and Asia, giving Turkey significant influence in the region, and the Black Sea (Ref. 9.3).

Over the past decade, Turkey has developed economically into a middle-income country and is now the 16th largest economy in the world (Ref. 9.4). Turkey is an EU accession candidate country, a member of the Organisation for Economic Cooperation and Development (OECD), the G20, and is an important donor to the bilateral Official Development Assistance (ODA).

Turkey’s journey to a democracy and market economy has been mixed. The army, seen as responsible for safeguarding the constitution, has toppled governments in power when it considered secular values were being challenged; although this has not happened since 1980 (Ref. 9.5) and the chances of this happening now are generally held to be remote.

9.5.1.3 Political Context

The Justice and Development Party (AKP) won a third term in 2011, with 327 seats out of 550 seats in Turkey’s Parliament. Mr. Recep Tayyip Erdogan is serving his third consecutive term as Prime Minister having held that office since 2002. Mr. Abdullah Gul is President, voted by Parliament. The government holds power, but the President can veto laws and appoint officials and judges (Ref. 9.3).

Constitutional reform is a key political issue, with a range of constitutional reforms voted for by referendum in 2010 (Ref. 9.3). In September, 2010 a Referendum on constitutional reform backed amendments increasing parliamentary control over the army and judiciary. Secularist opposition has challenged the AKP with accusations of trying to create an Islamic State and questioned the authority of the party to govern. This was demonstrated by mass protests in 2013, against Prime Minister Erdogan's government and what protesters perceive as developments that threaten secular values.

9.5.2 Administrative Framework

Turkey is divided into seven geographical regions, and for the purposes of this socioeconomic chapter, the terms 'region' and 'regional' are used to refer to these regions. There are two regions that border the Black Sea; namely the Black Sea Region and the Marmara Region

Administratively, each region is divided into provinces. Accordingly, the terms 'province' and 'provincial' are used to refer to the provinces within those regions that are on the Black Sea coast. Therefore, the provinces referred to in this chapter are only those that are on the Black Sea coast, i.e., the coastal provinces within the Black Sea and Marmara regions, and not all of the provinces that form part of these two regions. Figure 9.2 below shows Turkey's provincial administrative structure.

Figure 9.2 Project-related Turkey Sector Administrative Structure

Source: Ref. 9.6

The provinces in the Marmara Region on the Black Sea coastline are (west to east along the coast): Kirklareli, Istanbul, Kocaeli, and Sakarya.

The provinces in the Black Sea Region on the Black Sea coastline are (west to east along the coast): Duzce, Zonguldak, Bartin, Kastamonu, Sinop, Samsun, Ordu, Giresun, Trabzon, Rize, and Artvin.

In addition to land based regions, the Black Sea region within Turkish territorial waters and the EEZ is divided into two fishing regions, the East Black Sea and West Black Sea. Turkish maritime agencies also commonly refer to these two fishing zones in the Black Sea: the East Black Sea Region which includes the sea off the coast of the provinces from Sinop to Artvin, and the West Black Sea Region which includes the sea off the coast of the provinces from Kastamonu to Kirklareli.

9.5.3 Population and Demography

The total population of Turkey in 2012 was 75.6 million, of which 50.2% were male and 49.8% were female (Ref. 9.7).

The Marmara Region coastal provinces of Istanbul, Kocaeli and Samsun are the most populated Turkish provinces on the Black Sea coast. Istanbul has a population of 13.8 million and is also the most populated province in Turkey, accounting for approximately 18% of the total Turkish population. The other three Black Sea coastal provinces in the Marmara Region (Kirklareli, Kocaeli and Sakarya) account for just under 4% of the total Turkish population, while the 11 Black Sea coastal provinces in the Black Sea Region constitute just over 7% of the total Turkish population. In total, the 15 Black Sea coastal provinces constitute just over 30% of the total population of Turkey. Sinop, the province closest to the Pipeline route, has the third lowest population of all of the Black Sea coastal provinces.

Population data for Turkey and the Black Sea coastal provinces for the year 2012, including density, are given in Table 9.2. In the Marmara Region, the provinces of Istanbul, Kocaeli, Sakarya, and in the Black Sea Region, the provinces of Düzce, Zonguldak, Samsun, Ordu, and Trabzon, have a population density that is greater than the average for Turkey (Ref. 9.8). In Kastamonu, Sinop, Artvin however, the population density is lower than the average for Turkey and other Black Sea coastal provinces. Sinop, the province closest to the Pipeline route, has the third lowest population density of all of the Black Sea coastal provinces.

Table 9.2 Population, 2012

Province	Population	Proportion of Total Turkish Population (%)	Population Density (Person per km^2)
Marmara Region Coastal Provinces			
Kirklareli	341,218	0.5	54
Istanbul	13,854,740	18.3	2,666
Kocaeli	1,634,691	2.2	453
Sakarya	902,267	1.2	186

Continued…

Province	Population	Proportion of Total Turkish Population (%)	Population Density (Person per km^2)
Black Sea Region Coastal Provinces			
Düzce	346,493	0.5	135
Zonguldak	606,527	0.8	184
Bartın	188,436	0.2	91
Kastamonu	359,808	0.5	27
Sinop	201,311	0.3	35
Samsun	1,251,722	1.7	138
Ordu	741,371	1.0	125
Giresun	419,555	0.6	61
Trabzon	757,898	1.0	162
Rize	324,152	0.4	83
Artvin	167,082	0.2	23
Black Sea coastal provinces total	22,949,592	30.3	-
TURKEY	75,627,384	100	98

Source: Ref. 9.7

Complete.

Over the five year period to 2012, the national population has grown at an average of 1.39% per annum. There is however a distinct difference between the averages for the coastal provinces in the Marmara and Black Sea regions respectively, with the former displaying a cumulative population growth rate over the five year period more than five times higher than the latter (Table 9.3). One notable exception is the province of Düzce, which borders on the Marmara Region, where the population has increased by a total of 6.97% over the same five year period (Ref. 9.8).

Table 9.3 Population Growth Rate per Annum

Provincial Grouping	2008	2009	2010	2011	2012	Total 2008 to 2012
Marmara Region coastal provinces – average	1.29%	1.67%	2.49%	2.70%	1.69%	9.84%
Black Sea Region coastal provinces – average	0.70%	0.87%	-0.02%	-0.22%	0.51%	1.84%
Turkey (Total)	**1.32%**	**1.46%**	**1.60%**	**1.36%**	**1.21%**	**6.95%**

Source: (Ref. 9.8)

One reason contributing to the slower overall rate of population growth in the Black Sea Region coastal provinces over the last five years is that most of the provinces have experienced negative net migration, or only relatively low levels of positive net migration. This stands in contrast to the four Marmara Region coastal provinces, particularly Istanbul, Kocaeli and Sakarya provinces, which have experienced consistently positive net in-migration. Once again, Düzce province stands out as an exception to this pattern. The net migration numbers of the Black Sea coastal provinces are presented in Table 9.4.

Table 9.4 Total Net Migration, 1975 to 2012

Province	2007 to 2008	2008 to 2009	2009 to 2010	2010 to 2011	2011 to 2012	Total 2007-8 to 2011-12
Marmara Region Coastal Provinces						
İstanbul	26,675	39,481	102,583	121,782	30,461	877
Kırklareli	- 462	- 883	756	150	1,316	320,982
Kocaeli	23,018	12,033	15,124	13,244	11,405	74,824
Sakarya	3,434	3,711	1,621	3,904	4,670	17,340
Black Sea Region Coastal Provinces						
Düzce	1,810	2,706	927	574	-147	5,870
Zonguldak	- 1,891	- 4,443	- 7,555	- 7,836	-8,408	-30,133
Bartın	2,093	462	- 957	- 1,059	-185	354

Continued…

Province	2007 to 2008	2008 to 2009	2009 to 2010	2010 to 2011	2011 to 2012	Total 2007-8 to 2011-12
Kastamonu	772	- 1,523	- 1,611	- 459	407	-2,414
Sinop	827	4	1,060	- 580	-2,094	-783
Samsun	- 5,229	- 707	- 9,407	- 8,305	-9,312	-32,960
Ordu	- 3,739	- 961	- 8,345	- 10,509	21,645	-1,909
Giresun	1,550	- 2,597	- 3,040	- 2,288	166	-6,209
Trabzon	- 1,109	10,394	- 7,416	- 13,588	-3,614	-15,333
Rize	- 572	- 2,147	- 1,749	- 2	-1,541	-6,011
Artvin	- 1,960	- 1,341	- 873	0	-326	-4,500

Source: Ref. 9.9

Complete.

9.5.4 Economy

9.5.4.1 Gross Domestic Product

Turkey is an upper middle income country, with a GDP of US $789 billion, making it the 17th largest economy in the world, ranked behind Indonesia and ahead of the Netherlands (Ref. 9.10).

The Turkish economy has experienced largely continuous economic growth over the ten year period from 2002 to 2012, except during 2009 in the aftermath of the global economic crisis (Ref. 9.11). Growth restarted rapidly after the 2008 global financial crisis, and ensuing recession in 2009, at 9.2% in 2010 and 8.8% in 2011 (Ref. 9.12). After suffering falls in national per capita GDP (Turkish Lira) in 2008 and 2009, per capita GDP (measured in fixed prices using 1998 as the base year) has increased from 1,346 in 2009 to 1,609 in 2013 (Table 9.5). In current prices, the 2013 figure equates to 20,531 Turkish Lira.

The latest available data at provincial level (2001) shows that the majority of the Black Sea coastal provinces in the Marmara Region have a higher GDP per capita in comparison to Turkey (in its entirety), while the majority of the Black Sea coastal provinces in the Black Sea Region have a lower GDP per capita in comparison to Turkey (in its entirety) (Ref. 9.13).

More recent figures at the provincial level for GDP per capita are not available. However, other metrics such as population growth (Ref. 9.7), internal net migration (Ref. 9.8), sectoral employment trends (Ref. 9.14), indicate that despite regional development policies, regional socio-economic disparity between the regions continues to exist in Turkey. This is supported by a study that shows the Black Sea Region remains below the country's average for economic and social indicators and development (Ref. 9.14). In response to this imbalance, the government is implementing public investment policies to attract private sectors to 'underdeveloped' regions, to create regional development. However, the same study also identifies economic and social indicators which show that the 'underdeveloped' regions in Turkey are in the Black Sea Region, as well as, eastern, south-eastern and central Anatolia (Ref. 9.14).

Table 9.5 Per capita GDP in Turkey between 1998 and 2013

	Per Capita Gross Domestic Product		
Year	**Current Prices, Turkish Lira**	**Fixed Prices, base year 1998, Turkish Lira**	**Real Growth Rate (%, year-on-year, using 1998 fixed prices as base)**
1998	1,124	1,124	-
2003	6,809	1,143	-
2007	12,018	1442	3.4
2008	13,378	1,434	-0.6
2009	13,223	1,346	-6.1
2010	15,023	1,450	7.5
2011	17,484	1,552	7.2
2012	18,846	1,565	0.8
2013	20,531	1,609	2.8

Source: Ref. 9.13

9.5.4.2 Economic Sectoral Composition

The five largest economic sectors in Turkey in 2012 as measured by their share of GDP were manufacturing (24.4%), transport, storage and communication (9.9%), wholesale and retail trade (12.7%), financial services (12%), and agriculture (9.0%) (Ref. 9.15).

9.5.4.3 Employment

Turkey's labour market is characterised by low activity and labour productivity rates, especially among women and youth. In 2011, 50% of the working-age population was in employment, which is approximately 20% below the OECD average (Ref. 9.3). Following the global financial crisis, unemployment reached 14% in 2008; however, the unemployment rate in 2011 had fallen to 9.8%, below 10% for the first time since prior to 2008 (Ref. 9.16).

Of those who were employed in Turkey in 2011, 22.7% were employed in agriculture, 27.2% were employed in industry and 50.1% were employed in the services sector. Similar to national trends, the services sector is the largest employer within most Black Sea coastal provinces including Istanbul. Agriculture, however, accounts for a greater share of employment in in Kastamonu, Ordu and Giresun provinces (46%, 53% and 49%, respectively). The distribution of employed population and rates by economic activity in Turkey and the Black Sea coastal provinces is provided in Table 9.6.

Table 9.6 Employed Population and Rates by Economic Activity, 2011

Province	Total Employed Population	Number Employed by Sector			% of Total Employment		
		Agriculture	Industry	Services	Agri-culture	Industry	Services
Marmara Region Coastal Provinces							
Istanbul	4,565,000	31,000	1,677,000	2,857,000	0.7	36.7	62.6
Kırklareli	140,000	35,000	43,000	62,000	25.0	31.0	44.0
Kocaeli	502,000	22,000	221,000	258,000	4.4	44.1	51.5
Sakarya	281,000	71,000	89,000	121,000	25.2	31.7	43.2
Black Sea Coastal Provinces							
Düzce	130,000	42,000	43,000	45,000	32.1	33.3	34.6
Zonguldak	220,000	58,000	67,000	96,000	26,2	30.4	43.5
Bartın	69,000	25,000	18,000	26,000	36.3	26.5	37.2
Kastamonu	156,000	82,000	20,000	54,000	52.8	12.7	34.5
Sinop	77,000	27,000	20,000	30,000	35.2	26.0	38.8
Samsun	434,000	169,000	90,000	175,000	38.9	20.8	40.3
Ordu	282,000	138,000	57,000	88,000	48.8	20.1	31.1
Giresun	153,000	70,000	26,000	56,000	46.1	17.0	37.0
Trabzon	281,000	103,000	55,000	123,000	36.7	19.5	43.8
Rize	108,000	39,000	26,000	43,000	36.3	23.8	39.9
Artvin	73,000	29,000	11,000	33,000	40.1	14.7	45.2
TURKEY	24,320,000	5,531,000	6,605,000	12,184,000	22.7	27.2	50.1

Source: (Ref. 9.17)
Note: Population 15 years of age and over.

Complete.

Fisheries

The fisheries sector is a sub-sector of the agricultural sector in Turkey and accounts for approximately 0.16% of the total employed population. This equates to 0.7% of the total agriculture sector workforce (Ref. 9.18 and Ref. 9.19).

In the Black Sea fishing region, 16,486 workers were engaged in fishery operations in Turkey in 2011; this represents approximately 44% of the total workforce engaged in fishery operations in Turkey, and 0.22% of the total employment in this region (including Istanbul) (Ref. 9.20).

Full time workers account for approximately 96% of fishery workers in the Black Sea fishing region. This figure does not include those employed in secondary activities such as processing, packaging, marketing and distribution, manufacturing of fish processing equipment, net and gear making, ice production and supply, boat construction and maintenance (Ref. 9.20).

9.5.5 Marine Area Use and Rights

Activities within the marine area of the Turkish EEZ and territorial waters are primarily associated with commercial shipping, resource exploration and fishing. The following sections provide an overview of the Turkish administrative structure governing the marine area (Section 9.5.5.1), shipping (Section 9.5.5.2), oil and gas exploration and exploitation (Section 9.5.5.3), and fisheries (Section 9.5.5.4), including the current status of activities and the groups and organisations involved. There are no sub-sea cables or pipelines in the Turkish EEZ that intersect with the Project Area.

9.5.5.1 Marine Administrative System

Overview of Administrative System

Key ministries and departments with maritime administrative responsibilities in Turkey are the following:

- Ministry of Interior:
  - Coast Guard Command of the Black Sea Region.
- Ministry of Transport, Maritime Affairs and Communications:
  - General Directorate of Coastal Safety;
  - General Directorate of Maritime and Inland Waters;
  - General Directorate of Maritime Trade; and
  - General Directorate of Shipyards and Coastal Structures:
    i. Department of Navigation Safety and Maritime Security.
- Ministry of Food, Agriculture and Livestock:
  - General Directorate of Food and Aquatic Products.
- Ministry of Environment and Urbanisation:

  - General Directorate of Environmental Management: Department of Maritime and Coastal Management.
- Turkish Naval Forces:
  - Department of Navigation, Hydrography and Oceanography.

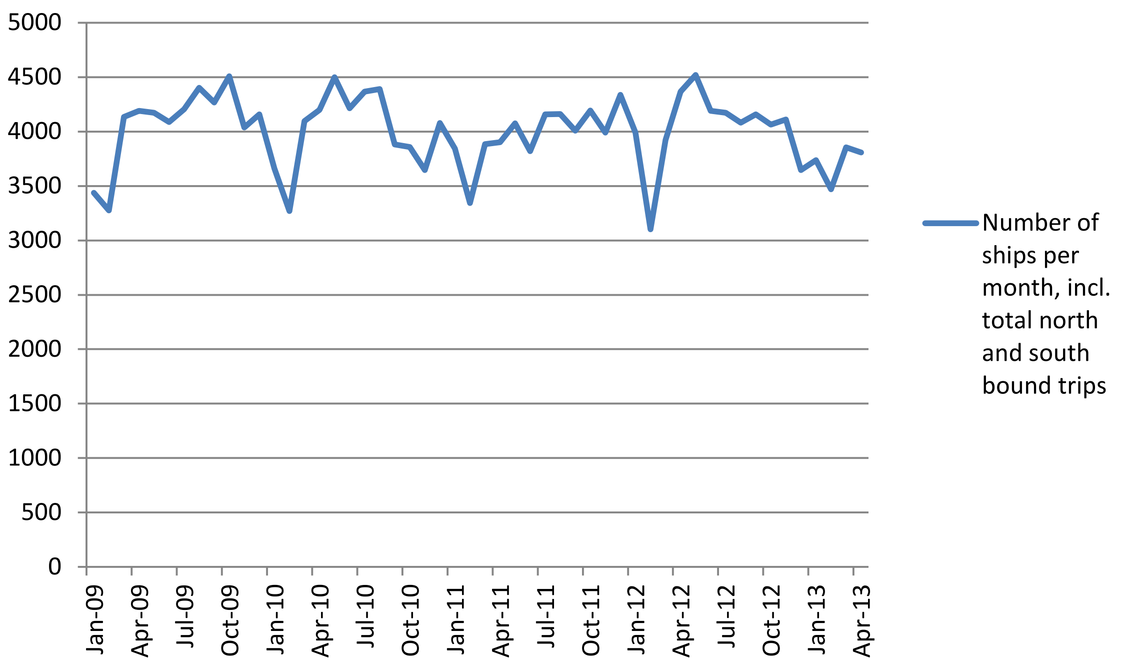
9.5.5.2 Shipping

The Turkish Black Sea coastline is approximately 1,700 km long and includes several important port cities including Istanbul, Zonguldak, Samsun, Trabzon and Rize. Within the Black Sea, maritime cargo transportation includes transport of containers, general cargo, liquid and dry bulk, roll-on roll-off, and rail ferry goods (Ref. 9.21).

Shipping Traffic

The Bosphorus is a busy strait carrying on average between approximately 3,000 and 4,500 ships (i.e., one ship equates to one trip north or south bound through the strait) per month (Ref. 9.23). The number of ships sailing through the Bosphorus Strait displays considerable variance, although there is a tendency for the number of ships to be lower during winter (Figure 9.3).

Figure 9.3 Shipping traffic through the Bosphorus Strait (January 2009 to April 2013)



Source: Ref. 9.23

Shipping Routes

The key commercial shipping routes within the Turkish EEZ connect between the ports of Istanbul, Samsun and Trabzon and numerous routes are known to cross the Turkish EEZ between neighbouring Black Sea countries.

The Black Sea is a major transport route for many of the Black Sea countries, with the majority of shipping traffic occurring between the following shipping hotspots:

- Bosphorus shipping junction (Istanbul);
- North-western harbour agglomeration (Odessa);
- Kerch Strait shipping junction; and
- North-eastern harbour agglomeration.

Figure 9.4 shows the major shipping transport routes in the Black Sea.

9.5.5.3 Oil and Gas Exploration

The Turkish Petroleum Corporation (TPAO) is responsible for the exploration of petroleum and natural gas in Turkey. TPAO has identified a large area of the Turkish EEZ in the Black Sea that could potentially be utilised for exploration and defined several exploration license areas, some of which overlap with the Project Area. Figure 9.5 shows TPAO's exploration license areas in the Black Sea.

TPAO has confirmed to South Stream Transport that there are no existing oil and gas explorational drilling or development activities taking place within the Project Area.

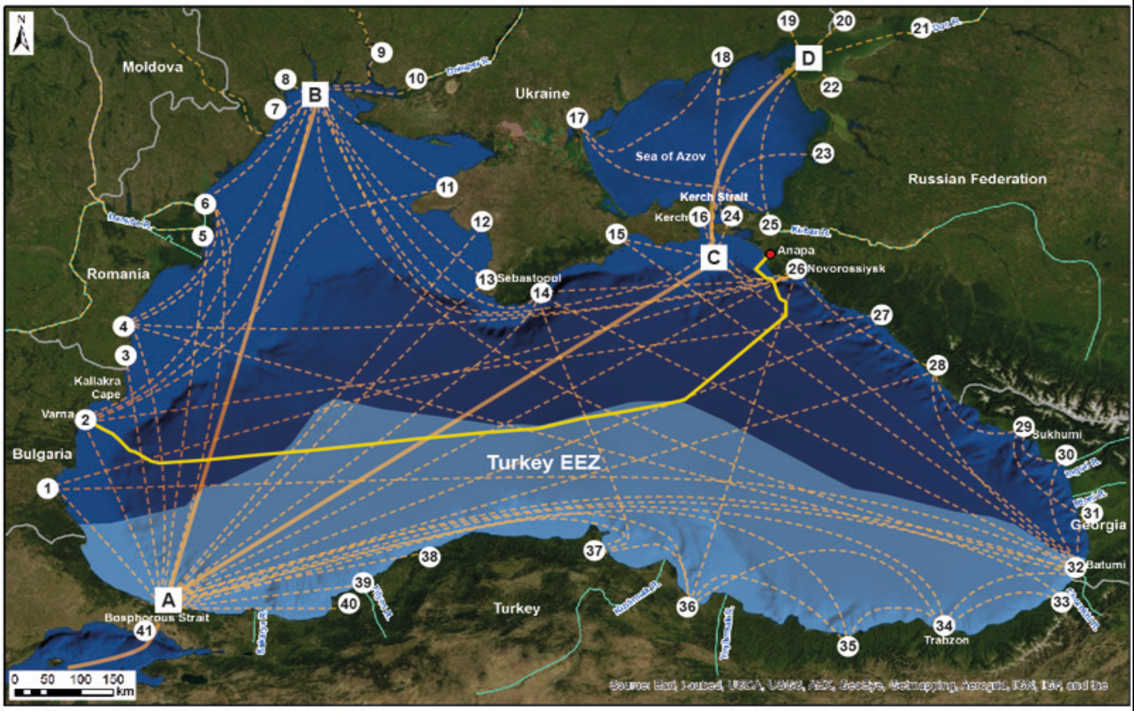
TPAO has, however, advised of two possible oil and gas exploration and production projects which may be brought forward over the next three years, namely the Tuna Prospect, in the northwest of License Area 3921 and the Şile Prospect in License Area 3920 (Ref. 9.24). These areas are shown in Figure 9.5.

TPAO is planning to undertake 3D seismic surveys as part of the 'Tuna Prospect' project in the northwest of licence area 3921 (near the Romanian EEZ) which may begin either at the end of the 2014 or in 2015. Further site surveys of this area may occur in 2015 or 2016. Depending on the findings of these surveys, an exploration well may be drilled in 2016 (Ref. 9.24).

Pre-drilling surveys may also be conducted north of licence area 3920 (near the Bulgarian EEZ) in 2015. Depending on the results of these surveys, an exploration well may be drilled in 2016. If a discovery is made in license areas 3920 and 3921, drilling of developmental wells may begin by 2017. The precise locations of the 3D seismic and site survey areas, or potential drilling locations has yet to be determined.

TPAO has also indicated that if oil or gas is discovered in the 'Tuna Prospect' license area 3921, it may be necessary to construct a pipeline(s) to carry the hydrocarbons south, thus potentially intersecting the Pipeline during the Operational Phase of the Project.

Figure 9.4 Shipping and Navigation Routes in the Black Sea



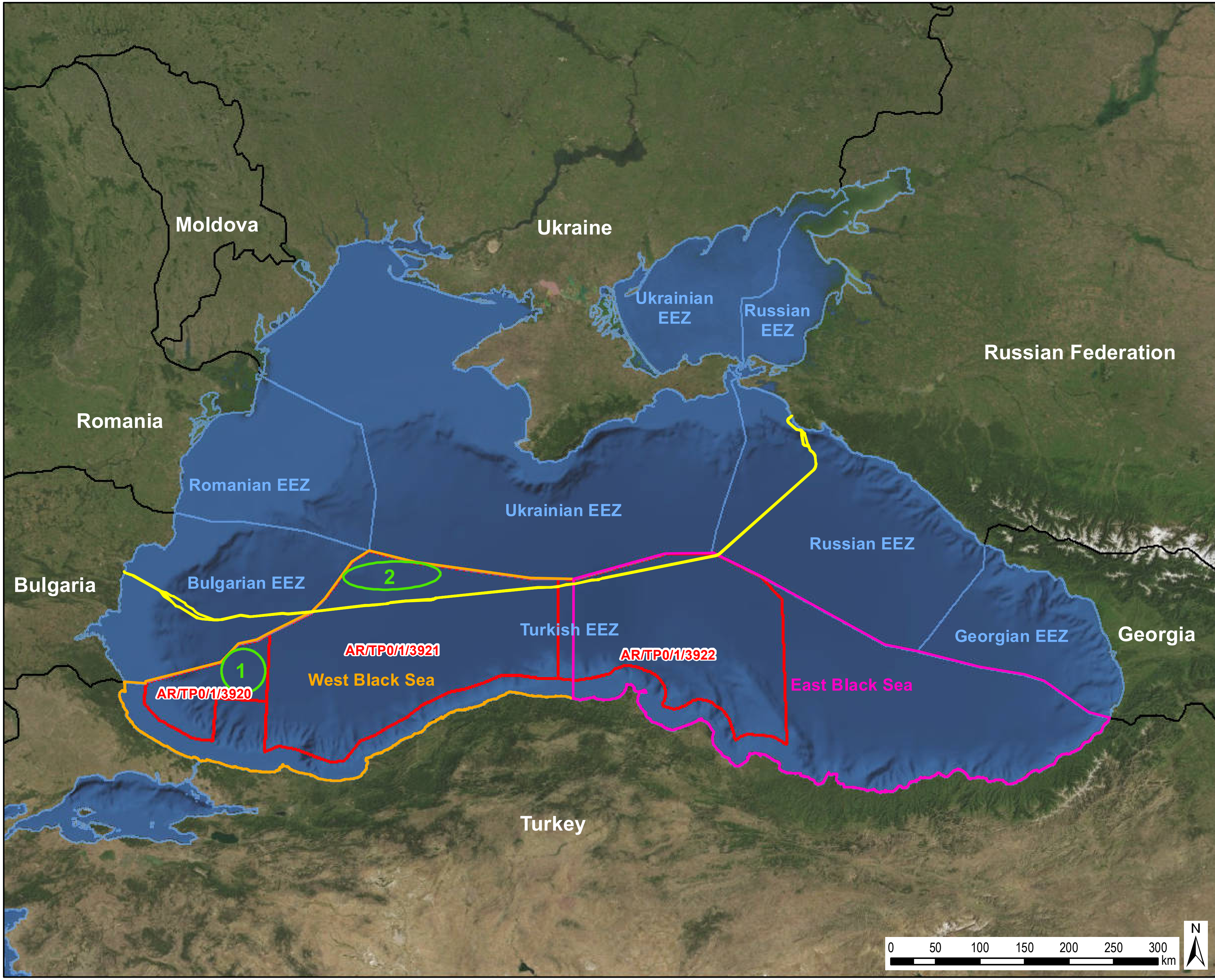
Key:

Pipeline

A: Bosporus shipping junction (Istanbul)
B: North western harbour agglomeration (Odessa)
C: Kerch Strait shipping junction
D: North eastern harbour agglomeration

1: Burgas
2: Varna
3: Mangala
4: Constantza
5: Sulina
6: Ust'-dunayski
7: Illichivsk
8: Odessa
9: Nikolayev
10: Kherson
11: Chemomorskoye
12: Evpatoria
13: Sevastopol
14: Yalta
15: Feodosia
16: Kerch
17: Genichesk
18: Berdyansk
19: Mariupol
20: Taganrog
21: Rostov-na-Donu
22: Yeysk
23: Primorsko-Akhtarsk
24: Port Kavkaz
25: Temryuk
26: Novorossiysk
27: Tuapse
28: Sochi
29: Sukhumi
30: Ochamchire
31: Poti
32: Batumi
33: Hopa
34: Trabzon
35: Giresun
36: Samsun
37: Sinop
38: Amasra (Bartin)
39: Zonguldak
40: Eregli
41: Istanbul

Source: Ref. 9.22



LEGEND

- South Stream Offshore Pipeline Project
- East Black Sea
- West Black Sea
- TPAO license areas
- Areas for proposed TPAO activities
  1. Şile prospect
  2. Tuna prospect
- Exclusive Economic Zones
- Country Boundaries

Projection: Lambert Conformal Conic

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — South Stream ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: EXPLORATION LICENSE AREAS OF TPAO

Drawn	Checked	Approved	Date
JM	VS	MW	03/06/2014

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46369082	1:5,500,000

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Rev:

Plot Date: 03 Jun 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Tukey ESIA\Chapter 9\Figure 9.5 Exploration License Areas of TPAO.mxd

9.5.5.4 Fisheries

Turkey is the biggest fishing nation in the Black Sea and has accounted for up to approximately 90% of all landings (catch) by volume and value of all the Black Sea nations since the early 1990s (Ref. 9.25). The fisheries sector, including inland fisheries, aquaculture and secondary sectors (e.g. processing and manufacturing) represents approximately 0.3% of Turkey's GDP. The workforce employed in fisheries in the Black Sea coastal provinces and Istanbul, represents 0.2% of total employment (Ref. 9.18 and Ref. 9.26). Workers in this sector range from paid crew members on fishing vessels, to partners and household members of fishermen, working without pay.

In Turkey, there are four sectors of commercial fish production: marine fisheries, aquaculture, inland fisheries, and other marine products (e.g. crustaceans and molluscs). Marine fisheries account for the largest proportion of fish production and are the focus of this section.

Fishing Regions

Turkey's main marine fishing regions are: Mediterranean Sea, Black Sea, Aegean Sea, and Sea of Marmara. Of these regions, the Black Sea accounts for the largest proportion of production, representing 77% of Turkey's total national catch in 2011.

The Black Sea region is divided into two fishing regions: the East Black Sea and West Black Sea. The East Black Sea region includes the coastal provinces from Artvin to Sinop, and the West Black Sea region is comprised of coastal provinces from Kastamonu to Kirklareli. Of the total Turkish fishing catch in 2011, 68% was caught in the Eastern Black Sea and 9% was caught in the Western Black Sea (Ref. 9.27). The Eastern Black Sea region accordingly accounts for approximately 88% of all fish caught by Turkey in its Black Sea fishing regions (Ref. 9.27).

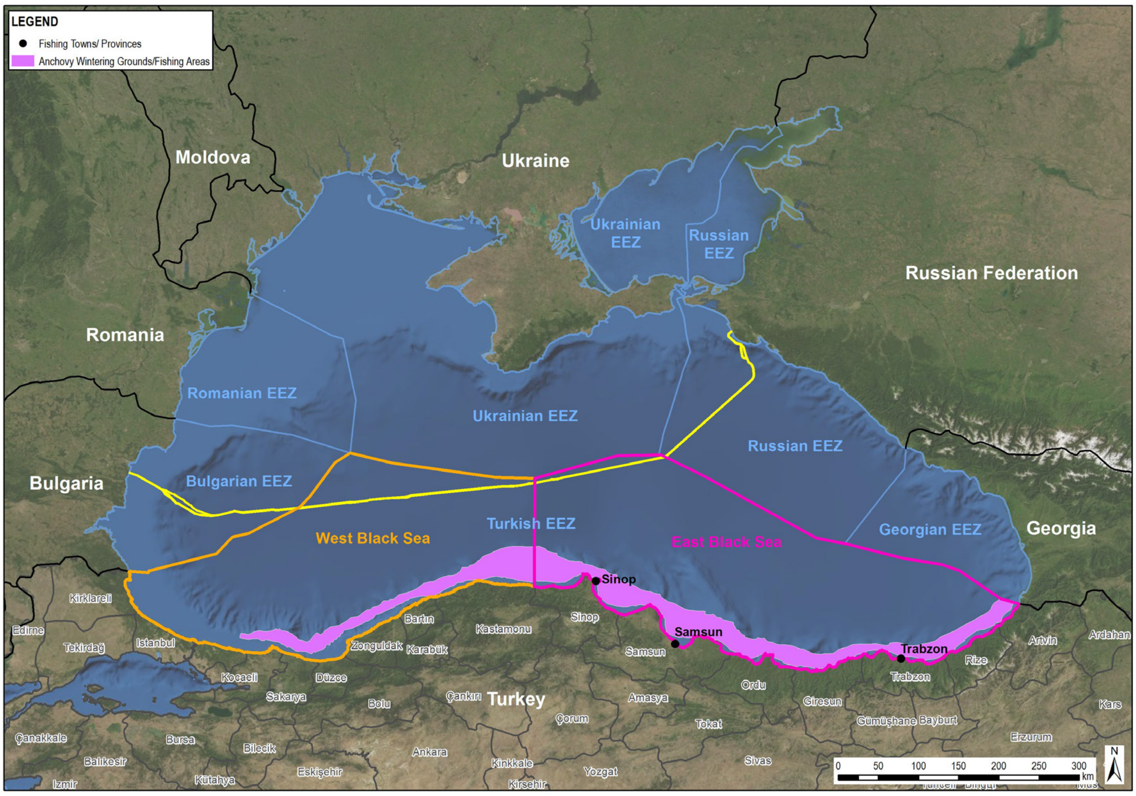
There are public and private fishing enterprises, ranging from large commercial companies, to small-scale and artisanal ventures. Of the Turkish fishing ports on the Black Sea Coast Trabzon, Zonguldak and Samsun are the most popular provinces in the Black Sea for fishing, having both fishermen and vessel licences (Ref. 9.28). Sinop, whilst a smaller port, is also a hub of fishing activity during the anchovy wintering period. Fishers come from other regions during anchovy season to base themselves in Sinop and to a lesser extent, Samsun. Therefore, fisheries related stakeholder engagement targeted the main fishing towns on the Black Sea coast of Samsun, Trabzon and Sinop.

The main Black Sea fishing cooperatives and public operators are shown in Table 9.7 (Ref. 9.18). The areas mentioned in the Table are also shown in Figure 9.6.

Table 9.7 Fisheries Along the Turkish Black Sea Coast (By Province)

Province	Operators
Düzce	Private: Akçakoca Fishery Cooperative
Zonguldak	Public: Ministry of Agriculture and Rural Affairs and Kozlu Municipality Private: Bozhane Fishery Cooperative and Alaplı Fishery Cooperative
Bartın	Public: Kurucaşile Municipality Private: Tarlaağzı and Gömü Villages Fishery Cooperative
Kastamonu	Public: Ministry of Agriculture and Rural Affairs, Abana Municipality, Gemiciler Village Mukhtar, İnebolu Municipality and Doğanyurt Municipality
Sinop	Public: Ministry of Agriculture and Rural Affairs and Ayvancık Municipality
Samsun	Private: Terme Fishery Cooperative, Küplüağzı Village Fishery Cooperative and Ereğli-Çınarcık-Canik Town Fishery Cooperative Public: Ministry of Agriculture and Rural Affairs
Ordu	Public: Gülyalı Municipality Private: Boztepe Kumbaşı Güzelyalı Kirazlimanı Neighbourhood Fishery Cooperative and Medreseönü Fishery Cooperative
Giresun	Public: Görele Municipality Private: Giresun Fishery Cooperative
Trabzon	Private: Of District Centre and Eskipazar District Fishery Cooperative, Araklı Fishery Cooperative, A. Merkez Fishery Cooperative, Fener Village Fishery Cooperative and Büyükliman Fishery Cooperative Public: Arsin Municipality
Rize	Private: Fındıklı Fishery Cooperative, Ardeşen Fishery Cooperative, Fındıklı Fishery Cooperative and PazarKirazlık Fishery Cooperative Public: İyidere Municipality
Artvin	Private: Park Maritime and Hopa Port Operations, Hopa Fishery Cooperative and Arhavi Fishery Cooperative

Figure 9.6 Fishing Areas in the Turkish Black Sea



Fish Stocks and Fishing Grounds

The Project is located in an area where water depths exceed 2,000 m. In these areas only pelagic fishing[1] can take place. Pelagic fishing in the Black Sea includes commercial species such as European anchovy (*Engraulis encrasicolus*), sprat (*Sprattus sprattus*), and Black Sea horse mackerel (*Trachurus mediterraneus ponticus*). Fishing is a substantial source of revenue for Turkey and other Black Sea countries.

Demersal (or bottom) fishing takes place along Turkey's coastline in waters up to a maximum of 150 m depth. In deeper waters, anoxic conditions prevent the occurrence of any commercially important demersal species (Ref. 9.29). Fishing grounds are concentrated in the shallower waters of the continental shelf (including feeding, breeding, wintering and spawning grounds), and are largely constrained by the rapid increase in depth along the continental slope to depths of more than 2,000 m (refer to Appendix 9.1). As such, most fishing occurs in coastal waters, and the 150 m depth contour can be used as a proxy boundary for the majority of Turkish fishing activity as this is the region in which commercially important fish species over winter near the Turkish coast.

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[1] Pelagic fishing relates to fishing activities which are focussed near the surface of coastal and open ocean waters. This does not include fishing activities focussed on bottom or demersal fish stocks, which include bottom trawling.

Statistical data on the number of fishing vessels, if any, operating in or around the Project Area is not available. However, consultations with Turkish fisheries to date have indicated that it is rare for fishing vessels to operate at such distances from the Turkish Black Sea coast (Ref. 9.30) as fishing activity is concentrated in shallower coastal waters, with the possible exception of large commercial vessels. As most fishing is done through artisanal or small-scale efforts the economics of travelling further from shore, combined with the fact that fish stocks are concentrated in coastal waters, indicate that these fishers do not fish in the Project Area.

Large commercial vessels may, on occasion, fish up to 50-60 miles from the coast during anchovy season (Ref. 9.34). However, there is no indication from fisheries that pipe-laying activities would impact fishing in the Project Area. Rather, fisheries noted that there may be maritime health and safety implications if pipe-laying activities were to coincide with anchovy season, as lighting from the pipe-laying vessel may attract anchovy which could result in these larger fishing vessels following the anchovy to the pipe-laying vessel. However, fisheries concurred that the Project's maritime safety measures were appropriate to ensure no accidents arise. As such, this risk has been scoped out from further consideration (refer to Table 9.1).

Fleet

The Turkish fishing fleet is mostly artisanal (86%), with the majority of Turkish vessels less than 10 m in length (80%), and under 10 gross tonnage (83%). More than half of the vessels (60%) use engines that are less than 100 horse power. A large proportion of vessels (85%) operate without hired crew (Ref. 9.18). However, the majority of catch is caught by the larger commercial vessels (refer to Appendix 9.1 for more information on the Turkish fishing fleet) (Ref. 9.18).

Anchovy

Engagement with fishing cooperatives and unions, as well as government and academic authorities, has highlighted the importance of the anchovy within Turkish fisheries. Turkey is responsible for approximately 93% of all anchovy caught in the Black Sea (Ref. 9.26 and Ref. 9.31), and in 2011, anchovy accounted for 62% of all marine fish caught by Turkish fleets in the Black Sea (Ref. 9.18).

There are two distinct types of anchovy fished in the Black Sea, and the migration route of the European anchovy is of greatest relevance to the Project (both relative to the other species of anchovy, and other fishing target species generally), as it directly crosses the proposed Pipeline route. In addition to the main anchovy migration route from the north-western continental shelf through the Central Black Sea into Turkish waters (see **Chapter 8 Biological Environment),** a new branch of European anchovy migration has also developed starting from Bulgaria and entering Turkish waters through the Western Black Sea coast around February. European anchovy are mobile and will avoid sources of disturbance; however, some disturbances such as noise and light may impact their behaviour.

9.5.6 Vulnerable Groups

IFC PS1 - Assessment and Management of Environmental and Social Risks states that it is necessary to identify individuals and groups that may be directly and differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status. Individual or group vulnerability is a pre-existing status that is independent of the Project and may be reflected by a disability, low incomes, an existing low level of access to key socio-economic or environmental resources or a low social status that limits the ability to adapt to change. Therefore, vulnerable individuals and groups are potentially more susceptible to adverse impacts or have a more limited ability to take advantage of beneficial impacts.

As the Project is located over 110 km from the nearest point of land on the Turkish Black Sea coast, no direct impacts on Turkish communities are expected. Using guidance provided in IFC PS1, small-scale and artisanal fishers are the only potentially vulnerable group that has been identified with respect to the Turkish Sector. This group may be vulnerable because they are likely to have fewer financial resources, including savings and/or access to credit, which in turn could make them vulnerable to economic fluctuations if their fishing activities or harvests were to be adversely affected by the Project (including by potential unplanned events such as a fuel spill).

Potential impacts on fishing and fishers are assessed in Section 9.6 below, with due consideration to the vulnerability of these people to potential changes. Additionally, potential impacts on fish are assessed in **Chapter 8 Biological Environment**. Potential impacts on fishing and fishers are also addressed in the context of unplanned events (such as a fuel spill) in **Chapter 13 Unplanned Events**.

People working in the fishing industry (particularly small scale and artisanal operations) may have low or variable (and unreliable) incomes. Fisheries workers with low incomes in turn are more likely to have fewer financial resources to rely on and are less likely to have savings and/or access to credit, which in turn can make them vulnerable to economic fluctuations. Fisheries workers along the Turkish Black Sea coast could fall into this vulnerable group category given the artisanal vessels account for approximately 86% of the Turkish Black Sea fleet and 80% of vessels are less than 10 m in length. Eighty-five percent of vessels operate without hired crew, 9% have between one and four members of crew and 5% of vessels have more than five crew members. The percentage of employees that do not receive a wage is 46%; around 30% are crew working in exchange for fish caught and 16% unpaid family members or partners (Ref. 9.18).

In 2011, the Eastern Black Sea was the highest yielding region in terms of fisheries (Ref. 9.27). In 2011, the region accounted for approximately 88% of Turkey's Black Sea catch and approximately 68% of Turkey's total national catch (Ref. 9.27). Therefore, fisheries related stakeholder engagement targeted the main fishing towns on the Black Sea coast of Samsun and Trabzon.

During the Project Development Phase, Trabzon was identified as an important town to visit and engage with key marine research institutes and fisheries cooperatives. In August 2013, a meeting in Trabzon was attended by representatives from the East Black Sea Fisheries Cooperative Union which is based in Trabzon. Additional meetings were held in May 2014 with the East Black Sea Fisheries Cooperative Union in Trabzon and the Samsun Union of Fisheries Cooperatives.

9.5.7 Baseline Summary and Key Findings

This section provides a summary of key findings and observations arising from the preceding baseline in respect of Turkey and the Black Sea coastal provinces.

9.5.7.1 Turkey

The main observations arising from the baseline in relation to Turkey is as follows:

- Turkey is the 16th largest economy in the world, ranked behind Indonesia and ahead of the Netherlands;
- Since the 2008 global financial crisis, and ensuing recession in 2009, GDP growth in Turkey has recovered rapidly at 9.2% in 2010 and 8.8% in 2011;
- Turkey is by far the biggest fishing nation in the Black Sea, accounting for approximately 80% to 90% of all landings since the early 1990s. Of Turkey's total catch, 77% is from the Black Sea, and Turkish commercial vessels are responsible for approximately 93% of all anchovy caught in the Black Sea;
- The fisheries sector, including inland fisheries, aquaculture and secondary sectors (e.g. processing and manufacturing) represents approximately 0.3% of Turkey's GDP;
- The fisheries sector accounts for approximately 0.7% of the total population employed in the agriculture sector and 0.16% of the total employed population;
- Marine usage within the Turkish EEZ is primarily associated with commercial shipping, resource exploration and fishing;
- The key commercial shipping routes within the Turkish EEZ connect between the ports of Istanbul, Samsun and Trabzon and numerous routes cross the Turkish EEZ on their routes to and between other Black Sea coastal countries; and
- TPAO has identified a large area of the Turkish EEZ in the Black Sea that could potentially be utilised for petroleum or natural gas extraction.

9.5.7.2 Black Sea Coastal Provinces

The main observations arising from the baseline in relation to the Turkish provinces along the Black Sea Coast (not including Istanbul) are as follows:

- In total, the 15 Black Sea coastal provinces constitute just over 30% of the total population of Turkey. Sinop, the province closest to the Pipeline route, has the third lowest population of all of Black Sea coastal provinces;
- There has been a slower overall rate of population growth in the coastal provinces within the Black Sea Region over the last five years compared to the national average, as the Black Sea coastal provinces have experienced a negative net migration, or only relatively low levels of positive net migration;
- The Black Sea Region remains below the country's average for economic and social indicators and development;

- In the Black Sea fishing region, 16,486 workers were engaged in fishery operations in Turkey, in 2011; representing approximately 44% of the total workforce engaged in fishery operations in Turkey, and approximately 0.2% of the total employment in this region (including Istanbul); and
- The Black Sea (combining the two designated fishing regions, West Black Sea and East Black Sea) accounts for the largest share of national fishing production, with 77% of Turkey's total catch in 2011. The majority of Turkey's Black Sea catch (87%) is caught in the Eastern Black Sea region.

9.6 Impact Assessment

This section presents the results of an assessment of the potential for impacts on the existing socio-economic environment arising from Project-related activities. **Chapter 5 Project Description** and the baseline socio-economic characteristics (Section 9.5) have been used to assist the assessment of potential socio-economic impacts. This assessment has been informed by the impact assessment methodology described in **Chapter 3 Impact Assessment Methodology**, with specific socio-economic criteria defined in this section.

9.6.1 Impact Assessment Methodology

9.6.1.1 Socio-Economic Impact Assessment Criteria

Context and Overview

This section examines the impacts associated with the Project, including economic, fishing and commercial ship transportation-related impacts, and future exploration of resources in the Project Area.

The need for an assessment of socio-economic effects results from the potential for the Project to generate impacts upon the economy, assets and facilities, or navigational safety experienced by various receptors.

The methodology specific to socio-economics presented in this section builds upon the general assessment methodology summarised in **Chapter 3 Impact Assessment Methodology**. The methodology is then developed specifically in relation to effects on socio-economics arising from the construction, operation and decommissioning of the Project, as is further outlined below.

Project Activities Relevant to Socio-Economics

The Project Description is presented in **Chapter 5 Project Description**. The elements of the Project relevant to this socio-economic impact assessment are set out below.

Construction and Pre-commissioning Phase

Pipe-laying for the Project is planned to commence at the border of the Russian and Turkish EEZ, and will be the continuation of the construction of the Russian Sector of the South Stream

Offshore Pipeline. The Project ends at the boundary between the Turkish and Bulgarian EEZs. The main activities relevant to this assessment include:

- Surveying of the Pipeline route; and
- Offshore pipe-laying.

During construction, offshore pipe-laying is accomplished by the sequential alignment, welding and lowering of pipe segments from a pipe-laying vessel. The pipelines will be laid directly on the seabed. The installation of the pipeline in the Turkish EEZ will require deep water pipe-laying vessels which are dynamically positioned (e.g. not anchored) and may use either the S-Lay or J-Lay methods.

The pipe-laying operation will be performed on a 24-hour basis. As described in **Chapter 5 Project Description,** a navigational Safety Exclusion Zone is proposed of 2 km radius (1.1 nautical miles (NM)) centred on the pipe-lay vessel.

There will be no onshore or associated facilities in Turkey. No temporary facilities will be constructed in Turkey and no Turkish ports will be used during the Project. Materials and equipment will be delivered to marshalling yards in Bulgaria or Russia via rail or sea. If delivered by sea from Asia or Europe via the Mediterranean Sea, up to five handysize (a size class of vessel) bulk carriers of 36,000 tonnes capacity per month are anticipated. These vessels will enter the Black Sea through the Bosphorus Straits.

Operational Phase

The permanent Project footprint on the seabed will be 420 m in width (encompassing the presence of the four pipelines and associated safety zone, in which no other activities may occur) extending across the entire Pipeline route within the Turkish EEZ, i.e. 470 km. The Project footprint has been agreed with the relevant Turkish authorities.

Overview of Receptor Groups

The key receptor groups that may be affected by the Project can be broadly divided into three categories:

- Fishers and fishing organisations or companies; and
- Oil and gas exploration companies.

Specific receptors and resources may vary depending on the type of impact/event. Socio-economic impacts could directly affect individuals, organisations or groups who are users or beneficiaries of socio-economic resources, for example by restricting access to a particular area, or they could affect physical assets or ecological resources used by these groups.

Accordingly, receptors which could experience a socio-economic impact in one or more of these ways as a result of the Project are identified and described in Table 9.8 which shows the key receptors in respect to economic related impacts.

Table 9.8 Potential Receptors by Impact Type

Impact type	Receptors	Applicable Phase	
		Construction and Pre-Commissioning	Operational
Socio-economic-related impacts	Fishers and fishing organisations or companies	✓	
	Oil and gas exploration companies	✓	✓

Receptor Sensitivity Criteria

The concept of sensitivity attempts to reflect the degree of response to a change in baseline conditions by a receptor. This degree of response may range from being very susceptible to change (and having little resilience) to being able to absorb or adapt to change (being very resilient).

Within the socio-economic context, receptor sensitivity is difficult to define as it varies significantly within and between individual receptors for any given impact. The degree of sensitivity of a socio-economic receptor is based on an individual's abilities to adapt to changes and maintain their livelihood and health (i.e. resilience) and, in situations where an impact may result in a loss or reduction of access to a resource, their ability to access an alternative resource that provides the same service (e.g. a livelihood or employment, recreation, etc.). Sensitivity can also refer to 'vulnerability', and is not uniform. For example, not all fishers or fishing communities are equally vulnerable.

In this assessment, sensitivity is a stakeholder's resilience or capacity to cope with sudden changes or shocks to the stakeholder or on the resource(s) used by a stakeholder. There are a range of variables that can determine a stakeholder's sensitivity and should be considered:

- Age, gender, race, religion;
- Land rights and ownership;
- Employment/unemployment/income;
- Livelihood strategies (and livelihood alternatives);
- Location/isolation;
- Public services, e.g. health access and quality;
- Access to, and use of, natural resources including water;
- Food security;
- Education/skills;
- Health or disability;

- Support networks; and
- Marginalisation (e.g. degree of access to services and formalised rights).

As described in Section 9.6.2, there is a very limited scope for Project impacts on socio-economic receptors. Due to the distance of the Project from the coast (more than 110 km) and the depth of the water along the Pipeline route (more than 2,000 m), the potential for interaction between the Project's activities and existing socio-economic receptors is minimal. As such, the potential impacts and receptors of interest to stakeholders have been identified and described below, although a quantitative assessment has not been undertaken. Receptor sensitivity has been assessed qualitatively.

Magnitude of Impacts

The magnitude of an impact is a measure of the degree of change in the baseline environment as a result of a development leading to positive or negative effects on socio-economic receptors. This baseline could refer to a diverse range of dimensions (i.e. financial, physical or emotional). As described in **Chapter 3 Impact Assessment Methodology**, impact magnitude considers factors such as the duration, frequency, reversibility, and extent of an impact. Additionally, certain criteria may take precedence over others and in some cases only certain criteria may be applicable depending on the type of impact being assessed.

It is also noted that impacts and outcomes associated with the Project may be either direct or indirect in nature. However, these characteristics, while important to recognise and understand in terms of the application of mitigation measures, do not affect impact magnitude and are not directly considered in the socio-economic impact magnitude criteria.

Given the limited scope for Project activities to impact socio-economic receptors, the assessment of the potential magnitude of impacts in this chapter takes a more qualitative approach as with receptor sensitivity.

9.6.1.2 Impact Assessment Methods

Identifying and Assessing Impact Magnitude

Potential changes to the existing baseline socio-economic characteristics of the Study Area, or within a wider zone of influence, may arise as a result of the activities of the Project. The Project activities are described in **Chapter 5 Project Description**.

The potential for adverse socio-economic impacts has been assessed in Sections 9.6.2 and 9.6.3 by taking into account the receptor and the characteristics of each impact (including their extent, duration, frequency and reversibility). For beneficial impacts, the beneficial nature of the impact has been noted but the magnitude of the impact and the sensitivity of the receptor has not been explicitly identified.

Identifying Mitigation and Assessing Residual Impacts

As described in **Chapter 5 Project Description**, the Project design process has incorporated a number of design principles and measures to reduce overall impact. These are defined as design control measures. As a result, to the extent practicable, this chapter has assessed the potential for impacts based on a Project design that has already incorporated these design controls.

Within the respective impact assessment sections below for each phase of the Project, following the initial pre-mitigation impact assessment, a set of receptor-specific mitigation measures and other Project enhancement measures have been identified. These are explained in detail below.

Following assessment of the mitigation measures, the overall significance of the impacts, taking into account the mitigation measures, has been reassessed to arrive at the residual impact. The reassessment has applied the same methodology used to undertake the original pre-mitigation assessment.

9.6.2 Impact Assessment: Construction and Pre-Commissioning Phase

This section identifies the potential impacts and risks to socio-economic receptors that may arise in association with the Construction and Pre-Commissioning Phase of the Project.

Due to the distance of the Project from the coast (more than 110 km) and the depth of the water (more than 2,000 m), the potential for interaction between the Project Activities and existing socio-economic receptors is minimal. However, two potential impacts and receptors of interest to stakeholders are described below, including the potential impact on fishers and fisheries, and the potential impact on oil and gas exploration.

9.6.2.1 Assessment of Potential Impacts

Potential Impact on Turkish Fisheries due to Construction Activity

Given the concerns that were raised and the importance of the issue expressed by stakeholders, as well as the identified vulnerability of fishers (including small-scale and artisanal fisheries), a specialised Fishing Study was undertaken (Appendix 9.1) to assess the status of fisheries and fishing communities in the Black Sea, and how these could be affected by the Project. The outcomes of this study concluded that there is no potential for impacts on Turkish fisheries:

- Firstly, the Fisheries Study has shown that the Turkish fishing fleet, which mostly comprises small vessels with limited range, concentrates their fishing efforts in waters relatively close to the Turkish coast and approximately 100 km from the Project Area. Although statistical data on fishing activity in the Project Area could not be sourced, qualitative data gathered during consultations with fisheries representatives has confirmed that no significant fishing activity occurs in the Project Area. As such, there is very little to no likelihood of interaction between the pipe-laying vessel spread and fishing vessels;
- Second, it has shown that any significant impact on fish migration routes and patterns across the Black Sea is unlikely, including for the key species targeted by Turkish fishing fleet. This includes European anchovy which accounts for the largest share of the Turkish fishing catch and which has been identified as having migration routes that intersect the Project Area in Turkey's EEZ. In the event that the anchovy migration across the Pipeline route was to coincide with construction, the relative size of the sea area disturbed by the

construction process would be insignificant in comparison to the approximate width of the migration route, and as such the migration would not be disturbed; and

- Whilst fisheries raised the possibility of construction activities in the Bulgarian Sector impacting fish migration routes through the western continental shelf into Turkish waters, the fishing study similarly concluded that impacts would not be significant enough to disrupt fish migrations. Since fish do not inhabit the deep anoxic waters of the Black Sea, sediment plumes from pipe-laying activities near the seabed would not result in loss of habitat, whilst fish would It is therefore considered that there is no potential for impacts on the resource (target species fish stocks), on catch levels, or on the fishing effort expended, as a result of the Project during the Construction and Pre-Commissioning Phase. Even considering the potential vulnerability of fishers (including small-scale and artisanal fisheries), it is unlikely that there will be any discernible change in fishing industry revenues, incomes or livelihoods associated with the fishing industry, including the anchovy fishery.

It is therefore considered that there is no potential for impacts on the resource (target species fish stocks), on catch levels, or on the fishing effort expended, as a result of the Project during the Construction and Pre-Commissioning Phase. In the Bulgarian Sector, given the limited area that the construction activities in offshore and nearshore sections of the South Stream Offshore Pipeline will occupy, and the temporary nature of the construction activities, no significant transboundary impacts to fish stocks and fisheries in Turkey are expected.Even considering the potential vulnerability of fishers (including small-scale and artisanal fisheries), it is unlikely that there will be any discernible change in fishing industry revenues, incomes or livelihoods associated with the fishing industry, including the anchovy fishery.

These conclusions were presented to fisheries representatives in both Trabzon and Samsun in May 2014 (see **Chapter 6 Stakeholder Engagement**) who confirmed they do not anticipate any impacts on their activities because of the distance of the Project offshore and the limited potential to impact anchovy migration.

The potential for an unplanned event, such as a leak or spill of fuel from a construction vessel to impact fish stocks, and in turn, fisheries and potential vulnerable groups in the Black Sea, is discussed in **Chapter 13 Unplanned Events**.

Potential Impact on Oil and Gas Exploration due to Construction Activity

The Project Area intersects with an oil and gas exploration block licenced to TPAO. However, due to the relatively small area occupied by the pipe-laying spread during construction, and the movement of the spread at approximately 2.5 km per day, any possible interactions would be temporary and localised.

Consultation with TPAO in 2013 established that exploration drilling activities are not expected to occur within the Project Area during the Construction and Pre-Commissioning Phase of the Project. Therefore, no potential impact of construction activities on TPAO’s exploration activities is identified. South Stream Transport will engage with TPAO prior to and during construction with regard to construction schedules and work progress reports to coordinate planned activities in the Turkish EEZ. Further information on TPAO’s future planned activities is included in **Chapter 13 Cumulative Impacts**.

It is therefore considered that there would be no impacts on oil and gas exploration, arising from the construction of the Project.

9.6.2.2 Management Measures

The above assessment has concluded that there will be no socio-economic impacts associated with the Construction and Pre-Commissioning Phase of the Project. Nevertheless, as a precaution, the following measures, in relation to the IFC mitigation hierarchy in **Chapter 3 Impact Assessment Methodology**, will be implemented during the Construction and Pre-Commissioning Phase.

Ongoing Stakeholder Consultation

South Stream Transport will continue a programme of stakeholder engagement and consultation throughout the Construction and Pre-Commissioning Phase. These engagement activities will be designed to facilitate dialogue with relevant stakeholders, including those potentially affected by the Project, or who are concerned about or interested in the Project. These activities will allow potential impacts, issues and concerns to be identified early on and addressed in an expedient manner. These activities will also inform relevant stakeholders of upcoming construction activities, as well as Project activities that have been completed, and provide advance warning of any anticipated changes. Engagement measures will include:

- The coordinates and timing of temporary marine exclusion zones will be communicated to vessel operators through the routine channels of the appropriate maritime authorities (refer to Section 9.5.5.4); and
- Additional meetings with fishers, as required, to further explain the temporary exclusion zones and address questions and concerns.

Ongoing and future stakeholder engagement activities are described further in the Stakeholder Engagement Plan for Turkey. Ongoing stakeholder engagement will also serve as a means of monitoring impacts on potentially affected stakeholders, such as Turkish fisheries, to ensure that the actual level of impact is not greater than predicted. If impacts are identified and verified, these will be a priority for resolution which will be agreed in consultation with affected stakeholders.

Grievance Procedure

South Stream Transport has developed a grievance procedure for the South Stream Offshore Pipeline, which will guide the management of grievances throughout the Project lifecycle. The Grievance Procedure is referred to in **Chapter 6 Stakeholder Engagement** and further described in the Project Stakeholder Engagement Plan.

The Grievance Procedure will be implemented by South Stream Transport in partnership with its contractors and will ensure that grievances are brought to the attention of the appropriate Project staff and addressed in an appropriate and timely way, following a standard procedure of investigation, analysis, and resolution. It will also ensure that resolutions are documented and communicated to the appropriate stakeholders.

The Grievance Procedure includes reference to a Compensation Management Framework, to ensure that cases requiring some form of compensation are evaluated consistently and equitably.

Compensation Management Framework and Livelihood Restoration Framework

South Stream Transport will develop a Compensation Management Framework as part of the overarching environmental and social management programme to ensure that claims or events requiring compensation are evaluated consistently and equitably. Forms of compensation will be determined on a case-by-case basis, and may include monetary or in-kind restitution, and/or livelihood restoration measures. As part of the process of implementing the Compensation Framework, South Stream Transport will engage with the affected stakeholders in order to identify appropriate compensation or restoration measures.

Although impacts on fishers and fishing activities are not anticipated, in the unlikely event that an impact occurs, the Compensation Management Framework will apply. South Stream Transport will also develop a Livelihood Restoration Framework which would apply in the event that fishing livelihoods are affected. The Livelihood Restoration Framework will define the process by which additional mitigation, compensation and supporting measures will be developed and applied in order to repair, re-establish, and restore livelihoods affected by the Project (including impacts related to unplanned events).

9.6.2.3 Summary

Table 9.9 summarises the results of the assessment of the potential for impacts during the Construction and Pre-Commissioning Phase.

Table 9.9 Summary Table of Potential for Socio-Economic Impacts (Construction and Pre-Commissioning Phase)

Impact	Receptor	Assessment conclusions	Management Measures*
Potential impact on Turkish fisheries due to construction of offshore pipeline within the Turkish EEZ	Fishers (including small-scale and artisanal fisheries)	No impact	On-going Stakeholder Engagement Grievance Procedure Compensation Management Framework Livelihood Restoration Framework
Potential impact on oil and gas exploration due to construction activity	TPAO	No impact	On-going Stakeholder Engagement Grievance Procedure

* As there are no impacts or significant impacts, the stated measures are proposed in place of mitigation

9.6.3 Impact Assessment: Operational Phase

This section identifies the potential impacts to socio-economic receptors that may arise in association with the Operational Phase of the Project.

As for the Construction and Pre-Commissioning Phase, the potential for interaction between the Project Activities and existing socio-economic receptors is minimal. However, one potential impact of interest to stakeholders is described below, comprising the potential impact on oil and gas exploration due the establishment of the exclusion zone on the seabed during operations.

9.6.3.1 Assessment of Potential for Impacts

Potential Impact on Oil and Gas Exploration due to Pipeline Exclusion Zone

The Project Area intersects several TPAO exploration licence blocks. It is possible that future oil and gas exploration or development activities in the Turkish EEZ could be impacted by the Project due to the presence of the pipelines and associated operational exclusion zone.

As part of the design process, South Stream Transport has liaised with the TPAO regarding the width of the Pipeline corridor (the permanent Project footprint) so as to reduce any potential impact the exclusion zone may have on TPAO activities. As a result of these consultations, it is proposed that the pipelines will be laid within a 420 m width corridor, in agreement with the relevant Turkish authorities. Due to the narrow width of the Pipeline corridor, no impact on the feasibility of potential oil and gas exploration or development activities is anticipated.

There is also the potential that future pipelines developed by TPAO would need to cross the Project Area depending on their location and route. Pipeline crossings are not uncommon, and are relatively straightforward from a technical standpoint; therefore, it is not considered that the Project has the potential to impact the feasibility and development of a potential future pipeline, if proposed by TPAO. No potential impact on oil and gas development is anticipated.

In the event of potential future interactions between the Project and TPAO's oil and gas exploration or development activities, South Stream Transport will engage with TPAO to establish the necessary protocols and agreements. Any simultaneous operations will be agreed mutually to ensure safe construction and operation of any overlapping activities or infrastructure. South Stream Transport will make reasonable efforts to ensure that simultaneous operations agreements, risk assessments and interfaces will be implemented prior to the commencement of any TPAO activities. To this end, South Stream Transport and TPAO have agreed to a minimum six-month advance notification period prior to the start of any works.

Regular liaison will be undertaken with the TPAO throughout the Operational Phase of the Project (Table 9.10). In addition, the Grievance Procedure will be available to all stakeholders, including the TPAO.

9.6.3.2 Management Measures

The above assessment has concluded that there will no socio-economic impacts associated with the Operational Phase of the Project. Nevertheless, as a precaution, the following measures will be implemented.

Grievance Procedure

South Stream Transport will continue to implement the Grievance Procedure throughout the Operational Phase, with any necessary revisions to ensure it is appropriate to this phase of the Project. As during construction, the Grievance Procedure will ensure that complaints and grievances are brought to the attention of the appropriate Project staff and addressed in an appropriate and timely way, following a standard procedure of investigation, analysis, and resolution. It will also ensure that resolutions are documented and communicated to the appropriate stakeholders. The Grievance Procedure is referred to in **Chapter 6 Stakeholder Engagement** and further described in the Stakeholder Engagement Plan.

Throughout the Operational Phase, South Stream Transport will implement a Grievance Procedure appropriate to this phase of the Project. This will continue to provide all stakeholders with a formal means of submitting grievances to South Stream Transport. The Grievance Procedure will ensure that grievances follow a standard procedure of investigation, analysis, and resolution. The Grievance Procedure is referred to in **Chapter 6 Stakeholder Engagement** and further described in the Stakeholder Engagement Plan.

Ongoing Stakeholder Engagement

South Stream Transport will continue a program of stakeholder engagement throughout the Operational Phase. These engagement activities will be commensurate with the level of activities and will inform stakeholders of any upcoming activities or anticipated changes. The stakeholder engagement activities are described in **Chapter 6 Stakeholder.**

9.6.3.3 Summary

Table 9.10 summaries the results of the assessment of the potential for impacts during the Operational Phase of the Project.

Table 9.10 Summary Table of Potential for Socio-Economic Impacts (Operational Phase)

Impact	Receptor	Assessment Conclusions	Management Measures*
Potential impact on oil and gas exploration due to the physical presence of pipelines on the seabed within licence blocks	TPAO	No impact	On-going Engagement Grievance Procedure

* As there are no impacts or significant impacts, the stated measures are proposed in place of mitigation.

9.7 Decommissioning Phase

Decommissioning of the South Stream Offshore Pipeline will be carried out according to prevailing international and national legislation and regulations and best practices regarding environmental and other potential impacts. It is envisaged that the process of developing detailed decommissioning management plans may be staged, initially outlining potential options and studies required for discussion with the regulatory authorities, and finally leading to agreed plans prior to the commencement of decommissioning.

Two options are available: namely, in situ decommissioning or pipe removal. *In situ* decommissioning involves cleaning the pipeline and filling it with seawater, after which the pipeline will remain in place as a static feature of the marine environment. The receptors and degree of impact are thus the same as those for the Operational Phase. In comparison, removal of the pipeline is a similar operation to pipe-laying, but in reverse. The receptors and degree of impact will thus be similar to those identified for the Construction and Pre-Commissioning Phase.

Impacts that may be associated with decommissioning will be assessed as part of the process of developing decommissioning management plans and are not assessed in this ESIA Report.

A careful record and archive of construction and operation activities will be maintained in a suitable format for future users of such information. It will include any special mitigation measures that were applied retrospectively, in addition to those identified prospectively in this impact assessment. It will also record all unexpected events that occurred during the Construction and Pre-Commissioning and Operational Phases of the Project.

9.8 Unplanned Events

Potential socio-economic impacts from unplanned events during the various phases of the Project are addressed in **Chapter 13 Unplanned Events**.

9.9 Cumulative Impact Assessment

9.9.1 Construction and Pre-Commissioning Phase

The potential for cumulative socio-economic impacts during the Construction and Pre-commissioning Phase has been considered and is detailed in **Chapter 14 Cumulative Impact Assessment**.

9.9.2 Commissioning and Operational Phase

The potential for cumulative socio-economic impacts during the Operational Phase has been considered and is detailed in **Chapter 14 Cumulative Impact Assessment**.

9.10 Human Rights

According to United Nations (UN) Guiding Principles on Business and Human Rights (Ref. 9.32), companies should respect Human Rights in projects and operations by seeking to prevent or mitigate potential Human Rights issues that may be caused directly by a Company's projects or operations, or by project partners and suppliers. According to IFC Performance Standard 1, "*each of the IFC Performance Standards has elements related to human rights dimensions that a project may face in the course of its operations. Due diligence against these Performance Standards enables companies to address many relevant human rights issues in its project*." The

UN Guiding Principles, the IFC Performance Standards and other International Labour Organisation (ILO) standards are the benchmark for guiding companies in ensuring respect for Human Rights.

Turkey is a signatory and party to many International Human Rights Conventions and Legislation which are detailed in **Chapter 2 Policy, Regulatory and Administrative Framework**.

Due to the fact that Human Rights factors are most usually linked with socio-economic factors, this section of the chapter discusses the findings of the Human Rights Due Diligence process.

9.10.1 Due Diligence Process

As discussed in the aforementioned sections, there are no significant socio-economic triggers which would necessitate a Human Rights Impact Assessment separate from the ESIA Report. South Stream Transport undertook a voluntary Human Rights Due Diligence complementary to the environmental and social risks and impact identification process to ensure that the Project does not infringe upon the human rights of others. The Due Diligence process also allows the Project to ensure there is a system in place to proactively monitor potential issues and concerns throughout the Project's lifecycle.

The goals of the Project's Due Diligence process are to:

- Identify, prevent, mitigate and account for actual or potential Human Rights impacts;
- Ensure policies and processes to manage Human Rights issues are in place;
- Express commitment to respect Human Rights through a policy endorsed by senior leadership;
- Ensure communication takes place with stakeholders about how issues will being addressed; and
- Ensure a grievance mechanism is in place to enable stakeholders to raise any Human Rights.

A Human Rights register was produced which identified the various elements of the Project and their interaction with actual or potential Human Rights impacts. Wherever possible, Human Rights mitigation and monitoring efforts tie into the Project's existing corporate standards, policies, and procedures as outlined in the Environmental and Social Management Plan (**Chapter 16 Environmental and Social Management**). A summary of the potential impacts and related Project responses are provided below.

The Due Diligence process recognises that the Human Rights risks may change over time as the Project evolves from the Construction and Pre-Commissioning Phase into the Decommissioning Phase. As such, the Project's Human Rights Due Diligence is an iterative process whereby business operations and operating context will be examined on a regular basis.

9.10.2 General Policies and Procedures

During the Due Diligence process, all corporate and Project policies, plans and procedures were reviewed to ensure a commitment from the senior level of management to protect and manage Human Rights. In addition, contractual language was reviewed to ensure that business relationships, including subcontractors and supplier relationships, are bound by the same policies and procedures.

South Stream Transport abides by its Corporate Social Responsibility and Sustainability Policy which outlines the Company's Guiding Principles, which with respect to human rights, include:

"…respecting internationally recognised Human Rights in our own operations, and promoting the respect of the aforementioned rights with regard to activities assigned to or carried out with Business Partners and in our relationships with stakeholders"

In addition, the Company commits to respecting the UN Global Compact Principles which are:

"…the protection of international human rights; rights to free association, collective bargaining, and employment non-discrimination; protection and preservation of the environment; and elimination of corruption, including bribery and extortion".

Commitments to these Guiding Principles are further stressed in the Health, Safety, Security, Environment and Corporate Social Responsibility policies (HSSE and CSR) requirements outlined for all contractors and suppliers. This ensures that respect for Human Rights is part of contractual relationships and adhered to in direct business activities.

9.10.3 Labour and Working Conditions

Considering Project activities will be completed offshore, there are no socio-economic receptors on land in Turkey, the Due Diligence process focused on labour and working conditions. Workers are an important group of stakeholders who may be subject to a range of direct impacts, potentially both positive and adverse, in terms of access to employment, the terms and conditions of that employment, and their health, safety and welfare whilst working on the Project.

Considering the Project has a robust Health, Safety, Security and Environment – Integrated Management System (HSSE-IMS), the Due Diligence process did not identify any potential impacts in relation to labour and workforce Health and Safety. Instead, it focused on four primary themes in regards to Project labour and working conditions which, if not properly addressed, could lead to Human Rights impacts:

- Measures to support a diverse workforce and prevent discrimination;
- Understanding which employment and labour laws at sea apply to the Project;
- Processes and measures to ensure safe working conditions; and
- Sufficient processes are in place to ensure no use of forced, compulsory or child labour (either directly or in supply or processing chains).

In order to mitigate for potential risks and impacts on the Project Workforce, it was determined that the Project will adopt the following policies and practices:

1. Human Resources Policy: The formulation and implementation of a Human Resource Policy addressing all the requirements of IFC PS2 will mitigate these risks (and potential impacts). The Human Resources Policy will be implemented via South Stream Transport's ESMP (**Chapter 16 Environmental and Social Management**);
2. Working Relationship: The underlying agreements for all working relationships will be documented by South Stream Transport, and its contractors and subcontractors, and communicated to the Project workforce. All workers will be informed about their working conditions and terms of employment and entitlements to wages and other benefits. All workers will be provided with a written contract containing this information in an appropriate language and/or method;
3. Working Conditions and Terms of Employment: South Stream Transport, and its contractors and subcontractors, will respect the agreed working conditions and terms of employment of the Project workforce (including wages and benefits, hours of work, overtime arrangements and overtime compensation, leave for illness, maternity, public holidays and annual leave);
4. Workers Organisations: South Stream Transport, and its contractors and subcontractors, will allow workers to form and join workers' organisations of their choosing and to bargain collectively in accordance with Turkish national law;
5. Non-Discrimination and Equal Opportunity: South Stream Transport, and its contractors and subcontractors, will base the employment relationship on the principles of equal opportunity and fair treatment and ensure that no employment decisions (including those related to recruitment and hiring, compensation, working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement and discipline) are made on the basis of personal characteristics unrelated to inherent job requirements;
6. Grievance Procedure: South Stream Transport will implement a fair and transparent Grievance Procedure for the Project workforce and contractors to allow them to raise reasonable concerns related to working conditions. South Stream Transport, and its contractors and subcontractors, will inform workers about the mechanism when they are hired and (again) when they commence work on the Project site or vessels and ensure that the mechanism is easily accessible. The Grievance Procedure will be supported by an appropriate level of management, and address concerns promptly through an understandable and transparent process providing feedback to those concerned without any retribution. Additionally, the grievance mechanism will not impede access to other juridical remedies or arbitration procedures; and
7. Child or Forced Labour: The minimum age of employment in Turkey is 16. In accordance with South Stream Transport's and its contractors' and subcontractors' hazard identification and safety risk management procedures, all parties will ensure that (a) no persons will be employed that are under the age of 16 and (b) no persons employed between the ages of 16 and 18 will be employed in hazardous work in a manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's

education or be harmful to the child's health and physical, mental, spiritual, moral or social development. All work of persons between the ages of 16 and 18 will be subject to an appropriate risk assessment and regular monitoring of health, working conditions and hours or work. Procedures for appropriate risk assessment, regular health monitoring, and for defining working conditions and hours of work for South Stream Transport, contractor and subcontractor employees more generally are addressed in Appendix 9.1. South Stream Transport, and its contractors and subcontractors, will not employ forced labour.

9.10.4 Black Sea Coastal Provinces

All Project activities for Turkey will be offshore. There will be no marshalling yard and no need to use Turkish ports for waste disposal, which means there will be no socio-economic receptors onshore. Therefore, there are no direct Human Rights impacts associated with Communities. South Stream Transport has initiated a Stakeholder Engagement Plan as outlined in **Chapter 6 Stakeholder Engagement** which ensures consultation with Turkish stakeholders, as well as implementation of a Project Grievance Procedure to ensure a timely and appropriate response to concerns raised by Black Sea coastal communities and that potential impacts are addressed accordingly.

9.10.5 Supplier Engagement

The Due Diligence process has focused on the fact that Human Rights impacts can be linked to Project activities as a result of the behaviour of parties with which the Project is associated, not only direct impacts caused by South Stream Transport. This is particularly relevant because construction of the Project is likely to be undertaken entirely by contractors and subcontractors. It was therefore determined that there could be a potential risk of harmful child labour taking place within the supply chain if not properly managed.

To avoid potential impacts in the supply chain, all mitigation requirements set out above under labour and working conditions will apply to South Stream Transport's contractors, subcontractors, and direct supplier requirements. Considering that the primary contractor for offshore pipeline work in the Turkish EEZ will be an internationally recognised company, it is likely that adherence to the aforementioned requirements set forth by South Stream Transport will not be a concern, although it will be monitored.

South Stream Transport, and its contractors and subcontractors, will also assess its primary supply chain on an on-going basis to ensure that no child labour or forced labour is used by its primary suppliers.

9.10.6 Security Provision

The Due Diligence process examined several factors associated with security provision following the guidance set out in the Voluntary Principles on Security and Human Rights (Ref. 9.33). It was determined that there is minimal risk of conflict which could affect the security environment offshore and it is unlikely that any security forces on board vessels, would be required. However, South Stream Transport will use its contractual process to ensure that provisions are in place for the conducting of background checks on security staff, as well as monitoring of performance.

Policies, plans and procedures to protect the safety and security of the workforce and Project stakeholders are documented in the HSSE-IMS.

9.11 Conclusions

9.11.1 Summary of Impact Assessment

This assessment has reviewed the potential for socio-economic impacts associated with the Project.

In relation to the Construction and Pre-Commissioning Phase, this chapter has considered the potential for impacts on fishing and on oil and gas exploration. The potential for impacts on Turkish fisheries has been investigated through a specialised Fishing Study (Appendix 9.1); this study has shown that Turkish fishing activity is concentrated in coastal waters that are approximately 100 km from the Project Area. Additionally, no impacts on anchovy (or other fish) migration routes in the Black Sea are anticipated. Accordingly, no impacts on Turkish fisheries are expected as a result of the construction of the Project.

The assessment also examined the potential for impacts on oil-and-gas exploration during the Construction and Pre-Commissioning Phase. However, it has been established through consultation with the licence holder (TPAO) that exploration drilling activities are not currently planned within the Project Area during the Construction and Pre-Commissioning Phase. Therefore, construction activities are not anticipated to impact on TPAO's potential exploration activities.

Accordingly, there will be no significant socio-economic impacts during the Construction and Pre-Commissioning Phase of the Project.

In relation to the Operational Phase, this chapter has considered the potential for impacts on oil and gas exploration and development due to the presence of the operational pipeline, and the associated Operational Safety Zone. While the Project Area intersects with TPAO exploration licence blocks, due to the narrow width of the Project Area, there is no expected impact on the feasibility of future oil and gas exploration or development activities occurring in the vicinity of the Project Area.

Accordingly, there will be no significant socio-economic impacts during the Operational Phase of the Project.

9.11.2 Overview of Management Measures

Although the Project is considered unlikely to result in significant socio-economic impacts, the following measures will be put in place to help manage stakeholder perceptions of any issues and to provide for a mechanism for identifying and handling any unexpected issues or impacts, should they arise.

- A range of construction management and environmental and social management processes and procedures to avoid, or where avoidance is not possible, minimise the potential for adverse impacts;
- Ongoing stakeholder engagement during construction of the Project to inform and update stakeholders about planned construction activities and the construction programme;
- A Grievance Procedure to allow for prompt, transparent and satisfactory handling of grievances raised by stakeholders, including from within the Black Sea coastal communities;
- A Compensation Management Framework to ensure that claims or events requiring compensation are evaluated consistently and equitably; and
- A Livelihoods Restoration Framework to define the process by which additional mitigation, compensation and supporting measures will be developed and applied in order to repair, re-establish, and restore livelihoods affected by the Project (including impacts related to unplanned events).

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Chapter 10: Cultural Heritage

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10 Cultural Heritage

10.1 Introduction

This chapter presents an assessment of the predicted impacts associated with cultural heritage during the Construction and Pre-Commissioning, Operational, and Decommissioning Phases of the Project.

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. 10.1). Cultural heritage is an important component of the cultural identity of communities, groups and individuals, and of social cohesion (Ref. 10.2). Cultural heritage includes (Ref. 10.1), including:

- Tangible cultural heritage, including:
    - Movable cultural heritage (paintings, sculptures, coins, manuscripts);
    - Immovable cultural heritage (monuments, archaeological sites, etc.); and
    - Underwater cultural heritage (shipwrecks, submerged occupation remains, underwater ruins and settlements);
- Intangible cultural heritage (oral traditions, performing arts, religion etc.); and
- Natural heritage (natural sites with cultural aspects such as cultural landscapes or seascapes, physical, biological or geological formations).

Cultural property (heritage) is defined in the Turkish Law on the Conservation of Cultural and Natural Property as "*movable and immovable property on the ground, under the ground or under the water pertaining to science, culture, religion and fine arts of before and after recorded history or that is of unique scientific and cultural value for social life before and after recorded history*" (Ref. 10.2, Article 3 (1)).

Within the Turkish Law, examples of immovable cultural property include, but are not limited to: archaeological sites, acropolis and necropolis, castles, fortresses, towers, walls, historic barracks, places of worship and tunnels (Ref. 10.2, Article 6 (d)). Movable cultural property includes "…*all kinds of cultural and natural property from geological periods, prehistory and recorded history, having documentary value in terms of geology, anthropology, prehistory, archaeology and art history reflecting the social, cultural, technical and scientific characteristics and level of the period they belong to*" (Ref. 10.2, Article 23 (a)). Some examples are: all kinds of animal and plant fossils, human skeletons, struck stone tools, volcanic glass (obsidian), all kinds of tools made of bones or metal, tiles, ceramics, similar pots and pans, statues, figurines, tablets, weapons to cut, for defence and assault, anchors, leather, cloth, papyrus, parchment or documents inscribed or described on metal and portable goods and their parts made of tiles, earth, glass, wood, and textiles (Ref. 10.2, Article 23 (a)).

The Turkish Law on the Conservation of Cultural and Natural Property does not specifically refer to shipwrecks. However, under the International Commission on Monuments and Sites (ICOMOS) 1996 Charter for the Protection and Management of the Underwater Archaeological Heritage (Sofia Charter ratified by Turkey 9 October 1996, Table 10.7), underwater cultural heritage is understood to mean the archaeological heritage which is in, or has been removed from, an underwater environment. It includes submerged sites and structures, wreck-sites and wreckage and their archaeological and natural context.

Archaeology is the scientific study of the physical evidence of past human societies recovered through artefact collection and analysis, and excavation. Physical archaeological resources include portable antiquities, monuments, historic buildings, historic landscapes, cemeteries, and burial areas. Archaeological sites form an intrinsic part of Turkish national heritage.

Both immovable and moveable cultural property can be found on archaeological sites. Archaeological sites consist of *"an area where man-made cultural and natural property converges as the product of various prehistoric to present civilisations, that is adequately defined by topography and homogenous, at the time historically, archaeologically, artistically, scientifically, socially or technically valuable, and exhibits partial structures"* (Ref. 10.2, Article 3 (7)).

Cultural heritage is protected under national legislation, and by international agreements adhered to by the Republic of Turkey (Refs. 10.1 to 10.16) (Section 10.6.2). Cultural heritage (including archaeology) is regarded as important due to, but not limited to, the following factors:

- Archaeological heritage is a fragile and non-renewable cultural resource (Ref. 10.3);
- Archaeology and cultural heritage are important to civilization and cultural life, therefore they are protected and potentially damaging activities are subject to regulation (Ref. 10.2); and
- Cultural heritage can be important to national and local identity and economic activities (tourism) (Ref. 10.4).

This chapter aims to identify any known or potential cultural heritage within the Project Area, and to assess potential Project impacts upon this cultural heritage[1]. In accordance with International Finance Corporation (IFC) and Organisation for Economic Co-operation and Development (OECD) guidance, this environmental and ESIA also considers natural and palaeontological intangible cultural heritage (Ref. 10.13, Ref. 10.14 and Ref. 10.15).

The Project aims to avoid impacts on cultural heritage where feasible, while balancing cultural heritage considerations with other environmental and engineering requirements. Where significant cultural heritage impacts remain, this chapter also presents suitable mitigation measures which aim to minimise predicted impacts.

[1] This chapter was prepared by qualified and registered cultural heritage professionals. The assessment has been undertaken according to the UK Institute for Archaeologists (IfA) Code of Conduct (Ref. 10.10) and adheres to the high professional standards required of Registered Archaeological Organisations of the IfA. Research, fieldwork and reporting has been undertaken following relevant and locally-applicable elements of the IfA Standard and Guidance for Historic Environment Desk-based Assessment (Ref. 10.11) and IfA Standard and Guidance for Archaeological Field Evaluation (field scanning) (Ref. 10.12).

The data and interpretations presented in this chapter are linked to other chapters, including **Chapter 6 Stakeholder Engagement, Chapter 7 Physical and Geophysical Environment, Chapter 8 Biological Environment, Chapter 9 Socio-Economics** and **Chapter 11 Ecosystem Services**.

10.2 Scoping

The scope of the cultural heritage impact assessment for the Project was defined through a scoping process which identified cultural heritage receptors and potentially significant impacts related to the Project (Ref. 10.17). Baseline information which informed the scoping process largely drew on information gathered from studies undertaken for the South Stream Offshore Pipeline, including feasibility, engineering and environmental surveys carried out between 2009 and 2012 (Section 10.4). Key steps in the scoping process for cultural heritage comprised the following:

- The Projects Front End Engineering and Design (FEED) was reviewed to identify activities with the potential to significantly affect cultural heritage receptors;
- Cultural heritage receptors within the Project Area of Influence (refer to **Chapter 1 Introduction** for definition) were identified through a process of secondary data review and surveys undertaken for the Project (as described in Section 10.4) and professional expertise; and
- Review of relevant national and international legislative requirements and lender requirements to ensure legislative and policy compliance.

The Project Area (as described in Section 10.3) contains marine cultural heritage receptors and such features are therefore an important consideration in the ESIA process. Potential impacts upon marine cultural heritage were identified through the Project's stakeholder engagement activities as being of high importance to the Project (**Chapter 6 Stakeholder Engagement**).

The Black Sea Region is rich in marine cultural heritage objects (CHOs) which are fragile and irreplaceable resources and include submerged settlements, shipwrecks and associated nautical material, other anthropogenic structures of historical or archaeological significance, and remains associated with 19th and 20th century conflict. There is little potential for the presence of human occupation and settlement, due to the fact that the Project Area has always been a submerged environment. The underlying geological sedimentary deposits of the Project Area have the potential to contain Mesozoic, Miocene and Pliocene marine fossils. Above these fossiliferous deposits is a mantle of Quaternary sediments. There is no potential for the presence of hominid and faunal remains as this area has always been a submerged environment. Marine sediment sequences may provide evidence for past climatic and environmental conditions.

The Project Area does not contain any World Heritage sites or known tangible or intangible archaeological or cultural heritage features of international significance. No intangible cultural heritage (such as specific notable or listed cultural traditions) related to the Project Area, and that could be exploited for commercial purposes, has been identified. With reference to the IFC Performance Standards 2012, the Project is not assessed as having any impact on indigenous peoples (Ref. 10.13) (**Chapter 9 Socio-Economics**).

The cultural heritage receptors within the Project Area are identified in this chapter and discussed in terms of their importance and the potential impact that the Project may have on them.

Cultural heritage experts met with Project engineers in April 2013 to discuss marine cultural heritage as well as proposed impact avoidance and mitigation strategies.

10.3 Spatial and Temporal Boundaries

The **Project Area** is 470 km in length and 2 km in width, extending along an east west orientation across the north of the Turkish EEZ from the Russia and Turkey EEZ boundary to the Turkey and Bulgaria EEZ boundary. No excavation of or filling over the seabed is anticipated. There will be no landfall facilities within the Turkish Sector. The Project Area is defined in full in **Chapter 5 Project Description**.

The cultural heritage Study Areas were determined in accordance with the Law on the Conservation of Cultural and Natural Property (23 July 1983, Law No. 2863, last amended February 2008) and Design Documentation State Survey Areas as set out in Agreement No. 240/10 dated 10 January 2010 between Peter Gaz and JSC Giprospetsgaz. This constitutes internationally recognised practice in site survey (Ref. 10.13, para 6; Ref. 10.14, GN12) and was established based on the Project design and consideration of bathymetry (i.e. topography) and setting (Ref. 10.18, para 7; Ref. 10.14, GN3).

The cultural heritage Desk Based Study Area covered an extensive area including the Black Sea and the surrounding land areas. The Desk Based Study Area provided information on the maritime cultures, shipping evolution, shipbuilding trends, and navigation patterns. This information facilitates the interpretation of survey data, which is collected from a narrower Survey Area, centred on the pipeline route.

The Survey Area comprised a minimum 2 km wide area centred on the original proposed pipeline route centreline. This area was widened where engineering design decisions required it to be extended. The field surveys identified geophysical anomalies within this 2 km wide area. All geotechnical and environmental field surveys covered this area (see Figure 10.5 to Figure 10.12 in Section 10.5[2]).

The Zone of Potential Influence was defined as the seabed within 150 m either side of the proposed centreline of an individual pipeline. This is based on the avoidance buffer distance chosen by the Project as a design control measure to ensure the avoidance of impacts to cultural heritage objects. The zone is one of potential influence as it is not the case that the entire area could be impacted by Project activities—rather, this area is used to ensure the avoidance of impacts by routing the pipeline away from objects. This avoidance buffer distance was chosen after careful consideration of engineering and design constraints and after a review of commonly used avoidance buffer intervals for similar marine construction projects. This area

[2] Some of the field surveys covered a broader area but still encompassed the Survey Area as defined in this Chapter.

is the same for the Construction and Pre-Commissioning Phase and for the Operational Phase. Specific investigations related to individual sonar anomalies were undertaken in this area.

These areas are set out in Table 10.1 (see Figure 10.5 to Figure 10.12 in Section 10.5)[3].

Table 10.1 Summary of Spatial Boundaries

Study Area	Spatial Boundary
Desk Based Study Area	Documentary and inventory research.
	Turkish waters of the Black Sea.
Survey Area	Marine surveys for environmental, geotechnical and engineering purposes.
	Review of survey data for archaeological information.
	Minimum 2 km wide area centred on the original proposed pipeline route centreline.
Zone of Potential Influence	150 m either side of the proposed centreline of an individual pipeline.

10.4 Baseline Data

10.4.1 Methodology and Data

Cultural heritage receptors of relevance to the impact assessment have been defined through a combination of secondary data sources and marine surveys carried out across the Study Areas.

10.4.2 Secondary Data

10.4.2.1 Desk-Based Research

Secondary data sources as follows were consulted as part of this cultural heritage assessment:

- Secondary data gathering included consultation of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage List (Ref. 10.19), Intangible Heritage Lists (Ref. 10.20) and Database of National Cultural Heritage Laws (Ref. 10.21) for cultural heritage. Analysis of the wider historical, cultural and archaeological context involved consultation of information in relevant digital databases, including: national and regional databases of the General Directorate for Cultural Heritage and Museums (Ref. 10.22); the Ministry of Culture and Tourism (Ref. 10.23); the TAY Project: Archaeological Settlements of

[3] Study areas are based on Pipeline route definition #300512 (dated 30 May 2012)

Turkey (Ref. 10.24), bathymetric and shipwreck data of the Turkish Office of Navigation, Hydrology and Oceanography (Ref. 10.25); and information from relevant archaeological institutions and museums;

- In order to complement the extensive research of Turkish-language sources, relevant international academic research papers were reviewed in a number of university libraries in Canada, the USA and the UK. Journals included *Antiquity, World Archaeology, Europe-Asia Studies, Historic Environment, American Journal of Archaeology, European Journal of Archaeology, Journal of Indo-European Studies, Black Sea Studies, Hellenic Studies, Greek Roman and Byzantine Studies, Journal of Mediterranean Archaeology, Journal of Nationalism and Ethnicity, Paléorient, Journal of World Prehistory, Proceedings of the Prehistoric Society, Préhistoire Européenne, Journal of Field Archaeology, Journal of Archaeological Sciences, Science, Expedition, Archaeological Oceanography, Marine Geology, International Journal of Nautical Archaeology* and the *Journal of Maritime Archaeology* (Refs. 10.26 to 10.37);
- Consultation of databases on the national and regional framework of Turkish archaeology and cultural heritage, including the European Heritage Network National Heritage Policies Database (Ref. 10.38);
- Analysis of the wider historical, cultural, archaeological and administrative context involved considering national and regional cultural policies and registers (Ref. 10.39), regional intangible cultural traditions (Ref. 10.40), and cultural festivals (Refs. 10.41 to 10.45);
- The history and location of naval and aerial combat sites in the vicinity of the pipeline corridor were assessed based on key local sources, memorials and international databases, including – Kriegsmarine Service Records (WASt), Lloyd's Register of Ships/Casualty Returns and Lloyd's List (Ref. 10.46); and
- This study considered the academic context of past and on-going Black Sea archaeological research projects, including wider Black Sea research projects such as the Black Sea Trade Project (Ref. 10.47), various projects of the Danish National Research Foundation Centre for Black Sea Studies (Ref. 10.48) and the French Research Institute in Oceanography's ASSEMBLAGE Project (Ref. 10.49).

10.4.2.2 Reporting Methodology

The referencing of marine cultural heritage follows an arbitrary site identification system for cultural heritage objects, e.g. TK-MCH-001 (Turkey, Marine Cultural Heritage, site number 1). In addition, target naming systems established in earlier survey stages are also referenced. Distances reported in the text in this chapter are measured from the nearest edge of a cultural heritage object to the nearest pipeline centreline.

10.4.2.3 Stakeholder Engagement

Meetings have been held with a range of stakeholders including the Ministry of Environment and Urbanisation, regional government authorities, residents of Black Sea coastal communities and a number of non-governmental organisations (NGOs). Potential impacts upon marine cultural heritage were identified through the Projects stakeholder engagement activities as being of high importance to the Project (**Chapter 6 Stakeholder Engagement**).

Project Correspondence with Turkish authorities has set the range and conditions to be met in event of the discovery of objects of archaeological heritage along the pipeline route as well as requirements for informing the authorities of any CHO finds.

Engagement has occurred with the following authorities to further discuss cultural heritage issues:

- Ministry of Foreign Affairs, Republic of Turkey;
- Sinop Provincial Directorate of Culture and Tourism; and
- Ministry of Culture and Tourism: General Directorate of Cultural Heritage and Museums.

The meetings involved presentations of cultural heritage findings, confirmation of procedures of the transfer and sharing of information on cultural heritage finds and discussion of the proposed avoidance and mitigation strategies.

As a result of the close coordination with, and response to the concerns of, the Republic of Turkey, the Ministry of Culture and Tourism provided to South Stream Transport a letter dated 3 October 2013 stating its satisfaction with the proposed approach to avoiding impacts on CHOs outlined in the Environmental Impact Assessment Application File (Appendix 10.1: Stakeholder Correspondence). The letter stated that a distance of 100 m must be maintained between the pipelines and identified potential cultural heritage objects, which is within the Project standard of 150 m and will be met (refer to Section 10.6.4.1).

10.4.3 Data Gaps

Based upon the review of the data presented in Section 10.4.2 a gap analysis was undertaken between March and May 2012 in order to identify information needed to adequately define baseline conditions. The gap analysis noted that:

- The available reporting did not consider results of, or interfaces with, other environmental topics, e.g. geotechnical studies, bathymetric and geophysical data in an integrated manner;
- The reliability of marine survey data was not known. The gap analysis indicated that following the review of the geophysical methods applied and all available reports, further marine archaeological surveys may be required; and
- Limited non-intrusive geophysical survey or Remotely Operated Vehicle (ROV) investigation had been carried out.

Actions arising from the gap analysis included: obtaining and reviewing the full suite of reports, including correspondence, raw marine survey data, relevant marine survey methods and subsea imagery prepared in 2011 and 2012 for offshore cultural heritage (Refs. 10.50 to 10.60); contacting relevant authorities to establish their requirements; and undertaking consultation.

After the gap analysis had been completed, a further survey to analyse geophysical anomalies using ROV was carried out in September and October of 2012 (Table 10.2). Following this further survey, the implementation of the gap analysis actions, and the application of the

Project design controls and mitigation measures (Section 10.7), it was confirmed that no further marine archaeological surveys were required.

10.4.4 Primary Data and Baseline Surveys

Surveys undertaken for the Project are detailed in Table 10.2. The location of archaeological and cultural heritage objects are marked on the constraints maps (see Figure 10.5 to Figure 10.12 in Section 10.5). Inventories of cultural heritage objects are contained in Appendix 10.2: Inventory of Marine Cultural Heritage Finds.

Table 10.2 Marine Surveys

Name of Survey	Month, Year	Surveyor	Location of Survey	Type of Survey
Offshore Geophysical Survey	May to Jul 2011	Peter Gaz	Turkish EEZ Waters	Multi-beam echosounder, sub-bottom profiler
Offshore Geophysical Survey	Jan to Mar 2012	Peter Gaz	Turkish EEZ Waters	Side-scan sonar, multi-beam echosounder, sub-bottom profiler
Offshore Geophysical Survey	Mar to Apr 2012	Peter Gaz	Turkish EEZ Waters	Side-scan sonar, multi-beam echosounder, sub-bottom profiler
Offshore Geophysical Survey	Sep to Oct 2012	Peter Gaz	Turkish EEZ Waters	ROV (e.g., visual) analysis of geophysical anomalies.

Geo-references constitute sensitive information which is omitted in order to protect CHOs from illegal looting. In order to protect shipwrecks from unauthorised access and potential looting, the Project has adopted a policy of site confidentiality. This means that the general locations of sites are mapped, but their exact locations (i.e. coordinates) are not publicly disclosed in this ESIA Report.

10.4.4.1 Marine Surveys and Analysis

Three steps were employed for the identification of marine cultural heritage:

- Geophysical and environmental marine surveys conducted to collect primary data;
- Geophysical and environmental marine survey data interpretation; and
- Geographic Information System (GIS) analysis integration.

The marine surveys were carried out by third-party contractors, while data post-processing and analysis were completed by both the third-party contractors and Project cultural heritage professionals. A description of marine survey methods is set out in Appendix 10.3: Marine Geophysical, Environmental and Archaeological Survey Methods.

Information on marine CHOs draws on data gathered from previous studies carried out for the Project, including extensive feasibility and engineering surveys performed since 2008 (Refs. 10.50 to 10.60). Those studies, which primarily focused on gathering information for geo-environmental, geotechnical, environmental and engineering purposes, are detailed in Table 10.2. The surveys utilised the following equipment to image and investigate the seafloor: side-scan sonar; multibeam echo sounder; and sub-bottom profiler. During investigations, objects that exhibited anthropogenic features were located and briefly analysed to determine if further investigations were required.

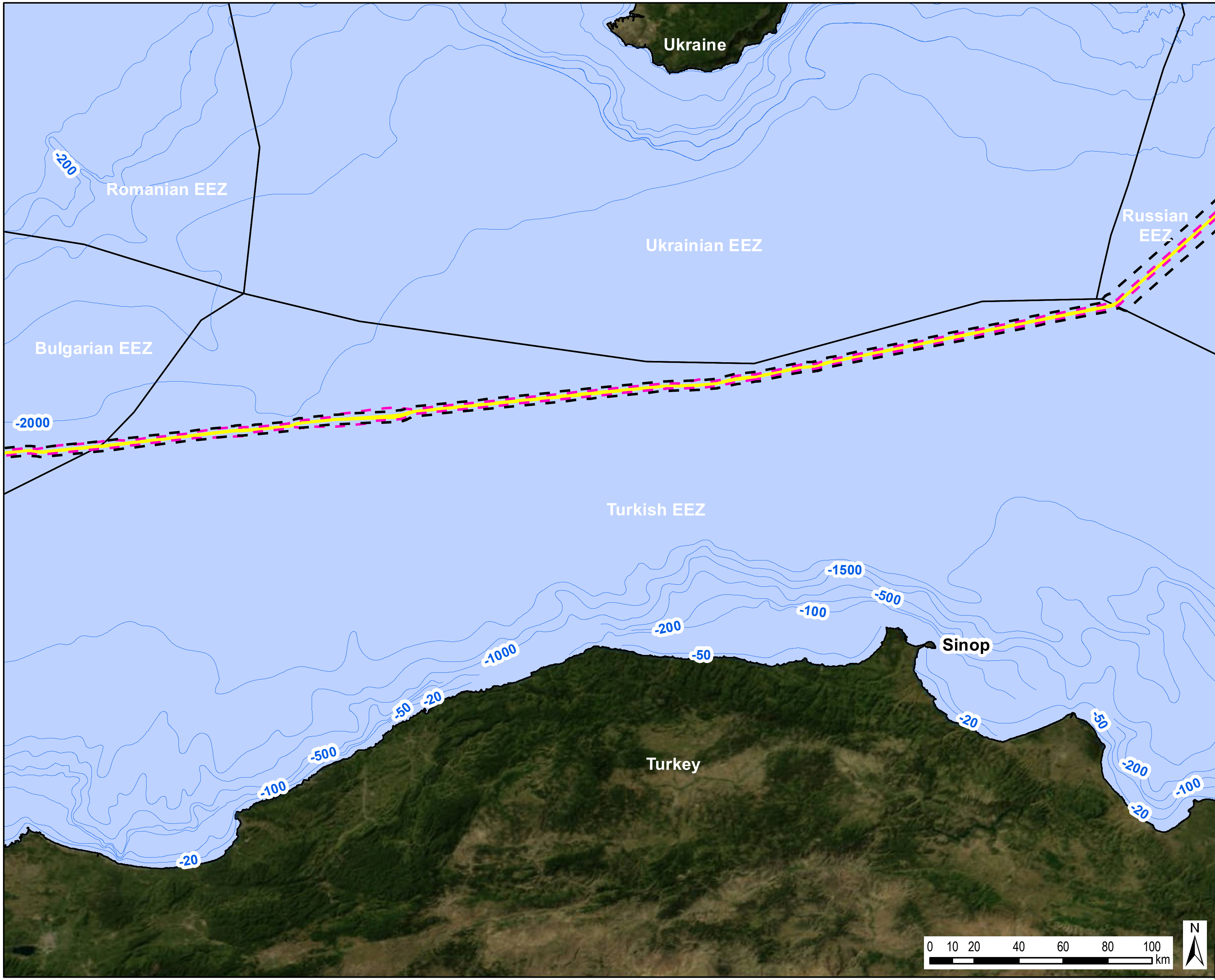
In addition, marine surveys in 2012 contributed information to this cultural heritage assessment. Fieldwork included a visual inspection of anomalies using an ROV equipped with an underwater video camera. These surveys are summarised in Table 10.2.

Desk-based analysis of marine geophysical survey data (ROV and video data) was undertaken by Peter Gaz. Further cultural heritage analysis was carried out in 2012 and 2013 to verify the survey data acquired for other purposes, analyse new survey data, and to assess the baseline conditions for marine archaeology CHOs within the Survey Area[4] (Figure 10.1). Table 10.3 provides details of the surveys carried out and methods used to achieve the required objectives.

Table 10.3 Marine Cultural Heritage Data Analysis

Survey Method	Survey Extent	Objective	Surveyor	Date
Desk-based analysis of marine geophysical data	Survey Area: approximately 2 km wide area centred on the original proposed pipeline route centreline	Desk-based analysis of marine geophysical survey data	Peter Gaz	Jan to Apr 2012
Desk-based analysis of marine geophysical survey data (ROV and video data)	Survey Area: approximately 2 km wide area centred on the original proposed pipeline route centreline	Verification of survey data. Visual survey for the presence of visible archaeological features Assessment of character and current condition of marine archaeology	URS	Aug – Nov 2012

[4] The analysis of CHO was based on Pipeline route definition #300512 (dated 30 May 2012).



LEGEND

- General study area
- Survey area

Turkish Sector of South Stream Offshore Pipeline

- Proposed offshore pipelines
- Isobaths
- Exclusive Economic Zones

Projection: Lambert Conformal Conic

Purpose of Issue	For Information
Client	South Stream Offshore Pipeline – Energising Europe
Project Title	SOUTH STREAM OFFSHORE PIPELINE
Drawing Title	MARINE CULTURAL HERITAGE STUDY AREAS

Drawn	Checked	Approved	Date
JM	VS	MW	03/06/2014

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10.4.5 Data Assumptions and Limitations

Potential cultural heritage objects occurring outside the defined Survey Area detailed herein have not been considered within this impact assessment. Similarly, it is recognised that although unlikely due to the very slow rate of sedimentation on the abyssal plain (see **Chapter 7 Physical and Geophysical Environment**) there is a low possibility that currently unknown cultural heritage objects may exist buried beneath the seabed within the Zone of Potential Influence that have not been identified through the ESIA investigations.

10.5 Baseline Characteristics

10.5.1 Overview

The Black Sea is rich in cultural heritage including the archaeological remains of shipwrecks and associated nautical material. Within the Project Area there is known and potential marine cultural heritage, including the remains of submerged vessels. This baseline section presents historical and cultural context followed by information on the marine known and potential cultural heritage objects identified within the Study Areas as defined in Section 10.3.

The Black Sea has been navigated for thousands of years and served as a nexus for human activity and migration. The subject of scholarly research for the past 50 years, it is unknown when humans first traversed these waters, as archaeological examples of early watercraft have yet to be encountered. Early vessels developed during the Mesolithic to Early Bronze Age (10,000 to 2000 BC) were relatively simple by today's standards and possibly consisted of dugout canoes, skin boats, and/or rafts. These types of watercrafts are intended for use in localized coastal waters and were probably used to transport a limited number of people for exploration and resource procurement purposes. Remains of such dugout boats have been discovered along the Bulgarian coast that date to the Early Bronze Age (3200 to 2000 BC) and represent some of the earliest watercraft to be discovered in the Black Sea.

It was during the Bronze Age that vessels began to increase in size and complexity. Simple canoes gave way to larger, plank-built vessels that were capable of carrying great quantities of goods and merchandise farther along the coast, as trade at this time likely existed between coastal settlements. A boom in maritime activities occurred with the arrival of Greek explorers during Antiquity (c. 700 BC to AD 395). Subsequent colonisation efforts allowed for major trade and production centres began to develop at settlements along every coast of the Black Sea. With the Greeks came their knowledge of seafaring and nautical traditions, which included sail-driven merchant ships and rowed military vessels, traditions eventually utilized by the Romans when they came into power. Maritime trade networks significantly expanded, especially during the medieval and post-medieval periods (395 to 1422), when Mediterranean and other European ships made their way into the Black Sea.

Shipbuilding underwent a profound change at this time; the concept of naval architecture was born and foreign construction conventions and ideas spread through the region. Speed, manoeuvrability, and carrying capacity were traits that shipwrights yearned to perfect, and gradually ships continued to grow in terms of size, grandeur, and intricacy. Seafaring soon became a global enterprise and the Black Sea became a highly attractive region both economically and militarily. Changes to shipbuilding continued, as steam-power and metal-hulled ships began to replace more traditional watercraft beginning in the 19th century. Large scale naval warfare during this time and through the 20th century also contributed to the development of ship design and construction.

A timeline of the southern Black Sea Region is presented in Table 10.4, summarising the regional chronology in order to assist in understanding the area's historical and cultural context. It is important to note that there is a degree of overlap between some cultural periods, and that local chronological models continue to be developed through the application of scientific dating methods.

Table 10.4 Timeline of the Southern Black Sea Region

Epoch	Period	Description
Pleistocene Era	Lower Palaeolithic circa (c.) 2,000,000 to 200,000 Before Present (BP)	Homo erectus / Homo ergaster (1.4 Million years ago (Ma) to 200,000 BP) European Neanderthal Homo sapiens (350,000 to 30,000 BP)
	Middle Palaeolithic c.200,000 to 43,000 BP	European Neanderthal Homo sapiens (350,000 to 30,000 BP)
	Upper Palaeolithic c.43,000 to 12,000 BP	European Neanderthal Homo sapiens (350,000 to 30,000 BP) European Early Modern Humans (43,000 BP+) Intermittent glaciations, hunting and gathering, cave art
Holocene Era	Mesolithic c.12,000 to 6,800 Before Christ (BC)	Hunting and gathering in extensive temperate forests and on coastlines
	Neolithic c.6,800 to 5,000 BC	Animal husbandry and agricultural cultivation, hunting wild animals, fishing and gathering wild foods
	Eneolithic / Chalcolithic c.5,000 to 3,200 BC	Development of gold and copper metalworking, development of increasingly complex societies and small towns
	Bronze Age c.3,300 to 1,200 BC	Early Bronze Age c. 3,200 – 2,500 BC Middle Bronze Age c. 2,500 – 1,600 BC, Hattian, Hurrian, and Hittite cultures Late Bronze Age c. 1,600 – 1,200 BC, Hittite and Assyrian cultures

Continued...

Epoch	Period		Description
Holocene Era	Iron Age c.900BC to Anno Domini (AD) 200		Assyrian and Phrygian cultures
	Antiquity c.800 BC to AD 395	Archaic c.800 to 480 BC	Persian Empire, 550 – 323 BC 6th century BC, Early Greek Pontic colonies
		Classical c.480 to 323 BC	Persian Empire, 550 – 323 BC
		Hellenistic 323 to 146 BC	Kingdom of Pergamon, 250 – 133 BC
		Roman 29 BC to AD 395	Entered Roman Republic
	Medieval AD 395 to 1475	AD 330 to 1453	Byzantine Empire
		1071	Battle of Manzikert
		1243	Mongolian invasion
		1288 to 1878	Ottoman Empire
		1371 to 1479	Serbian-Ottoman Wars
		1453	Conquest of Constantinople, renamed Istanbul
	Post-medieval 1475 to 1829	1568 to 1829	Russo-Turkish Wars
		1683	Austro-Ottoman War
	Modern 1829 to present	1853 to 1856	Crimean War

Continued…

Epoch	Period		Description
Holocene Era	Modern 1829 to present	1877 to 1878	Russo-Turkish War
		1914 to 1918	First World War
		1919 to 1922	Greco-Turkish War
		1923	Turkey becomes a republic, Atatürk declared president
		1939 to 1945	Second World War
		1946 to 1950	Institution of multi-party democracy

Complete.

10.5.2 Archaeological and Historical Context

The following archaeological and historical context sets out the background setting of the Project. Cultural heritage receptors identified within the Survey Area and Zone of Potential Influence are summarised in Table 10.5 (in Section 10.5.5) and an illustrated inventory is contained in Appendix 10.2.

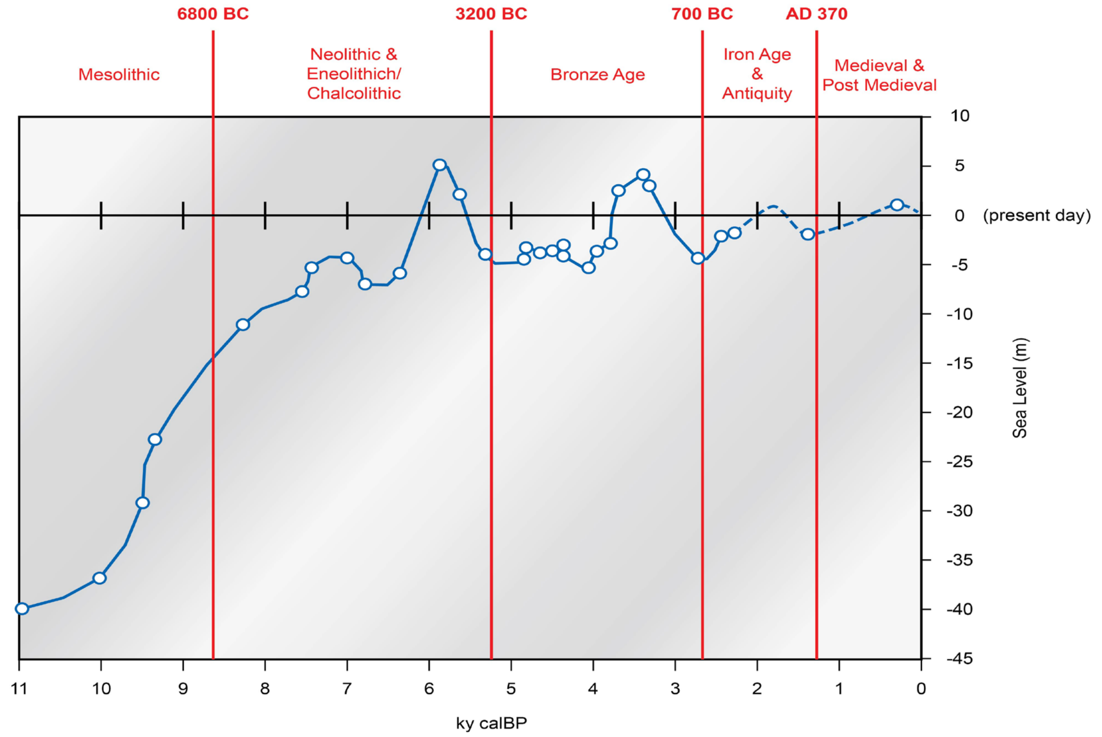
The Project Area has always been submerged and never exposed dry land, and as such there is no potential for submerged settlements (Figure 10.2).

10.5.2.1 Lower Palaeolithic (c.2,000,000 to 200,000 BP)

During the Lower Palaeolithic, pre-modern humans (*Homo erectus*) lived in small groups, hunting and gathering from a home base often near a river or cave. Remains include stone tools and fossil bone. Evidence for Lower Palaeolithic activity is very rare, but of great scientific importance. Some of the earliest known sites in the region are at Kaletepe (Ref. 10.61) and Dursunlu (Ref. 10.62) in south-central Turkey and Yarımburgaz in the north-west (Ref. 10.63, Ref. 10.64). Along the Black Sea coast, Lower Palaeolithic sites have been investigated at Domuzdere and Ağaçlı, near the Bosphorus (Ref. 10.65 and Ref. 10.66).

Desk based literature review has not identified any Lower Palaeolithic sites within the Project Area. As the Project Area has always been a submerged environment and there is extremely low potential for such material to exist, Lower Palaeolithic sites are not considered further within this impact assessment.

Figure 10.2 Sea Level Curve of the Black Sea



Note: Figure after Filipova-Marinova, M. 2007 "Archaeological and paleontological evidence of climate dynamics, sea-level change and coastline migration in the Bulgarian sector of the Circum-Pontic Region," figure 2, p. 460. In V. Yanko-Hombach, A.S. Gilbert, N. Panin & P.M. Doukhanov (eds) *The Black Sea Flood Question: Changes in Coastline, Climate, and Human Settlement*. Springer, Dordrecht, pp. 453-481.

10.5.2.2 Middle Palaeolithic (c.200,000 to 43,000 BP)

During much of Middle Palaeolithic, the region was a peri-glacial environment, located south of the ice sheets and west of the glaciers of the Caucasus Mountains. The Ice Age glaciations did not reach the southern shores of the Black Sea, but the colder climate was reflected in the animal species present.

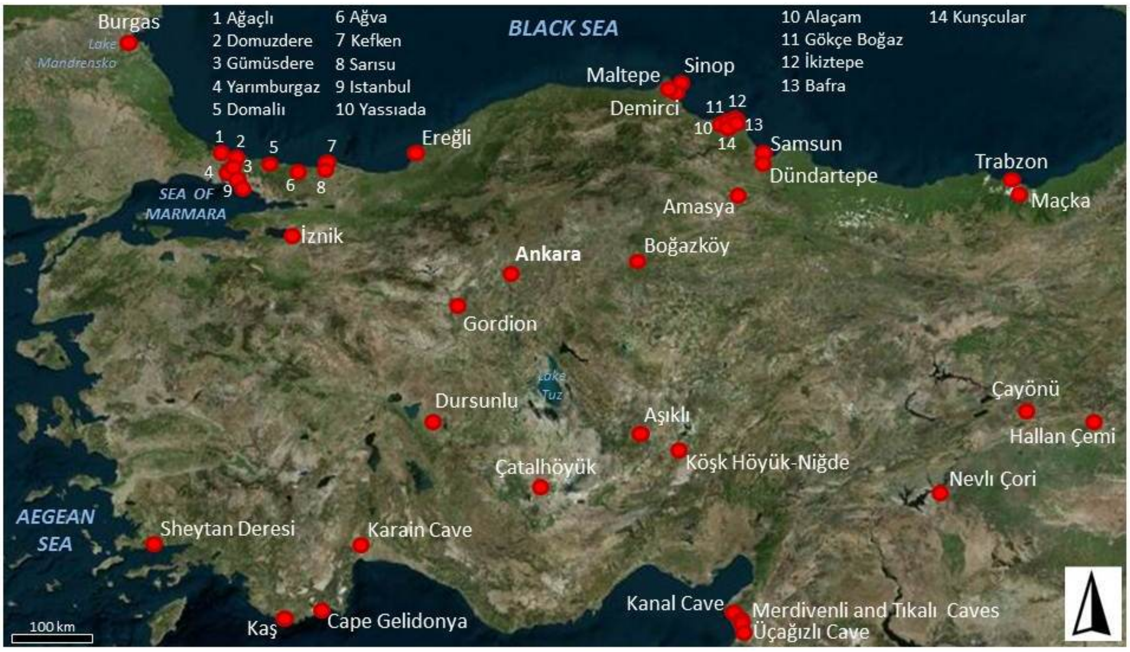
At this time, Neanderthals and early humans lived in caves, open-air settlements, and temporary hunting camps. Mousterian (120,000 to 30,000 BP) tools have been recovered from Karain Cave in southwest Turkey. Near the Black Sea coast, Middle Palaeolithic material has been discovered at Kefken, Ağva, Domalıı, Domuzdere, Gümüsdere, Ağaçlı (all located in the northwest close to the Bosphorus) (Figure 10.3), and in the Tekeköy valley (Samsun) (Ref. 10.64, Ref. 10.65 Ref. 10.67).

Desk based literature review has not identified any Middle Palaeolithic sites within the Project Area. As the Project Area has always been a submerged environment and there is extremely low potential for such material to exist, Middle Palaeolithic sites are not considered further within this impact assessment.

10.5.2.3 Upper Palaeolithic (c.43,000 to 12,000 BP)

During the Upper Palaeolithic, anatomically modern humans arrived in Europe and southwest Asia. Tools became increasingly complex and varied, with distinctive regional styles, perhaps indicating the emergence of territorial groups. Notable Upper Palaeolithic sites are those of Kanal and Üçağızlı Cave in the Hatay region of Turkey (Ref. 10.63). Near the Black Sea coast, Upper Palaeolithic material has been discovered at Kefken, Sarısu, Domuzdere, and Ağaçlı, near the Bosphorus (Figure 10.3) (Ref. 10.65).

Figure 10.3 Select Archaeological Sites and Finds in Turkey



Desk based literature review has not identified any Upper Palaeolithic sites within the Project Area. As the Project Area has always been a submerged environment and there is extremely low potential for such material to exist, Upper Palaeolithic sites are not considered further within this impact assessment.

10.5.2.4 Mesolithic (c.10,000 to 6800 BC)

The retreat of the ice sheets of the Würm glaciation marked the end of the Pleistocene epoch and the start of the Holocene (Ref. 10.68). The climate became more temperate, and ice-sheets retreated from the tops of Turkish mountains.

Mesolithic populations subsisted by semi-nomadic, seasonal hunting and gathering. Bows and arrows, slingshots, and composite tools made from small microliths were developed. Harpoons and net-sinkers have been found, indicating a greater role of fish in the diet than in previous periods. Mesolithic material has been discovered at sites such as Hallan Çemi Tepesi (Ref. 10.69) and Aşıklı Höyük (Ref. 10.70) in central Turkey, but few finds have been discovered along the Black Sea coast (Ref. 10.71). A site discovered 6 km off Sinop (Figure 10.3) on a gentle slope and beach terrace landform (in approximately 95 m of water) that featured a structure consisting of one apparently worked beam, tree branches, and a series of rough stones was initially dated to the Mesolithic; this site, which was thought one of the earliest coastal habitations along the Black Sea coast that predates the relinking of the Mediterranean Sea with the Black Sea, was later determined to be geological rather than archaeological in nature (Ref. 10.31 and Refs. 10.72 to 10.82).

Desk based literature review has not identified any Mesolithic sites within the Project Area. As the Project Area has always been a submerged environment and there is extremely low potential for such material to exist, Mesolithic sites are not considered further within this impact assessment.

10.5.3 Neolithic and Eneolithic / Chalcolithic (c.6,800 to 3,200 BC)

Analysis of sea level curves indicated that several transgression or regression episodes occurred during the Neolithic. Several submerged marine beach facies and estuarine peat layers have been found along the Black Sea coastline at depths that ranged from 8 m to 5 m below present-day sea levels (Ref. 10.31, Ref. 10.72, Ref. 10.73, Refs. 10.75 to 10.81). Sea level oscillations continued throughout this period resulting from global climate changes possibly brought about by a range of factors, such as periodic variations, planetary orbital shifts, increased volcanism, and regional plate tectonics (Figure 10.2).

One of the most notable Neolithic sites is that of Çatalhöyük in south-central Turkey, a multi-component settlement site that shows clear evidence of agriculture and animal domestication (Ref. 10.83). Very little material has been found along the Black Sea coast (Ref. 10.64 and Ref. 10.84).

A *höyük* (mound) site at Dündartepe (Öksürüktepe) (Samsun) along the Black Sea coast has been dated to the Eneolithic, as have sites at Demirci (Sinop), Kunşcular (Bafra), İkiztepe (Bafra), Gökçe Boğaz (Alaçam), and Maltepe (Sinop) based on analysis of painted pottery sherds (Figure 10.3) (Ref. 10.71, Ref. 10.85 and Refs. 10.86 to 10.88). Cultural development of the central Black Sea region before the Bronze Age has been studied by several researchers, who also mentioned several other cultural activity centres along the central coast of the Black Sea (Ref. 10.89). Ceramic remains from the Sinop area closely resemble finds discovered in Bulgaria along the western coast of the Black Sea, which has led to hypotheses regarding long-distance trade connections from the Eneolithic to the Bronze Age (Ref. 10.90); presently, it is unknown how this potential trade network was structured and if trade occurred by land, sea, or both.

Desk based literature review has not identified any Neolithic and Eneolithic / Chalcolithic sites within the Project Area. As the Project Area has always been a submerged environment and there is extremely low potential for such material to exist, Neolithic and Eneolithic / Chalcolithic sites are not considered further within this impact assessment.

10.5.3.1 Bronze Age (c. 3300 to 1200 BC)

It is not until the Late Chalcolithic to Early Bronze Age (c. 3800 to 3200 BC) that the sea levels stabilised across the Black Sea. By this time sea levels reached between 8 m and 5 m below present day sea levels.

During the Bronze Age, farming and technology continued to develop and societies became more complex as social hierarchies emerged. Bronze metalworking developed and land and sea trade expanded.

The Chalcolithic settlements along the Black Sea coast continued on into the Early and Middle Bronze Ages (c. 3300 to 1600 BC), notably Kunşcular and İkiztepe (Ref. 10.85). There is scarce archaeological information concerning the prehistoric ages of the Black Sea. The only site that provides information, the Early Bronze Age site İkiztepe, is located in Samsun Province near Bafra (Figure 10.3). Researchers who have studied in the Black Sea region have located several other Early Bronze Age sites such as Gökçeboğaz Tepe, Dede Tepe, Bağtepe, and Tekkeköy (all located between Sinop and Sansum) (Figure 10.3) (Ref. 10.89). This period also saw the rise of the Hittites and the Assyrians, both of which had knowledge of early iron working at this time (Ref. 10.91 and Ref. 10.92). The country of the Kaška tribes was limited to the coastline of Sinop and Bafra (Ref. 10.93). There is much less evidence for Late Bronze Age (c. 1600 to 1200 BC) activity in this region. The site of Troy in western Turkey, by contrast, saw more continuous occupation throughout the entire Bronze Age (Ref. 10.94).

Little is known of maritime activity along the Turkish Black Sea coast in the Bronze Age. There was extensive seafaring in the Aegean and eastern Mediterranean during this time, as evidenced by regional iconography and archaeological remains (Ref. 10.95). The Late Bronze Age *Uluburun* shipwreck, located off Kaş in the southwest of Turkey (Mediterranean Sea), can serve as an appropriate comparative example, as it has the most complete hull remains of any Late Bronze Age shipwreck and dates between 1316 and 1305 BC (Ref. 10.96). Notable is the *Uluburun* shipwreck's method of construction, which is known as shell-based, as the hull planks are joined together using pegged mortise and tenons. Mortise-and-tenon joinery was a common shipbuilding practice all throughout the Mediterranean from the Bronze Age through the medieval period (Ref. 10.97). In this method, adjacent hull planks, or strakes, were joined by pegs in holes on their narrow sides where they were in contact. Other Bronze Age shipwrecks in Turkish waters include those at Cape Gelidonya and Sheytan Deresi, also off the south-west coast in the Mediterranean (Ref. 10.98 and Ref. 10.99).

Desk based literature review has not identified any Bronze Age sites within the Project Area. As the Project Area has always been a submerged environment and there is extremely low potential for such material to exist, Bronze Age sites are not considered further within this impact assessment. Presently undated CHOs have been identified within the Survey Area (but located more than 150 m from the proposed centreline of any of the four pipelines); some of these may date to the Bronze Age.

10.5.3.2 Iron Age (c. 900 BC to AD 200)

The sea levels of the Black Sea experienced minimal change during the Iron Age. The sea level was approximately 4 m below present day levels at the beginning of this period and rose approximately 5 m before dipping again to 2 m below present day levels (Ref. 10.78). This oscillation is attributed to ocean-atmosphere reorganisation associated with the Phanagorian Regression.

The collapse of the Hittite kingdom (1200 to 1180 BC) saw the arrival of the Phrygians and other Indo-European migrants from the west and the expansion of the Urartian kingdom in the east (Ref. 10.100). Phrygian ceramics dating back to the 7th century BC have been discovered beneath a Hellenistic temple in Sinop (Ref. 10.101). During this period there is a general shift from Black Sea coastal settlement sites to those on the inland plateaus, even though significant iron deposits and iron-bearing sands existed along this coastline (Ref. 10.85, Ref. 10.102 and Ref. 10.103). Despite this shift, archaeological investigations have shown that İkiztepe and the Bafra plain (on the Black Sea coast) continued to be occupied through the Iron Age, as evidenced by a collection of Phrygian pottery sherds, a Hellenistic monumental tomb, and coinage (Ref. 10.104).

Archaeological evidence for Iron Age maritime activity along the Turkish Black Sea coast is scarce. No shipwrecks or associated nautical material have been discovered or published, but this should not discount the possibility that such material exists. In Bulgaria, for example, a dugout canoe was found in Mandrensko Lake near Burgas that dates to the 1st millennium BC (Ref. 10.105), and hundreds of stone anchors have been discovered along the western Black Sea coast (Refs. 10.106 to 10.109), indicating a strong maritime industry in the western Black Sea. After the Greeks arrived in the Black Sea during the 7th century BC, it is likely that local inhabitants adopted Greek shipbuilding techniques and expanded their sea-going endeavours.

Desk based literature review has not identified any Iron Age sites within the Project Area. As the Project Area has always been a submerged environment and there is extremely low potential for such material to exist, Iron Age sites are not considered further within this impact assessment. Presently undated CHOs have been identified within the Survey Area (but located more than 150 m from the proposed centreline of any of the four pipelines); some of these may date to the Iron Age.

10.5.3.3 Antiquity (c. 800 BC to AD 395)

The Black Sea in Antiquity follows the same sea level curve as seen in the Iron Age. The sea level was approximately 4 m below present day levels at the beginning of this period and rose approximately 5 m before dipping again to 2 m below present day levels (Ref. 10.78).

Much is known historically and archaeologically of the Antiquity period, starting with Greek colonisation of the Black Sea beginning c. 7th century BC (Ref. 10.110 and Ref. 10.111). Mass colonisation began in the 6th century BC and continued until the late Archaic (c. 480 BC). During this period, both the Greeks and the western Anatolian cities established new cities along the Black Sea coast. The first Milesian colony, Sinope (Sinop), was likely founded in the late 7th century BC based on archaeological data. Other notably Greek colony cities include Heraclea Pontica (Ereğli), Amisos (Samsun), Cotyora (Ordu), Cerasus (Giresun), and Trapezus (Trabzon), some of which served as major production and trade centres for the entire Black Sea region (Figure 10.4). Colonists engaged in fishing, agriculture and craft production, while trade and shipping were secondary sources of income (Ref. 10.112). Principal Turkish exports during this period included fish and processed fish, timber and wooden items, metal goods, gems, olive oil, and wine, while imports from the Mediterranean included oil, wine, and finished products (e.g. ceramics, metal goods, glassware) (Ref. 10.101, Ref. 10.113 and Ref. 10.114).

Figure 10.4 Greek Cities of the Black Sea

The geographical division of Pontus into coastal areas and inland areas reflects a sharp cultural division between Greeks and native Anatolians (Ref. 10.115). It is likely that the Greek cities of the coast, which looked regularly towards the sea, did not significantly influence the inland areas.

The Persians were another group who made their authority felt in the Black Sea. However, there is no detailed information about the Persian influence in the region. A valuable resource for the Classical period (5th century BC) is Xenophon; in his *Anabasis*, he writes about the native populations of Pontus (which stretched along the Black Sea coast from Sinop to Trabzon, Figure 10.4) like the Khalybs, Taokhs, Phasis, Skyths and Moskhos (Ref. 10.116). After this period, detailed knowledge on Pontus decreases.

The Greeks had a foothold in the region for approximately 700 years until the Greek city-states on the Black Sea coast came under Roman control starting in the 2nd century BC (Ref. 10.113). The Bosphoran Kingdom was taken as Roman influence and expansion policies in Asia Minor continued.

Regarding seafaring, the Greeks brought with them an extensive knowledge of sea-based navigation and shipbuilding technology. The warship and merchant ship were the two main types of Greek vessels that existed during this period, but the latter is the one that likely made it to the eastern Black Sea region. Merchant ships were deep, broad wooden vessels that used sails as the primary mode of propulsion (Ref. 10.95). This ship type is depicted in decorative motifs from the period and even exists in an archaeological example from the eastern Mediterranean, the *Kyrenia* shipwreck. Warships, by contrast, were long, narrow wooden vessels with raised platforms and curved posts at both ends (Ref. 10.95). While characteristically different, it is believed that warships and merchant ships were built in the same fashion; that is, they were built in the shell-first style using an elaborate system of mortise and tenons to secure planking strakes, followed by the insertion of transverse frames as a secondary means of hull strengthening. The Greeks built their vessels using this method throughout Antiquity, while eventually increasing the size of both ship types.

The Romans, by contrast, were not a seafaring people and likely relied on Greek nautical traditions to design and build their vessels. Whilst not much is known about their warships, extensive research has been conducted on the Roman merchant fleet. These vessels were double-ended wooden sailing ships usually with two masts with a cargo capacity ranging from 3,000 to 10,000 amphorae (Ref. 10.95). They were rigged with one large, square mainsail and a smaller, triangular topsail and were fitted with large quarter rudders (i.e. steering oars) at the stern. The same shell-first, mortise-and-tenon construction method used during the Hellenistic period was employed by the Romans.

A number of Hellenistic and Roman settlements and production centres have been investigated in northern Turkey, including Sinop, and Ereğli on the Black Sea coast (Ref. 10.71). Underwater archaeological surveys off Ereğli in 2011 discovered a shipwreck that dates to the late 4th century BC, and another shipwreck off Sinop (Figure 10.3) has been dated to the 1st century AD (Ref. 10.117). Given the extensive maritime trade network that existed in the Black Sea and the Mediterranean during this period and the high preservation qualities of the anoxic waters, there is a high possibility that additional Antiquity-era shipwrecks exist in the Turkish waters of the Black Sea.

Desk based literature review has not identified any Antique period sites within the Project Area and there is a low potential for such material to exist, Antiquity Period sites are not considered further within this impact assessment. Presently undated CHOs have been identified within the Survey Area (but located more than 150 m from the proposed centreline of any of the four pipelines); some of these may date to the Antique period.

10.5.3.4 Medieval (370 to 1475) and Post-medieval Periods (1475 to 1829)

The Byzantine Empire began in 4th century AD after the Roman capital was moved to the city of Byzantium and renamed Constantinople (Ref. 10.113). Maritime activity continued to increase throughout the Black Sea given its strategic location between Europe and Asia. As the Byzantine Empire sought control over the eastern Mediterranean and Black Seas, many naval engagements resulted. There was much political unrest and naval warfare between the Byzantines, Germanic kingdoms, and Persians during this time (Ref. 10.95).

Regarding maritime trade, Sinop and Trabzon (Figure 10.3) continued to be major port centres, and the grain trade from Alexandria (Egypt) to Byzantine ports was most notable. Long-distance commerce peaked during the 14th century.

Small merchant vessels, sometimes referred to as *dorkon*, were used and were renowned for their agility and speed. The 4th and 7th century AD shipwrecks discovered at Yassıada, Turkey (on the Sea of Marmara) can provide possible parallels for the types of sea-going watercraft used in the Black Sea. These vessels were Byzantine merchantmen and featured construction techniques that could be traced back to the Graeco-Roman tradition of shipbuilding: a shell-first, mortise-and-tenon joined hull. These wrecks also show a gradual departure from this type of construction to one that relied more heavily on the strength of the skeletal framework within the hull. Naval ships were also built in this manner and were responsible for the protection and expansion of the Byzantine Empire. One- and two-decked warships, powered by oars and sails, were built to be exceptionally fast vessels and were often equipped with waterline rams at the ship's bow.

Underwater archaeological surveys off Sinop in 2000 and 2011 discovered six shipwrecks that date to the mid-5th century AD, and one shipwreck off Ereğli has been dated to the 6th century AD (Ref. 10.74, Ref. 10.82 and Refs. 10.117 to 10.119). All but one of these wrecks is located in the oxic/anoxic interface at a depth from 100 m to 115 m below surface. Cargos from these sites primarily consist of locally-made and imported amphorae (container of a characteristic shape and size, descending from at least as early as the Neolithic Period), and the wrecks themselves have been designated as Byzantine. Given the extensive maritime trade network that existed in the Black Sea and the Mediterranean during this period and the high preservation qualities of the anoxic waters, there is a high possibility that additional Medieval-era shipwrecks exist in the Turkish waters of the Black Sea.

In addition to shipwrecks, a portion of a Thracian wall has been recorded as eroding into the sea at the coastal site of Karacaköy (Ref. 10.83). Given rising sea levels during this period and changing coastlines, it is possible for other submerged settlements to exist long the Black Sea coastline. The fall of Constantinople in 1453 at the hands of the Ottomans resulted in increased naval activity in the region. The Ottoman fleet reached its height by the 17th century as their organisational structure and style of commend evolved out of Venetian and Genoese models (Ref. 10.120). Maritime trade was controlled by the Ottoman Empire. Foreign merchant vessels were mostly prohibited from entering the Bosphorus Straits, and all trade routes were redirected to Istanbul (formerly Constantinople) so that goods and resources could be taxed (Ref. 10.113). Merchantmen were built from primarily Italian design and were round, sail-driven vessels with tall sides and bulging prows (Ref. 10.95). These ships carried cotton, flax, hemp, wheat, millet, rice, olives, hazelnuts, walnuts, skins and hides, fish, salt, opium, beeswax, and silk throughout the region (Ref. 10.113).

Russian forces began to challenge the Ottomans starting in the 16th century. The following centuries saw a series of Russo-Turkish Wars and treaties that resulted from major engagements gave more maritime rights to Russia (Ref. 10.113). By 1774, Russian merchant vessels could freely navigate the Black Sea and in the following decades foreign merchantmen were allowed to do so as well, thereby re-establishing a pan-European maritime commercial network.

The Black Sea experienced 20th century naval warfare during World War I. Turkey and Bulgaria joined with the Central Powers between 1914 and 1915, while Russia and Romania sided with the Allied forces. In response to bombing attacks by the Ottomans, Russia placed a series of sea-mines along the Anatolian coast and disrupted the transportation of coal, thereby crippling the Ottoman fleet (Ref. 10.113).

Archaeological remains from the post-medieval period can be found throughout Anatolia, especially at the site of Zeytinlik (Sinop) on the Black Sea coast and İznik on the Sea of Marmara, which consist primarily of Ottoman ceramic assemblages (Ref. 10.27 and Ref. 10.83). Maritime archaeology finds have also has been discovered. Underwater archaeological surveys off Sinop and Ereğli (Figure 10.3) in 2011 and 2012 located at least six shipwrecks that date from the 17th to the 19th century (Ref. 10.117, Ref. 10.119). Cargoes could not be identified on the majority of these sites, but in one case, cut timber was clearly determined to be cargo material. Archaeological examples of Ottoman-period shipwrecks have been found in southwest Turkey at Yassıada (Sea of Marmara), which exhibit skeleton-based (i.e. frame-based) construction methods (Ref. 10.120 and Ref. 10.121). Given the extensive maritime trade network that existed in and around the Black Sea during this period and the high preservation qualities of its anoxic waters, there is a high possibility that additional post-medieval-era shipwrecks exist in the Turkish waters of the Black Sea.

Two shipwrecks were discovered during the Project's marine surveys that originally lay (prior to pipeline re-routing) within the Zone of Potential Influence that potentially date to the post-medieval or modern period:

- *Wooden shipwreck (TK-MCH-001); and*
- *Wooden shipwreck (TK-MCH-002).*

Potential CHOs that are within the Survey Area but located further than 150 m from the proposed centreline of any of the four pipelines could also date to this period.

10.5.3.5 Modern Period (1922 to Present)

During the early 20th century, the political climate of Turkey changed with the creation of the Republic of Turkey in 1923. Turkey stayed largely neutral during World War II, but did join the Allied forces towards the end of the war. The refugee ship MV *Struma* was sunk by a Soviet submarine north of the Bosphorus Straits, over 100 km distant from the Project Area (Ref. 10.113).

Shipbuilding changed radically in the modern period. In the early to mid-19th century, metal started to be used more regularly for structural elements and eventually the hull; by the end of the century the majority of ships were being built completely out of iron and steel. Another revolutionary change came with the advent of marine steam engines, and later combustion engines, which had a resounding effect on how ships were built, manned, and operated.

Naval warfare was directly affected by these changes. As vessels became more robust and resilient as a result of their metal hulls, weaponry and ordinance were also redesigned to be more effective. Torpedoes, sea mines, and submarines were used quite extensively in naval combat starting at the end of the 19th century. In the 20th century, aircraft were introduced in military campaigns. During both World War I and World War II, the nearshore area of Turkey experienced significant naval activity from Russian forces (e.g. establishing minefields).

Two shipwreck sites were identified that originally lay (prior to pipeline re-routing) within the Zone of Potential Influence that potentially date to the post-medieval or modern period, noted in Section 10.5.3.4 above. For the purposes of this chapter they have been included in the post-medieval period. Potential CHOs that are within the Survey Area but located further than 150 m from the proposed centreline of any of the four pipelines could also date to this period.

10.5.3.6 Uncertain Date

Within the Survey Area, but outside the Zone of Potential Influence, 30 objects were identified as CHOs in the form of shipwrecks and 38 objects have been identified as potential CHOs. This assessment is based on the size (greater than 5 m long), shape, height off the bottom, and acoustic reflectivity of the objects in the side-scan sonar images. Specific temporal classifications cannot be made at this time based solely on the sonar images, but it is believed the ages of these objects span from the Antique period to the Modern era.

There is the potential for currently unknown or unregistered CHOs to exist in the offshore section that lack archaeological context (isolated or chance finds). These may include nautical items that were lost while sailing (e.g. anchors, trade goods), heavy objects jettisoned during inclement weather or conflict, disarticulated ship remains, remains of 19th and 20th century conflict, intentionally scuttled or abandoned material, and un-associated debris or garbage.

10.5.4 Intangible Cultural Heritage

Intangible cultural heritage refers to cultural resources, knowledge, innovations and/or practices of local communities embodying traditional lifestyles (Ref. 10.20). With reference to IFC PS8 paragraph 3 (iii) (Ref. 10.13), the Project does not propose to use any intangible forms of culture for commercial purposes. The UNESCO Representative List of the Intangible Cultural Heritage of Humanity supports the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage. There are no marine or nautical-related nationally, regionally or locally registered elements of intangible cultural heritage or Turkish Living Human Treasures in the vicinity of the Project (Ref. 10.20 and Ref. 10.22).

Some Turkish festivals are related to rituals and beliefs associated with the Black Sea. The Black Sea is thought to have healing powers, and these powers are sought during the Alaturbi Festival, celebrated from late May to early July in the communities of Akçaabat and Beşikdüzü, west of Trabzon (Ref. 10.123). While the festival celebrates and honours the sea, the restorative powers of the sea are sought by those suffering aches, pains, and epilepsy. Healing is sought through three methods. Those physically able to, and who can do so safely, jump into the water fully immersing themselves and swimming. Less physically able pilgrims may take a bath in seawater. Others, with presumably less onerous ailments, seek the healing powers of the Black Sea from the deck of a boat traversing the waters. The Black Sea is enmeshed in well-known legends and cross-cultural epics. The Black Sea was the setting for the voyage of Jason and his fellow crew on the *Argo*. The fictional voyage to Colchis, in present day Georgia, in search of the Golden Fleece, would have taken the Argonauts along the northern coast of Turkey, certainly in sight of land. The legendary crew would have used northern Turkey to replenish supplies and drinking water. The Black Sea of the Neolithic is hypothesised to have figured in an event that was passed down to eventually be recorded in early written works. A catastrophic inflow of water from the Mediterranean Sea into the Black Sea approximately 7,000 years ago may be the source of the Great Flood narrative told in several cultures, including several versions of the Mesopotamian Flood myth and the story of Noah's flood (Ref. 10.124).

The Project is unlikely to impact any intangible cultural heritage given the distance from the coast and, as such, this is not considered further in the impact assessment.

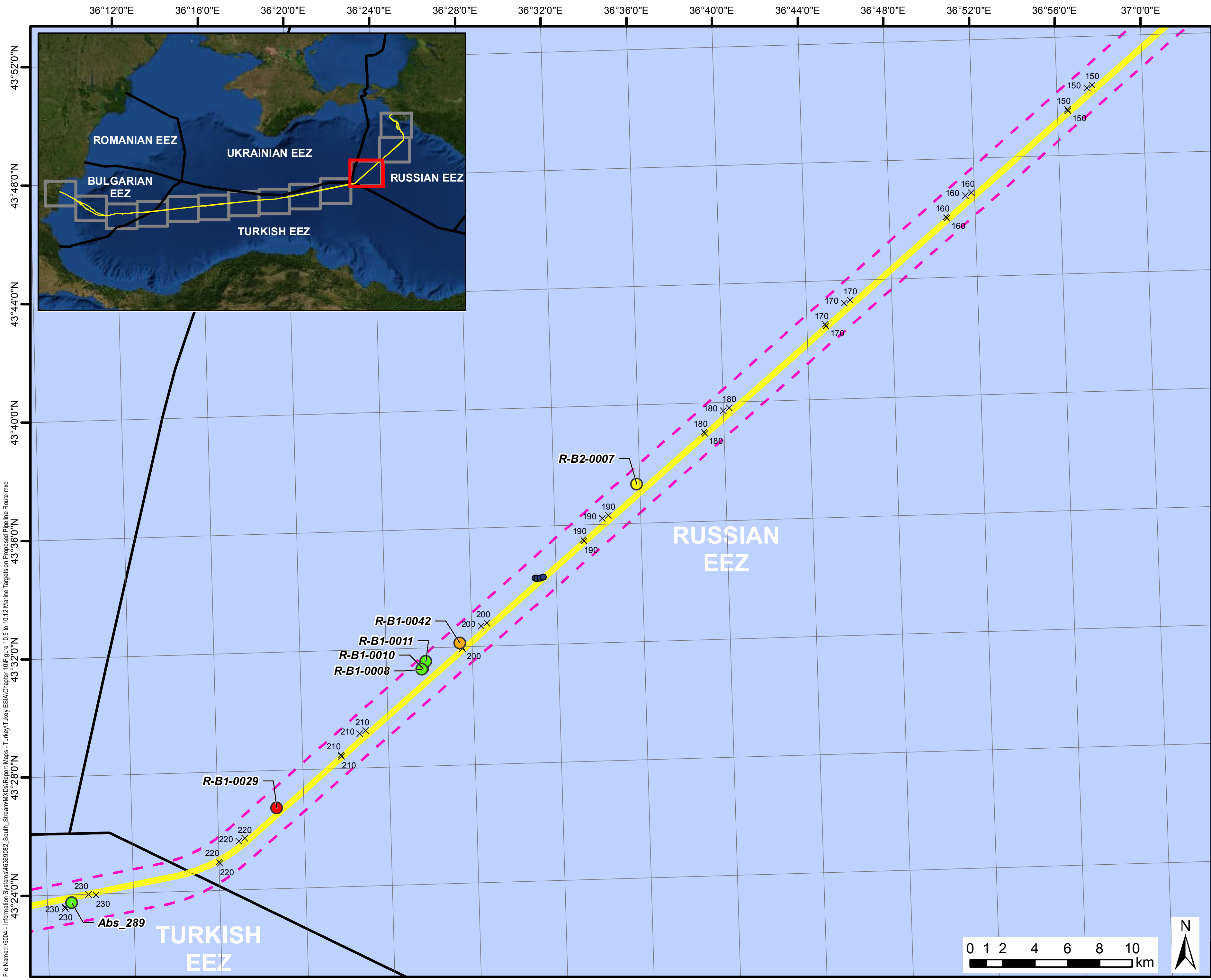
10.5.5 Baseline Summary

The previous section has described the wider archaeological, historical and cultural context. This section focuses on receptors located within the Study Area (Figure 10.5 to Figure 10.12 in Section 10.5). Table 10.5 presents an overall summary of marine cultural heritage receptors and the distances to the nearest pipeline. Sites in ***bold italic*** type are those that were considered to be vulnerable to Project impacts and are discussed further in this chapter (Section 10.6).

Table 10.5 Cultural Heritage Receptors in the Project Area

Date	Marine	Distance from Nearest Pipeline Centreline
Lower Palaeolithic to Antiquity	No dated sites identified within the Project Area	
Medieval and Post-medieval	***Wooden shipwreck (TK-MCH-001)*** in the Zone of Potential Influence	Within 150 m (prior to re-routing of the pipelines)
	Wooden shipwreck (TK-MCH-002) in the Zone of Potential Influence	
Modern	No dated sites identified within the Survey Area	
Uncertain date	30 submerged CHOs in the Survey Area	Over 150 m but within the Survey Area (approximately 2 km wide area centred on the original proposed Pipeline route centreline)
	38 submerged potential CHOs in the Survey Area*	
Intangible cultural heritage	No receptor identified within the Project Area	

* The original total was 44 potential CHO in the Survey Area, 6 of which were in the zone of potential influence. Subsequently these 6 were found not to be CHOs and so have not been included in this table. See Section 10.5.5.1 for further details.



LEGEND

Turkish Sector of South Stream Offshore Pipeline

- Proposed offshore pipelines
- 10km markers

Marine Targets

Distance from pipeline

- < 50m
- 50 - 100m
- 100 - 150m
- > 150m

Seabed Intervention

- Crossings
- Free spans (dynamic)
- Free spans (static)
- Rockfall protection
- Turbidity current
- 300m isobath
- Survey area
- Exclusive Economic Zone boundary

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
MARINE TARGETS ON PROPOSED PIPELINE ROUTE

Drawn	Checked	Approved	Date
DH/KJM	BS	MW	31/03/14

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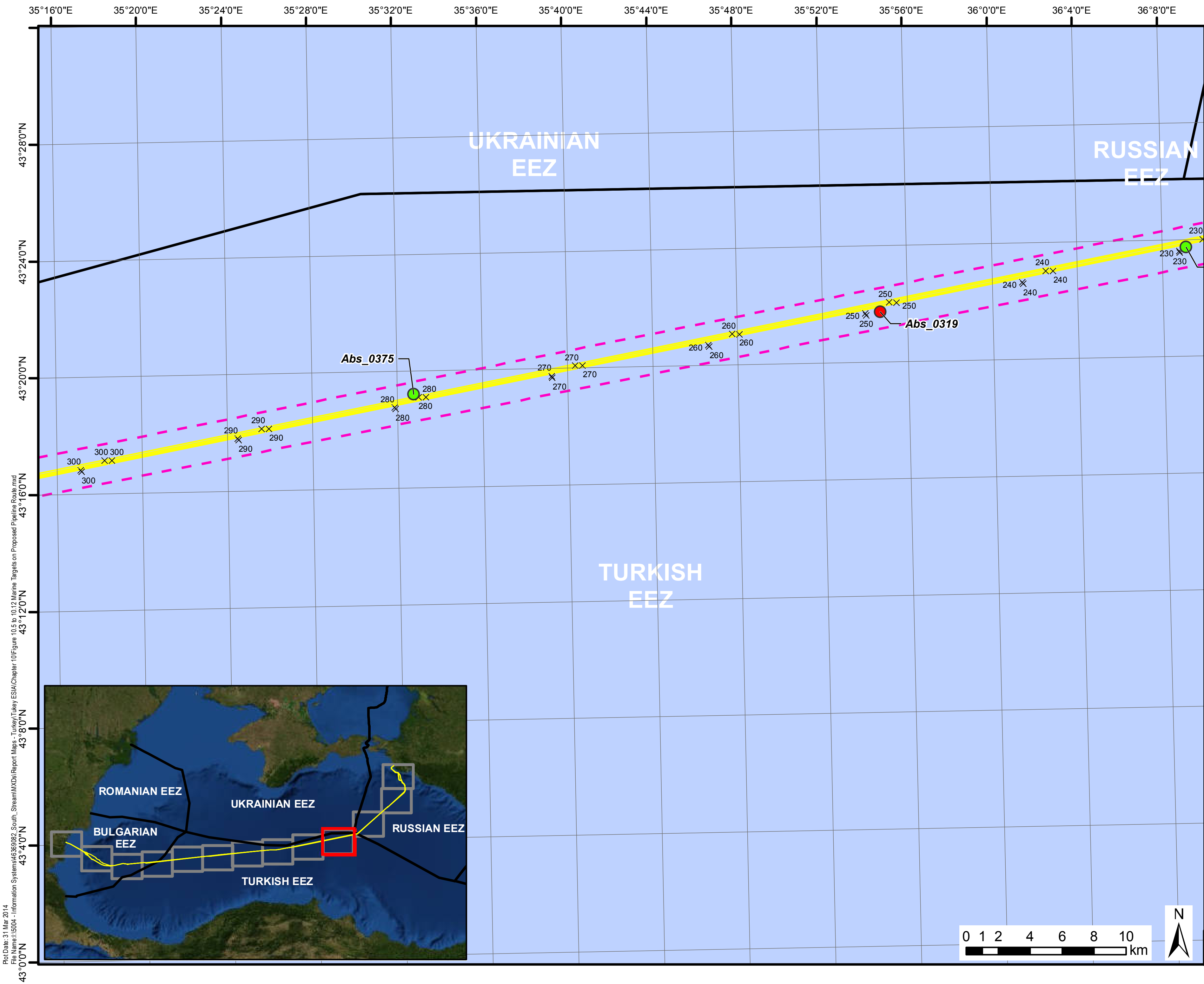

LEGEND

Turkish Sector of South Stream Offshore Pipeline

- Proposed offshore pipelines
- 10km markers

Marine Targets

Distance from pipeline

- < 50m
- 50 - 100m
- 100 - 150m
- > 150m

Seabed Intervention

- Crossings
- Free spans (dynamic)
- Free spans (static)
- Rockfall protection
- Turbidity current
- 300m isobath
- Survey area
- Exclusive Economic Zone boundary

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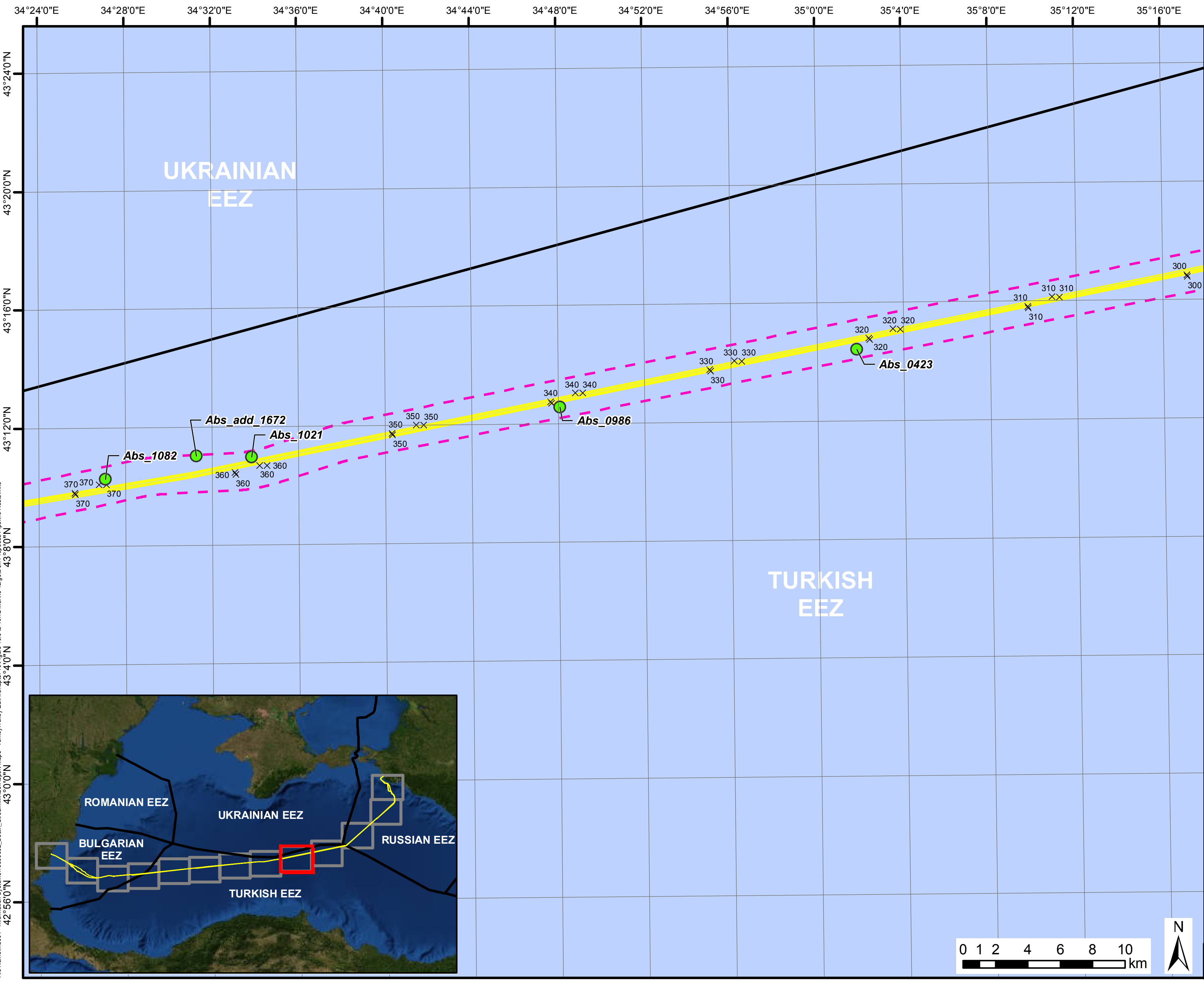

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Drawing Title
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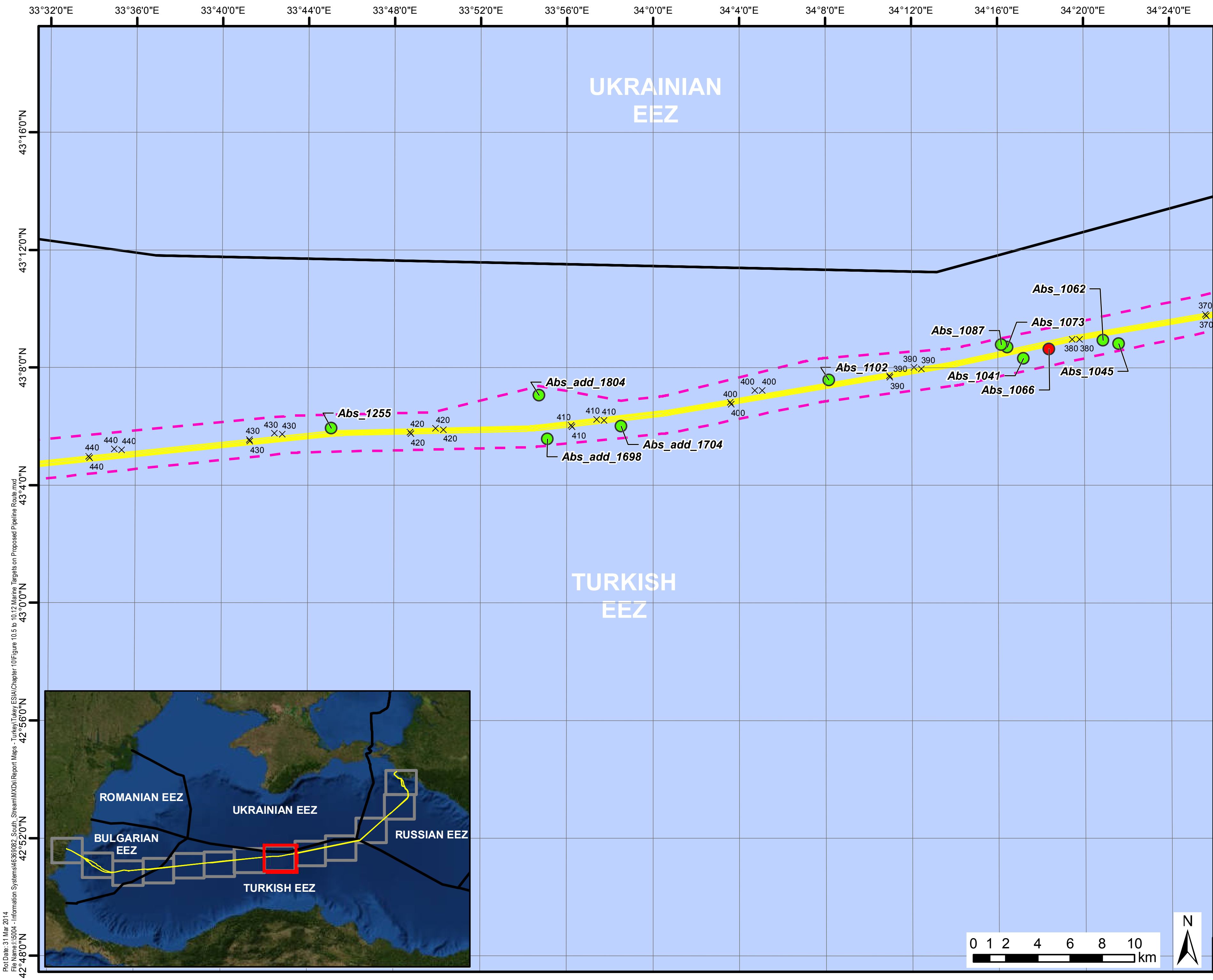

LEGEND

Turkish Sector of South Stream Offshore Pipeline

- Proposed offshore pipelines
- 10km markers

Marine Targets

Distance from pipeline

- < 50m
- 50 - 100m
- 100 - 150m
- > 150m

Seabed Intervention

- Crossings
- Free spans (dynamic)
- Free spans (static)
- Rockfall protection
- Turbidity current
- 300m isobath
- Survey area
- Exclusive Economic Zone boundary

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

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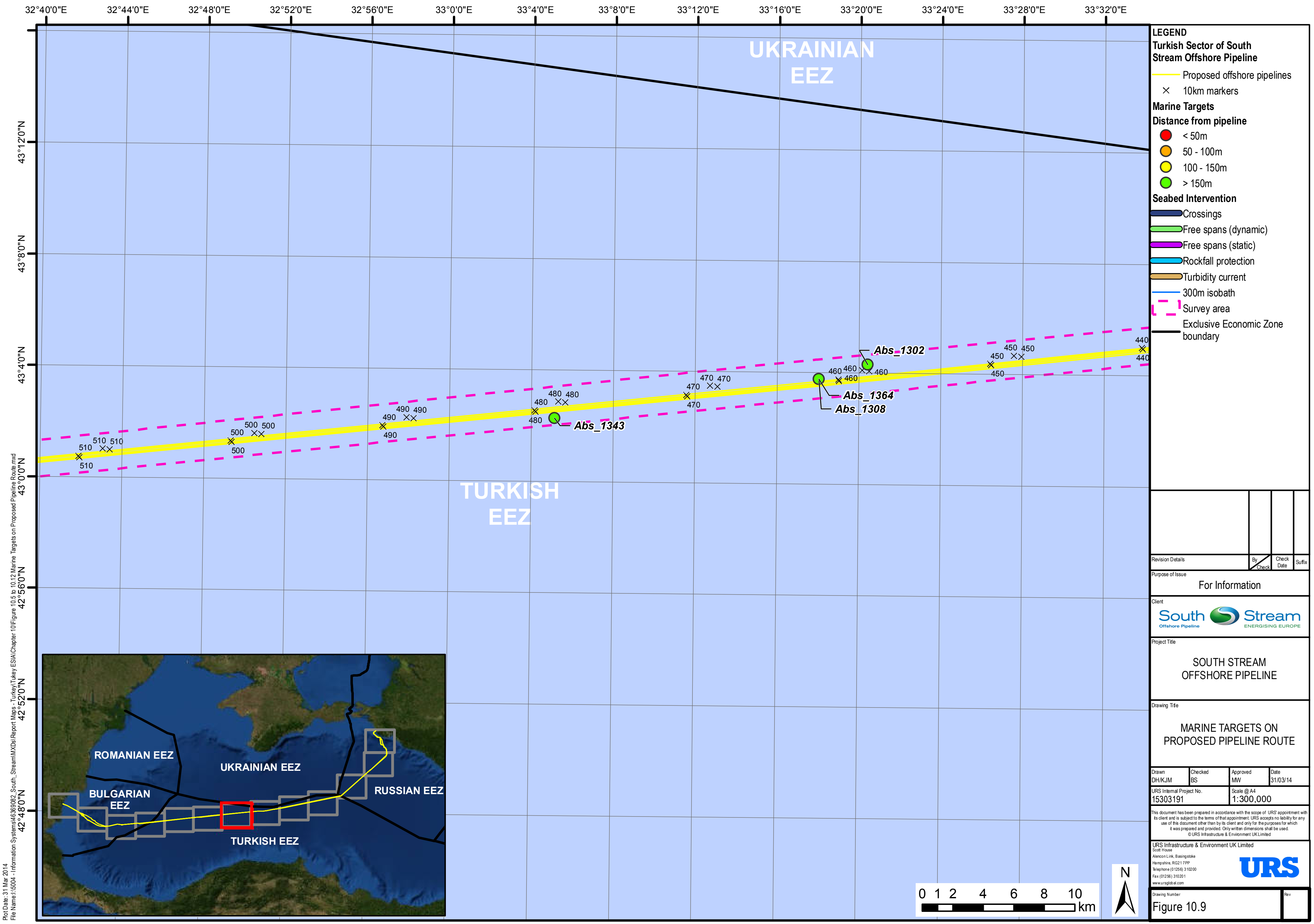

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LEGEND
Turkish Sector of South Stream Offshore Pipeline
Proposed offshore pipelines
10km markers
Marine Targets
Distance from pipeline
< 50m
50 - 100m
100 - 150m
> 150m
Seabed Intervention
Crossings
Free spans (dynamic)
Free spans (static)
Rockfall protection
Turbidity current
300m isobath
Survey area
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Client
South Stream Offshore Pipeline ENERGISING EUROPE
Project Title
SOUTH STREAM OFFSHORE PIPELINE
Drawing Title
MARINE TARGETS ON PROPOSED PIPELINE ROUTE
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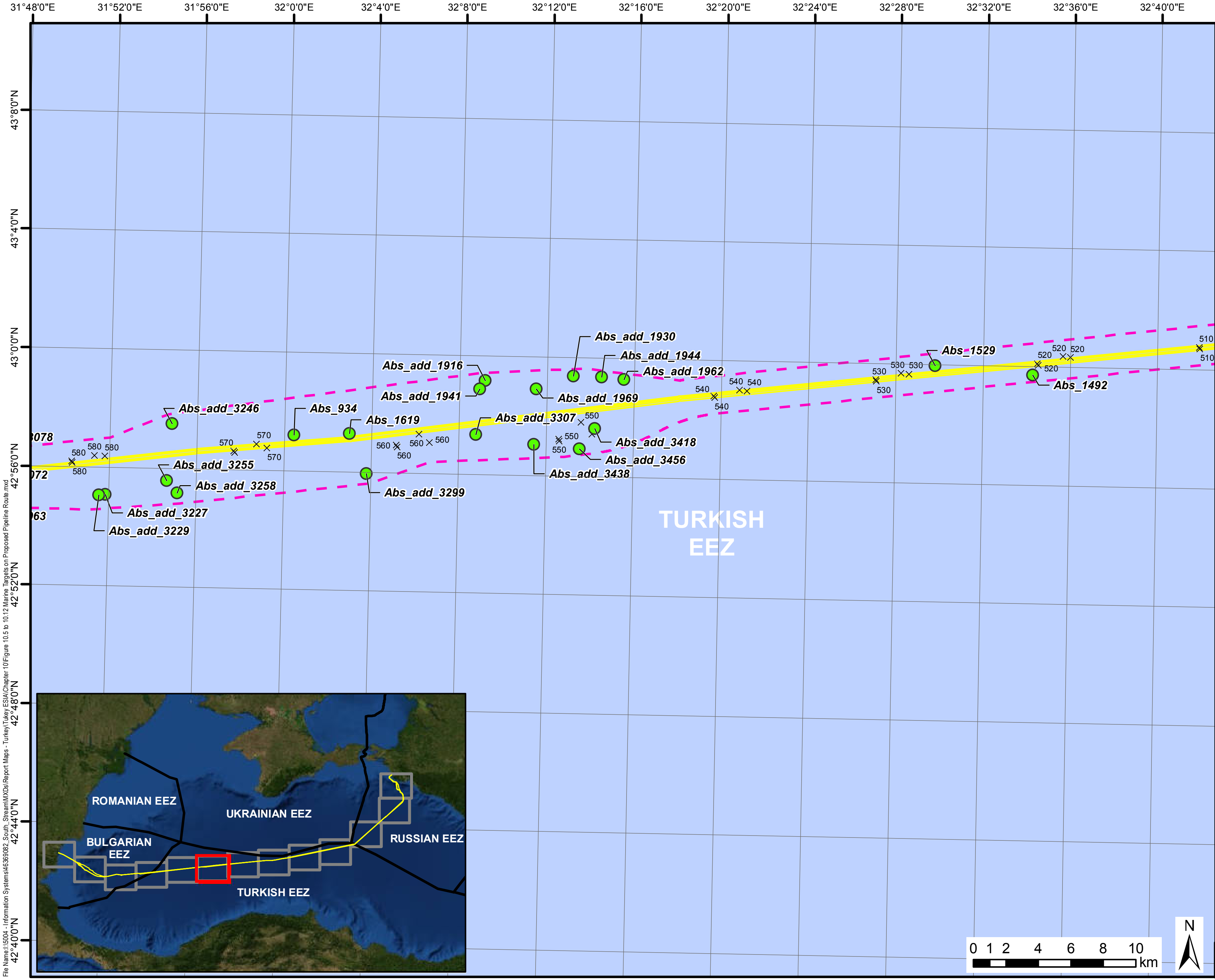

LEGEND

Turkish Sector of South Stream Offshore Pipeline

- Proposed offshore pipelines
- 10km markers

Marine Targets

Distance from pipeline

- < 50m
- 50 - 100m
- 100 - 150m
- > 150m

Seabed Intervention

- Crossings
- Free spans (dynamic)
- Free spans (static)
- Rockfall protection
- Turbidity current
- 300m isobath
- Survey area
- Exclusive Economic Zone boundary

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

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Project Title: SOUTH STREAM OFFSHORE PIPELINE

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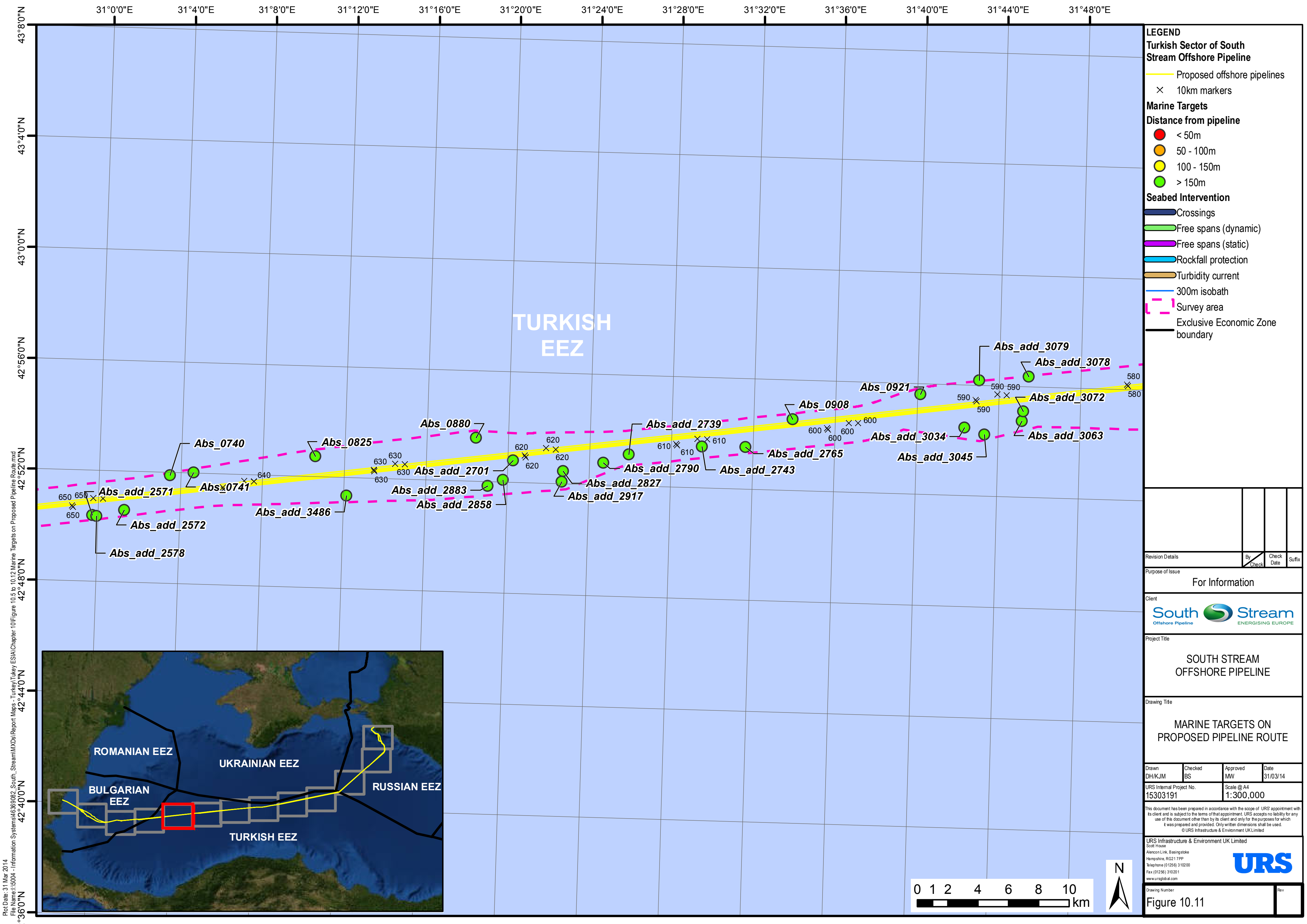

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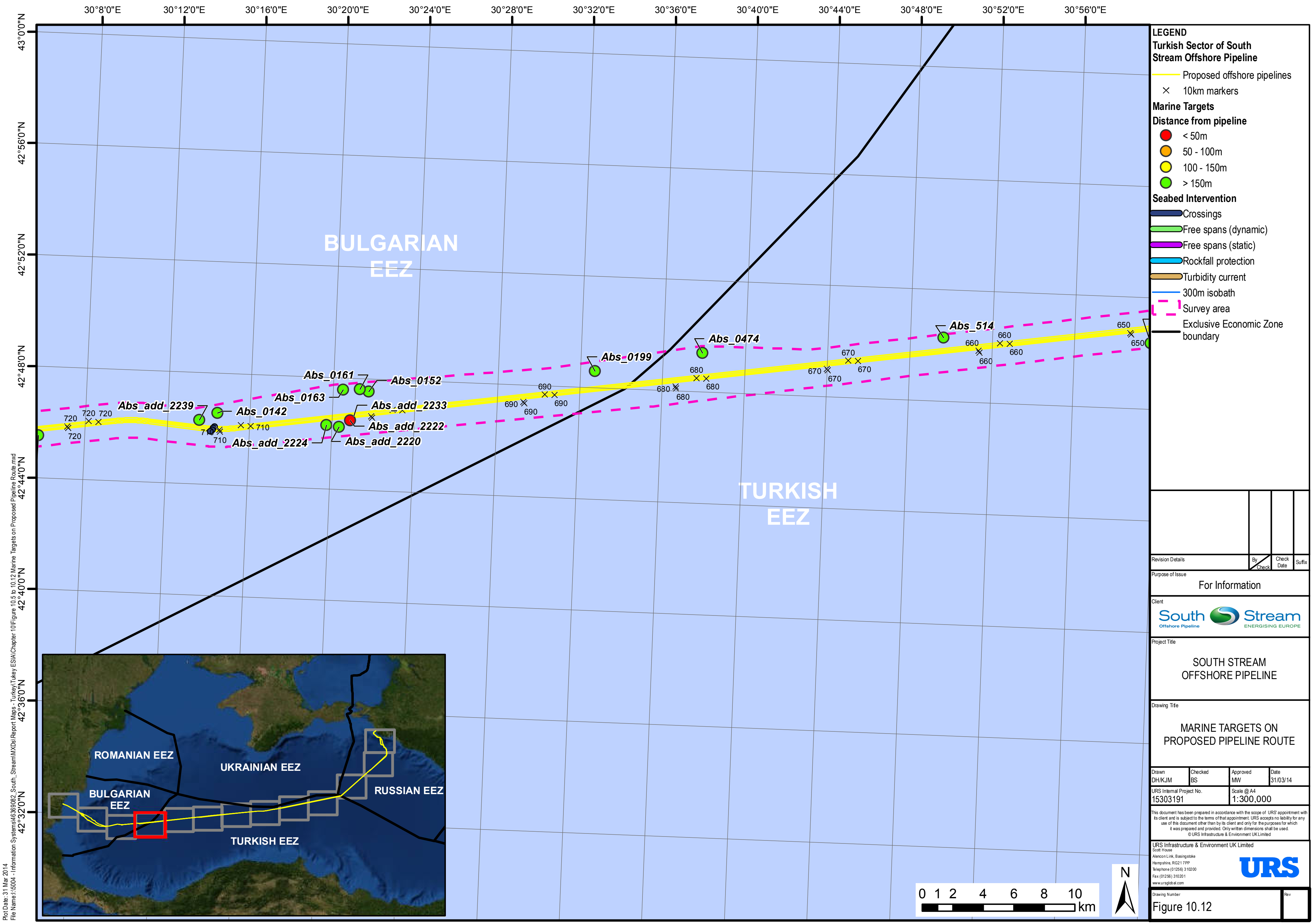

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10.5.5.1 Baseline Conditions

As shown in Table 10.6, the marine environment has a high potential to feature the following cultural heritage: shipwrecks; maritime structures and objects; and remains associated with 19th and 20th century conflict. As a result of the anoxic conditions in the Black Sea, which inhibit corrosion and microbial degradation, the preservation potential for any CHO is greatly enhanced below a water depth of 120 m to 200 m.

Geophysical field surveys conducted in 2011 and 2012 discovered a total of 76 potential CHOs within the Survey Area i.e. within a minimum 2 km wide area centred on the original proposed pipeline route centreline in the Turkish EEZ, eight of which were within the Zone of Potential Influence i.e. within 150 m of the proposed centreline of the nearest pipeline (Table 10.6; Refs. 10.50 to 10.60). Figure 10.5 to Figure 10.12 in Section 10.5 show the geographical distribution of these targets.

Table 10.6 Marine CHOs and Potential CHOs within the Survey Area

Oceanographic Region	Number of CHOs and Potential CHOs within Survey Area (2 km wide area centred on the original proposed Pipeline route centreline)	Number of CHOs and Potential CHOs within Zone of Potential Influence (150 m of the nearest pipeline centreline)
Abyssal plain	76 (following further investigation this number was reduced to 70, see Section 10.5.5.2)	8 (following further investigation this number was reduced to 2, see Section 10.5.5.2)

10.5.5.2 Objects within the Zone of Potential Influence (150 m of the Centreline of Any of the Four Proposed Pipeline Routes)

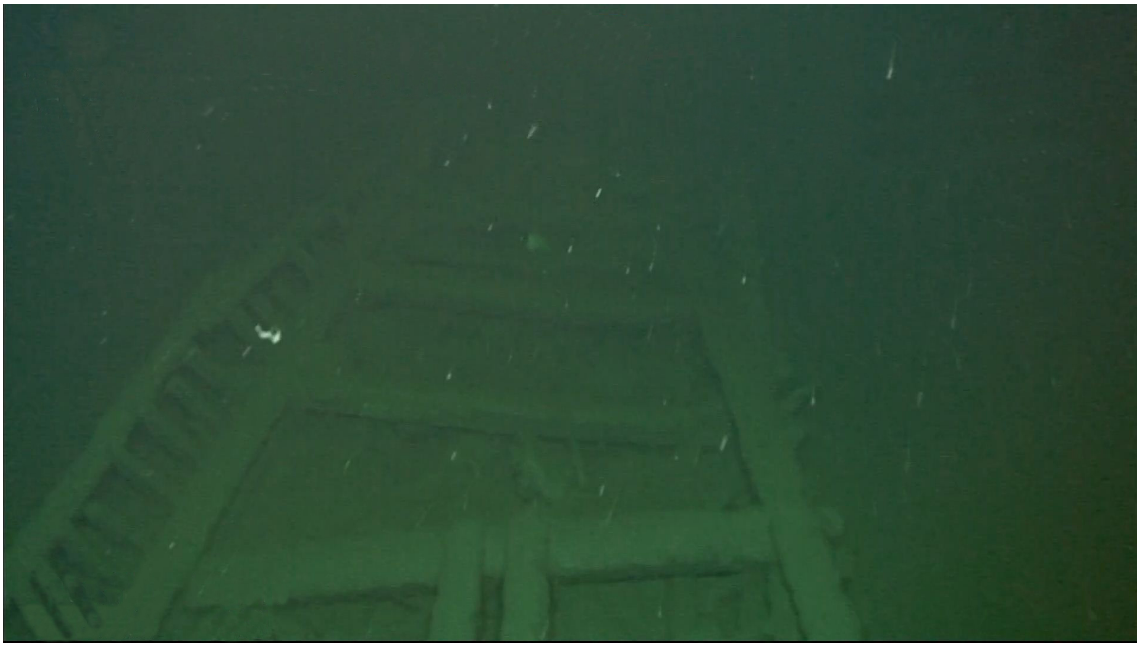
There were a total of eight potential CHOs within the Zone of Potential Influence i.e. within 150 m of the centreline of any of the four proposed pipeline routes. All of these targets received inspection via ROV in order to determine their identity and potential cultural heritage significance. Six of these potential CHOs (targets Abs_0362, Abs_0364, Abs_1014, Abs_add_2675, Abs_add_2727, and Abs_add_3289) proved to be logs, trees, and modern objects of no cultural heritage significance thereby reducing the total number of CHOs and potential CHOs within the Survey Area from 76 to 70 (Table 10.6). Two of these targets (TK-MCH-001 and TK-MCH-002) were subsequently positively identified as CHOs that range in date potentially from the post-medieval period to the modern period. The locations of these objects are shown on Figure 10.5 to Figure 10.12 in Section 10.5, whilst an illustrated inventory is presented in Appendix 10.2. These two objects are discussed in the following paragraphs.

Object TK-MCH-001 (recorded during original surveys as target Abs_0319) is a wooden shipwreck that lies at a depth of approximately 2,170 m on the abyssal plain (Figure 10.13). The wreck is partially buried beneath the seafloor, but has a good amount of exposed hull material. The tops of the frames, the stern post, and the stem are all visible. The transom is flat and composed of large, horizontal transom timbers, while four thwart timbers span the entire width of the vessel. Planking has come loose from the upper portion of the frames, and the bow consists of mostly disarticulated timbers. There is no clear evidence of cargo, but there are objects within the hull that are covered by a layer of sediment. The wreck site measures approximately 7.8 m long by 4.3 m wide, and likely dates to the Post-Medieval to Modern period (18th to 19th century). Prior to re-routing of the Pipeline it was located approximately 30 m north of the centreline of the proposed route of Pipeline 4. It now lies approximately 310 m north of the centreline of the route of Pipeline 4 following re-routing undertaken in February 2014.

Figure 10.13 ROV Image of Object TK-MCH-001

Object TK-MCH-002 (recorded during original surveys as target Abs_1066) is a wooden shipwreck that lies at a depth of approximately 2,190 m on the abyssal plain Figure 10.14. The wreck is partially buried beneath the seafloor, but has a good amount of exposed hull material. Frames and gunwales are visible on both sides, which are mostly intact. At least six thwarts span the entire width of the vessel, and two short, longitudinal timbers rest upon the two centre-most thwarts, possibly a mast step. There is no clear evidence of cargo, but there are objects within the hull that are covered by a layer of sediment; these include stacked timbers at the stern of the vessel and a pile of debris near amidships. The wreck site measures approximately 11.8 m long by 5.6 m wide, and likely dates to the Post-Medieval to Modern period (18th to 19th century). Prior to re-routing of the pipeline it was located approximately 5 m north of the centreline of the proposed route of Pipeline 4. It now lies approximately 185 m north of the centreline of the route of Pipeline 4 following re-routing undertaken in February 2014.

Figure 10.14 ROV Image of Object TK-MCH-002



10.5.5.3 Objects outside the Zone of Potential Influence but within the Survey Area

Thirty (30) of the 68 objects located outside the Zone of Potential Influence but within the Survey Area have been identified as shipwrecks, and 38 objects have been identified as being potential CHOs on the basis of their size (greater than 5 m long), shape, height off the bottom, and acoustic reflectivity in the side-scan sonar images (Appendix 10.2).

10.5.6 Critical Cultural Heritage

The Project does not have the potential to impact any critical cultural heritage, as defined in IFC PS8 (Ref. 10.13), or proposed national monuments. The nearest Turkish World Heritage property is the city of Safranbolu (WHS614), located on the northern Turkish coastline approximately 260 km from the Project Area.

10.5.7 Palaeontological Heritage

The underlying geology of the area comprises a system of ridges of the Black Sea Caucasus, folded Palaeozoic Era structures (c.541 to 252.2 Ma) and Jurassic (c.201 to 152 Ma) and Cretaceous (c.145 to 72 Ma) period strata (Ref. 10.125; periods defined by the International Commission on Stratigraphy v2013/01, Ref. 10.68). For further details on geology and soils, see **Chapter 7 Physical and Geophysical Environment**.

The Black Sea region was submerged beneath an ocean during the Mesozoic Era (c.252 to 66 Ma), and it is rich in marine fossils of the Miocene (c.23 to 5 Ma) and Pliocene (c.5 to 2.5 Ma) series, including molluscs, gastropods and bivalves; the fossilised bones of sea turtles and cetaceans have also been found. These deposits are frequently revealed in cliff faces and eroded river and stream channels. Above these fossiliferous deposits is a mantle of Quaternary Period (c.2.6 Ma to present) deposits, comprising soils and coastal marine sediments. Sediments may contain climatic and environmental indicators such as diatoms, ostracods and foraminifera (Ref. 10.126). Other fossil bearing deposits are as follows:

- The Palaeozoic basement may contain remains of Carboniferous (c.358 to 323 Ma) marine fossils (conodonts, brachiopods, corals, echinoderms, mollusca, benthonic foraminifera; plant microflora, branches, leaves) and Permian (c.300 to 252 Ma) plant microflora;
- Jurassic strata (c.208 to 146 Ma) may contain fossils of ichthyosaurs and plesiosaurs, fish, bivalves, belemnites, brachiopods, echinoids, starfish, sponges and ammonites; and
- Cretaceous strata (c.146 to 65 Ma) may contain fossil remains of sharks, rays, fish, ichthyosaurs, plesiosaurs, mosasaurs, baculites, marine diatoms (Ref. 10.127 and Ref. 10.128).

The Cenozoic Era (c.65 Ma to present) saw the development of mammals, birds, protozoa and flowering plants. Cenozoic fossils from limestone areas include marine fauna such as shells, sea urchins, sharks, marine reptiles, whilst terrestrial fauna included reptiles, birds and mammals.

During the Quaternary Period (2.6 Ma to present), a series of repeated glaciations during the Pleistocene Epoch (1.8 Ma to 11,700 BP) saw the extinction of large mammals. Faunal and botanical remains and a collection of lithic artefacts have been recovered from Lower Palaeolithic sites of Domuzdere and Ağaçlı along the Black Sea coast (Ref. 10.65, Ref. 10.66).

The Project Area has always been a submerged environment, thereby eliminating the potential for Quaternary Period megafauna or prehistoric habitation. However, Quaternary sediments, in particular marine sediment sequences, have the potential to contain evidence for past climatic and environmental conditions, including evidence of sea level changes. Such sediments are present across the entire Black Sea marine region, and are subject to extensive ongoing targeted research programmes; deposits in the vicinity of the proposed pipeline route do not present any specific interests or research targets.

10.5.8 Baseline Summary

The Project Area contains two CHOs within the Zone of Potential Influence (within 150 m of the centreline of any of the four pipelines prior to re-routing) and 68 objects (30 CHOs and 38 potential CHOs) further than 150 m from the pipeline centrelines but within the Survey Area. The Project Area does not contain any World Heritage sites or known tangible or intangible archaeological or cultural heritage features of international significance. No intangible cultural heritage (such as specific notable or listed cultural traditions) related to the Project Area, and that could be exploited for commercial purposes, has been identified.

10.6 Impact Assessment

This section discusses the potential cultural heritage impacts associated with the Project and the requirement for mitigation. Impacts to marine cultural heritage receptors may arise during the Construction and Pre-Commissioning, Operational and Decommissioning Phases of the Project.

10.6.1 Impact Assessment Methodology

The impact assessment methodology specific to cultural heritage, presented in this section, builds upon the general assessment methodology summarised in **Chapter 3 Impact Assessment Methodology**. The methodology is then developed specifically in relation to cultural heritage receptors in relation to impacts arising from the construction, operation and decommissioning of the Project, as is further outlined below.

10.6.2 Applicable Standards

10.6.2.1 National Legislation

As detailed in **Chapter 2 Policy, Regulatory and Administrative Framework**, this cultural heritage assessment has taken into consideration national legislation, including the Turkish Law on the Conservation of Cultural and Natural Property (1983, Law No. 2863, last amended February 2008), Environmental Act, Law No. 2872 (1983), and EIA Regulation No. 21498 (1993). Cultural heritage protection measures are legally regulated by national laws, regulations and ordinances, and by international conventions ratified by Turkey.

There is no distinction made between general terrestrial cultural heritage and underwater cultural heritage in the relevant legislation. The Turkish Law on the Conservation of Cultural and Natural Property (Ref. 10.2) covers both. All zones in need of protection and a subsequent prohibition for unauthorised diving have been declared in Article 35 of the law (the zoning information was published in 1989 and subsequently amended). The law states that a permit is required for archaeological diving anywhere in Turkish waters. Only licenced archaeologists (academics and qualified researchers) can obtain a permit for this type of work in Turkey. Turkey has a centralised administration where the Ministry of Culture and Tourism has jurisdiction over underwater cultural heritage and the Turkish Coast Guard is responsible for the enforcement of the prohibitions at the registered archaeological sites within the territorial waters.

Key national standards include:

- Law on the Conservation of Cultural and Natural Property (23 July 1983, Law No. 2863, last amended February 2008) (Ref. 10.2);
- Regulation on the Collection and Control of Movable Cultural and Natural Property to be Protected (17 January 1984) (Ref. 10.5);
- Regulation on Treasure Hunting (1984) (Ref. 10.6);
- Regulation on Survey, Sounding and Excavation to be Performed in Relation to Cultural and Natural Property (10 August 1984) (Ref. 10.7);
- Regulation on the Identification and Registration of Immovable Cultural and Natural Property to be Protected (10 December 1987) (Ref. 10.8); and

- Regulation on the Classification, Registration and Admission to the Museum of the Movable Cultural and Natural Assets Requiring Preservation (20 April 2009) (Ref. 10.9).

Turkey is party to a number of European cultural heritage instruments, including:

- European Cultural Convention (1954) (entered into force: 10 October 1957) (Ref. 10.129);
- European Convention on Offences relating to Cultural Property (1985) (signature: 26 September 1985) (Ref. 10.130);
- European Convention for the Protection of the Architectural Heritage of Europe (Granada Convention, 1985) (entered into force: 1 February 1990) (Ref. 10.131); and
- European Convention on the Protection of the Archaeological Heritage (Valetta Convention, revised, 1992) (entered into force: 30 May 2000) (Ref. 10.132).

10.6.2.2 International Agreements

The Republic of Turkey has ratified a number of international conventions regarding cultural heritage including various conventions of the Council of Europe (CoE), ICOMOS and the UNESCO, which are set out in Table 10.7 (Ref. 10.1, Ref. 10.40 and Refs. 10.129 to 10.138).

Table 10.7 Summary of Relevant International Agreements

Agreement and Objective	Objective	Date of Ratification
UNESCO 1954 Convention for the Protection of Cultural Property in the Event of Armed Conflict with Regulations for the Execution of the Convention (The Hague Convention)	To ensure that cultural property and goods are protected during times of war and/or armed conflict through the adoption and use of protective signage.	Accession 15 Dec 1965
UNESCO 1970 Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (Convention on Cultural Property)	Prohibits and prevents the illicit import, export and transfer of ownership of cultural property and aims to discourage the pillage of archaeological sites and cultural heritage by controlling international trade in looted antiquities through import controls and other measures.	21 Apr 1981
UNESCO 1972 Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)	To ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage on its territories.	16 Mar 1983

Continued...

Agreement and Objective	Objective	Date of Ratification
UNESCO 2003 Convention for the Safeguarding of the Intangible Cultural Heritage	To safeguard and ensure respect for the world's Intangible Cultural Heritage, including raising awareness of the importance of intangible heritage and encouraging international cooperation and assistance.	27 Mar 2006
CoE 1954 European Cultural Convention	To develop mutual understanding among the peoples of Europe and reciprocal appreciation of their cultural diversity, to safeguard European culture, to promote national contributions to Europe's common cultural heritage respecting the same fundamental values.	10 Oct 1957
CoE 1985 European Convention on Offences relating to Cultural Property	Promotes the safeguard and protection of Europe's heritage from pillage, theft, destruction, illegal transfer, and any other unlawful activity.	26 Sep 1985
CoE 1985 Convention for the Protection of the Architectural Heritage of Europe (Granada Convention)	Reinforces and promotes policies for conserving and enhancing Europe's heritage. Affirms the need for European solidarity with regard to heritage conservation and fosters practical co-operation among the Parties.	11 Oct 1989 (entered into force 1 Feb 1990)
CoE 1992 European Convention on the Protection of the Archaeological Heritage (Valetta Convention)	Promotes the protection of archaeological sites, remains, objects, and areas of interest; to prohibit and restrain illicit excavations; to take the necessary measures to ensure that excavations are authorised and entrusted only to qualified persons; and to control and protect the results obtained.	Entered into force 30 May 2000
ICOMOS 1990 Charter for the Protection and Management of the Archaeological Heritage (Lausanne Charter)	Notes that archaeological heritage is a fragile and non-renewable cultural resource, and that policies for the protection of the archaeological heritage should be integrated into land use, development, planning, cultural, environmental and educational policies. Sets out principles of survey, investigation, maintenance, protection, presentation, information, reconstruction, training, international cooperation.	11 Oct 1990

Continued...

Agreement and Objective	Objective	Date of Ratification
ICOMOS 1996 Charter for the Protection and Management of the Underwater Archaeological Heritage (Sofia Charter)	This Charter, intended as a supplement to the ICOMOS Charter for the Protection and Management of Archaeological Heritage, is intended to encourage the protection and management of underwater cultural heritage in inland and inshore waters, in shallow seas and in the deep oceans. Defines fundamental principles, project design, funding, time-table, research objectives, methodology, techniques, and qualifications.	9 Oct 1996

Complete.

10.6.2.3 Standards and Guidelines for Financing

IFC Performance Standard and Guidance on Cultural Heritage (Ref. 10.13 and Ref. 10.14) aims to protect cultural heritage from the adverse impacts of Project activities and supports its preservation, in accordance with the World Heritage Convention (Ref. 10.1). Its scope includes:

- Tangible cultural heritage with archaeological, palaeontological, historical, cultural, artistic, and religious values. These are present in the Project Area;
- Unique natural features or tangible objects that embody cultural values, such as sacred groves, sacred trees, rocks, lakes, and waterfalls. These are not present in the Project Area;
- Intangible forms of culture proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles. These are not present in the Project Area; and
- Critical Cultural Heritage – internationally recognised or legally protected cultural heritage areas, including proposed World Heritage Sites. Heritage of communities who use, or have used within living memory, the cultural heritage for long-standing cultural purposes. These are not present in the Project Area.

In addition, this cultural heritage assessment has been developed with reference to the OECD Common Approaches (Ref. 10.15).

Where further detailed guidance was needed and was not covered by the IFC PS or OECD Common Approaches, the Project has referred to UNESCO and ICOMOS guidance as appropriate.

10.6.3 Impact Assessment Criteria

The criteria used to assess the potential impacts upon cultural heritage receptors follow the current international standard for cultural heritage impact assessment, issued by the International Council on Monuments and Sites (Ref. 10.139). It is acknowledged that this current international standard contains much reference to World Heritage, but the assessment tools contained within its appendices are applicable to all cultural heritage. It has been adapted for Turkey by applying tiered national standards based on the designation level of known monuments. Cultural monuments are classified according to national standards by type and their significance to Turkish culture and history.

10.6.3.1 Receptor Sensitivity Criteria

Identified cultural heritage receptors have been evaluated for their sensitivity in accordance with Table 10.8 which presents a description of receptor sensitivity, (using the categories high, moderate, low and negligible) and highlights relevant applicable legal standards. The terms high, moderate, low and negligible are terms which correlate to the impact assessment matrix which applies to the whole ESIA Report (**Chapter 3 Impact Assessment Methodology**[5]). Legal standards are detailed in **Chapter 2 Policy, Regulatory and Administrative Framework** and in Section 10.6.2.1.

The sensitivity of marine cultural heritage receptors also reflects how vulnerable or robust an object, site, monument, artefact, assemblage or complex is to damage or destruction by a number of factors, including:

- Natural conditions, such as erosion, and chemical deterioration;
- Environmental conditions, such as faunal and floral impacts;
- Human conditions, such as vandalism or interference, recreational use, e.g. vehicle damage, anchor strike; and
- Project-related conditions, including construction and operational impacts.

[5] This is comparable to the categorisations adopted by national standards; the terms High and Major are deemed equivalent. The overall matrix for this ESIA Report has no 'Very High' category, and for this reason the 'High' category conflates sites of national and international sensitivity. No World Heritage Sites or proposed World Heritage Sites will be impacted by the Project.

Table 10.8 Cultural Heritage Receptor Sensitivity

Sensitivity and Value	Description, Based on ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (Appendices 3A and 3B)	Applicable Legal Standards*
High	Sites of acknowledged international importance inscribed as World Heritage Sites. Individual attributes that convey Outstanding Universal Value. Nationally-designated archaeological sites, protected by national laws. Undesignated sites of demonstrable national value. Assets that can contribute significantly to acknowledged national or international research objectives, whether designated or not. Well or extremely well preserved historic seascapes with considerable or exceptional coherence, time-depth, or other critical factors.	*International:* UNESCO World Heritage Sites UNESCO Representative List of the Intangible Cultural Heritage of Humanity IUCN Marine Protected Areas (Category III Natural monuments or features, including shipwrecks and cultural sites) UNESCO Geoparks (with cultural heritage and/or palaeontology linkage) UNESCO MAB Biosphere Reserves (with cultural heritage linkage) Ramsar Convention on Wetlands of International Importance sites (with cultural heritage linkage) *Turkey:* Law on the Conservation of Cultural and Natural Property (1983) National and regional databases of underwater cultural heritage Bathymetric and shipwreck data of the Turkish Office of Navigation, Hydrography and Oceanography Turkish Living Human Treasures database
Moderate	Designated or undesignated sites, or seascapes that can contribute significantly to regional research objectives. Designated or undesignated historic seascapes of regional value, which would warrant designation.	*Turkey:* Law on the Conservation of Cultural and Natural Property (1983) National and regional databases of underwater cultural heritage Bathymetric and shipwreck data of the Turkish Office of Navigation, Hydrography and Oceanography Turkish Living Human Treasures database

Continued...

Sensitivity and Value	Description, Based on ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (Appendices 3A and 3B)	Applicable Legal Standards*
Low	Designated or undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations, or with little or no surviving archaeological interest. Assets with potential to contribute to local research objectives. Undesignated historic seascapes with importance to local interest groups, whose value is limited by poor preservation and/or poor survival of contextual associations. Landscapes or seascapes of little or no significant historical interest.	*Turkey:* Law on the Conservation of Cultural and Natural Property (1983) National and regional databases of underwater cultural heritage Bathymetric and shipwreck data of the Turkish Office of Navigation, Hydrography and Oceanography
Negligible (Not used in this cultural heritage assessment)	Assets with little or no surviving archaeological interest. Areas with few intangible cultural heritage associations or vestiges surviving.	-
Unknown	The importance of the resource cannot be ascertained.	-

* These standards are theoretically applicable to impact assessment; however, there are no instances of World Heritage Sites, Representative Intangible Heritage, Category III Marine Protected Areas, Geoparks, MAB Biosphere Reserves or Ramsar sites with cultural heritage linkage within the Project Area.

Complete.

Taking into account the criteria as presented in Table 10.8 the known receptors within 150 m of the nearest original proposed pipeline route centreline had the potential to be impacted by Project activities. The sensitivity of these known receptors is discussed below and summarised in Table 10.9. As these receptors have been avoided by 150 m as a result of pipeline re-routing (Section 10.5.5.2) they are not considered further in this impact assessment.

In addition to known receptors, South Stream Transport acknowledges that, although highly unlikely, there is a low possibility of encountering yet undiscovered objects, which are therefore considered in this assessment.

10.6.3.2 TK-MCH-001 – Wooden Shipwreck (Post-Medieval to Modern)

- *Description*: The shipwreck site measures approximately 7.8 m long by 4.3 m wide, and is primarily constructed of wood. Located in the marine environment in greater than 2,000 m of water. It dates to the post-medieval to modern period (18th to 19th century). The shipwreck site does not appear to have any post-depositional anthropogenic disturbance.

- *IFC Classification*: Marine cultural heritage object with archaeological significance, not registered with the Ministry of Culture and Tourism.
- *Proximity to Project Work*: This wooden shipwreck lay approximately 30 m north of the centreline of the original proposed route of Pipeline 4. It now lies approximately 310 m north of the centreline of the route of Pipeline 4 following re-routing undertaken in February 2014.
- *Sensitivity*: The receptor's sensitivity is assessed as high due to its potential for significant contributions to the understanding of early boat construction techniques and maritime trade on the Black Sea. It does not appear to have any post-depositional anthropogenic disturbance.

10.6.3.3 TK-MCH-002 – Wooden Shipwreck (Post-Medieval to Modern)

- *Description*: The wreck measures approximately 11.8 m long by 5.6 m wide, and is primarily constructed of wood. Located in the marine environment in greater than 2,000 m of water. It dates to the post-medieval to modern period (18th to 19th century). It does not appear to have any post-depositional anthropogenic disturbance.
- *IFC Classification*: Marine cultural heritage object with archaeological significance, not registered with the Ministry of Culture and Tourism.
- *Proximity to Project Works*: This wooden shipwreck lay approximately 5 m north of the centreline of the original proposed route of Pipeline 4. It now lies approximately 185 m north of the centreline of the route of Pipeline 4 following re-routing undertaken in February 2014.
- *Sensitivity*: The receptor's sensitivity is assessed as high due to its potential for significant contributions to the understanding of early boat construction techniques and maritime trade on the Black Sea. It does not appear to have any post-depositional anthropogenic disturbance.

Table 10.9 Marine Cultural Heritage Receptor Sensitivities

Marine Cultural Heritage Receptor	Condition	Receptor Sensitivity
TK-MCH-001 Wooden shipwreck Abyssal plain Post-medieval to modern period	This undesignated site has potential to contribute to the understanding of early ship construction techniques and international networks of maritime trade on the Black Sea (i.e. can contribute significantly to international or national research objectives). Partially protected by covering silts on the sea floor, and there is no evidence that the wreck has been disturbed after it sank.	High

Continued…

Marine Cultural Heritage Receptor	Condition	Receptor Sensitivity
TK-MCH-002 Wooden shipwreck Abyssal plain Post-medieval to modern period	This undesignated site has potential to contribute to the understanding of Black Sea ship construction techniques and maritime trade (i.e. can contribute significantly to international or national research objectives). Partially protected by covering silts on the sea floor, and there is no evidence that the wreck has been disturbed after it sank.	High

Complete.

10.6.3.4 Impact Magnitude Criteria

Table 10.10 presents a description of the magnitude of change to cultural heritage receptors that can be caused by a project, using the classifications high, moderate, low and negligible, based on the current ICOMOS standard (Ref. 10.139).

Table 10.10 Cultural Heritage Impact Magnitude Criteria

Magnitude	Description, Taken from ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (appendices 3A and 3B)
High	Changes to most or all key archaeological sites such that the resource is totally altered. Changes to key marine structures elements such that the resource is totally altered. Change to most or all key maritime landscape elements or components; extreme visual effects; fundamental changes to use or access; resulting in total change to maritime landscape character unit. Comprehensive changes to setting (refer to the glossary for definition).
Moderate	Changes to many key materials of archaeological sites, such that the resource is clearly modified. Changes to setting that affect the character of the asset. Changes to many key marine structures or elements, or to the setting such that the resource is significantly modified. Change to many key maritime landscape elements or components; visual change to many key aspects of the maritime landscape; considerable changes to use or access; resulting in moderate changes to maritime landscape character.
Low	Minor changes to key archaeological sites, such that the resource is slightly altered or clearly modified. Slight changes to setting, or changes to setting that affect the character of the asset.

Continued…

Magnitude	Description, Taken from ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (appendices 3A and 3B)
Low	Slight changes to the setting of key maritime structures. Changes to many key maritime structures, or to the setting of a maritime structure, such that the resource is slightly different and noticeably changed. Change to many key historic maritime elements or components; slight or minor visual change to many key aspects of the maritime landscape; changes to use or access; resulting in limited to minor changes to maritime landscape character.
Negligible	Very minor or no changes to archaeological asset or setting. Very minor or no changes to elements components of maritime landscapes; no visual changes. Very minor or no changes in amenity or community factors.
No change	No change.
Uncertain	The extent of data on the site or feature, or the nature of construction activities does not enable a determination of likely effects to be made at this stage.

Complete.

10.6.3.5 Impact Significance

Chapter 3 Impact Assessment Methodology details how impact significance (High, Moderate, Low, Not Significant) can be defined through the consideration of impact magnitude and receptor sensitivity criteria. The impact significance matrix presented in Table 10.11 has been applied in order to assign levels of significance to defined cultural heritage impacts.

Table 10.11 Impacts Significance Matrix

		Receptor Sensitivity (Vulnerability and Value)			
		Negligible	*Low*	*Moderate*	*High*
Impact Magnitude (Extent, Frequency, Reversibility, Duration)	*Negligible*	Not significant	Not significant	Not significant	Not significant / Low*
	Low	Not significant	Low	Low / Moderate†	Moderate
	Moderate	Not significant	Low / Moderate	Moderate	High
	High	Low	Moderate	High	High

* Allows technical discipline author to decide if impact significance is **Not significant** or **Low**
† Allows technical discipline author to decide if impact significance is **Low** or **Moderate**

10.6.4 Assessment of Potential Impacts

10.6.4.1 Impact Sources

The cultural heritage baseline conditions as described in Section 10.5 have the potential to be impacted by various Project activities as described in **Chapter 5 Project Description**. This section identifies the activities that are likely to take place during the Construction and Pre-Commissioning and Operational Phases of the Project that have an ability to generate an impact on cultural heritage receptors. Table 10.12 outlines the Project activities that could potentially impact cultural heritage within the Study Area.

Table 10.12 Project Activities that Could Potentially Impact Cultural Heritage

Phase	Activity
Construction and Pre-Commissioning	Use of underwater survey equipment (e.g. ROV, side-scan sonar, etc.) during the pre-construction and construction pipeline route surveys (pre-lay, unexploded ordinance (UXO), and as-built), and during real time touch down monitoring of pipe-laying activity. Removal of any obstacles (e.g. munitions, boulders). Laying the pipe on seabed.
Operational	Visual inspection via underwater vehicle (e.g. ROV) and maintenance of pipelines, which may result in seafloor intervention.

The majority of the activities which have the potential to affect cultural heritage receptors occur during the Construction Phase of the Project. Operational Phase activities have little potential to impact on cultural heritage receptors, as routine operational activities are infrequent, minimally invasive and will take place in areas that will have already undergone disturbance during construction activities and have had any appropriate design control or mitigation measures implemented. Decommissioning Phase activities are not discussed further in this assessment (see Section 10.9).

A number of pre-construction and Construction Phase activities may impact upon the seabed, resulting in potential disturbance of marine cultural heritage receptors (both known and unknown). The activities are summarised in Table 10.12.

The engineering and design of the Project has incorporated a number of Project design control measures to ensure impact avoidance and minimisation; these measures are detailed in **Chapter 5 Project Description**.

The design control measure for cultural heritage consists of the optimisation of the pipeline route to avoid known and potential CHOs by a 150 m buffer. This avoidance buffer distance was chosen after careful consideration of engineering and design constraints and after a review of commonly-used avoidance buffer intervals for similar marine construction projects.

The two presently known marine cultural heritage objects, TK-MCH-001 and TK-MCH-002 (shipwrecks) listed in Table 10.13, have been avoided by a distance of no less than 150 m by micro re-routing of the pipeline in February 2014 and have therefore been scoped out of further assessment.

Table 10.13 Cultural Heritage Receptors Scoped Out of Further Assessment

Marine Cultural Heritage Receptor	Reasons for Scoping Out
TK-MCH-001 Wooden shipwreck Abyssal plain Post-medieval to modern period	Pipelines have been rerouted to avoid known objects by a minimum of 150 m. This object now lies approximately 310 m north of the centreline of the route of Pipeline 4 following re-routing undertaken in February 2014.
TK-MCH-002 Wooden shipwreck Abyssal plain Post-medieval to modern period	Pipelines have been rerouted to avoid known objects by a minimum of 150 m. This object now lies approximately 185 m north of the centreline of the route of Pipeline 4 following re-routing undertaken in February 2014.

The only additional receptors that could be impacted by Project Activities are unknown CHOs that have not yet been detected during the surveys that have been carried out for the Project to date. Although review of already-collected marine data suggests that chance finds of CHOs are highly unlikely to occur during Project construction and operation activities (see Section 10.7.1), there is the potential for pre-construction, Construction Phase and operational activities to impact upon currently unknown CHOs that could be located in proximity to any of the four pipelines. The following sections will therefore focus on potential impacts to such unknown receptors and on the mitigation measures that will be implemented to minimise such impacts.

10.6.4.2 Assessment of Potential Impacts (Pre-mitigation) – Construction and Pre-Commissioning Phase

This section provides an assessment of potential impacts to any unknown cultural heritage receptors using the impact magnitude and receptor sensitivity matrix discussed in **Chapter 3 Impact Assessment Methodology**.

Construction and Pre-Commissioning Phase activities which may impact upon the seabed, resulting in potential disturbance of presently unknown marine cultural heritage receptors include:

- Use of underwater survey equipment (via ROV and any towed sensor arrays) during the pre-construction and construction pipeline route surveys (pre-lay, unexploded ordinance (UXO), as-built), and during real time touch down monitoring of pipe-laying activity that may result in seabed contact by ROV strikes and thruster washing;

- Seafloor intervention (e.g. removal of obstacles such as munitions, boulders etc.); and
- Direct disturbance of the CHO as a result of pipe-laying.

Potential impacts and their significance without mitigation are summarised in Table 10.14. A summary of the impacts identified and their pre- and post-mitigation significance ranking is provided in Table 10.17 in Section 10.6.4.3.

Table 10.14 Summary of Predicted Impacts on Marine Cultural Heritage (Without Mitigation), Construction and Pre-Commissioning Phase

Cultural Heritage Receptor	Phase	Impact	Receptor Sensitivity	Magnitude of Impact	Impact Significance Without Mitigation
Currently unknown cultural heritage receptors	Construction and Pre-Commissioning	Damage to submerged cultural heritage	Low to High (depending on value of receptor and sensitivity / vulnerability to damage)	Moderate	**Low** to **High** Adverse

10.6.4.3 Assessment of Potential Impacts (Pre-Mitigation) – Operational Phase

Operational activities that may impact upon the seabed, resulting in potential disturbance of presently unknown marine cultural heritage receptors are the visual inspection via underwater vehicle (e.g., ROV) and maintenance of pipelines, which may result in seafloor intervention. Potential impacts and their significance without mitigation are summarised in Table 10.15. A summary of the impacts identified and their pre- and post-mitigation significance ranking is provided in Table 10.17.

Table 10.15 Summary of Predicted Impacts on Marine Cultural Heritage (Without Mitigation), Operational Phase

Cultural Heritage Receptor	Phase	Impact	Receptor Sensitivity	Magnitude of Impact	Impact Significance Without Mitigation
Currently unknown cultural heritage receptors	Operational	Damage to submerged cultural heritage	Low to High (depending on value of receptor and sensitivity / vulnerability to damage)	Moderate	**Low** to **High** Adverse

10.7 Mitigation and Monitoring

Where the Project involves potential adverse impacts on cultural heritage that have not been avoided through the application of Design Controls (Section 10.6.4.1) appropriate mitigation measures to avoid, minimise, mitigate and offset these impacts will be applied. The cultural heritage mitigation measures presented in this chapter are based on the policy, regulatory and administrative frameworks as outlined in **Chapter 2 Policy, Regulatory and Administrative Framework**, as well as national laws and regulations, international conventions ratified by the Republic of Turkey (Section 10.6.2) and Good International Industry Practice (GIIP).

An Environmental and Social Management Plan (ESMP) will be prepared for the Project before any on-site works begin (**Chapter 16 Environmental and Social Management**). The ESMP will set out mitigation and monitoring measures, including those for cultural heritage mitigation and monitoring, as described in the sections below.

Mitigation and monitoring measures will include on-going stakeholder engagement with the Ministry of Foreign Affairs, the Ministry of Culture and Tourism: General Directorate of Cultural Heritage and Museums and the Sinop Provincial Directorate of Culture and Tourism.

Mitigation measures will be designed and executed following national guidance as set out in Section 10.6.2:

- Law on the Conservation of Cultural and Natural Property (23 July 1983, Law No. 2863, last amended February 2008) (Ref. 10.2);
- Regulation on the Collection and Control of Movable Cultural and Natural Property to be Protected (17 January 1984) (Ref. 10.5);
- Regulation on Survey, Sounding and Excavation to be Performed in Relation to Cultural and Natural Property (10 August 1984) (Ref. 10.7); and
- Regulation on the Identification and Registration of Immovable Cultural and Natural Property to be Protected (10 December 1987) (Ref. 10.8).

The overarching mitigation measure to prevent any adverse impacts on CHOs, which will be applied throughout the Project life cycle, consists of the adoption by South Stream Transport of a cultural heritage stewardship programme. The objective of such programme is to ensure that all parties involved in the construction, operation and decommissioning of the Pipeline are at all times aware of the importance of cultural heritage and that compliance with national legislation and international conventions is achieved during any activity associated with the Project.

Systematic stewardship of cultural heritage can be ensured throughout the Project life-cycle by developing and implementing a Cultural Heritage Construction Management Plan (CMP) during the Construction and Pre-Commissioning Phase of the Project (see Section 10.7.1) and Operational Management Plans (OMPs) during the Operational Phase (see Section 10.7.3).

Appropriate staff training in Cultural Heritage Awareness Training will be undertaken by staff and subcontractors during all Phases of the Project to assist in the prevention of interference or accidental damage to cultural heritage. The approach to this training will be included within the Project Cultural Heritage CMP.

All known marine cultural heritage receptors will be plotted on digital and paper Project maps and in the Project GIS database, which will be available to the design team and construction contractors.

A review of already-collected marine data suggests that chance finds of CHOs are highly unlikely to occur during Project construction and operation activities. Real time touch down monitoring of pipe-laying activity, using ROV, will be undertaken to confirm the absence of CHOs along the pipeline route and to enable a prompt response in case of chance finds.

Should chance finds of cultural heritage objects occur during Project construction activities (including pre-lay surveys prior to construction), the Chance Finds Procedure will be implemented to allow the monitoring archaeologist to record and assess the find, and carry out an appropriate avoidance or mitigation response. Relevant Turkish authorities will be informed of all chance finds.

In addition to implementing the cultural heritage stewardship programme the Project will implement specific mitigation measures during the various Project phases. Table 10.16 provides a summary of the cultural heritage mitigation measures – as the principal impacts on cultural heritage will be associated with the Construction and Pre-Commissioning Phase, the majority of proposed mitigation measures relate to this phase of the Project. These mitigation measures are explained in more detail in the sections that follow the table.

Table 10.16 Summary of Cultural Heritage Mitigation Measures by Project Phase

Phase	Marine
Construction and Pre-Commissioning, including Pre-Construction Surveys	Cultural Heritage CMP and Chance Find Procedures
	Careful piloting of ROVs during surveying and during installation monitoring
	Real time monitoring of pipe-laying activity
	Archaeological watching briefs on pipe-lay vessel
	Staff Cultural Heritage Awareness Training
	Plotting of location of CHOs on Project mapping and GIS
Operational	Application of Cultural Heritage CMP and Chance Find Procedures Plotting of location of CHOs on Project mapping and GIS Careful piloting of ROVs during surveying and maintenance activities
Decommissioning	The need and scope of the assessment will be confirmed once plans for the Decommissioning Phase have been finalised

10.7.1 Mitigation Measures

10.7.1.1 Mitigation Measures – Construction and Pre-commissioning Phase

A Cultural Heritage CMP will be developed by South Stream Transport and it will include a Chance Find Procedure. If chance finds are identified during construction, different procedures will be applied depending on the sensitivity of the receptor. The Cultural Heritage CMP will include a tiered approach that will assign responsibility for dealing with the chance find to the appointed watching brief Archaeologist, institutional counterpart or National Cultural Agencies, depending on the significance of the find.

In addition, the Cultural Heritage CMP will include procedures to ensure the following:

- Potential impacts on currently unknown CHOs from the use of ROVs for monitoring and surveying will be minimised by limiting propeller or thruster washing, proper tether management and avoiding ROV strikes by careful piloting; and
- During surveying and pipe-laying works, archaeological watching briefs will be undertaken to monitor surveying and construction activities. A qualified archaeologist will monitor during the pre-lay surveys and pipe-laying activities to determine the presence or absence of potential cultural heritage objects and to ensure that known cultural heritage objects are not impacted by surveying and pipe-laying activities. Archaeological watching briefs will be undertaken by appropriately qualified and experienced cultural heritage professionals. Specifically the watching briefs will be undertaken to ensure that:
    - The avoidance distance of 150 m for known CHOs is adhered to during pipe-laying; and
    - The procedure for chance finds, as outlined in the Project Cultural Heritage CMP and detailed in the Contractor's CMP, is appropriately implemented (**Chapter 16 Environmental and Social Management**).

10.7.1.2 Mitigation Measures – Commissioning and Operational Phase

As during construction, Project mapping and GIS will be updated, as necessary, should any chance finds of cultural heritage objects occur.

As no significant intrusive work will be carried out on the pipelines during their operation, no significant impacts are expected. However, inspection and maintenance activities that may involve the use of ROVs may be required. In such cases, the mitigation measures will be as per the Construction Phase and will include the limitation of ROV propeller or thruster washing, proper tether management and avoidance of ROV strikes by careful piloting.

A Chance Find Procedure appropriate to the Operational Phase of the Project will be developed in advance of the commencement of operation of the pipelines and will be included in the Operational Management Plans. The Operational Management Plans will describe environmental and social mitigation, management and monitoring requirements and actions in relation to normal operating conditions and planned maintenance, minor repairs and minor incidents.

10.7.2 Monitoring Requirements

As set out in **Chapter 16 Environmental and Social Management**, a Cultural Heritage CMP will be implemented throughout the Project Construction and Pre-Commissioning Phase with OMPs implemented during the Operational Phase, as appropriate. Monitoring requirements will form part of the Cultural Heritage CMP and any Operational Phase Plans, including Chance Finds Procedures and staff cultural heritage awareness training.

Monitoring requirements identified during the Construction and Pre-Commissioning Phase comprise:

- Archaeological watching briefs on marine works, including the pipe-lay vessel; and
- Monitoring of the seafloor and CHO condition will be undertaken as part of the real time touch down monitoring of pipe-laying activity and during the as-built pipeline route survey.

Monitoring requirements have been identified for the Operational Phase and comprise:

- Where a CHO is located within 150 m of the centreline of any one of the four pipelines (i.e. a currently unknown CHO discovered during the construction activities that could not be avoided by re-routing of the pipeline), monitoring of the CHO condition and seafloor between the CHO and the pipeline by ROV including sonar and visual inspection will be undertaken during the Operational Phase.

10.8 Residual Impact Assessment

Table 10.17 and Table 10.18 present a summary of the potential residual impacts on cultural heritage receptors during the Construction and Pre-commissioning Phase and the Operational Phase respectively, following the implementation of defined mitigation measures during various Project activities.

During the Construction and Pre-Commissioning Phase, without mitigation, there is the potential for currently unknown cultural heritage to be impacted by the Project resulting in potential **Low** to **High** adverse impacts, depending on the importance of the find. Should any currently unknown CHO be identified, the mitigation measures outlined in Section 10.6.4.3 will be applied and any residual impacts are anticipated to be **Low**.

During the Operational Phase, without mitigation, there is the potential for as yet unknown cultural heritage to be impacted by the Project resulting in potential **Low** to **High** adverse impacts, depending on the significance of the find. Should any currently unknown CHO be identified, mitigation measures outlined in Section 10.7 will be enforced where possible and any residual impacts are anticipated to be **Not Significant**.

Table 10.17 Cultural Heritage: Construction and Pre-Commissioning Phase

Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre - Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Pre-construction route surveys, as-built survey and real time touch down monitoring Offshore pipe-laying on seabed	Seabed disturbance Object removal Damage to cultural heritage receptor	Currently unknown cultural heritage receptors	Low to High	Low to High	**Low** to **High** Adverse	Real time monitoring of the pipe-laying process Careful piloting of ROVs during surveying and during installation monitoring. Minimise propeller or thruster washing. Proper tether management. Archaeological watching briefs on pipe-lay vessels. Cultural Heritage Management Plan and Chance Find Procedures. Staff Cultural Heritage Awareness Training.	**Low** adverse

Table 10.18 Cultural Heritage: Operational Phase

Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre - Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Inspection and maintenance of pipelines	Seabed disturbance	Currently unknown cultural heritage receptors	Low to High	Low to High	**Low** to **High** Adverse	Careful piloting of ROVs during surveying and maintenance activities. Minimise propeller or thruster washing. Proper tether management. Operations Management Plan and Chance Find Procedures. Staff Cultural Heritage Awareness Training.	**Not Significant**

10.9 Decommissioning Phase

Decommissioning of the South Stream Offshore Pipeline will be carried out according to prevailing international and national legislation and regulations and best practices regarding environmental and other potential impacts. It is envisaged that the process of developing detailed decommissioning management plans may be staged, initially outlining potential options and studies required for discussion with the regulatory authorities, and finally leading to agreed plans prior to the commencement of decommissioning.

Two options are available; namely in situ decommissioning or pipe removal:

- In situ decommissioning involves cleaning the Pipeline and filling it with seawater. The receptors and degree of impact are thus the same as those for the Operational Phase; or
- Removal of the Pipeline is a similar operation to pipe-laying, but in reverse. The receptors and degree of impact will thus be similar to those identified for the Construction and Pre-Commissioning Phase.

Impacts that may be associated with decommissioning will be assessed as part of the process of developing decommissioning management plans and are not assessed in this ESIA Report.

10.10 Unplanned Events

An unplanned event, such as the controlled detonation of a UXO, an ROV strike, the sudden abandonment of the Pipeline, during construction, as a result of emergency situations, or a major pipeline breach and pressure loss during operation, may result in damage to or destruction of submerged archaeological material. The magnitude of this impact is assessed as high, and the significance is assessed as **Moderate** to **High** adverse, depending on the sensitivity of the receptor. However, the likelihood of this event occurring is very low and therefore, for the purposes of this assessment, such potential impact has been discounted.

Appropriate unplanned event contingency planning will be undertaken that minimises further the likelihood of low probability events occurring, as well as minimising event consequences (**Chapter 13 Unplanned Events**).

10.11 Cumulative Impacts

The cumulative impact assessment considers the Project within the context of other Projects in the Project Area and greater regional context (**Chapter 14 Cumulative Impact Assessment**).

None of the identified potential developments will impact upon the marine cultural heritage resources that will be affected by the Project, and thus there is no risk that the Project will contribute to cumulative impacts upon marine cultural heritage features.

10.12 Conclusions

The Construction and Pre-Commissioning Phase of the Project has the greatest potential to lead to potentially adverse effects to marine cultural heritage receptors.

- Impacts to known cultural heritage receptors, TK-MCH-001 and TK-MCH-002, have been avoided as a result of the design control of re-routing the pipelines to ensure a minimum separation distance of 150 m from these known CHOs.
- Potential impacts on as yet unknown CHOs will be mitigated by archaeological watching briefs (monitoring), Chance Find Procedures and Cultural Heritage Awareness Training along with the careful piloting and management of ROVs. These measures will reduce any potential impacts to **Low** significance.

Operational impacts on unknown CHOs are largely mitigated through careful ROV piloting. These mitigation measures will reduce operational impacts to cultural heritage receptors to **Not Significant**.

Throughout the Project life-cycle, impacts on cultural heritage will be systematically controlled and monitored by the application of a Cultural Heritage CMP and OMPs both of which will include Chance Find Procedures and provisions for Cultural Heritage Awareness Training.

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11.1 Introduction

International Finance Corporation (IFC) Performance Standard (PS) 6 defines ecosystem services as "*the benefits that people, including businesses, obtain from ecosystems"* (Ref. 11.1), which accords with the definition provided by the Millennium Ecosystem Assessment (MA) (Ref. 11.2). While there is no single system for categorising ecosystem services, the MA framework is widely accepted and, as acknowledged in IFC PS6 (paragraph 2), provides a useful starting point. The MA identifies four broad categories of ecosystem service:

- *Provisioning services*: the products people obtain from ecosystems. In the context of the marine environment these may include *inter alia* (i) fisheries; (ii) oil and gas; and (iii) chemical compounds. In most cases, the exploitation of provisioning services involves a significant input of man-made capital and labour, for example in the form of fishing boats, oil rigs, and their crews (Ref. 11.3);
- *Regulating services*: the benefits people obtain from the regulation of ecosystem processes. In the marine environment these may include *inter alia* (i) climate regulation through carbon storage and sequestration; (ii) waste absorption and detoxification; and iii) biological control of pests and diseases;
- *Cultural services*: the cultural, educational, and spiritual benefits people obtain from ecosystems. These may include *inter alia* (i) cultural, spiritual, or religious upliftment from cultural heritage, spiritual, or sacred sites; (ii) opportunities for recreation such as sport, fishing, ecotourism, or recreational enjoyment; and (iii) opportunities for scientific exploration, knowledge-building, and education; and
- *Supporting services*: the natural processes that maintain the other services such as provision of habitat, nutrient cycling, water cycling or exchange, primary production, and resilience.

Supporting services differ from provisioning, regulating, and cultural services in that, unlike the other types of service from which people can directly benefit, their impacts on human well-being are indirect (Ref 11.4 and Ref 11.5). Supporting services are strongly interrelated to each other and are generally underpinned by a vast array of physical, chemical, and biological interactions. It is these supporting services that underpin the provision of the final services which are of direct value to people.

The benefits of ecosystems are conferred at many scales and often to multiple different beneficiaries. At the local level, ecosystem services are frequently the basis for rural livelihoods and subsistence, particularly for the poor. Artisanal fishing, for example, provides both cash income and food for low-income families. Benefits can also be regional—such as the fisheries that contribute to the Gross Domestic Product (GDP) of various Black Sea countries—or national, such as sites that form part of a country's cultural heritage. At a global scale, ecosystems regulate climate and support the biodiversity which underpins all biological production.

Businesses and projects may also benefit from ecosystem services through, for example, the direct use of inputs, such as water, or through protection from natural hazards. Identifying and protecting such services can have further benefits such as avoiding punitive regulation and negative publicity, strengthening the organisation's reputation and, in some cases, providing effective natural alternatives to more expensive engineering solutions.

This chapter presents an assessment of the potential impacts and dependencies on ecosystem services resulting from the Construction and Pre-Commissioning, Operational and Decommissioning Phases of the Project. In addition, mitigation measures which aim to avoid, minimise and, where residual impacts remain, to compensate and offset impacts on priority ecosystem services are proposed.

Specifically, the purpose of this chapter is to:

- Systematically identify and assess the likely impacts of Project activities on Ecosystem Services (ESS) and the nature and significance of these impacts on ESS beneficiaries;
- Evaluate Project dependence on ESS in order to help manage risks and take advantage of opportunities related to ecosystem change; and
- Help inform, for unavoidable impacts, the selection of appropriate mitigation measures which aim to maintain the value and functionality of priority ESS and enhance the resource efficiency of Project operations.

This chapter is not intended to be read in isolation; instead it presents and assesses the key ecosystem service considerations relevant to the topics presented in other chapters of this ESIA Report, including key inter-linkages, to ensure that the values which ecosystem service beneficiaries attach to ecosystem goods and services are appropriately considered and addressed throughout the ESIA process.

11.2 Approach

The approach to, and methodology for, the ecosystem services assessment in this chapter is based on a URS proprietary tool: Ecosystem Services Identification, Valuation, and Integration (ESIVI) (Ref. 11.6). The ESIVI tool was created in order to provide a rigorous and transparent framework for ecosystem service assessments that meets the requirements set out in the 2012 IFC PSs.

The development of the ESIVI tool was informed by both the conceptual framework established by the MA, which explicitly links ecosystem services and human well-being, and the World Resources Institute (WRI's) conceptual framework for Ecosystem Services Review for Impact Assessment (Ref. 11.7). The WRI framework puts the Project at the centre of the interactions between human well-being, ecosystem services, ecosystems, and drivers of ecosystem change, recognising that the Project has the potential to affect all the components of the framework and is itself affected by them. It reflects the two ways the Project relates to ecosystem services in terms of:

- Potential impacts on the existing relationships between human well-being, ecosystem services, and ecosystems; and

- Project dependence on these relationships for the achievement of successful performance.

The development of the ESIVI tool was informed by expertise built up from carrying out policy and project level work on ecosystem service assessments over the past ten years as well as a number of Good International Industry Practices (GIIP) and guidelines, including:

- IFC Performance Standards 1, 4, 5, 6, 7, 8, and their accompanying Guidance Notes (Ref. 11.8);
- Landsberg et al. (2011), 'Ecosystem Services Review for Impact Assessment: Introduction and Guide to Scoping' (Ref. 11.7);
- International Petroleum Industry Environmental Conservation Association (IPIECA) / Oil and Gas Producers (OGP) (2011), 'Ecosystem Services Guidance: Biodiversity and Ecosystem Services Guide and Checklists' (Ref. 11.9);
- Convention on Biological Diversity (2006), 'Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment' (Ref. 11.10);
- The Economics of Ecosystems and Biodiversity (2010), 'The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature' (Ref. 11.11);
- Bateman et al. (2010), 'Economic Analysis for Ecosystem Service Assessments' (Ref. 11.12);
- Burkhard et al. (2009), 'Landscapes' Capacities to Provide Ecosystem Services – A Concept for Land-Cover Based Assessments' (Ref. 11.13);
- Landsberg et al. (2013), 'Weaving Ecosystem Services into Impact Assessment: A Step-by-Step Method' (Ref.11.14); and
- United Nations Environment Programme – World Conservation Monitoring Centre (2012), 'UK National Ecosystem Services Assessment' (Ref. 11.15).

The ecosystem services assessment process in the ESIVI tool comprises four stages[1]:

- *Scoping*: to identify the key services provided by affected ecosystems that could potentially be impacted by the Project or that the Project may depend upon;
- *Baseline establishment*: to assess the status of key services within the affected ecosystems in the absence of the Project, as well as the location of ecosystem service beneficiaries and the extent to which they benefit from the services provided;
- *Impact assessment*: to identify the likely impacts of Project activities on ecosystem services and their beneficiaries, the significance of these impacts, and which services should be considered *priority ecosystem services*; and
- *Mitigation and residual impact assessment*: to identify the range of measures that may be implemented to avoid, minimise, and compensate or offset adverse impacts on priority ecosystem services and to determine the residual impacts once mitigation is in place.

[1] Note that these stages of the ESIVI tool are consistent with the methodology described in **Chapter 3 Impact Assessment Methodology** and used in other chapters.

Figure 11.1 provides a schematic overview of the assessment process and the key sources of data at each stage.

Figure 11.1 The Ecosystem Services Assessment Process

Stage	Steps	Information sources
Scoping	• Identify ecosystem services the Project may impact and/or on which the Project depends • Identify potentially affected beneficiaries • Scope out those services on which impacts are likely to be insignificant	• ESIA technical chapters • Literature review • Mapping and imagery
Baseline	• Establish provision of scoped in services • Identify key trends and threats • Identify beneficiaries use of services and assess sensitivity to changes in provision	• ESIA technical chapters • Stakeholder consultation • Literature review
Impact Assessment	• Assess nature and significance of impacts on ecosystem services and effects on beneficiaries • Identify priority services	• ESIA technical chapters • Stakeholder consultation • Liaison with ESIA technical chapter authors
Mitigation	• Identify measures to avoid adverse impacts or to at least maintain the value and functionality of priority services where impacts cannot be avoided.	• ESIA technical chapters and literature review • Stakeholder consultation • Liaison with ESIA technical chapter authors

11.3 Scoping

The objective of the initial scoping exercise is to identify those ecosystem services which could potentially be affected by Project activities or that the Project may depend upon and which, therefore, ought to be subject to more detailed investigation.

Due to the complexity and interconnectivity of ecosystems, together with the uncertainty surrounding how each process within an ecosystem is likely to respond to change, isolating and assessing each of the likely impacts of a project on particular ecosystems services is a difficult task. Further, the potentially wide range of people who benefit from ecosystem services and the different values they attach to such services mean that assessing the impacts and dependencies of a project on ecosystem services is an extensive undertaking.

As such, a comprehensive assessment of every impact or dependency on each ecosystem service is beyond the scope of an ESIA[2]. An effective ESIA should therefore focus resources on assessing the services which are likely to be of highest priority, with further, more detailed assessments being carried out where necessary to inform the development of follow up reports.

An important element of the scoping stage is therefore to identify which services can be excluded from the ESIA in order to provide a comprehensive and manageable assessment. This was done using the ESIVI tool which contains a checklist of ecosystem services that has been compiled using the guidance, checklists, and other relevant information contained in the studies listed in the previous section. In this assessment the ESIVI checklist (Table 11.1) was used to systematically identify the services which may potentially be impacted by the Project or upon which the Project may depend. Definitions and examples of each of the ecosystem services are provided in Appendix 11.1: Ecosystem Service Checklist.

Table 11.1 Ecosystem Services Checklist

Provisioning Services	Regulating Services	Cultural Services
Crops	Local climate regulation	Tourism and recreation values
Livestock and fodder	Global climate regulation	Cultural and spiritual values
Capture fisheries	Air quality regulation	Scientific and knowledge values
Aquaculture	Hazard regulation	Wild species diversity
Wild foods	Water quality regulation	
Timber	Pollination	
Energy	Disease and pest control	
Oil, gas, and minerals	Noise regulation	
Biochemicals and medicine		
Water (supply)		
Fibres and ornamental resources		
Genetic resources		

Note: It is important to note that impacts on supporting services are not explicitly accounted for in the ESIVI ecosystem services assessment in order to avoid double-counting.

[2] Note, IFC Guidance Note 6 states that "client requirements are focused on the mitigation of impacts on ecosystem services and the benefits that ecosystem services might bring to companies rather than on the economic valuation for such services".

Using the ESIVI checklist (Table 11.1), the range of ecosystem services potentially provided, the affected ecosystems, and the likely beneficiaries (direct or indirect) of each of those services were identified. The type of beneficiary was identified at this stage because different types of beneficiary are assessed differently with regards to mitigation requirements. For example, IFC PS 6 applies to ESS whose beneficiaries are at the local or regional scale, while PS 1 applies to ESS with global beneficiaries, such as carbon sequestration. Further, the type of beneficiaries also informs whether an ecosystem service is classed as a Type 1 service, where impacts on ecosystem services may adversely affect communities, or a Type 2 service, where the project directly depends on an ecosystem service for its operations.

Once the broadest possible range of potential ecosystem services and their associated beneficiaries were identified, each service was systematically reviewed and scored against the inclusion criteria shown in Table 11.2 to identify which ecosystem services should be included in the more detailed impact assessment and which should be scoped out of the assessment.

Table 11.2 Criteria for Determining the Scope of the Ecosystem Services Assessment

Inclusion Criteria	Assigned Score		
Is this service provided by affected ecosystems?	No 0	Potentially 1	Yes 2
Is the Project likely to have an impact on the ecosystem which provides this service?	No 0	Potentially 1	Yes 2
Is the Project likely to reduce any of the benefits that any people derive from this ESS?**	No 0	Potentially 1	Yes 2
Does the Project depend on this ESS for successful performance?	No 0	Potentially 1	Yes 2
Does the client have direct management control or significant influence over this ESS?†	No 0	Potentially 1	Yes 2
Is the Project likely to have an overall beneficial impact on service use or provision?	No 0		Yes 15
Ecosystem Service Relevance			**Score**
Negligible	Service not present and unlikely to be affected Does not have to be assessed further		0

Continued...

Inclusion Criteria		Assigned Score
Low	Project may have an insignificant impact/dependence on the service Does not have to be assessed further	1-4
Moderate	Project likely to have a significant impact on beneficiaries of the service or likely to be dependent on the service Must be assessed further	5-8
High	Project likely to have a significant impact on beneficiaries of the service and likely to be dependent on the service Must be assessed further	9-10
Benefit	Project is likely to have a positive impact on service provision Does not have to be assessed further	>10

Note, under the scoring system set out in Table 11.2, a service can only be classed as high relevance if it is both a Type 1 and a Type 2 service i.e., the Project could reduce the benefits that people derive from the service and the Project itself depends on the service for successful performance.

** Note, this criterion specifically refers to potential impacts on users of a service while the preceding criterion refers to potential impacts on the ecosystem which provides the service. This is an important distinction because a Project may have significant impacts on an ecosystem (such as by withdrawing significant amounts of water from a river), however, whether or not people are using this service is an important factor in assessing the significance of the impact.

† Note, this criterion follows the guidelines set out in the IFC PS and identifies whether a client can be said to have control over a Project's impacts on an ecosystem service (this may exclude, for example, upstream manufacture of inputs or downstream use of a product) and whether the impacts are likely to be of significant influence (while a Project may impact on a service, for example, it may be possible to exclude these impacts from the assessment if it is known at the scoping stage that the impacts will be insignificant in terms of beneficiaries well-being).

Complete.

The purpose of this initial scoping exercise was to identify any ecosystem services which may be provided by affected ecosystems, the extent of use, and how likely each of these services are to be impacted by the Project. Once the likely relevance was assessed, a shortlist of ecosystem services to be included in the baseline and impact assessment sections was compiled. Since this is a scoping exercise, the potential impact ratings shown in Table 11.3 should not be interpreted as an ultimate determination of impact significance; rather they are intended as an indication of the potential for an impact on a service to occur and the potential level of that impact.

The scoping exercise was undertaken through a review of both the information and data collected for the EIA Report and other ESIA chapters, including satellite mapping, and stakeholder consultation. A review of published literature was also carried out to supplement the existing evidence and to provide more detailed technical information where needed. As further information became available throughout the baseline and impact assessment process, the initial scoping exercise was revisited and updated where necessary in order to ensure that all relevant ecosystem services were included in the impact assessment. The full results of the scoping exercise are found in Appendix 11.2: Scoping Results, while a summary of the rationale for inclusion or exclusion of each ecosystem service is provided in the Table 11.3.

Table 11.3 Scoping Exercise: Summary of the Rationale for Inclusion or Exclusion of Each Ecosystem Service

Ecosystem Service	Relevance*	Include in Impact Assessment	Justification
Crops	Negligible	No	Project activities take place wholly within the marine environment and therefore there are no impacts on crops.
Livestock and fodder	Negligible	No	Project activities take place wholly within the marine environment and therefore there are no impacts on grazing lands or livestock.
Capture fisheries	Low	No	Fishing is undertaken within the Black Sea and supports income and livelihoods dependent on fishing industries across a number of countries. Fishing takes place along Turkey's coastline in water depths of up to around 100 to 150 m, and does not occur near the Project Area (**Chapter 9 Socio-Economic**). Due to the location of the Project Area in Turkey's EEZ, and its closest point to Turkey's coast being more 100 km to the south, it is highly unlikely that any Turkish fisheries will be affected. Commercially important fish species such as the European anchovy migrate through the Project Area, however, **Chapter 8 Biological Environment** concludes that there is unlikely to be any significant impact on fish migration routes and patterns across the Black Sea, including for the key species targeted by Turkish fishing fleet. Artisanal or small scale fisheries workers in Turkey may have low incomes and are more likely to have fewer financial resources to rely on, which can make them vulnerable to economic fluctuations, i.e. considered a vulnerable group using IFC PS1 guidelines. However, considering that no fishing takes place in the Project Area, and the ESIA Report concludes no impact on fish or fisheries, there are unlikely to be impacts on the well-being of any beneficiaries.
Aquaculture	Negligible	No	There is no aquaculture practised within the Project Area or potentially affected by Project Activities.
Wild foods	Negligible	No	There are no wild foods collected from within the area potentially affected by Project Activities.

Continued...

Ecosystem Service	Relevance*	Include in Impact Assessment	Justification
Timber	Negligible	No	Project Activities take place wholly within the marine environment and therefore there are no impacts on timber or other wood products.
Energy	Negligible	No	There are no known uses of biomass fuel, tidal energy, offshore wind, or biofuels within the Project Area.
Oils, gas, and minerals	Low	No	There is significant oil and gas exploration activity within the Black Sea region (Ref. 11.16). The Turkish Petroleum Corporation (TPAO) is responsible for the exploration of petroleum and natural gas in Turkey. TPAO has identified a large area of the Turkish EEZ in the Black Sea that could potentially be utilised for petroleum exploration and has defined several exploration license areas that overlap with the Project Area. As part of the design process, South Stream Transport has liaised with the TPAO regarding the width of the pipeline corridor so as to reduce any potential impact on future TPAO activities. As a result of these consultations, it is proposed that the pipelines will be laid within a 420 m width corridor, in agreement with the relevant Turkish authorities. Due to the narrow width of the pipeline corridor, there will be no impact on the feasibility of potential oil and gas exploration or development activities occurring in the vicinity of the Project. As such, the Project is unlikely to significantly impact provision or use of this service (**Chapter 9 Socio-Economic**).
Biochemicals and medicine	Negligible	No	The deep seas represent the largest reservoir of genetic resources and biological substances, including some of major biotechnological interest. The unusual characteristics of deep sea organisms, their unique adaptations that enable them to survive in dark, cold, and highly pressurised environments offer unique opportunities; making them the subject of considerable excitement in the scientific community with many potentially interesting commercial possibilities (Ref. 11.17 and Ref 11.18). However, there are no known stores substances of biochemical or medicinal interest present within the Project Area.
Water (supply)	Negligible	No	Project Activities take place wholly within the marine environment and therefore there are no impacts on freshwater resources.

Continued…

Ecosystem Service	Relevance*	Include in Impact Assessment	Justification
Fibres and ornamental resources	Negligible	No	There are no fibres or ornamental resources collected from within the Project Area.
Genetic resources	Negligible	No	As noted above the deep seas represent the largest reservoir of genetic resources and biological substances. However, there is no evidence that there are any unique genes or genetic information present within the area potentially affected by Project activities. While it is possible that there may be as yet undiscovered genetic resources, there is no recorded scientific interest in the immediate vicinity of the Project Area and the habitat is widely replicated throughout the Black Sea.
Local climate regulation	Negligible	No	It is unlikely that the area affected by Project activities has a significant influence on local or regional temperature, precipitation, or other climatic factors.
Global climate regulation	Low	No	The role of oceans in sequestering carbon is well documented (Ref. 11.19) and it is possible that disturbance of the seabed could potentially lead to the release of methane deposits. However, the impact of Project Activities on greenhouse gas storage and sequestration relative to global greenhouse gas emissions and their effects on the well-being of populations affected by climate change is considered to be negligible.
Hazard regulation	Negligible	No	The potentially affected ecosystems play no known role in hazard regulation.
Air quality regulation	Negligible	No	The affected marine ecosystems are unlikely to play a significant role in the regulation of air quality.

Continued...

Ecosystem Service	Relevance*	Include in Impact Assessment	Justification
Water quality regulation	Low	No	The Project could potentially impact marine water quality through accidental spills from vessels during construction. However, the affected marine ecosystems are unlikely to play a significant role in the filtration and decomposition of organic wastes and pollutants in water. Further, there are no identified beneficiaries who are dependent on the water quality regulation service in the Project Area. As such there is unlikely to be a significant impact on the well-being of any beneficiaries of this service.
Pollination	Negligible	No	Project Activities take place wholly within the marine environment and do not affect any ecosystems that might support pollination.
Disease and pest control	Negligible	No	There is no evidence to suggest that the ecosystems or any particular species within the vicinity of the Project Area play a significant role in pest control. There is also no evidence of any habitats which may influence the incidence and abundance of human pathogens.
Noise regulation	Negligible	No	The marine ecosystems within the Project Area do not play a role in noise attenuation.
Waste absorption and detoxification	Low	No	Waste absorption and detoxification are important regulating services as marine organisms store, bury, and transform many waste materials through assimilation and chemical transformation, either directly or indirectly. Oceans have a unique (though not infinite) ability to clean up sewage, waste material, and pollutants. In particular, bioturbation, the biogenic mixing of sediments on the seafloor by burrowing organisms (Ref. 11.20), and accumulation regulate the processes of decomposition and/or sequestration (e.g. by burial) of organic wastes. Given the limited scale and scope of Project activities relative to the total Black Sea area, it is considered unlikely that the ecosystem functions and processes that support waste absorption and detoxification will be significantly affected.
Tourism and recreation values	Negligible	No	Project activities will not impact any areas used for tourism or recreational activities.

Continued…

Ecosystem Service	Relevance*	Include in Impact Assessment	Justification
Cultural and spiritual values	Negligible	No	**Chapter 10 Cultural Heritage** identifies no marine or nautical-related nationally, regionally, or locally registered elements of intangible cultural heritage† or Turkish Living Human Treasures‡ in the vicinity of the Project. There are, however, a number of identified and potential Cultural Heritage Objects (CHOs) within the Project Area. Due to the anoxic conditions of the Black Sea, which inhibits corrosion and microbial degradation, and the depth at which they are located, CHOs are likely to be well preserved. Impacts to known CHOs are avoided as a result of the design control to re-route the pipelines during detailed design to ensure a minimum separation distance of 150 m from these known CHOs.
Scientific and knowledge values	Benefit	No	Marine surveys for the Project collected geophysical data from Black Sea locations not previously studied. Preliminary analysis of these data suggests that the Project has facilitated the discovery of information which will be valuable to scientific knowledge. Publication of the results of this research will be explored in appropriate academic publications when available. Due to the potentially significant contribution to science that such surveys have revealed, the impact of the Project on this service is considered to be beneficial.
Wild species diversity	Moderate	Yes	While there are no known natural areas within the affected marine environment that are critical to the maintenance of species populations or for the protection of the capacity of ecological communities to recover from disturbances, the Project has the potential to impact upon vulnerable and endangered species which could impact on the well-being of those who place value on the diversity of life within the Black Sea. The area of the Black Sea in which the Project is located has been considered a Critical Habitat in terms of the species of conservational concern which could be present such as Black Sea bottlenose and common dolphins and the Mediterranean Shearwater. Marine mammals such as dolphins are highly charismatic species which are valued by people throughout the Black Sea region and as such, impacts on such species could impact on the well-being of groups who value these species. More information on these species and the potential impacts of the Project is presented in **Chapter 8 Biological Environment**.

* As calculated using the approach set out in Table 11.2, see Appendix 11.2 for full details.
† Intangible cultural heritage refers to cultural resources, knowledge, innovations and/or practices of local communities embodying traditional lifestyles.
‡ Living Human Treasures are persons who possess to a high degree the knowledge and skills required for performing or re-creating specific elements of the intangible cultural heritage. http://www.unesco.org/culture/ich/?pg=00061.

Complete.

Based on the results of the scoping exercise, wild species diversity was the only ecosystem service taken forward for more detailed impact assessment.

11.4 Spatial and Temporal Boundaries

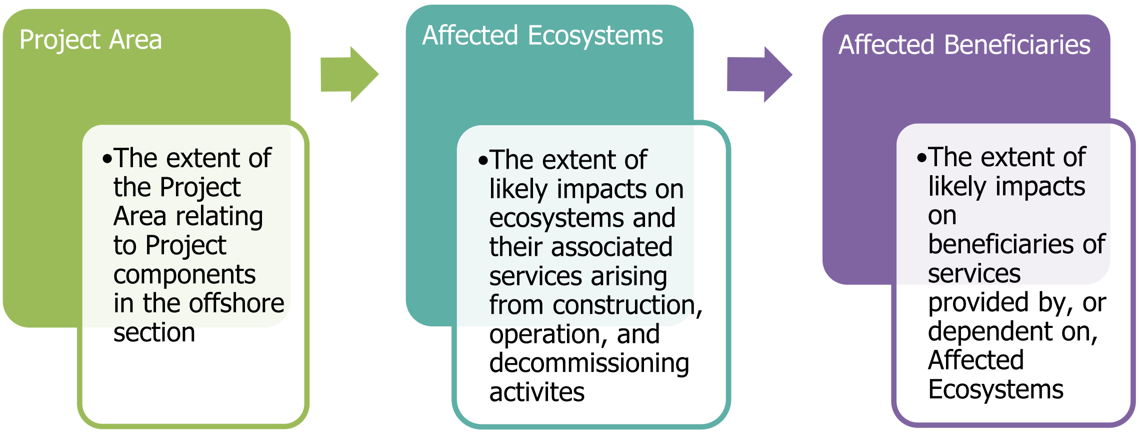
Ecosystem services are the contributions that ecosystems make to human well-being and business performance. As such, the focus of the ecosystem services assessment is on assessing changes in beneficiary well-being as a result of impacts on ecosystems and their associated services (Figure 11.2).

Figure 11.2 Impact Pathway for Assessing Impacts on Ecosystem Services

The assessment in this chapter therefore differs from other chapters in that it involves a two-stage process. First, the impacts on the ecosystem and its associated services (the biophysical receptor) need to be understood before the implications for ecosystem service beneficiaries (the social receptor) can be assessed. As such, the spatial boundaries of this assessment are determined by the Project Area and the ecosystems within it which are affected by the Construction and Pre-Commissioning, Operational and Decommissioning Phases of the Project, the flows of ecosystem services generated by these ecosystems and, ultimately, the locations of the ecosystem service beneficiaries (a socially defined area).

The relationship between the Project Area, the Affected Ecosystems, and the Affected Beneficiaries is illustrated in Figure 11.3. Further details on each of the assessment areas are provided in the following sections.

Figure 11.3 Defining Spatial Boundaries for Assessing Impacts on Ecosystem Services



11.4.1 Project Area

As described in **Chapter 1 Introduction**, the Project Area is some 470 km in length and 2 km in width, extending along an east west orientation across the north of the Turkish EEZ.

11.4.2 Affected Ecosystems

The Affected Ecosystems are defined by the extent of the ecosystems or habitats which are most likely to be impacted by the Construction and Pre-Commissioning, Operational, or Decommissioning Phases of the Project.

Identifying the ecosystems most likely to be impacted by the Project provides a useful starting point from which to identify both the potential impacts on the ecosystem services supplied by these habitats and the people who benefit from them.

For the purposes of this assessment, the starting point for assessing the potential impacts of the Project on ecosystem services and their beneficiaries has been defined as the entire Central Black Sea, including the Turkish EEZ.

11.4.3 Affected Beneficiaries

Due to the interconnectedness of ecosystem processes and the flows of services they provide, impacts on Affected Ecosystems may impact the ability of people to use or access particular services outside of the Affected Ecosystems. For example, fish species may breed at particular sites within Affected Ecosystems and then migrate throughout the marine environment supporting fishing industries across multiple countries.

As such, beneficiaries living outside of the Affected Ecosystems may be impacted by changes to the services provided and the assessment therefore needs to consider, "…*project-related impacts across the potentially affected landscape or seascape…which does not necessarily correspond to any one pre-defined unit of geographical space"* (Ref 11.8).

Further, the location of beneficiaries can vary depending on the type of service and, as such, beneficiaries are not restricted to a particular spatial area or landscape. For example, while the beneficiaries of local climate regulation services may be restricted to the surrounding area, the beneficiaries of global climate regulation may be located throughout the world. As such, the extent of impacts on beneficiaries of ecosystem services can extend far beyond the Project Area or the Affected Ecosystems.

The Affected Beneficiaries are therefore defined by the location of the beneficiaries of the services provided by or dependent upon the Affected Ecosystems. While most of the beneficiaries are likely to be located within or around the ecosystems providing services, they vary across different services and can be located regionally, nationally, or even globally.

As such, the location of Affected Beneficiaries are not restricted to a single pre-defined unit of geographical space and instead are defined for each ecosystem service depending on the beneficiaries of that service.

11.4.4 Temporal Boundaries

The temporal boundaries of this assessment are defined by the five key phases of the Project as set out in **Chapter 1 Introduction**. These include:

- Feasibility Phase (2007 to early 2012);
- Development Phase (late 2011 to late 2013);
- Construction and Pre-Commissioning Phase (2014 to end of 2017);
- Full Operational Phase (2017 to 2065); and
- Decommissioning Phase (2065 onwards).

Unless otherwise indicated, the temporal boundaries of this assessment are assumed to be the operational life of the Project (i.e. 50 years). Decommissioning is considered in less detail because the decommissioning program will be developed during the Operational Phase of the Project. A review, and relevant studies if necessary, will be undertaken during the Operational Phase to confirm that the planned decommissioning activities utilise GIIP and are the most appropriate to the prevailing circumstances.

11.5 Baseline Data

11.5.1 Methodology and Data

Following the scoping exercise, the next step was to establish the present condition of the scoped-in services as well as broad trends in their provision and use. The baseline provides an analysis of the existing condition of an ecosystem and the services it provides in the absence of the Project, taking into account external factors (i.e. not related to the Project) that may affect future service provision including, for example, changes in fisheries policy, etc. Ultimately, the baseline provides a counterfactual or reference scenario from which the impacts of the Project can be measured and covers:

- Current provision of services and how the ecosystem or habitat supports their delivery;
- The importance of ecosystem services to beneficiaries; and
- How ecosystem services and the benefits they provide are likely to change in future in the absence of the Project.

The data used for the baseline assessment was obtained from a wide range of sources including secondary sources (i.e. existing data including government or academic reports etc.) and primary sources (i.e. new data collected through interviews and stakeholder engagement activities) as described in **Chapter 6 Stakeholder Engagement**.

The remainder of this section sets out the data sources in more detail and the limitations of the assessment in terms of the availability of data collected.

11.5.2 Secondary Data

Secondary data and information was obtained through a literature review of relevant peer-reviewed journal articles, research reports, and publically available databases.

11.5.3 Data Gaps

Due to the fact that the importance of services provided by different ecosystems depends upon how people interact with and value them, the analysis of secondary data revealed a number of information gaps in relation to the provision and use of services which were not captured through secondary data sources.

11.5.3.1 Primary Data and Baseline Surveys

In light of the data gaps that emerged from the review of secondary data, a data collection exercise was undertaken which sought to supplement the secondary data gaps as well as to verify the secondary data available. Primary data on ecosystem services was collected during country visits in 2013. These visits included meetings and interviews with government authorities and fisheries enterprises representatives.

A series of marine baseline surveys were also conducted between 2009 and 2011 to collect data on marine ecological receptors that might be present in the Project Area. These surveys collected ecological and physico-chemical data over a wide area and during several seasons. More information on these surveys is presented in **Chapter 8 Biological Environment**.

Since ecosystem services represent the intersection between the natural and human environment, this chapter also draws upon the baseline information and analysis conducted in other relevant chapters of this ESIA Report. Any gaps in the baseline data relating to ecosystem services were discussed with the relevant technical chapter specialists in case the information was readily available and/or could be obtained through on-going data collection and stakeholder engagement.

11.5.3.2 Data Assumptions and Limitations

Accurate, quantifiable data on the use of ecosystem services is used where possible, however, for many ecosystem services the data were not available to establish a detailed and quantifiable metric in terms of baseline provision or use for each ecosystem service.

While this is a potential limitation, it does not significantly undermine the results of the assessment since the ecosystem services assessment refers to and builds upon the assessments undertaken in each chapter of this ESIA Report which use measurable metrics for assessing changes in the natural environment. The emphasis of this assessment is placed on drawing together the information presented in other chapters of this ESIA Report to assess the impacts on the well-being of beneficiaries resulting from changes in the natural environment. As such, the ecosystem services assessment aims to measure changes in well-being as a result of changes in the provision of ecosystem services.

Due to the fact that there is a high degree of variance between the values different beneficiaries attach to different services, measuring well-being impacts using a single metric across all services and beneficiaries is a difficult task. One approach is to use economic valuation techniques to estimate the value of changes in well-being resulting from changes in ecosystem service provision in monetary terms.

However, due to the need for detailed, high quality primary data to establish reliable economic valuation estimates, the time consuming nature of undertaking such primary data collection exercises, and the relatively limited value this would add to the overall assessment, an economic valuation of ecosystem service use has not been undertaken here. This is in line with IFC Guidance Note 6 which states, "…*client requirements are focused on the mitigation of impacts on ecosystem services and the benefits that ecosystem services might bring to companies rather than on the economic valuation of such services"* (Ref 11.8).

In light of this, the value of services provided by Affected Ecosystems has been assessed in a qualitative manner through stakeholder engagement, discussions with relevant specialists, and literature review.

11.6 Baseline Characteristics

11.6.1 Wild Species Diversity

Definition: People derive value from interaction with wild species as well as from knowledge of their continued existence; these values may extend locally, regionally, nationally, or even globally. Species are considered to be locally important if they are valued by local communities for reasons in addition to the other ecosystem services they may provide. Species are considered to be regionally important if they are listed on the Black Sea Red Data Book and globally important if listed on the International Union for Conservation of Nature (IUCN) Red List as being vulnerable, endangered, or critically endangered.

The Project is located within a marine ecosystem that provides habitats for several species, including plankton, fish, seabirds, and marine mammals. While there are no local groups of beneficiaries identified who may place particular value on the area or the species within it, there are several fish, bird, and mammal species are of regional and international importance which are likely to be of value to the conservation community.

The habitat of the abyssal plain is a fairly uniform expanse of muddy seabed. Although very little is known about the seabed of the Black Sea abyssal plain it is an area that is devoid of meiofaunal and macrofaunal life. Anoxic conditions and the presence of hydrogen sulphide mean that only sulphur or methane metabolising bacteria, and one infaunal species of microscopic metazoan, have been observed to survive in these zones. However, the diversity and abundance of microscopic organisms in this habitat is not fully known. In some circumstances deep sea bacterial communities can form microbial mats or reef structures, although no such communities were observed along the proposed Pipeline route (Ref. 11.21).

In this area of the Black Sea **plankton** abundance is low and in terms of the larvae and juveniles of commercially important species, only anchovy, sprat, and horse mackerel were observed in the Project Area. There are no **benthic invertebrates** known to inhabit the anoxic abyssal plain of the Black Sea.

For **birds**, most feeding takes places in coastal areas although there are likely to be some species foraging offshore when pelagic fish species like anchovy are migrating between the northern and southern coasts of the Black Sea. The most common birds seen in the Project Area were the Mediterranean shearwater (*Puffinus yelkouan*), which has an IUCN status of vulnerable and the Caspian gull (*Larus cachinnans*).

In addition to seabirds, there are a number of bird species observed which are not linked to the sea, or generally not found in the open sea. During surveys two falcon species were observed: the peregrine falcon (*Falco peregrinus*) listed as endangered in the Red Data Book of the Black Sea and the Saker falcon (*Falco cherrug*) listed as endangered in the IUCN Red List and vulnerable in the Black Sea Red Data Book.

For **fish**, the most common species likely to be present in the surface waters of the Turkish EEZ include but are not limited to sprat, anchovy, Black Sea garfish (*Belone belone euxini*), Black Sea pelagic pipefish (*Syngnathus schmidti*), and Black Sea horse mackerel, Atlantic bonito (*Sarda sarda*), and chub mackerel (*Scomber colias*). Of these species, the Black Sea garfish and Black Sea pelagic pipefish are endemic whilst all other species are cosmopolitan. The Black Sea garfish and Atlantic bonito are listed on the Black Sea Red Data Book as endangered and critically endangered respectively. However, the Atlantic bonito is critically endangered in the western Black Sea near Bulgaria only. Although sprat is not listed in the IUCN Red List, the Azov sprat (*Clupeonnella cultriventris*) which may be synonymous to other sprat species for Black Sea countries is listed as endangered.

Three species of **marine mammals** are known to occur in the Black Sea and are represented by subspecies. These are the Black Sea harbour porpoise (*Phocoena phocoena relicta*), the Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*) and the Black Sea common dolphin (*Delphinus delphis ponticus*). Two of the three cetacean species that occur in Turkish waters, namely harbour porpoise and bottlenose dolphin are globally endangered and included in the Black Sea Red Data Book. All three species are listed in Annex II of the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) as endangered. The presence of marine mammals is low compared to the continental shelf zones of the Black Sea.

For further information see **Chapter 8 Biological Environment**.

11.6.2 Baseline Summary

A summary of the baseline conditions of the key ecosystem services is provided in Table 11.4. Likely future trends are indicated as follows: ↗ increasing provision; ↘ decreasing provision; ←→ no overall change in provision; and ± some increases and some decreases in provision. The importance of the ecosystem service is indicated by: high importance; medium-high importance; medium-low importance; and low importance.

Table 11.4 Baseline Summary

Service	Provision	Future Trend and Importance	Key Drivers of Change	Key Beneficiaries
Wild species diversity	A number of vulnerable species are present within the marine environment		Habitat loss, disease, invasive species	National and global conservation community

11.7 Impact Assessment

11.7.1 Impact Assessment Methodology

The assessment of impacts on ecosystem services broadly follows the approach set out in **Chapter 3 Impact Assessment Methodology**. It follows the same steps and uses the same assessment criteria but differs in one important respect: it assesses impacts from the point of view of the ecosystem service beneficiaries. The impact is therefore measured as the change in human well-being (relative to the baseline) as a result of a change in the level of provision of an ecosystem service.

The nature and significance of impacts are determined using a set of criteria that reflect the value of ecosystem services to beneficiaries; the resilience of ecosystems and their beneficiaries to change; and the extent, duration, reversibility, and frequency of the impacts. These criteria are explained more fully in the sections that follow.

11.7.1.1 Impact Assessment Criteria

Receptor Sensitivity

Receptor sensitivity is determined using information from the baseline and provides a detailed understanding of the importance of each ecosystem service to its respective beneficiaries, taking account of:

The **value** of ecosystem services to beneficiaries, i.e.:

- The extent to which beneficiaries are *dependent on the ecosystem service* (e.g. whether fishing is undertaken occasionally as a recreational activity or regularly as an important part of livelihoods); and
- The *scarcity value* of the ecosystem service (e.g. the availability of suitable alternatives or substitutes) and how readily replaceable it is considering accessibility and affordability.

And the **resilience** of ecosystems and beneficiaries to change, i.e.:

- The *sensitivity of the ecosystem* to change (e.g. as a result of climate change, population pressures etc). This will depend on *inter alia* the existing condition of the ecosystem, its functions, and its thresholds. For example, some fish species (such as anchovy) are particularly sensitive to changes in noise levels (Ref. 11.22); and

- The *sensitivity of beneficiaries* to changes in ecosystem service provision. This will depend on *inter alia* beneficiaries' existing endowments of, or access to, factors such as financial, human, physical, natural, and institutional capital. For example, artisanal fishers are likely to be more sensitive to changes in fish populations than large scale commercial fishing operations.

The extent to which an ecosystem service fulfils each of these criteria is scored on a four point scale as shown in Table 11.5. Note that receptor sensitivity is independent of Project impacts and relates to the existing situation and the capacity of ecosystems and ecosystem service beneficiaries to adapt to any type of change (e.g. climate change, population growth, etc.).

Table 11.5 Criteria Used to Determine Receptor Sensitivity

	Sensitivity Criteria	Assigned Scores			
		Score 1	**Score 2**	**Score 3**	**Score 4**
Value	What is the degree of dependence by beneficiaries on the ecosystem service? *Note: this can include type of use e.g. subsistence vs. recreational and intensity of use e.g. occasional vs. continual*	Negligible	Low	Moderate	High
Value	To what extent is this ecosystem service replaceable? Or are good substitutes available without entailing significant costs? *Note: this should specifically refer to the availability of alternatives*	Service is widely available	Some alternatives available	Few alternatives available	No alternatives available
Resilience	What is the sensitivity of the ecosystem to change? *Note: this should refer to the biological sensitivity of the ecosystem to change*	Negligible	Low	Moderate	High
Resilience	What is the vulnerability of the human receptors to any change in ecosystem service provision? *Note: this should refer to the socio-economic capacity of people to adapt*	Negligible	Low	Moderate	High

The scores assigned to each criterion are then added together for each ecosystem service to arrive at the overall receptor sensitivity score as shown in Table 11.6.

Table 11.6 Approach to Determining Overall Receptor Sensitivity

Receptor Sensitivity		Score
Negligible	The service is of low value to beneficiaries (due to low dependency or the existence of widely available alternatives) and the environmental and human receptors are highly resilient.	4
Low	The service is of low value to beneficiaries (due to low dependency or the existence of widely available alternatives) and the environmental and human receptors are moderately to highly resilient. Alternatively, the service is of moderate value to beneficiaries and the environmental and human receptors are highly resilient.	5-8
Moderate	The service is of moderate value to beneficiaries (due to moderate dependency or the existence of some alternatives) and the environmental and human receptors are moderately resilient. Alternatively, the service is of high value to beneficiaries and the environmental and human receptors are highly resilient.	9-12
High	The service is of high value to beneficiaries (due to high dependency or the lack of suitable alternatives) and the environmental and human receptors have low resilience. Alternatively, the service is of moderate value to beneficiaries and the environmental and human receptors have low resilience.	13-16

Impact Magnitude

The assessment of Project impacts on ecosystem services follows the methodology described in **Chapter 3 Impact Assessment**. The magnitude of each of the identified impacts on ecosystem services is evaluated on the basis of the following criteria:

- The **severity** of the impact on the well-being of ecosystem service beneficiaries;
- The **reversibility** of the impact (i.e. how quickly is the ecosystem able to recover from the impact);
- The **duration** of the impact *on beneficiaries*; and
- The **frequency** with which ecosystem service beneficiaries are affected by the impacts of Project activities.

Each impact is scored against each of the criteria on a four point scale as shown in Table 11.7.

Table 11.7 Criteria for Determining Impact Magnitude

Magnitude Criteria	Assigned Scores			
	Score 1	**Score 2**	**Score 3**	**Score 4**
Severity: What is the likely severity of the impact on the well-being of any beneficiaries of the service, considering both the number of beneficiaries affected and the degree to which they are affected?	Negligible	Low	Moderate	High
Reversibility: How quickly is the ecosystem (or ecosystem functionality) able to recover from the impact?	Short term *Will recover completely in a short period of time once the activity ceases, e.g. turbidity levels in a water column*	Medium term *Reversible after some time with no intervention. Ecosystem functionality will recover with some changes to ecosystem function at natural recovery rates (e.g.re-establishment of planktonic nutrient cycling process)*	Long term *Reversible after some time with intervention. Recovery will occur but is retarded by impact (e.g. introduction of species whose numbers were depleted by the impact)*	Permanent
Duration: How long is the impact on beneficiaries expected to last?	Short term *Impacts occur over a few weeks or for a single season*	Medium term *Impacts occur over an extended period covering multiple seasons*	Long term *Impacts affect the current human generation, e.g. 25 years*	Permanent *Impacts extend over multiple generations, e.g. >25 years*
Frequency: How often are ecosystem service beneficiaries affected by the impacts of the Project activity?	Once off	Periodic *Effects are intermittent and sporadic over assessment period*	Regular *Effects are intermittent but regularly repeated over assessment period*	Continuous

The scores assigned to each criterion are added together for each ecosystem service to arrive at a total impact magnitude score for each ecosystem service which is classified as shown in Table 11.8.

Table 11.8 Determining Overall Impact Magnitude

Impact Magnitude		Score
Negligible	The impact is within the normal range of variation of the ecosystem and is not significant for the ecosystem service beneficiaries	4
Low	The impact results in a small reduction in the availability or functionality of the ecosystem but is unlikely to give rise to any significant, lasting change in service provision or well-being of any beneficiaries and will not impact on Project operations	5-8
Moderate	The impact results in a moderate reduction in the availability or functionality of the ecosystem which may give rise to a change in service provision and the well-being of any beneficiaries and/or may compromise Project operations	9-12
High	The impact results in the loss of all or a significant proportion of the availability or functionality of an ecosystem which is likely to give rise to a significant change in service provision and the well-being of any beneficiaries and/or will compromise Project operations	13-16

11.7.1.2 Impact Significance

Once the receptor sensitivity and impact magnitude for each of the ecosystem services is estimated they are then combined to estimate the impact significance using the impacts significance matrix set out in Table 11.9.

Table 11.9 Impacts Significance Matrix

		Receptor Sensitivity (Vulnerability and Value)			
		Negligible	*Low*	*Moderate*	*High*
Impact Magnitude (Extent, Frequency, Reversibility, Duration)	*Negligible*	Not significant	Not significant	Not significant	Not significant / Low*
	Low	Not significant	Low	Low / Moderate†	Moderate
	Moderate	Not significant	Low / Moderate	Moderate	High
	High	Low	Moderate	High	High

* Allows technical discipline author to decide if impact significance is **Not significant** or **Low**
† Allows technical discipline author to decide if impact significance is **Low** or **Moderate**

Based upon the resulting impact significance score, *priority ecosystem services* i.e. those upon which the Project is likely to have a significant impact and which result in adverse impacts on beneficiaries, and/or those upon which the Project is directly dependent for its operations are determined as follows:

- **Not significant** to **Low** impact significance – not a priority service and no mitigation required beyond that which is set out in other Chapters; and
- **Moderate** to **High** impact significance – *priority service* and further mitigation measures required to maintain the value and functionality of the affected service.

A residual impact assessment was then undertaken to evaluate the effectiveness of the proposed mitigation measures and assess the net impacts with these measures in place. The mitigation measures specified in this chapter relate to design controls and mitigation measures outlined in each of the relevant technical chapters. These chapters have adopted a mitigation hierarchy of mitigation selection, from avoidance through to offsetting, which is outlined in full in **Chapter 3 Impact Assessment Methodology**.

11.7.2 Assessment of Potential Impacts: Construction and Pre-Commissioning

11.7.2.1 Introduction

The following sections provide a description of the nature and significance of Project impacts on ecosystem services and their beneficiaries during the Construction and Pre-Commissioning Phase. A detailed breakdown of the scoring assigned to each ecosystem service is provided in Appendix 11.3 Impact Assessment – Construction and Pre Commissioning and Operation.

Wild Species Diversity

The service considered in this section is the diversity of locally, regionally, nationally, or globally important species which live within, or are dependent upon, the Affected Ecosystems. The beneficiaries include any communities who value and appreciate the existence and diversity of species living within or dependent upon Affected Ecosystems.

The Project Activities which may impact provision of this service include:

- Disturbance to fish through vessel discharges, displacement of food resources, underwater noise emissions, and use of lighting;
- Disturbance to seabirds through physical presence of vessels (bird strikes), displacement of food resources, use of lighting, and vessel discharges; and
- Disturbance to marine mammals through vessel discharges, displacement of food resources, underwater noise emissions, and collisions.

Receptor Sensitivity

Beneficiaries of wild species diversity (i.e. those who value the existence of wild species) do not depend on the service as an important source of livelihoods or income and, due to the distance from land, there are no local groups of beneficiaries which attach particular importance to interactions with any of the species. However, there are a number of threatened species within the marine environment in the Project Area which may be important to conservation communities and any beneficiaries who gain satisfaction from knowing that certain species or the habitats that support them exist. Further, marine mammal species such as dolphins are charismatic and valued by beneficiaries across the Black Sea countries (for example, dolphinariums are popular in both Russia and Bulgaria). Impacts on such species could therefore impact on the well-being of groups who value these species.

While the ecological role of a particular species could potentially be replaced by another, the existence value of that species cannot. Therefore, there are no replacements available to individual species. If a species is lost from an area it could be reintroduced from other areas although there are significant costs associated with such processes and a successful reintroduction can be difficult to achieve.

Due to the presence of endangered and vulnerable bird and mammal species for at least parts of the year in the Project Area (**Chapter 8 Biological Environment**), the sensitivity of the ecosystem to any form of disturbance is considered to be high. However, the sensitivity of human beneficiaries is considered low due to the widespread national and international financial and legislative resources available to adapt to any changes.

In sum, the receptor sensitivity for the wild species diversity service is considered to be moderate.

Impact Magnitude

Construction activities and associated vessel operations and movements, have the potential to temporarily disturb fish, seabirds, and marine mammals.

Collisions may also occur with marine mammals. However, these are highly mobile animals with acute sensory perception and are generally able to avoid areas of disturbance and only a few individuals are likely to be affected. All of the construction impacts on marine mammals are of negligible to low magnitude. Seabirds can be attracted to lights from the vessels or can be displaced by vessel movements. However all of the construction impacts on seabirds are of negligible to low magnitude. Fish can be impacted by waste discharges and noise and light emissions from construction vessels. The majority of impacts on fish are of negligible magnitude with the exception of noise which can be considered of low magnitude.

While there may be some impact on the distribution of populations in the area, there are unlikely to be any significant changes in the size or health of populations of these species. There are no local groups of beneficiaries who are likely to be impacted by this. **Chapter 9 Socio-Economic** states there will be no impact on fisheries from Project Activities. However, due to the protected status of the bottlenose and common dolphin species, such impacts may be of concern to the conservation community. Nevertheless, impacts on the well-being of conservation communities are likely to be low and limited to the construction period.

In summary, the impact magnitude on the wild species diversity service is considered to be low.

Impact Significance

In combination, the total impact significance on the wild species diversity ecosystem service is considered to be **Low** and is not identified as a priority service.

11.7.2.2 Mitigation and Monitoring

Based on the results of the impact assessment (see Appendix 11.3 for a detailed summary of the scoring assigned to each ecosystem service), no priority services were identified which are likely to be significantly impacted during the Construction and Pre-Commissioning Phases of the Project and which will require additional mitigation beyond that set out in the other chapters.

11.7.2.3 Residual Impacts: Construction and Pre-Commissioning Phase

The residual Project impacts during the Construction and Pre-Commissioning Phase are summarised in Table 11.10.

11.7.3 Assessment of Potential Impacts: Operational Phase

11.7.3.1 Introduction

In the following sections the key beneficiaries of each ecosystem service and the relevant Project impacts during the Operational Phase are discussed. For each of the ecosystem services the beneficiaries are grouped together and the Project impact is assessed in terms of the total impacts on that service across all of its beneficiaries. A detailed breakdown of the scoring assigned to each ecosystem service is provided in Appendix 11.3.

Wild Species Diversity

Pipeline inspection and maintenance will involve some vessel movements. The limited frequency and extent of such activities means that any interaction with fish, seabirds, and marine mammals will be minimal and there is unlikely to be any impact on well-being of any beneficiaries.

Impacts on wild species diversity from operational activities are therefore considered to be of negligible magnitude and **Not Significant**.

11.7.3.2 Mitigation and monitoring

There were no priority services identified for the Operational Phase and therefore no mitigation beyond that set out in the other ESIA chapters is required.

11.7.3.3 Residual Impacts: Operational Phase

Table 11.11 presents a summary of the residual effects of impacts on ecosystem services on their beneficiaries.

Table 11.10 Assessment of Potential Impacts: Construction and Pre-Commissioning

Ecosystem Service	Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Wild species diversity	Offshore pipe-laying	Disturbance to marine species	National and Global conservation community	Moderate	Low	**Low**	None required	**Low**

Table 11.11 Assessment of Potential Impacts: Operational Phase

Ecosystem Service	Activity	Potential Impact	Receptor	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact Significance	Summary of Mitigation Measures	Residual Impact Significance
Wild species diversity	Vessel movements and routine operations	Disturbance to marine species	National and Global conservation community	Moderate	Negligible	**Not Significant**	None required	**Not Significant**

11.7.4 Assessment of Potential Impacts: Decommissioning Phase

Decommissioning of the South Stream Offshore Pipeline will be carried out according to prevailing international and national legislation and regulations and best practices regarding environmental and other potential impacts.

A review, and relevant studies if necessary, will be undertaken during the Operational Phase to confirm that the planned decommissioning activities utilise GIIP and are the most appropriate to the prevailing circumstances. The review will outline management controls and demonstrate that the decommissioning activities will not cause unacceptable environmental and social impacts. The decommissioning activities will also require all relevant approvals and authorisations from the Turkish Government departments responsible at the time.

Two options are available; namely in situ decommissioning or pipe removal:

- In situ decommissioning involves cleaning the pipeline and filling it with seawater. The receptors and degree of impact are thus the same as those for the Operational Phase; or
- Removal of the pipeline is a similar operation to pipe-laying, but in reverse. The receptors and degree of impact will thus be similar to those identified for the Construction and Pre-Commissioning Phase.

Impacts that may be associated with decommissioning will be assessed as part of the process of developing decommissioning management plans and are not assessed in this ESIA Report.

11.8 Unplanned Events

Unplanned events are assessed in **Chapter 13 Unplanned Events**, those relevant to the provision or use of ecosystem services are discussed below.

11.8.1 Construction and Pre-Commissioning Phase

The use of survey and pipe-laying vessels and equipment could lead to fuel and oil spillages. Oil spills within the marine environment could have significant impacts across a range of ecosystem services including fisheries and wild species diversity. Although the likelihood of unplanned events occurring during construction is very low, given the presence of sensitive marine ecological and commercial species, an oil spill of sufficient size and proximity could have significant adverse consequences.

It is therefore a key objective of the Project to minimise the likelihood of occurrence of an oil spill and for contractors to develop Oil Spill Prevention and Response Plans that would effectively minimise the potential for adverse impacts on potentially impacted marine species and habitats. The mitigation measures described in **Chapter 13 Unplanned Events** contain detailed measures to minimise the probability of an oil spill occurring, and thus reduce the potential adverse impacts to marine habitats, and their beneficiaries, in the event of a spill.

Another risk to wild species diversity and capture fisheries in the marine environment is through the potential for introduction of non-native invasive species which could out-compete species currently living within the marine ecosystem (**Chapter 8 Biological Environment**). Vessel operations have the potential to inadvertently introduce invasive non-native species, either in ballast water or carried as fouling organisms on the hull. Mitigation measures for invasive species are presented in **Chapter 13 Unplanned events**.

11.8.2 Operational Phase

During the Operational Phase of the Project unplanned events at sea may occur as a result of unplanned leakages of natural gas from the Pipeline. This could be incurred by third-party vessel interaction with the pipeline by events including sinking, grounding and dropped object (such as a container) damage to the Pipeline. **Chapter 13 Unplanned Events** assesses the likelihood of occurrence of such events as being remote.

Gas passage through the water column could also impact upon marine organisms (such as fish and marine benthos), resulting in potential acute or chronic impacts depending upon exposure levels and environmental conditions (e.g. water temperature, dissolved oxygen).

In the event of an uncontrolled gas release from the pipeline, the gas flow will be shut off as soon as practicable. During normal operations, this would occur along approximately one third (the Western end) of the length of Pipeline in the Turkish EEZ. For areas where the water would not ingress, any gas released from a damaged sub-sea pipeline would rise through the water column as a plume of gas bubbles. On reaching the sea surface, the gas would disperse into the air. **Chapter 13 Unplanned Events** provides details of the measures included in the pipeline design that aim to minimise the potential for uncontrolled gas releases from the pipeline.

Maritime vessel operations during the Operational Phase will be limited to the periodic use of maintenance vessels. During operation, there is potential for vessels to be used from outside of the Black Sea which could inadvertently introduce invasive alien species to the marine environment in the same manner as stated during the Construction and Pre-Commissioning Phase. Mitigation measures adopted during construction will also be applicable to operation.

11.8.3 Decommissioning Phase

The expected service lifetime of the South Stream Offshore Pipeline is 50 years. The decommissioning program will be developed during the Operational Phase of the Project. Consequently, unplanned events associated with the Decommissioning Phase are unknown at this stage; however, it is anticipated that some of the potential unplanned events will be similar in nature to some of those that may arise during the Construction and Pre-Commissioning Phase.

11.9 Cumulative Impacts Assessment

The cumulative impact assessment (CIA) considers the incremental impacts of the Project on priority ecosystem services and their associated beneficiaries within the context of other existing, planned, or reasonably defined developments at the time the risks and impacts identification process was undertaken.

However, as discussed in **Chapter 14 Cumulative Impact Assessment**, no significant cumulative impacts have been identified during the Construction and Pre-Commissioning, Operational or Decommissioning Phases.

11.10 Conclusions

In terms of ecosystem services, the assessment has identified no priority services on which the Project is likely to have a significant impact during the Construction and Pre-Commissioning Phase or during the Operational Phase. A summary is provided in Table 11.12.

Table 11.12 Assessment Summary

Priority Service	Potential Impact	Impact Significance	Mitigation Measures	Residual Impact
Wild species diversity	Disturbance to species as a result of vessel movements and operations	C: **Low**	None required	C: **Low**
		O: **Not significant**		O: **Not significant**

C: Construction Phase; O: Operational Phase

No mitigation was identified to be required beyond that set out in other ESIA chapters. The combined effects of the Project and other developments are not expected to result in any significant cumulative impacts on ecosystem service beneficiaries.

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Chapter 12: Waste Management

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Tables

12 Waste Management

12.1 Introduction

This chapter presents an assessment of the potential waste impacts arising from the Project. It relates to solid waste, non-aqueous liquid waste, and wastewaters.

It should be noted that no solid waste and no non-aqueous liquid wastes will be disposed of at Turkish facilities. Where appropriate, the assessment below considers the disposal of certain wastes at waste disposal facilities in Russia or Bulgaria.

The methodology used to assess potential waste impacts differs slightly from that detailed in **Chapter 3 Impact Assessment Methodology** due to the unique nature of waste when considered as a Project impact. Unlike many other impact categories, waste is a product of the Project and impacts from waste will depend on the ability of facilities and management systems to store, transport, treat and dispose of waste in a safe and environmentally sound manner. There are a number of applicable legislative requirements and standards that exist, which must be adhered to, and a range of potential waste management practices that can be applied.

The assessment is based on the Project description provided in **Chapter 5 Project Description** and the waste products anticipated to be generated as part of Construction and Pre-Commissioning, Operational, and Decommissioning Phases.

The waste description section (Section 12.5) evaluates the type and volume of wastes anticipated to be generated. Section 12.6 considers the potential impacts of wastes based on the availability and capacity of waste management infrastructure. It is recognised that impacts can arise throughout the waste management supply chain and therefore the generation, storage, collection and transport, reuse, recycling, recovery, treatment and disposal of waste are considered.

Mitigation measures that will be adopted to manage anticipated wastes so as to minimise their environmental impact and ensure compliance with relevant local, national and international regulations are provided. These approaches represent standard Good International Industry Practice (GIIP) for the various waste streams under consideration and make use of existing facilities in Russia and Bulgaria as far as practicable. The assessed significance of the residual impacts for each waste stream takes into account the identified mitigation measures.

The Project Environmental and Social Management Plan (ESMP) (described in **Chapter 16 Environmental and Social Management**) sets out how the mitigation measures detailed within this chapter shall be practically applied to the Construction and Pre-Commissioning and Operational Phases of the Project.

12.2 Applicable Legislation, Standards, and Guidelines

Chapter 2 Policy, Regulatory and Administrative Framework describes the framework of legislation, standards and guidelines relevant to the ESIA process; those of particular relevance to waste management are summarised in Table 12.1.

12.2.1 International Legislation

There are four international conventions associated with waste management that are relevant in the context of this ESIA Report. Table 12.1 highlights the most relevant parts of these conventions in relation to waste management aspects of the Project.

Table 12.1 Summary of International Waste Management Requirements

Name	Relevance
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), 1972 (Ref. 12.1) (Turkey is not a Party to the London Convention)	The objective of the London Convention is to control pollution of the sea caused by dumping activities and to encourage supplementary regional agreements. As such, it covers the deliberate disposal at sea of wastes or other matter from vessels, aircraft and platforms. Under these requirements, Parties are to establish authorities responsible for issuing permits, keeping records and monitoring the condition of the seas. Furthermore, Parties are to promote measures, which prevent pollution from hydrocarbons, additional matter transported other than for dumping, wastes generated during operation of ships, etc. and matter originating from exploration of the sea bed. Annexes I and II of the London Convention list matter which is defined as prohibited or restricted with regards to dumping.
Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention), 1992 (Ref. 12.2) (Turkey has signed and ratified the Basel Convention)	The Basel Convention regulates transboundary movements of hazardous wastes and provides obligations upon its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. The main principles of the Convention are as follows: • Transboundary movements of hazardous wastes should be reduced to a minimum, which is consistent with their environmentally sound management; • Hazardous wastes should be treated and disposed of as close as possible to their source of origin; and • Hazardous waste generation should be reduced and minimised at source. Annexes I to VIII of the Basel Convention provide lists of waste categories requiring special consideration or controls, including disposal operations. Annex I outlines a list of waste categories to be controlled, Annex II details waste categories requiring special consideration and Annex III provides a list of important hazardous characteristics.
Convention on Persistent Organic Pollutants (Stockholm Convention), 2001 (Ref. 12.3) (Turkey has signed and ratified the Stockholm Convention)	The Convention seeks to ensure the limitation of pollution by persistent organic pollutants (POPs). It defines the substances in question, whilst leaving open the possibility of adding new ones, and also defines the rules governing the production, importing and exporting of those substances.

Continued…

Name	Relevance
International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78 Convention) Annex I – VI (Ref. 12.4) (Turkey has acceded to all Annexes of the MARPOL Convention)	The Convention covers the prevention of pollution of the marine environment by ships from operational or accidental causes. With regards to waste management, the Convention defines conditions for waste disposal in the marine environment by ship, particularly in determined "special areas" such as the Black Sea (for Annexes I and V). Annex I includes regulations for the Prevention of Pollution by Oil and is mandatory. Annex II includes regulations for the Control of Pollution by Noxious Liquid Substances in Bulk. Annex III includes regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packed Form. Of particular relevance to waste management aspects of the Project are Annex IV and Annex V. Annex IV includes regulations for the Prevention of Pollution by Sewage from Ships. Annex V includes regulations for the Prevention of Pollution by Garbage from Ships. Annex VI includes regulations for the Prevention of Air Pollution from Ships.
Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention), 1992 (Ref. 12.5). (Turkey has signed and ratified the Bucharest Convention)	The Convention provides a basic framework of agreement and three specific Protocols, which are: (1) the control of land-based sources of pollution; (2) control of dumping of waste; and (3) joint action in the case of accidents (such as oil spills). Discharges from ships are managed in accordance with MARPOL and are as such compliant with the Bucharest Convention. The "Protocol on the Protection of the Black Sea Marine Environment Against Pollution by Dumping" does not apply to any of the wastes generated by the Project in the Turkish EEZ since the Project Activities in these waters do not comprise dumping as defined in the Convention.

Complete.

Of these international conventions, the most relevant to this project is the MARPOL Convention, which governs management of waste on board vessels.

Under MARPOL Annex I, within any Special Area, as defined by the Annex, any discharge of oil from a ship exceeding 400 gross registered tonnage (GRT) is prohibited, except when:

- The ship is proceeding en route;
- The oily mixture is processed through oil filtering equipment meeting the relevant MARPOL requirements;
- The oil content of the effluent without dilution does not exceed 15 parts per million;
- The oily mixture does not originate from cargo pump room bilges on oil tankers; and
- The oily mixture, in case of oil tankers, is not mixed with oil cargo residue.

The Black Sea is a Special Area under MARPOL Annex I. This effectively prohibits the discharge of oily sludge and slops, and requires oily bilge water to be treated through an oily water separator (OWS) prior to discharge.

MARPOL Annex IV provides regulations for the prevention of pollution by sewage from ships. MARPOL Annex IV defines "sewage" as:

- Drainage and other wastes from any forms of toilet and urinal;
- Drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubs and scuppers located in such premises;
- Drainage from spaces containing living animals; or
- Other waste waters when mixed with the drainages defined above.

The discharge of sewage into the sea is prohibited, except when:

- The ship is discharging comminuted and disinfected sewage at a distance of more than three nautical miles (NM) from the nearest land, or sewage which is not comminuted or disinfected at a distance of more than 12 NM from the nearest land, provided that in any case, the sewage that has been stored in holding tanks shall not be discharged instantaneously but at a moderate rate when the ship is en route and proceeding at not less than 4 knots; or
- The ship has in operation an approved sewage treatment and (additionally) the effluent shall not produce visible floating solids nor cause discoloration of the surrounding water.

MARPOL Annex V provides regulations for the prevention of pollution by garbage from ships and limits the disposal, be it continuous or periodic, of food, domestic and operational waste into the sea. Annex V completely prohibits the disposal of plastics anywhere into the sea and places strict restrictions upon discharges into designated Special Areas. The Black Sea is a Special Area under Annex V.

Amendments to Annex V entered into force on 1 January 2013, and the revised Annex V prohibits the discharge of all garbage into the sea, except as provided otherwise. An overview of the revised MARPOL Annex V discharge provisions (as relevant to the Project) is presented in Table 12.2.

Table 12.2 Relevant Requirements for Disposal of Garbage under MARPOL Annex V

Type of waste	Ships within Special Areas
Food waste comminuted or ground	Discharge permitted provided vessel is ≥12 nautical miles (NM) from the nearest land and *en route*
Food waste not comminuted or ground	Discharge prohibited
Cargo residues* not contained in wash water	Discharge prohibited
Cargo residues* contained in wash water	Discharge only permitted in specific circumstances† and ≥12 NM from the nearest land and *en route*

Continued…

Type of waste	Ships within Special Areas
Cleaning agents and additives contained in cargo hold wash water	Discharge only permitted in specific circumstances† and ≥12 NM from the nearest land and *en route*
Cleaning agents and additives contained in deck and external surface wash water	Discharge permitted
All other garbage including plastics, domestic waste, cooking oil, incinerator ashes, operational wastes and fishing gear	Discharge prohibited
Mixed garbage	When garbage is mixed with or contaminated by other substances prohibited from discharging or having different discharge requirements, the more stringent requirements shall apply

* These substances must not be harmful to the marine environment.
† According to regulation 6.1.2 of MARPOL Convention Annex V, the discharge shall only be allowed if: (a) both the port of departure and the next port of destination are within the special area and the ship will not transit outside the special area between these ports (regulation 6.1.2.2); and (b) if no adequate reception facilities are available at those ports (regulation 6.1.2.3).

Complete.

12.2.2 International Standards and Guidelines

In addition to the international legislation outlined above, the Project is aligned with the International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines and Performance Standards (PS).

Table 12.3 summarises the IFC EHS Guidelines and PS that require consideration in relation to waste management aspects of the Project.

12.2.3 National Waste Management Legislation

Given that only aqueous wastes (waste waters) will be disposed of in the Turkish Exclusive Economic Zone (EEZ) and that no solid or non-aqueous wastes will be landed at Turkish facilities, the main national regulation of relevance is the Regulation on Water Pollution Control (Official Gazette Date: 31 December 2004 and No: 25687). This sets the legal and technical principles to be followed in the control of water pollution, in order to protect ground and surface waters and to prevent water pollution including within the Black Sea in the EEZ, taking into consideration sustainable development objectives. A summary of national waste management legislations is presented in Table 12.4.

Table 12.3 IFC Guidelines and Performance Standards Relevant to Waste Management

Name	Relevance
IFC (2007): General EHS Guidelines: Environmental (Ref. 12.6)	The IFC EHS Guidelines are technical reference documents that provide general and industry-specific examples of Good International Industry Practice (GIIP). The Guidelines cover a wide range of technical subjects, including hazardous and non-hazardous waste management. Section 1.5 Hazardous Waste Management states that: *"Projects which manufacture, handle, use, or store hazardous materials should establish management programs that are commensurate with the potential risks present. The main objectives of projects involving hazardous materials should be the protection of the workforce and the prevention and control of releases and accidents. These objectives should be addressed by integrating prevention and control measures, management actions, and procedures into day-to-day business activities."* Section 1.6 Waste Management states that: • *"Facilities that generate and store wastes should practise the following:* • *establishing waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences;* • *establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes;* • *avoiding or minimizing the generation of waste materials, as far as practicable;* • *where waste generation cannot be avoided but has been minimised, recovering and reusing waste; and* • *where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environmentally sound manner."*
IFC PS3: Resource Efficiency and Pollution Prevention (01 Jan 2012) (Ref. 12.7)	The IFC provides eight PSs that offer guidance regarding the identification of risks and impacts associated with projects, and which aim to reduce, avoid or mitigate these risks and impacts. Of relevance to waste management is PS3: Resource Efficiency and Pollution Prevention. The aim of this standard is to minimise or avoid adverse impacts on human health and the environment, promote sustainable use of resources and reduce greenhouse gas emissions. PS3 states that the client will avoid generation of hazardous and non-hazardous materials, but where waste cannot be avoided, waste arisings will be reduced, recovered or reused before subjecting the materials to treatment and disposal in an environmentally sound manner. Waste disposal should be at sites operating to acceptable standards and, where this is not the case, consideration should be given to alternative disposal options, including the development of facilities on site. The use and production of hazardous waste should be avoided as far as is possible and, where this is not practicable, material will be controlled and minimised.

Continued...

Name	Relevance
IFC PS3 Guidance Note: Resource Efficiency and Pollution Prevention (01 Jan 2012) (Ref. 12.8)	To aid in the interpretation of IFC Performance Standards, Guidance Notes relevant to each standard are also provided. Guidance Note 3 corresponds to PS3 and outlines further details regarding the management of hazardous and non-hazardous wastes. With regard to hazardous waste, Guidance Note 3 lists international conventions the client should refer to when reviewing components of materials and hazardous waste; these conventions are listed in the Bibliography of Guidance Note 3.

Complete.

Table 12.4 Summary of National Waste Management Legislation

Legislation	Date /Reference Number	Relevance to the Project
Regulation on Water Pollution Control	Date 31 Dec 2004 and No. 25687	Sets the legal and technical principles to be followed in the control of water pollution, in order to protect the ground and surface waters and to prevent water pollution, taking into consideration the sustainable development objectives.
Regulation on Control of Waste Oils	Date: 30 July 2008 and No: 26952	Provides standards for storage, transportation and disposal of waste oils and to prevent their discharge into the receiving environment.
Regulation on Waste Collection from Vessels and Control of Wastes	Date: 26 Dec 2004 and No: 25682	Lays down the principles and procedures on waste reception from ships in ports. Defines the requirements related to receiving, storing and transporting of wastes from vessels as well as providing methods and principles concerning the establishment and operation of waste reception facilities in harbours.
Regulation on Declaration According to the Safety of Life At Sea (SOLAS) and MARPOL Conventions	Date: 11 Aug 2006 and No: 26256 (For MARPOL Annexes: Date: 24 Jun 1990 for Annex I, II and V, updated on 16 Mar 2013 and 14 May 2013 to include Annex III, IV and VI)	Sets forth principles and procedures for reporting, communication and notification activities within the scope of SOLAS and MARPOL Conventions.

12.2.4 Regional and Local Waste Management Legislation

There are no regional or local waste management regulations which are relevant to this assessment.

12.3 Baseline Conditions and Existing Waste Management Arrangements

The Strategic Action Plan (SAP) for the Environmental Protection and Rehabilitation of the Black Sea (adopted in Sofia, Bulgaria, 17 April 2009) (Black Sea Commission) (Ref. 12.9) includes a number of provisions related to waste management.

Waste management itself is not one of the priority transboundary problems identified in the SAP, although oil pollution is recognised as an aspect of chemical pollution, which is one of the four priority problems.

The SAP presents Ecosystem Quality Objectives (EcoQOs), which are statements that reflect how stakeholders would like the state of the Black Sea to be over the long term, based on a resolution of priority problems identified in the Transboundary Diagnostic Analysis. Each EcoQO is assigned a number of management targets that address the immediate, underlying and root causes of the concern areas. For regional level interventions, the Black Sea coastal states and the international partners shall work collectively to take the required steps to fulfil those interventions. National level supporting interventions will be the responsibility of individual states.

Several of these management targets relates to waste management:

- Target (18): Amend national waste strategies and/or national coastal zone management plans with the aim of coastal and marine litter minimisation;
- Target (19): Develop regional and national marine litter monitoring and assessment methodologies on the basis of common research approaches, evaluation criteria and reporting requirements;
- Target (20): Promote and/or develop investment projects within national strategies/local plans to engineer, construct and install new solid waste recycling facilities, landfill sites and incineration plants, complying with best available technology regulations;
- Target (60): Provide adequate port reception facilities for ship-generated wastes according to MARPOL 73/78, Annex I, IV, V;
- Target (61): Establish a harmonised fee/cost recovery system on ship-generated waste;
- Target (62): Develop systems for the identification of illegal pollution sources from vessels and off-shore installations; and
- Target (63): Develop and/or establish a harmonised enforcement system in cases of illegal discharges from vessels and off-shore installations, including technical means and fines.

The SAP presents indicators for each target, although a status update has not been published by the Black Sea Commission.

Existing waste management facilities at one or more of Temryuk and Novorossiysk Ports (in Russia) and Varna and Burgas Ports (in Bulgaria) will be used for the management of wastes generated by the Project offshore. No ports or facilities in Turkey will be used for waste disposal or storage.

12.3.1 Russia

Temryuk and Novorossiysk Port have arrangements in place with port waste management companies to provide waste reception facilities for vessels using the port, and these contractors include:

- Marine Consulting LLC;
- Mortrans-Service NHB LLC;
- SPC Crocus LLC; and
- Krymskvtorsyryo LLC.

12.3.2 Bulgaria

Both the Port of Varna and the Port of Burgas maintain facilities for the offloading of oil waste, construction waste, garbage and wastewater from ships. The Port of Varna - Varna East and Varna West, which is expected to receive a proportion of Project waste, is certified to International Organisation for Standardisation (ISO) 14001:2004 and maintains a program for management of port generated waste (including from vessels using the port), effective for the period 2011 to 2016. The Port of Varna maintains facilities for the temporary storage of port generated waste before transport for subsequent treatment, in compliance with the requirements of the Waste Management Act (No. 53/2012).

The Port Infrastructure State Company is responsible for any collection, transportation, storage and treatment of ship generated waste and cargo residues.

Contracts that are in place for waste management at the Port of Varna (transport and disposal) include:

- Marine Antipollution Enterprise (MAE), South Industrial Zone, Varna (licensed collection contractor for MAPROL Annex I and V waste at port of Varna);
- Transins Reciclig Company of Varna Ltd;
- Titan AS Ltd;
- Eco Varna PLC;
- Metarex Ltd; and
- Transins Battery Ltd.

The port services for reception and treatment of waste at the Port of Burgas are also performed by MAE (head office in Varna, South Industrial Area). Bilge and sludge are collected by PCMV, a company which collects oily waste from vessels, on demand by ship agents.

Contracts that are in place for waste management at the Port of Burgas are as follows:

- Titan Burgas;
- Ocean Shipping; and
- Specta auto.

The Port of Burgas has mobile facilities for the storage of vessel waste; it also has facilities for storage and treatment of bilge and sludge. The Port of Burgas has no licensed volume limits or waste type restrictions.

12.3.3 Selection of Waste Contractor

The contractor managing the vessels used for the Project will arrange with one or more of these port waste management companies to receive vessel waste, depending on which port is used, and the port waste management company will be responsible for the onwards transportation and management of the vessel waste, using the existing regional disposal and treatment facilities. Further inspection of the waste management facilities will be undertaken prior to completion of waste management contracts, i.e. to confirm that sufficient capacities are available to manage Project wastes legally and safely, in accordance with the requirements set out in Section 12.6 and the suite of Construction and Operations Management Plans (refer to **Chapter 16 Environmental and Social Management**).

12.4 Methodology and Assessment Criteria

In contrast to the other environmental and social technical disciplines assessed within this ESIA Report, the assessment of impacts describes the estimated wastes arising, but does not assess the magnitude of these impacts pre- and post-mitigation since waste storage, management and disposal is considered part of the Project design, and as such it is not realistic to consider any situation in which no mitigation would be carried out. The mitigation section therefore describes the measures that will be adopted to manage the wastes generated by the Project (including identifying potentially suitable facilities), and the significance of residual impacts following mitigation is then assessed.

Impact magnitudes for the residual impacts following mitigation are assessed based on:

- The hazardous properties (physical, chemical and biological) of the relevant waste stream; and
- The availability of suitable waste management facilities, taking into consideration:
  - The volume of waste produced;

- The capacity of the identified waste management facilities for managing the waste in compliance with relevant guidelines[1]; and
- The degree of certainty in the availability of these facilities.

Table 12.5 presents a matrix that compares waste type and the availability of suitable waste management facilities, to determine impact magnitude (negligible, low, moderate, and high).

Table 12.5 Magnitude of Waste Impacts

Waste Management Option	Type of Waste		
	Inert	Non-hazardous	Hazardous
Suitable facilities or outlets available with sufficient capacity to manage the quantities of wastes generated	Negligible	Negligible	Low
Suitable facilities or outlets available but capacity to accept waste from project may be constrained due to size of facility or distance from site	Low	Moderate	Moderate
Facilities are unavailable or unsuitable; or means of management is uncertain	Moderate	Moderate	High

Since receptor sensitivity was assumed to be constant, the rankings (negligible, low, moderate, and high) delivered by the impact magnitude matrix in Table 12.5 also reflect "impact significance"; the definitions of significance detailed in **Chapter 3 Impact Assessment Methodology** are therefore applicable.

The definition of hazardous waste includes any wastes specifically designated as hazardous within applicable legislative requirements. For the purposes of this ESIA Report, hazardous wastes are also defined in terms of the IFC General EHS Guidelines for Waste Management, i.e. wastes that share the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed.

Inert waste is recognised in IFC guidelines and is defined in the European Union (EU) Landfill Directive such that *"waste is considered inert if:*

1. *It does not undergo any significant physical, chemical or biological transformations;*

[1] The capacity of facilities has been qualitatively assessed by comparing the size and scale of the potential facilities with the estimated quantities of wastes arising from the Project; and using professional judgement to determine whether the facility is likely have sufficient capacity to accommodate the project's wastes.

2. *It does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and*
3. *Its total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater."*

In practice, inert waste typically comprises surplus excavated soil and rock, and waste construction materials such as brick and concrete.

Suitable facilities are those which are licensed by the relevant regulatory authorities and (in the case of hazardous waste sites) are operating in accordance with GIIP[2]. The suitability of facilities has been assessed for the purposes of the ESIA Report by site visits and review of available information, and the operational capabilities and licensing status of the facilities actually used will be confirmed.

No specific waste study area was defined for the purpose of this chapter. Rather, the assessment considered waste arising within the established Project Area boundaries and associated activities defined in **Chapter 1 Introduction**.

12.5 Impact Assessment

The Project has the potential to give rise to a number of wastes during the Construction and Pre-Commissioning, Operational and Decommissioning Phases.

The potential impacts arising from the management of wastes include:

- Impacts on ecological receptors from releases of waste to air, water or land; and
- Nuisance, including litter, odour, dust and vermin.

The impacts of wastes associated with the Decommissioning Phase of the Project have not been assessed in detail as the available waste facilities and disposal technologies are likely to change significantly over the 50 year life of the Project. For the Decommissioning Phase, the assessment is limited to identifying the types and approximate quantity of waste generated.

Generally, Project wastes can be categorised in terms of their basic properties:

- Non-hazardous waste – e.g. scrap metal, waste paper, card and wood, glass, food waste, packaging waste and other general wastes; and
- Hazardous waste – e.g. oils, certain types of healthcare waste, batteries and other waste exhibiting hazardous properties.

The main types of waste expected to arise from the Construction and Pre-commissioning Phase and Operational Phase of the Project are described in the following sections, with wastes

[2] In these cases, it is assumed that residual impacts due to releases from these facilities are addressed as part of the facilities pre-existing licensing regime and are therefore not assessed within this ESIA Report.

classified according to the European Waste Catalogue (EWC) classification scheme. The waste characterisation has also been conducted based on the Turkish Regulation on General Principles of Waste Management (Official Gazette Date: 05 July 2008 and No: 26927) which is identical to the EWC.

12.5.1 Construction and Pre-Commissioning Phase

The main activities which have the potential to generate waste in the Turkish Sector during the Construction and Pre-commissioning Phase are:

- Activities of pipe-lay vessels and regular deliveries of construction materials;
- Activities of other vessels and support craft;
- Assembly (mounting, joining, pulling) of the pipelines; and
- Activities of the crew involved in the operation of Project vessels and workers associated with the maintenance of the vessels.

Types and quantities of waste likely to be produced have been calculated and are summarised in Table 12.6. Further details are provided in the following paragraphs.

Table 12.6 Estimated Types and Volumes of Waste during Offshore Construction and Pre-Commissioning Activities

EWC Code	EWC Description	Source	Estimated Quantity (for all four pipelines) (tonnes)
12 01 01	Ferrous metal filings and turnings	Scrap from preparing pipes for welding	100 to 1000
12 01 05	Plastics shavings and turnings	Scrap from preparing pipes for welding by abrasion of polypropylene coating	10 to 100
12 01 13	Welding wastes	Waste from pipe welding	10 to 100
13 01 10*	Mineral based non-chlorinated hydraulic oils	MARPOL Annex I waste from vessels	1 to 10
13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	MARPOL Annex I waste from vessels	1 to 100
13 04 03*	Bilge oils from other navigation	MARPOL Annex I waste from vessels	10 to 100

Continued…

EWC Code	EWC Description	Source	Estimated Quantity (for all four pipelines) (tonnes)
13 07 01*	Fuel oil and diesel wastes (sludges)	MARPOL Annex I waste from vessels	1000 to 2000
15 01 01	Paper and cardboard packaging	Waste paper/card packaging from construction materials and crew facilities	1 to 10
15 01 02	Plastic packaging	Waste plastic packaging from construction materials and crew facilities	1 to 10
15 01 03	Wooden packaging	Waste wooden packaging from construction materials	10 to 100
15 01 04	Metallic packaging	Waste metal drums (clean) and drinks cans	1 to 10
15 01 07	Glass packaging	Waste glass from construction materials and crew facilities	1 to 10
15 01 10*	Packaging containing residues of or contaminated by dangerous substances	Waste metal drums containing solvent/oil residues	Less than 1
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	Oily rags	Less than 1
17 02 03	Plastic	Waste plastic from joint protection sleeves	Less than 1
17 09 04	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	General mixed construction waste from offshore works	100 to 1000
18 01 03*	Wastes whose collection and disposal is subject to special requirements in order to prevent infection	Potentially infectious waste from clinics	Less than 1

Continued...

EWC Code	EWC Description	Source	Estimated Quantity (for all four pipelines) (tonnes)
20 01 08	Biodegradable kitchen and canteen waste	Source-separated waste canteen waste	100 to 1000
20 01 21*	Fluorescent tubes and other mercury-containing waste	Source-separated waste fluorescent tubes	Less than 1
20 03 01	Mixed municipal waste	Mixed garbage from crew accommodation	100 to 1000
n/a	n/a	Sewage ("black water") from construction vessels	14.4 m^3 per day

* hazardous wastes

Complete.

12.5.1.1 Waste from Workforce

Municipal waste will be generated by construction workers and crew of all vessels and is categorised as 'garbage' under MARPOL Annex V. This type of waste will include general mixed waste, food waste and recyclable waste.

The quantities of MARPOL Annex V waste are estimated based on an assumed generation rate of 1.5 kilograms per day. The total number of crew days is estimated as 623,000. This results in overall waste arising of 934 tonnes. Some of this will be biodegradable food waste, some will be general garbage and others will be potentially recyclable.

The workforce and crew aboard vessels will also generate sewage, which is regulated under MARPOL Annex IV.

12.5.1.2 Waste from Construction Activities

Pipeline assembling activities will generate wastes associated with the jointing and installation of pipeline sections including stubs of welding electrodes, spent polishing bodies and metal swarf.

The construction materials and equipment used may require the disposal of associated packaging elements, typically a mixture of paper and cardboard, wood and plastic waste. Due to the scale of equipment used in the pipe-laying, some packaging waste items may be relatively large in dimension.

12.5.1.3 Hazardous Waste

A number of hazardous wastes may potentially be generated as a result of the offshore construction and pre-commissioning works, including:

- Waste oils and batteries from maintenance of construction plant;

- Oily waste generated during normal operation of the vessels undertaking the works (e.g. oily sludges and bilge oil);
- Waste fluorescent tubes and other lamps containing mercury from construction vessels;
- Packaging with residues of hazardous substances; and
- Clinical wastes, which may be generated from medical facilities on board the vessels.

Oily wastes will be generated by vessels as a result of fuel filtering, collection of oily slops from machinery spaces, and from oily bilge water. Oily wastes generated by vessels are controlled under MARPOL Annex I. The discharge of any oily sludge or slops is prohibited. Bilge water may be discharged following treatment by an OWS system, provided such discharge is in compliance with the requirements of MARPOL Annex I. In practice, the requirement under MARPOL Annex I for vessels to be "proceeding en route" when they discharge treated bilge water may preclude pipe lay vessels from treating and discharging any bilge water, since they will be almost stationary whilst pipe laying. The oily residue following treatment of bilge water through an OWS will be managed in the same way as oily sludge or slops.

Oily sludge generation on board vessels is assumed to be 0.5% of fuel consumption. Vessel fuel consumption during construction and pre-commissioning is estimated as 200,000 tonnes giving sludge generation of approximately 1,000 tonnes. Unknown quantities of oily bilge water will also be generated, and will depend on the operational conditions of the vessels, in particular whether they have oily water separation systems and/or bilge water holding tanks. Other waste types have been estimated based on the vessel number and type used in pipeline construction vessel spread.

12.5.2 Operational Phase

In comparison to the Construction and Pre-Commissioning Phase, it is anticipated that the Operational Phase of the Project will generate much smaller quantities of waste.

Types and quantities of waste likely to be produced have been calculated and are presented in Table 12.7.

Normal operation of the pipelines will not generate waste in the Turkish Sector. Surveys will be carried out of critical areas on an annual basis using Remotely Operated Vehicles (ROV), and of the whole Pipeline every five years. These surveys will be carried out from vessels and the survey duration is expected to be five days for annual surveys and up to 30 days for the five year surveys. The survey vessels will generate relatively small quantities of waste classified under MARPOL Annex V (garbage) and MARPOL Annex I (oily waste): it is assumed that there will be no significant construction work during normal operation.

In the event of emergency pipeline repair, vessels will need to be mobilised and welding may be required. The types of waste would be similar to those generated during construction, but since the frequency and severity of pipeline repair cannot be estimated, there is no information on the quantities of waste arising. Since the probability of failure is expected to be low, the likelihood of significant quantities of repair waste being generated is also expected to be low.

Table 12.7 Estimated Types and Volumes of Waste during Operational Activities

EWC Code	EWC Description	Source	Estimated Quantity (for all four pipelines)
13 01 10*	mineral based non-chlorinated hydraulic oils	MARPOL Annex I waste from vessels	Less than 1 tonne per annum (average)
13 02 05*	mineral-based non-chlorinated engine, gear and lubricating oils	MARPOL Annex I waste from vessels	Less than 1 tonne per annum (average)
13 04 03*	bilge oils from other navigation	MARPOL Annex I waste from vessels	1 to 10 tonnes per annum (average)
13 07 01*	fuel oil and diesel wastes (sludges)	MARPOL Annex I waste from vessels	1 to 10 tonnes per annum (average)
20 01 08	biodegradable kitchen and canteen waste	Canteen waste from crew facilities	Less than 1 tonne per annum (average)
20 03 01	mixed municipal waste	Canteen waste from crew facilities	Less than 1 tonne per annum (average)

* hazardous wastes

12.5.3 Decommissioning Phase

The expected service lifetime of the South Stream Offshore Pipeline is 50 years. Decommissioning of the pipeline will be undertaken in accordance with the legislation prevailing at that time, in liaison with the relevant regulatory authorities.

Within this timeframe there may be changes to statutory decommissioning requirements, as well as advances in technology and knowledge. South Stream Transport will therefore utilise GIIP during all decommissioning operations.

The actual method used for decommissioning will not be determined until closer to the time of decommissioning, and in particular no decision has been made on whether the subsea pipelines will be removed, or whether they will be decommissioned in situ (i.e. flushed, filled with water, sealed and left in position).

If during decommissioning the pipelines are removed, the main waste materials generated by decommissioning will be metal (from pipes and ancillary equipment). Depending on the techniques used, small quantities of waste associated with maintenance of the plant used for decommissioning may also be generated. An estimate of potential waste arising during decommissioning is given in Table 12.8.

Table 12.8 Estimated Types and Volumes of Waste during Decommissioning Activities

EWC Code	EWC Description	Source	Estimated Quantity (for all four pipelines) (tonnes)
17 04 05	Iron and steel	Removal of pipelines and associated equipment	1.4 million tonnes
13 01 10*	Mineral based non-chlorinated hydraulic oils	MARPOL Annex I waste from vessels	1 to 100 tonnes
13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	MARPOL Annex I waste from vessels	1 to 100 tonnes
13 04 03*	Bilge oils from other navigation	MARPOL Annex I waste from vessels	1 to 100 tonnes
13 07 01*	Fuel oil and diesel	MARPOL Annex I waste from vessels	1 to 100 tonnes
20 01 08	Biodegradable kitchen and canteen waste	Canteen waste from crew facilities	1 to 100 tonnes
20 03 01	Mixed municipal waste	Canteen waste from crew facilities	1 to 100 tonnes

* hazardous wastes

12.6 Design Controls and Mitigation Measures

12.6.1 General Approach to Waste Management

The general approach to managing solid waste will be described in the Integrated Waste Management Plan (WMP) drawn up by contractors. This will provide guidance on:

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

The Integrated WMP will refer to vessel-specific WMPs which will include provisions for segregating waste on board, having secure areas for storage of hazardous waste and recycling / reuse where practicable.

The structure of the Integrated WMP should follow the outline provided in Table 12.9.

Table 12.9 Typical Contents of an Integrated Waste Management Plan

Section	Content
Introduction	Background
	Plan Objectives
	Limitations of the WMP
	Layout of the WMP
Project Description	Project Details
	Nature of Project
	Location
Management Arrangements	Roles and Responsibilities
	WMP Distribution
	Instruction and Training
	Performance Indicators
Waste Management Arrangements	Forecast Waste Arisings
	Record of Decisions Taken Regarding Waste Management
	Opportunities for Increasing Recycled Content
	Opportunities for Waste Minimisation
	Waste Storage and Segregation Arrangements
	Waste Management Arrangements
	Monitoring Arrangements

All wastes will be managed in accordance with the applicable regulations and statutory obligations.

12.6.2 General Design Controls and Mitigation Measures

The general approach to mitigating impacts will be to use licensed facilities which comply with national regulations (whether Bulgarian or Russian, as appropriate) and the requirements of the IFC EHS Guidelines and Performance Standards. Prior to the start of construction works, contracts will be arranged with licensed organisations for the transport, reuse, recycling, treatment and final disposal of waste. No waste generated by construction of the Project will be transported and disposed of onshore in Turkey. However, it should be noted that no decision as to which potential waste facility sites in Russia and Bulgaria will be used has been taken at this time and will be subject to further investigation.

12.6.3 Specific Design Controls and Mitigation Measures

The specific mitigation measures that will be adopted to ensure responsible management of the wastes arising from the Project are described below and summarised in Table 12.10.

12.6.3.1 Waste from Workforce and Construction Activities

Offshore waste during both construction and operation will be managed in accordance with the requirements of MARPOL 73/78.

With respect to MARPOL Annex V waste, there will be no discharge of any garbage within 12 nautical miles of the coast. Outside this 12 NM limit, food waste may be comminuted or ground prior to discharge, providing vessels are en route. MARPOL Annex V does not give any minimum speed as part of the definition of "en route".

Garbage will be stored on vessels in suitable containers, clearly marked to indicate the type of waste within. Any garbage requiring transfer, either to support vessels or for onshore disposal, will be located in order to provide ease of access for loading and unloading. Once the waste has been transferred to shore, it will be collected by the port authorities or their nominated contractors using the existing port waste reception facilities.

Alternatively, if equipped, vessels may make use of on-board garbage incineration units, provided these are the type approved in accordance with the International Maritime Organisation (IMO) "Standard Specification for Shipboard Incinerators" and comply with the requirements of Regulation 16 of MARPOL Annex VI and the Standard Specification for On-board Ship Incinerators, adopted by the Marine Environment Protection Committee on 25 September 1997 (Ref. 12.4). On vessels capable of incineration the following solid wastes may be incinerated: domestic waste (excluding glass); operating wastes (e.g. oily sludges); textiles; and uncontaminated plastic containers. Solid wastes that will not be incinerated include mercury vapour lamps and mercury-containing fluorescent tubes, glass and scrap metal.

There will be no inappropriate mixing of waste types (e.g. domestic waste with hazardous waste) and containers will be not overfilled. Where feasible, recyclable garbage (e.g. glass and plastics) will be separated at source, separately stored and collected for recycling by the port waste reception contractors.

Where waste is transferred to other ships, specific procedures will govern methods employed for preparing material and ensuring accidental discharge, spillages or leaks do not occur. Consignment notes detailing the quantity and type of waste transferred between ships will be kept.

Project vessels will carry a Garbage Management Plan, which will include written procedures for collection, storage, processing and disposal of waste, including the use of any relevant equipment fitted onboard. The Garbage Management Plan will designate the persons responsible for carrying out the Plan. Vessels over 400 gross tonnage or carrying more than 15 passengers shall also maintain a Garbage Book.

For the purposes of complying with MARPOL 73/78, construction waste arising on board the vessels will be managed as MARPOL Annex V waste, with discharge at sea strictly prohibited. All waste (predominantly welding and packaging waste) will be retained on board, source-separated where practicable, and collected by the port authorities or their nominated contractors using the existing port waste reception facilities. Any hazardous waste generated during offshore construction (other than MARPOL Annex I Oily Waste, described separately below) will be stored, collected and managed separately in accordance with Turkish regulations.

Sewage from vessels will be managed in accordance with MARPOL Annex IV. Discharge of sewage will only take place when:

- The ship is discharging comminuted and disinfected sewage at a distance of more than three NM from the nearest land, or sewage which is not comminuted or disinfected at a distance of more than 12 NM from the nearest land, provided that in any case, the sewage that has been stored in holding tanks shall not be discharged instantaneously but at a moderate rate when the ship is en route and proceeding at not less than 4 knots; or
- The ship has in operation an approved sewage treatment and the effluent does not produce visible floating solids nor cause discoloration of the surrounding water.

12.6.3.2 Hazardous Waste

Under MARPOL Annex I, vessels are permitted to discharge bilge water which has been treated using an OWS such that it has oil content below 15 parts per million (ppm), provided the vessel is proceeding en route. "En route" for the purposes of MARPOL Annex I is defined as meaning *"… that the ship is underway at sea on a course or courses, including deviation from the shortest direct route, which as far as practicable for navigation purposes, will cause any discharge to be spread over as great an area of the sea as is reasonable and practicable".* Vessels which are stationary (i.e. not en route) will be required to retain bilge water on board for subsequent discharge to dedicated collection vessels; or treatment and discharge once they are proceeding en route; or discharge to port waste reception facilities.

Oily sludge will be collected and stored in dedicated sludge tanks. Oily sludge (and residues from bilge water OWS systems) will be treated by incineration in the case of those vessels having MARPOL compliant incinerators. In all other cases, oily wastes will be retained on board for subsequent discharge to dedicated collection vessels or port waste reception facilities.

Vessels will maintain an Oil Record Book and Oil Pollution Emergency Plan in accordance with MARPOL Annex I.

12.6.3.3 Summary

Table 12.10 summarises the management measures proposed for the various waste types anticipated to be generated by the Project and outlines the facilities which may be used for the intermediate storage, treatment and/or disposal of the wastes.

Table 12.10 Mitigation and Management Measures

Description of Waste Type	EWC code	Potential Management Route	Potential Facilities
Construction and Pre-Commissioning Phase			
Scrap from preparing pipes for welding	12 01 01	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Novorosmetall LLC or Krymskvtorsyryo LLC (Russia); MAE Varna (Bulgaria)
Scrap from preparing pipes for welding by abrasion of polypropylene coating	12 01 05	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Waste from pipe welding	12 01 13	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
MARPOL Annex I waste from vessels	13 01 10*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)
Maintenance of mobile plant and MARPOL Annex I waste from vessels	13 02 05*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)
MARPOL Annex I waste from vessels	13 04 03*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)
MARPOL Annex I waste from vessels	13 07 01*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)
Waste paper and card packaging from construction materials and office and mess facilities	15 01 01	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)

Continued...

Description of Waste Type	EWC code	Potential Management Route	Potential Facilities
Waste plastic packaging from construction materials and office/mess facilities	15 01 02	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Waste wooden packaging from construction materials	15 01 03	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Waste metal drums (clean) and drinks cans	15 01 04	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Waste glass from construction materials and office/mess facilities	15 01 07	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Waste metal drums containing solvent/oil residues	15 01 10*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Oily rags	15 02 02*	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)
Empty gas bottles/canisters	16 05 05	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Waste plastic from joint protection sleeves	17 02 03	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)

Continued…

Description of Waste Type	EWC code	Potential Management Route	Potential Facilities
General mixed construction waste	17 09 04	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Potentially infectious waste from clinics	18 01 03*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Mercury Safety Agency LLC (Russia); MAE Varna (Bulgaria)
Source-separated waste canteen waste (from welfare facilities/mess/offices) and MARPOL Annex V waste	20 01 08	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Source-separated waste fluorescent tubes (from welfare facilities/mess/offices)	20 01 21*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Mercury Safety Agency LLC (Russia); MAE Varna (Bulgaria)
Mixed waste (from welfare facilities/mess/offices) and MARPOL Annex V waste	20 03 01	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Sewage (black water) from vessels	n/a	Treated and discharged in accordance with MARPOL Annex IV and Turkish regulations	n/a
Bilge water	n/a	Treated and discharged in accordance with MARPOL Annex I and Turkish regulations	n/a
Operational Phase			
MARPOL Annex I waste from vessels	13 01 10*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)

Continued...

Description of Waste Type	EWC code	Potential Management Route	Potential Facilities
MARPOL Annex I waste from vessels	13 02 05*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
MARPOL Annex I waste from vessels	13 04 03*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
MARPOL Annex I waste from vessels	13 07 01*	Transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Canteen waste from crew facilities	20 01 08	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Canteen waste from crew facilities	20 03 01	Incinerated on-board or transferred to vessel waste reception facilities for disposal at suitable waste facility	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)
Sewage (black water) from vessels	n/a	Treated and discharged in accordance with MARPOL Annex IV and Turkish regulations	n/a
Bilge water	n/a	Treated and discharged in accordance with MARPOL Annex I and Turkish regulations	n/a

* Hazardous waste

Complete.

If during decommissioning the pipelines are removed, due to the long period of time before decommissioning is programmed to start, it is not possible to identify specific management routes and facilities for decommissioning waste. However, the great majority of decommissioning waste will be metal.

12.6.4 Monitoring

South Stream Transport will develop a detailed overarching Environmental and Social Monitoring Programme that will detail the monitoring requirements for the Project. As part of this Monitoring Programme, the quantities of waste generated by the overall South Stream Offshore Pipeline and the means of management of these wastes will be monitored on a regular basis. Monitoring will also be carried out to ensure compliance with Turkish regulations and MARPOL requirements for maintenance of Oil and Garbage Record Books as required under MARPOL Annex I and V respectively.

Monitoring records will be maintained which will include, as a minimum, the following information:

- Types and quantities of waste generated;
- Types and quantities of waste leaving Project sites or vessels for recycling, recovery or disposal;
- Details of vehicles or vessels transporting waste;
- Location of treatment or disposal facilities to which the waste is transported; and
- Records of any spillages or unplanned releases, or any enforcement actions.

12.6.5 Assessment of Residual Impact Significance

Table 12.11 indicates the assessed residual impact significance of each waste stream assuming management measures as described are implemented.

Table 12.11 Assessment of Residual Impact Significance

Description of Waste Type	Potential Facilities	Waste Category	Facility Assessment	Residual Impact
Construction and Pre-Commissioning Phase				
Scrap from preparing pipes for welding	Novorosmetall LLC or Krymskvtorsyryo LLC (Russia); MAE Varna (Bulgaria)	Inert	Suitable facilities with sufficient capacity	**Negligible**
Scrap from preparing pipes for welding by abrasion of polypropylene coating	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**

Continued...

Description of Waste Type	Potential Facilities	Waste Category	Facility Assessment	Residual Impact
Waste from pipe welding	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
MARPOL Annex I waste from vessels	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)	Hazardous	Suitable facilities with sufficient capacity	**Low**
Maintenance of mobile plant and MARPOL Annex I waste from vessels	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)	Hazardous	Suitable facilities with sufficient capacity	**Low**
Waste paper and card packaging from construction materials and office and mess facilities	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Waste plastic packaging from construction materials and office and mess facilities	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Waste wooden packaging from construction materials	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Waste metal drums (clean) and drinks cans	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Inert	Suitable facilities with sufficient capacity	**Negligible**
Waste glass from construction materials and office and mess facilities	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Inert	Suitable facilities with sufficient capacity	**Negligible**
Waste metal drums containing solvent/oil residues	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Hazardous	Suitable facilities with sufficient capacity	**Low**

Continued...

Description of Waste Type	Potential Facilities	Waste Category	Facility Assessment	Residual Impact
Oily rags	Mortrans-Service NHB LLC or SPC Crocus LLC (Russia); MAE Varna (Bulgaria)	Hazardous	Suitable facilities with sufficient capacity	**Low**
Empty gas bottles and canisters	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Waste plastic from joint protection sleeves	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
General mixed construction waste	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Potentially infectious waste from clinics	Mercury Safety Agency LLC (Russia); MAE Varna (Bulgaria)	Hazardous	Suitable facilities with sufficient capacity	**Low**
Source-separated waste canteen waste (from welfare facilities/mess/offices) and MARPOL Annex V waste	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Source-separated waste fluorescent tubes (from welfare facilities/mess/offices)	Mercury Safety Agency LLC (Russia); MAE Varna (Bulgaria)	Hazardous	Suitable facilities with sufficient capacity	**Low**
Mixed waste (from welfare facilities/mess/offices) and MARPOL Annex V waste	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Sewage (black water) from vessels	n/a	Non-hazardous	n/a	n/a

Continued...

Description of Waste Type	Potential Facilities	Waste Category	Facility Assessment	Residual Impact
Bilge water	n/a	Non-hazardous	n/a	n/a
Operational Phase				
MARPOL Annex I waste from vessels	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Hazardous	Suitable facilities with sufficient capacity	**Low**
Canteen waste from crew facilities	Marine Consulting LLC or Mortrans-Service NHB LLC (Russia); MAE Varna (Bulgaria)	Non-hazardous	Suitable facilities with sufficient capacity	**Negligible**
Sewage (black water) from vessels	n/a	Non-hazardous	n/a	n/a
Bilge water	n/a	Non-hazardous	n/a	n/a

Complete.

Temryuk and Novorossiysk Port (in Russia) and Varna and Burgas Ports (in Bulgaria) each have established port waste management contractors who have the facilities to accept and manage the wastes likely to be generated from vessels operating in the Turkish EEZ.

The overall quantities of waste requiring management are relatively small in comparison with the capacity of the receiving facilities. Any impacts from accidental release during temporary storage or transport of hazardous wastes will be minimised by implementing vessel specific WMP.

12.7 Unplanned Events

Procedures for dealing with unplanned events will be set out in the Project Emergency Preparedness and Response Plan (EPRP). The mitigation measures described in this section (including the procedures for temporary storage and transportation of waste) have been developed with the intention of mitigating the likelihood of any unplanned release of wastes; for example, releases due to inadequate storage arrangements at the site, or spillages during loading and unloading of wastes, and the Project EPRP will include contingency arrangements in the unlikely event of releases (e.g. provision of spill kits). More general information is contained within **Chapter 13 Unplanned Events.**

12.8 Cumulative Impacts

Given that there are no significant residual impacts relating to waste and the quantities of waste to be produced by the Project are well within the management capacity of the identified facilities, it is not expected that there will be any cumulative impacts associated with managing waste from the Project and the other identified projects, even if it assumed that all projects happen simultaneously. Waste impacts are briefly discussed in **Chapter 14 Cumulative Impact Assessment**.

12.9 Conclusions

The assessment of waste management impacts arising from the Project has identified the waste streams that are anticipated to be produced during the Construction and Pre-Commissioning Phase, Operational Phase and Decommissioning Phase and identified the availability and suitability of existing waste management facilities to manage those wastes. Mitigation measures have been recommended in order to minimise the impacts as far as possible, including the preparation and implementation of an Integrated WMP by contractors. Provided that all of the mitigation measures described above are correctly implemented, the overall waste management impacts from the development are not expected to be significant.

References

Number	Reference
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Ref. 12.2	Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention), 1992. http://www.basel.int/Home/tabid/2202/mctl/ViewDetails/EventModID/8295/EventID/443/xmid/8052/Default.aspx. Accessed April 2014.
Ref. 12.3	Convention on Persistent Organic Pollutants (Stockholm Convention), 2001. http://chm.pops.int/Home/tabid/2121/mctl/ViewDetails/EventModID/1126/EventID/468/xmid/6921/Default.aspx. Accessed April 2014.
Ref. 12.4	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78 Convention) Annex I – VI. http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx. Accessed April 2014.
Ref. 12.5	The Convention on the Protection of the Black Sea Against Pollution (Bucharest convention), 1992. http://www.blacksea-commission.org/_convention.asp. Accessed April 2014
Ref. 12.6	IFC Environmental, Health, and Safety (EHS) Guidelines - General EHS Guidelines, 2007. http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/IFC+Sustainability/Sustainability+Framework/Environmental,+Health,+and+Safety+Guidelines/EHS+Guidelines+Technical+Revision/. Accessed April 2014.
Ref. 12.7	IFC PS3: Resource Efficiency and Pollution Prevention, 2012. http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/IFC+Sustainability/Sustainability+Framework/Sustainability+Framework+-+2012/Performance+Standards+and+Guidance+Notes+2012/. Accessed April 2014
Ref. 12.8	IFC PS3 Guidance Note: Resource Efficiency and Pollution Prevention, 2012. http://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/IFC+Sustainability/Sustainability+Framework/Sustainability+Framework+-+2012/Performance+Standards+and+Guidance+Notes+2012/. Accessed April 2014.
Ref. 12.9	Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea (2009). Accessed from http://www.blacksea-commission.org/_bssap2009.asp. Accessed on 14 March 2013.

Chapter 13: Unplanned Events

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13 Unplanned Events

13.1 Introduction

Unplanned events are episodes that are not expected to occur during the Project's normal construction and operational phase activities, such as accidents. The Project follows safety and engineering design criteria that aim to reduce the probability and consequences of unplanned events that could lead to adverse environmental, socio-economic or health and safety impacts.

This chapter provides an assessment of the potential environmental and socio-economic risks and impacts from unplanned offshore events that could occur during the Construction and Pre-Commissioning, and Operational Phases of the Project so that design controls and mitigation measures can be put in place. The approach to unplanned event management during the Decommissioning Phase is also presented herein. Project risks and impacts associated with worker occupational health and safety (OH&S) are considered in Appendix 9.2: Occupational Health and Safety.

The assessment considers both the likelihood of unplanned event occurrence as well as the potential consequences of such events.

13.2 Scope and Approach

The Project Area (is defined as 470 km in length and 2 km in width, extending along an east west orientation across the north of the Turkish EEZ from the Russia and Turkey EEZ boundary to the Turkey and Bulgaria EEZ boundary. Information on the Project Area is given in **Chapter 1 Introduction**.

Locations and areas of activity (e.g. shipping routes) in the wider Project Area of Influence that could be affected by unplanned events are also considered.

This chapter focuses on those unplanned events considered to be of most relevance to the Project given the nature of the construction activities, the operational requirements of the pipelines and the geographic location of the Project. In order to assist the unplanned event identification process, South Stream Transport has undertaken an Emergency Threat Analysis[1] for the Project that determines the risks posed by potential emergencies and the need for an Emergency Preparedness and Response Plan and related contingency arrangements. The unplanned events considered within this chapter have been identified via the Emergency Threat Analysis.

Where available, information on the likelihood of occurrence of unplanned events has been drawn from statistics from industry organisations. Data on the frequency of shipping incidents

[1] Involves use of an emergency risk analysis spreadsheet that assigns risk ratings against potential unplanned events taking account of event likelihood and consequences. In August 2013, South Stream Transport undertook an internal Emergency Threat Analysis workshop involving relevant specialists.

has been taken from statistics published by recognised industry bodies, including the International Association of Oil and Gas Producers and European Maritime Safety Agency.

Given the inherent uncertain nature of potential unplanned events, the potential variability of such events in terms of geographic location and coverage, and limitations of directly relevant event statistics, a qualitative assessment methodology has been adopted herein. This methodology has entailed the following tasks:

- Screening of unplanned events to identify those which are carried forward for further consideration;
- Identifying the range of activities that could lead to the occurrence of a potential unplanned event during the Construction and Pre-Commissioning and Operational Phases of the Project;
- If possible, determining the likelihood of occurrence of such events;
- Defining and describing the geographic range of occurrence of potential unplanned events;
- For each unplanned event, estimation of the potential resultant impacts in relation to potentially affected receptors; and
- Definition of appropriate risk management measures to reduce the likelihood of occurrence of each unplanned event and reduce the residual consequences so that the resultant risk is acceptable.

When determining the potential consequences of unplanned events, the resultant impacts have been assessed in relation to categories of receptors as follows:

- Environmental receptors; and
- Socio-economic receptors.

OH&S impacts associated with unplanned events are not considered in this chapter. However, South Stream Transport will implement internationally recognised procedures to assure the OH&S of the workforce (including during unplanned events) along with the necessary equipment and training to make these effective. OH&S measures will be included in a Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS) which will form an important part of the corporate management system (**Chapter 16 Environmental and Social Management**).

In order to support the unplanned events assessment as reported herein, the following additional assessments have been undertaken:

- *Maritime Risk Assessment* (Appendix 13.1): which considers the risks of vessel accidents occurring and the potential for consequential oil spillages;
- *Oil spill modelling* (Ref. 13.1 and Appendix 13.1): undertaken as part of the maritime risk assessment to investigate the fate and behaviour of various oil spill scenarios that may occur following an unplanned marine event (as identified by the maritime risk assessment); and

- *Marine geohazard evaluation* (Appendix 13.2): which highlights the potential geohazards present along the pipeline alignment, and the actions that have been undertaken to manage risks to pipeline integrity.

13.3 Legal Context

Relevant legislation in Turkey is listed below. It reinforces the prevention and elimination of accidents and promulgates the need for emergency management plans:

- Law Pertaining to Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Harmful Substances, No. 5312, and associated regulations (Official Gazette Date: 21 October 2006 and No: 26326); and
- Regulation on the Control of Major Industrial Accidents (Official Gazette Date: 18 August 2010 and No: 27676).

13.4 Emergency Preparedness and Response Plan

Chapter 16 Environmental and Social Management highlights that South Stream Transport will prepare an over-arching Emergency Preparedness and Response Plan for the overall South Stream Offshore Pipeline (i.e. covering the Russian, Turkish and Bulgarian sectors) in line with the International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines. The plan will be part of the HSSE-IMS as defined in **Chapter 16 Environmental and Social Management**. South Stream Transport's Emergency Preparedness and Response Plan will be prepared in coordination with the relevant Turkish authorities to ensure it is fit for purpose.

This plan will define response actions for material unplanned events or risks that have been identified by the Emergency Threat Analysis. The plan will cover all Project phases and will include details as suggested by the IFC EHS Guidelines such as the following:

- Purpose and scope;
- Emergency response management strategy;
- Emergency risk analysis, Emergency Preparedness and Response Plan and definition of the relationships with Contractors Emergency Response Plans;
- Roles and responsibilities;
- Communication requirements;
- Emergency drill requirements (including examinations, inspections and testing); and
- Review processes.

South Stream Transport's construction contractors will be responsible for preparing their own Emergency Response Plans for their work activities, and specifically those events identified by the Emergency Threat Analysis. Contractors are expected to apply Good International Industry Practices (GIIP) and applicable recognized industry standards when preparing their Emergency Response Plans.

The preparation of contractors Emergency Response Plans will be a requirement of the applicable works contract, and will be available prior to the start of construction activities and will be subject to South Stream Transport review and approval. South Stream Transport will ensure that contractors plans are integrated with other Project response plans, including South Stream Transport's overarching Emergency Preparedness and Response Plan.

The Project will also submit an Emergency Response Plan and Risk Assessment Report to the Turkish authorities according to specific regulatory requirements[2] prior to construction works taking place.

13.5 Construction and Pre-Commissioning Phase

13.5.1 Events Identification

During the Construction and Pre-Commissioning Phase of the Project, unplanned events in the Turkish EEZ may occur as a result of offshore construction activities, use of maritime vessels and as a result of maritime vessel accidents.

Table 13.1 lists the main activities that could result in an unplanned event, a description of the unplanned event, and the receptors which could be affected.

Table 13.1 Marine Activities Potentially Resulting in an Unplanned Event (Construction and Pre-Commissioning Phase)

Activity	Event	Receptors	
		Environmental	Socio-Economic
Offshore construction activities and associated use of maritime vessels	Maritime accidents or collisions leading to oil spills (including during bunkering)	✓	✓
	Introduction of invasive species by marine vessels	✓	✓

Table 13.1 indicates that during the Construction and Pre-Commissioning Phase, there is a risk of maritime vessel accidents and collisions. These events have the potential to impact upon socio-economic and human health receptors. Such maritime vessel accidents and collisions can also result in oil spillages which can have resultant impacts upon environmental, as well as socio-economic and human health receptors. Table 13.1 also indicates the risks associated with the introduction of invasive species by maritime vessels.

[2] Regulation on Pertaining to Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Harmful Substances (Official Gazette Date: 21 October 2006 and No: 26326); Law Pertaining to Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Harmful Substances, No. 5312, (Official Gazette Date: 21 October 2006 and No: 26326).

In order to assist in defining the risks and potential secondary environmental or socio-economic impacts associated with maritime accidents and associated oil spills, a maritime risk assessment has been undertaken which has included modelling of marine oil spills that are considered most likely to occur due to accidental collisions of marine vessels or during vessel bunkering (refuelling). The risk assessment assists in defining risk management activities. Details of the maritime risk assessment are presented in Appendix 13.1: Maritime Risk Assessment and Oil Spill Modelling, which highlights the potential likelihood of accidents occurring. Appendix 13.1 also presents results from oil spill modelling which has been used to assess the implications and risk management activities as related to environmental, socio-economic and human health receptors.

It is noted that there is a risk of encountering geohazards along the Pipeline route. Geohazards associated with the offshore environment include seismic activity, soft sediments, and gas seeps. Appendix 13.2: Maritime Risk Marine Geohazards presents details of potential marine geohazards and the resultant pipeline design responses.

Some unplanned events have been excluded from the assessment as they are not expected to lead to significant environmental or socio-economic impacts. Unplanned events that have been excluded from discussion are:

- *Grounding*: Grounding of marine vessels is not considered given that such vessels will not pass through Turkish nearshore areas;
- *Spillages and discharge of potentially hazardous materials other than fuel or oil*: Spillage of relatively small quantities of potentially hazardous chemicals (discharges of sewage, garbage, bilge and oily water) from marine vessels can be readily managed through ensuring that vessels operate in accordance with the International Convention for the Prevention of Pollution From Ships (MARPOL), The Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) and national regulations. All contractors and operators of vessels working on behalf of South Stream Transport will be required to prepare Shipboard Marine Pollution Emergency Plans (SMPEP) as applicable for each vessel. Effective implementation of the SMPEP will mean that the implications of any such events will be sufficiently small not to warrant a detailed discussion of these events herein;
- *Unexploded ordnance (UXO) Clearance*: A UXO survey will be carried out along each pipeline route well in advance of pipe-laying. A UXO clearance plan (if required) will be developed by South Stream Transport in close conjunction with the relevant authorities at the appropriate time. In the event that UXO requires clearance (controlled detonation) in close proximity to an as yet unidentified Cultural Heritage Object (CHO), the possibility that the CHO might be damaged or lost cannot be discounted. **Chapter 10 Cultural Heritage** discusses this issue further noting that the likelihood of such an event is considered remote. UXO clearance via a controlled detonation also has the potential to result in behavioural disturbances to marine fish and/or mammals over several kilometres; and
- *Impacts of unplanned pipeline construction events*: During the Construction and Pre-Commissioning Phase a range of unplanned construction events may be encountered, including wet buckle events (whereby the submerged pipeline floods which can result in pipeline buckling). Such events have the potential to result in significant construction delays and associated costs. It is considered that the environmental implications of such events,

such as, pipeline recovery, disposal, relaying, would be similar to the environmental impacts as associated with routine construction activities as reported within this Environmental and Social Impact Assessment (ESIA) Report. Under such circumstances, remedial activities will be undertaken in accordance with GIIP which will limit the potential for significant environmental impacts.

13.5.2 Maritime Risk Assessment

13.5.2.1 Maritime Collisions and Oil Spillages

A maritime vessel collision could conceivably occur at any location along the Pipeline route, although the likelihood of such a collision occurring is considered to be very low. The likelihood that such an incident would result in an oil spill is even lower, as a high-energy collision would be required to damage a vessel to such an extent that marine diesel was spilled into the sea.

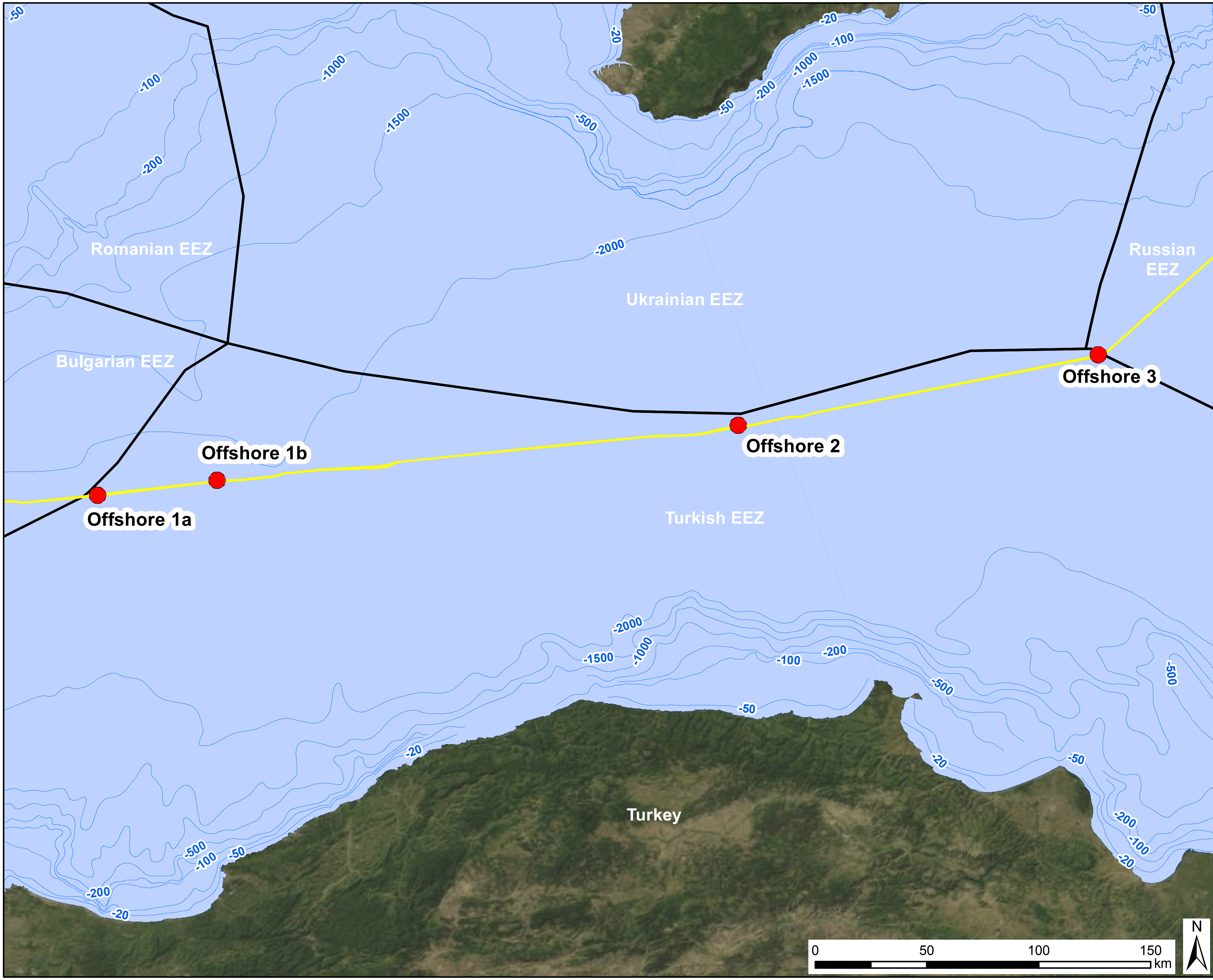
Appendix 13.1 presents details of maritime risk assessment which has entailed the following:

- Estimate the likelihood of an oil spill occurring following a maritime collision (based on available historical information), and rank these into categories;
- Estimate the severity of the potential consequences of any oil spill that could occur and rank these severities into categories;
- Construct a risk matrix of likelihood and consequence severity; and
- Assess various oil spill scenarios and determine their overall risk rating.

Following an evaluation of potential unplanned collision events, the oil spill scenarios (involving marine diesel oil – MDO[3]) as detailed in Table 13.2 were defined, together with details of potential resultant oil spillages. The maritime risk assessment and oil spill modelling (Appendix 13.1) goes on to indicate that such unplanned collision events do not present a major risk of oil spills and that overall risk ratings are considered to be acceptable.

On the basis of the scenarios above, oil spill modelling has been undertaken for the offshore oil spillage of 2,000 m^3 of MDO. Figure 13.1 illustrates the oil spillage locations that have been modelled. Details of the modelling undertaken and the results obtained are included in Appendix 13.1.

[3] Where practical, Project vessels deployed in the Project Area will use marine gas oil (MGO) or MDO, commonly referred to as 'marine diesel' and conforming to ISO-8217:2010 Marine Distillate Fuel Grades DMA, DMB or DMZ (rather than persistent oils such as most crude oils and Heavy Fuel Oil (HFO).



LEGEND

- Oil spill modelling locations
- Isobaths
- Exclusive Economic Zone boundary

Turkish Sector of South Stream Offshore Pipeline

- Proposed offshore 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

OIL SPILL MODELLING
RELEASE LOCATIONS

Drawn	Checked	Approved	Date
DH	RW	MW	03/06/2014

URS Internal Project No.	Scale @ A4
46369082	1:2,200,000

URS Infrastructure & Environment UK Limited
Scott House
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Telephone (01256) 310200
Fax (01256) 310201
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Drawing Number	Rev
Figure 13.1	

Plot Date: 03 Jun 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Tukey ESIA\Chapter 13\Figure 13.1 Oil Spill Modelling Release Locations.mxd

Table 13.2 Potential Oil Spill Scenarios in the Marine Environment

Location	Event Description	Assumption
Black Sea Offshore	Grounding	Not possible.
Black Sea Offshore	Collision of the pipe-lay vessel with third party	MDO spillage of 2,000 m^3 (loss of fuel over six hours). *Estimate based on the loss of 25% of the fuel capacity of the Saipem 7000. Given the vessel size this was considered a credible volume for both collision and sinking scenarios.*
	Collision with Project vessel	MDO spillage of 750 m^3 (loss of fuel over six hours). *This represents the loss of one full fuel tank from a supply vessel or similar type vessel during a collision.*
	Bunkering incident	MDO spillage of 10 m^3. *Given normal industry safety measures (e.g. break away coupling) this was considered a credible spill volume in the event of incident during bunkering.*
	Sinking	MDO spillage of 2,000 m^3 (loss of fuel over six hours). *As above.*

13.5.2.2 Oil Spillage Risk Factors

The severity of the consequences of an oil spill depends on several factors including (a) type of oil spilled, (b) the amount of oil spilled and, perhaps most importantly, (c) the proximity of the oil spill to oil-sensitive resources. These issues are considered in the sections below.

a) Type of Oil Spilled

Maritime vessels typically use the following types of fuel oil:

- Marine gas oil (MGO): Consisting of only distillates from oil-refining. This fuel is used in the small diesel engines of boats and smaller ships and can be used in auxiliary equipment such as generators and compressors;
- Marine diesel oil (MDO): A blend of heavy gas oil that may contain small amounts of black refinery feed stocks. This is used as fuel by the medium-speed diesel engines of smaller ships and can also be used in auxiliary equipment such as generators and compressors; and
- Intermediate fuel oils (IFO): Blends in varying proportion of gas oil and residues from crude oil distillation. This includes IFO-380 or heavy fuel oil (HFO) consisting almost entirely of residues. HFO is used to power the slow-speed cross-head diesel engines used in most large ships and requires heating and purification when stored and used.

Oils have been classified by the International Oil Pollution Compensation Funds, the body involved with compensation for oil spills from tankers, into two groups; 'persistent' oils and 'non-persistent' oils:

- Persistent oils include most crude oils and HFO. When spilled on the open sea these oils progressively 'weather' to produce high-viscosity, water-in-oil emulsions that are very persistent on the sea surface and which contaminate shorelines when they drift ashore; and
- Non-persistent oils are mainly distillate fuels such as gasoline and diesel fuel. When spilled in the open sea these oils evaporate to some degree and are rapidly dispersed and dissipated by the prevailing wave action. MGO and MDO are classified as being non-persistent.

Taking into account the above, where practicable vessels deployed in the Project Area will use MDO. As such, the oil spill modelling undertaken as detailed in Appendix 13.1 only considers oil spill scenarios that involve MDO.

b) Amount of Oil Spilled

The amount of oil spilled from an incident influences the area which is potentially affected.

c) Proximity of the Oil Spill to Oil-Sensitive Resources

Oil spills in the open ocean are generally dispersed and dissipated by the effects of wind, waves and currents which reduce their ability to reach coastal sites. Spills to the surface in open water environments tend only to have an immediate effect on receptors on the sea surface and in the water column immediately beneath the spill. Seabirds and some fishing activities may be adversely affected. In addition, some scattered tar balls can be found along coastlines which are evidence of past oil spills of crude oil and HFO, or caused by operational activities such as tank-washing.

13.5.3 Potential Impacts to Environmental Receptors

Typically ecological impacts are more severe when oil spills occur in shallower nearshore waters where spilled oil can affect the shoreline or be naturally dispersed into shallow water by wave action. Different organisms have different sensitivities to the toxic and physical effects of spilled oils. A spill of a relatively small amount of oil close to particularly sensitive coastal sites such as mud-flats and salt marshes can cause more ecological damage than a larger oil spill further from such sensitive sites. Spilled oil that becomes naturally dispersed by wave action through the water column to reach benthic habitats in shallow water can cause adverse effects to habitats such as fish nurseries.

The principal areas of ecological concern with respect to oil spills are:

- Impacts on seabirds on the sea surface caused by oil contaminating the plumage of seabirds leading to the loss of insulation and subsequent hypothermia; and
- Impacts on coastal habitats and marine species including benthic species in shallow areas.

Chapter 8 Biological Environment describes the marine habitats and species known to be present within the Project Area. The chapter describes the seafloor habitat as a fairly uniform expanse of muddy seabed. Although very little is known about the offshore deep water seabed of the Black Sea abyssal plain, it is an area that is devoid of meiofaunal and macrofaunal life. Plankton and fish species are known to be present within the Project Area, but are only recorded in low numbers; as a result, fisheries are largely absent from the central Black Sea. The migration route of the European anchovy, a commercially important species, crosses the Project Area and fish numbers within the Project Area are higher during the seasonal migration period. Sea birds are also found in low numbers within the Project Area, particularly during the seasonal migration periods for anchovy. Marine mammals, namely common dolphin and bottlenose dolphin, are also known to be present within the Project Area. More information on fish mortality is provided in Section 13.5.5.2 with regards to impacts on fisheries.

13.5.4 Oil Spill Design Controls

Given the presence of the sensitive marine species as indicated in the section above, an oil spill of sufficient size could have significant adverse consequences. It is therefore a key objective of the Project to minimise the likelihood of occurrence of an oil spill and to develop Oil Spill Prevention and Response Plans that would effectively minimise the potential for adverse impacts on potentially impacted marine species and habitats. Mitigation measures to be applied include the following:

- Where practicable vessels deployed in the Project Area will use MGO or MDO and, therefore, any accidental spill of fuel will have less adverse consequences than a spill that involves heavier fuels;
- All contractors and operators of marine vessels working on behalf of South Stream Transport will be required to develop and implement an Oil Spill Prevention and Response Plan. South Stream Transport will ensure that contractor Oil Spill Prevention and Response Plans are appropriately aligned with the Black Sea Contingency Plan (Ref. 13.2). The Oil Spill Prevention and Response Plans will specifically target the prevention of potential oil spillage incidents as detailed in Table 13.2;
- The contractor will develop and implement standard operational procedures (SOPs) which will define procedures that involve the handling of fuels/oils that aim to minimise the potential for spillages;
- Contractors and operators of vessels working on behalf of South Stream Transport will operate in compliance with MARPOL regulations on oil spill prevention and response and are required to prepare Shipboard Oil Pollution Emergency Plans (SOPEP) and Shipboard Marine Pollution Emergency Plans (SMPEP) as applicable for each vessel (Ref. 13.3 and Ref. 13.4). The SOPEPs will specify the control and response measures that have to be available on-board every vessel to respond to a spill that does not require external intervention; and
- All marine vessel crews will have the appropriate training, qualification and certification to undertake the tasks required during the construction of the pipelines.

The mitigation measures indicated above will minimise the probability of an oil spill occurring, and thus reduce the potential adverse impacts to marine habitats in the event of a spill.

13.5.5 Potential Impacts to Socio-Economic Receptors

13.5.5.1 Beach Users and Tourism

The mitigation measures highlighted in Section 13.5.4 minimise the risk of an oil spill occurring. In addition, the oil spill modelling results described within Appendix 13.1 indicate that the most likely oil spill scenarios that may occur during the Construction and Pre-Commissioning Phase are not expected to have a significant impact on any beach users or tourism along the Turkish coastline, as the oil would likely arrive in a highly weathered and dispersed state across a wide area of coastline, and would not be visible in the water column.

13.5.5.2 Fisheries

Oil spills would have the potential to affect fishery resources in a number of ways as described in the sections below.

Fish Mortality

Despite the susceptibility of juvenile stages of fish to relatively low concentrations of oil in the water column, adult free swimming fish and wild stocks of commercially important species will tend to swim away after detecting oil in the water column, thus it is unlikely that a spill will cause serious mortalities in any wild stocks. In general juvenile fish and eggs are significantly more susceptible to oil pollutants than adults, and thus oil spillages can result in localised mortalities. Following a spillage, the reproductive success of unaffected fish, as well as the influx of eggs, juveniles and adults from unaffected areas leads the recovery of stock numbers. Given that many marine species produce vast numbers of eggs and larvae that are widely distributed by tidal currents means that species can recover from any mortality events as a result of short-term unfavourable conditions. Thus, the depletion of adult stocks is very rarely recorded following spillages as marine organisms can generally adapt to high mortalities though production of large numbers of eggs and replacement from outside the affected area.

The impacts of an oil spill will depend upon the type of oil used and duration of the exposure to the components in the oil. Non-persistent oil such as MGO and MDO, when spilled in the open sea, evaporate to some degree and are rapidly dispersed and dissipated by wave action.

Economic Potential of Fisheries (Including in Coastal Waters)

Significant fishing activity does not occur within the central Black Sea. The Turkish fishing fleet in the Black Sea is mostly comprised of small vessels with limited range which concentrate their fishing efforts in waters relatively close to the Turkish coast and at least 100 km from the Project Area.

The number of fish species present within the Black Sea sharply decreases with water depth, with waters becoming anoxic below a depth of approximately 150 m. The low numbers and productivity of plankton further restricts the distribution of organisms in the deeper offshore waters of the Black Sea. Within the Project Area, fish species are predominantly pelagic, of which the most important (in terms of fisheries resource) are European anchovy, sprat, Black Sea horse mackerel and Atlantic bonito. The European anchovy is of particular importance to

Turkish fisheries as it accounts for over 60% of the total catch in the Turkish waters of the Black Sea.

The oil spill modelling results described within Appendix 13.1 indicate that the most likely oil spill scenarios that may occur during the Construction and Pre-Commissioning Phase are not expected to have a significant impact on Turkish coastal waters, as the oil would likely arrive in a highly weathered and dispersed state across a wide area of coastline, and would not be visible in the water column. Appendix 13.1 also states that oil spillages in the Project Area are not anticipated to have a significant impact upon coastal fishing areas and in turn any commercial or artisanal Turkish fisheries.

Damage to Fishing Gear

It is considered that the risks of damage and contamination to fishing gear is very low as fishing activity is concentrated in Turkish coastal waters, MGO or MDO spillages are expected to be rapidly dispersed, and that following a spillage, any affected areas would likely be avoided by fishing vessels.

Fisheries – Mitigation

Appendix 13.1 has established that Project construction activities do not present a major risk of oil spills and that the fuels in question, if spilt, would evaporate to a significant degree with the remainder being naturally dispersed in the water column by wave action within a few days of being spilled. This reduces the potential for adverse impacts upon fisheries and the Turkish Black Sea fisheries industry. The oil spill design control measures presented in Section 0, further limits the potential for adverse impacts upon fisheries and the Turkish Black Sea fisheries industry.

Although significant impacts on fishers and fishing activities from unplanned events are not anticipated, in the unlikely event that an impact occurs, fishers and fisheries will have access to recourse through the Grievance Procedure and Compensation Management Framework. Further information regarding these measures is included in **Chapter 9 Socio-Economics**.

13.5.6 Invasive Species Risk Assessment

Vessel operations have the potential to inadvertently introduce invasive alien species, either in ballast water, on the biofilm inside ballast tanks or carried as fouling organisms on the vessel hull. Historically, some introductions of alien species have had extreme ecological consequences, either directly through the introduction of benthic predators such as *Rapana venosa* or through system wide perturbations as exemplified by the invasion of the planktonic ctenophore *Mnemiopsis leidyi.* In other instances, such as the introduction of the bivalve *Anadara inaequivalvis*, the effects have been less severe and in the case of *Beroe ovata*, have in fact served to redress some of the ecological perturbations caused by *M.leidyi*. See **Chapter 8 Biological Environment** for more information.

13.5.6.1 Potential Impacts to Environmental Receptors

Despite its low likelihood of occurrence, there is the possibility of population or community-wide effects on the entire ecology of the Black Sea should invasive alien species be inadvertently introduced. Introduced invasive planktonic species can out compete native plankton species and cause changes to the marine food web. As such, introduction of invasive species can lead to the decrease in populations of pelagic fish that are the main food of most cetaceans or seabirds. Introduction of benthic predators such as *Rapana venosa* can cause changes to benthic species diversity which in turn can impact larger species (fish, birds or mammals) which feed on these species.

13.5.6.2 Potential Impacts to Socio-Economic Receptors

As the introduction of invasive species can have knock-on effects for larger species, higher up the food chain, commercially important fish populations could be impacted through a decrease in the availability of their food source. A collapse or reduction in the fish stocks would cause a reduction in the fish available to fisheries.

13.5.6.3 Mitigation Measures – Invasive Species

Given the above, the introduction of invasive species, although a rare event, could potentially have adverse environmental and socio-economic consequences. It is therefore a key objective of the Project to minimise the likelihood of occurrence of the introduction of invasive species and to develop measures that would effectively minimise the adverse impacts on potentially impacted marine habitats and associated species. Where practicable, mitigation measures to be applied include the following:

- Where relevant and practicable these measures will be based on those identified in the IPIECA (Global Oil and Gas Industry Association for Environmental and Social Issues) document Alien Invasive Species and the Oil and Gas Industry, Guidance for Prevention and Management (Ref. 13.5) and the International Maritime Organisation (IMO) Ballast Water Management Convention and Guidelines (Ref. 13.6). They will be applied to all marine plant and equipment that is used on the Project and which has the potential to be a vector of live organisms, spores, larvae and young and will include ballast water management, use of antifouling coatings, cleaning of equipment prior to deployment and the change of cooling water. The contractor Health, Safety, Security and Environment (HSSE) Plan will contain a detailed description of the actions to be taken to implement these requirements, which may include the following:
    - Vessels entering the Black Sea will have on-board, and implement, a Ballast Water and Sediment Management Plan;
    - Vessels entering the Black Sea will have a Ballast Water Record Book to record when ballast water is taken on board; circulated or treated for ballast water management purposes; and discharged into the sea or reception facilities;
    - Vessels entering the Black Sea using ballast water exchange will, whenever possible, conduct ballast water exchange as far from the nearest land as possible, and in all cases at least 50 nautical miles (nm) from the nearest land, and in water at least 200 m in depth; and

  - Vessels entering the Black Sea will conduct ballast water management in accordance with their year of construction and ballast water capacity.
- Where practicable, cleaning of hulls and tanks before use and prior to entering the Black Sea; and
- Where practicable, the use anti-fouling coatings (non-Tributyltin (TBT)) or sealing coatings to minimise inadvertent transport of organisms.

13.6 Operational Phase

13.6.1 Events Identification

During the Operational Phase of the Project unplanned events at sea may occur as a result of unplanned leakages of natural gas from the pipelines, as well as the introduction of invasive species by maintenance vessels.

Table 13.3 lists the activities that are discussed in this section that could result in an unplanned event, describes the events, and the receptors that could be affected.

Table 13.3 Marine Activities Potentially Resulting in an Unplanned event (Operational Phase)

Activity	Event	Receptors	
		Environmental	Socio-Economic
Operation of the pipelines	Failure of or damage to the pipeline which may result in gas releases and fire / explosions	✓	✓
	Introduction of invasive species by maritime vessels	✓	✓

13.6.2 Maritime Risk Assessment

In order to assist in the risk assessment process, a Shipping Risk Report was prepared for the Project (Ref. 13.7). The report considers the risks to the marine pipelines posed by shipping in the Black Sea. The following shipping hazards were identified as posing a potential risk to the integrity of the pipelines:

- *Ship sinking onto and damaging the pipeline*: The risks of ship sinking damaging the pipelines can occur along the entire Pipeline route, although there is only a risk when the ship is large enough to cause damage to the Pipeline. The likelihood of this occurring is reduced given the water depths in which the Project lies; and
- *Ships dropping objects (such as containers) onto the pipeline*: The risks of ships dropping objects on to the pipeline can occur along the entire Pipeline route. When a container hits

the top of a pipeline, the result can be a dent in a pipeline. The likelihood of this occurring is reduced given the water depths in which the Project lies.

The hazards as detailed above have the potential to result in pipeline damage or failure, which could result in the release of gas (and potential subsequent fire) from the pipeline which has the potential to impact upon environmental, socio-economic and human health receptors. However, due to the pipeline engineering design standards being applied which aim to minimise the potential for pipeline rupture and associated gas leakages and quality assurance during construction, together with the high external pipeline pressure at 2,000 m water depth, the potential for such a safety incident from an offshore pipeline is remote.

For a fire incident following a gas leakage to impact upon human health receptors, it would require a pipeline failure and gas leakage, followed by ignition at the sea surface in conjunction with a passing vessel. The most likely occurrence of this type of event would be where an object such as a container or the vessel itself, causes an impact failure by sinking on the pipeline as detailed above. The potential resultant impacts associated with environmental, socio-economic and human health receptors is discussed in the following sections.

Some unplanned events have been excluded from the assessment undertaken in this section as they are not expected to lead to significant environmental and socio-economic impacts. Unplanned events that have been excluded from discussion are:

- *Pipeline repairs and salvage as associated with unplanned events*: following unplanned events there may be the need for pipeline salvage/ repair works. It is considered that such activities would be similar to pipeline construction activities. Under such circumstances, salvage and remedial works would be undertaken in accordance with GIIP which would limit the potential for significant environmental impacts; and
- *Maritime vessel collisions and resultant oil spillages*: given the low number of survey vessels anticipated to be used during the Operational Phase, it is considered that the risk of collisions and oil spillages is remote therefore it can be scoped out of the assessment. Maritime vessels operated on behalf of the South Stream Transport will be operated in accordance with GIIP which would limit the potential for significant environmental impacts whilst Oil Spill Prevention and Response Plans will still be required to limit the potential for oil spills.

13.6.3 Potential Impacts to Environmental Receptors – Gas Leakages

In cases of an offshore leak, there are some locations along the South Stream Offshore Pipeline where gas will not leak from the pipelines. This will occur where the external pressure around the pipeline (i.e. the pressure of the seawater) is greater than the pressure of the gas within the pipeline. During normal operations, this would occur along approximately one third (the Western end) of the length of pipeline in Turkish waters. For areas where the water would not ingress, any gas released from a damaged sub-sea pipeline would rise through the water column as a plume of gas bubbles. On reaching the sea surface, the gas would disperse into the air.

Gas releases into the atmosphere would not be significant in the context of greenhouse gas emissions in Turkey, although methane levels at the release site would be temporarily elevated which could locally impact upon any present marine ecology including seabirds.

Gas passage through the water column could also impact upon marine organisms (such as fish and marine benthos), resulting in potential acute or chronic impacts depending upon exposure levels and environmental conditions (e.g. water temperature, dissolved oxygen) (Ref. 13.8). Gas is able to rapidly penetrate into marine organisms (especially through the gills) and disturb the main functional systems (respiration, nervous system, blood formation, enzyme activity, and others). Initially, organisms such as fish may exhibit behavioural symptoms such as startle responses, increased activity and scattering in the water. Thereafter, further exposure can lead to symptoms of poisoning. As with most toxicants, early life stages are most vulnerable to effects.

13.6.4 Potential Impacts to Socio-Economic Receptors – Gas Leakages and Fire

Should the marine Pipeline rupture via the unplanned events as detailed in Section 13.6.3, in certain locations along the Pipeline route gas would rise through the water column and disperse into the air.

Short-term human exposure to low concentrations of natural gas may cause headaches, dizziness, drowsiness, nausea and vomiting. High vapour concentration may lead to unconsciousness due to the absence of oxygen.

Natural gas is extremely flammable, forming a flammable mixture at a concentration of approximately 5% gas in air (by volume). In the unlikely event of a gas leakage, the risk to human health is associated with fire and explosion rather than gas exposure. Ignition of the gas cloud by an ignition source present on the ship in the gas cloud could result in a flash fire and harm, including potential ship's crew fatalities, as well as result in vessel damage.

Given that any gas leakages would be temporary (as the pipeline will be shut down as soon as is practicable) and localised, it is considered that fish species present in the vicinity would only be subject to short-term exposure and no significant mortalities are expected to occur. Therefore, it is anticipated that there will be no significant impact on fish populations which could have a secondary impact on fisheries.

13.6.5 Mitigation Measures

Chapter 5 Project Description describes how the pipeline design and operating philosophy minimises the potential for uncontrolled gas releases from the pipeline. Gas pressure, temperature, flow and other inventory parameters will be monitored at the landfall facilities and remotely by the Supervisory Control and Data Acquisition (SCADA) system. Any departure from defined parameters would trigger an emergency shutdown sequence, which will deploy emergency shutdown valves at the two landfalls and other events aimed at isolating the section of the pipeline where a leak is suspected thereby reducing the extent and duration of any leak.

A number of design controls have been identified to reduce the potential impacts of geohazards on the integrity of the pipeline. During the Development Phase, geohazard mapping was undertaken to facilitate route alignment based on the marine survey findings and associated engineering assessments (Ref. 13.9 and 13.10). In addition, the occurrence of mass movements triggered by events such as earthquakes was taken into account (Ref. 13.7). The pipelines will be designed in accordance with DNV-OS-F101 which considered standards for geohazard risk analyses.

The Pipeline design thus aims to minimise the occurrence of the unplanned gas releases following pipeline damage, whilst the Emergency Preparedness and Response Plan will minimise the potential environmental consequences of such events. The Emergency Response Plan to be prepared by each contractor will define actions to be taken during a gas release (making reference to South Stream Transport's overarching Emergency Preparedness and Response Plan). In addition, the Emergency Response Plan which will be prepared and maintained by each contractor will define actions to be undertaken to protect the workforce. Details of the Emergency Preparedness and Response Plan are provided in Section 13.4.

13.6.6 Invasive Species Risk Assessment

Maritime vessel operations during the Operational Phase will be limited to the periodic use of maintenance vessels (refer to **Chapter 5 Project Description**). During routine monitoring or in the event that repairs are necessary, there is potential for vessels to be used from outside of the Black Sea. As such, there is the potential to inadvertently introduce invasive alien species to the marine environment in the same manner as stated during the Construction and Pre-Commissioning Phase.

13.6.6.1 Potential Impacts to Environmental Receptors

The potential environmental consequences of introducing invasive species are considered under Section 13.5.6.1. Given the limited maritime vessel use required during the Operational Phase, it is considered that the risks of such events occurring is less than during the Construction and Pre-Commissioning Phase.

13.6.6.2 Potential Impacts to Socio-Economic Receptors

As stated in Section 13.5.6.2, the introduction of invasive species can have knock-on effects for commercial fisheries within the Black Sea. Given the limited vessel use required during operation, the likelihood of such an event occurring is less than during the Construction and Pre-Commissioning Phase.

13.6.6.3 Mitigation Measures – Invasive Species

Although the likelihood of introducing invasive species during the Operational Phase is much reduced when compared to the Construction and Pre-Commissioning Phase, the Project will develop measures that minimise the risks of adverse impacts upon marine habitats and associated species and fisheries. Mitigation measures as detailed in Section 13.5.6.3 will also be applied during the Operational Phase.

13.7 Decommissioning

The decommissioning programme will be developed during the Operational Phase of the Project (expected service lifetime of the South Stream Offshore Pipeline is 50 years). Technological options and preferred methods for decommissioning of such gas transportation systems as the South Stream Offshore Pipeline may be different in 50 years' time.

Consequently, unplanned events associated with the Decommissioning Phase are unknown at this stage; however, it is anticipated that some of the potential unplanned events will be similar in nature to some of those that may arise during the Construction and Pre-Commissioning Phase. As such, the mitigation actions as defined in Sections 13.5.5.2 and 13.5.6.3 and elsewhere within this ESIA Report are also likely to be applicable to the Decommissioning Phase.

Under all circumstances, decommissioning activities will be undertaken in accordance with GIIP and with the applicable international and national legislation and regulations prevailing at that time, and in liaison with the relevant regulatory authorities. As part of the decommissioning planning programme, the potential for unplanned events will be considered and appropriate mitigation and management measures put in place to reduce risks and consequences to the surrounding environmental and social receptors.

References

Number	Reference
Ref. 13.1	Black Sea Diesel and Fuel Release Modelling: South Stream Development. Genesis: Technical Note August 2013.
Ref. 13.2	Black Sea Contingency Plan 2002. To the Protocol on Cooperation in Combating Pollution of the Black Sea by Oil and Other Harmful Substances in Emergency Situations – Volume 1 Response to Oil Spills. AG ESAS 8.4d.
Ref. 13.3	"Guidelines for the development of the Shipboard Oil Pollution Emergency Plans", [IMO Resolution MEPC.54(32); adopted on March 6, 1992; and Resolution MEPC.86(44), adopted on 13 March 2000]
Ref. 13.4	IMO IB586E – Shipboard Oil Pollution Emergency Plans (SOPEP), 2010 Edition.
Ref. 13.5	Alien Invasive Species and the Oil and Gas Industry - Guidance for Prevention and Management. IPIECA. 2010.
Ref. 13.6	International Convention for the Control and Management of Ships Ballast Water & Sediments, 2004. http://globallast.imo.org/index.asp?page=mepc.htm. Accessed April 2014.
Ref. 13.7	South Stream Offshore Pipeline FEED - Shipping Risk Analysis Report. Intecsea Report 10-00050-10-SR-REP-0040-0011 dated February 2013.
Ref. 13.8	Intecsea Worley Parsons Group (2013) South Stream Offshore Pipeline FEED Pipeline Geohazard Summary Report 10-00050-10-SS-REP-0050-0003, 19-April-13, Rev B1.
Ref. 13.9	Intecsea Worley Parsons Group (2013) South Stream Offshore Pipeline FEED Pipeline Geohazard Impact Assessment Report 10-00050-10-MX-REP-0060-0013, 19-April-13, Rev 0.
Ref. 13.10	Intecsea Worley Parsons Group (2013) South Stream Offshore Pipeline FEED Pipeline Geohazard Study Review Report 10-00050-10-GE-REP-00520-0002, 27-Feb-13, Rev 0.

Chapter 14: Cumulative Impact Assessment

URS-EIA-REP-203876

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14 Cumulative Impact Assessment

14.1 Introduction

While the impacts of an individual project may be judged to be acceptable, there is also a need to consider the potential for a project's impacts to interact with impacts associated with other developments - so called 'cumulative' impacts.

This chapter presents a cumulative impact assessment (CIA) of the Project. The sections herein present details of applicable CIA guidance, the adopted CIA methodology, CIA scoping, and impact assessment. The CIA takes account of planned and reasonably defined developments in the vicinity of the Project.

14.2 Definitions

International Finance Corporation (IFC) Performance Standard (PS) 1 (Ref. 14.1) defines cumulative impacts as:

"Impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted".

The impacts of the Project thus need to be considered in conjunction with the potential impacts from other future developments or activities that are planned and reasonably defined and are located within a geographical scope where potential environmental and social interactions could act together with the Project to create a more (or less) significant overall impact.

14.3 CIA Guidance

14.3.1 International Finance Corporation (IFC) Guidance

IFC PS1: *Assessment and Management of Environmental and Social Risks and Impacts* (Ref. 14.1) recognises that in some instances, developers need to consider cumulative impacts in their environmental and social impact and risk identification and management process.

PS1 states that the impact and risk identification process:

"…will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence" including, *"master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant".*

Furthermore, it goes on to state that:

"The client can take these into account by focusing on the project's incremental contribution to selected impacts generally recognised as important on the basis of scientific concern or

concerns from the Affected Communities within the area addressed by these larger scope regional studies or cumulative assessments".

In order to provide guidance on undertaking a CIA, IFC released a guidance note in August 2013 titled *Cumulative Impact Assessment and Management – Guidance for the Private Sector in Emerging Markets* (Ref. 14.2). This guidance note uses the concept of Valued Environmental and Social Components (VECs), these being environmental and social attributes that are considered to be important in assessing risk[1], which can include:

- Physical features;
- Wildlife populations;
- Environmental processes;
- Ecosystem conditions (e.g. biodiversity);
- Social conditions (e.g. health, economics); and
- Cultural aspects.

The guidance note provides a six step process for assessing the potential for cumulative impacts upon VECs as follows:

- Scoping Phase I – identifying VECs, spatial and temporal boundaries;
- Scoping Phase II – other activities and environmental drivers;
- Establish information on the baseline status of VECs;
- Assess cumulative impacts on VECs;
- Assess significance of predicted cumulative impacts; and
- Management of cumulative impacts – design and implementation.

This CIA has used the guidance note as a framework for assessing potential cumulative impacts associated with the Project and from other 'reasonably defined developments'.

14.3.2 Other Relevant Guidance

Cognisance has also been taken of the European Directive 2011/92/EU (Ref. 14.3):

"…on the assessments of effects of certain public and private projects on the environment", which requires the assessment of:

…the direct effects and any indirect, secondary, cumulative, short, medium and long term, permanent or temporary, positive and negative effects of the project".

[1] VECs are considered to be equivalent to "receptors" as defined in **Chapter 3 Impact Assessment Methodology**.

14.4 CIA Methodology

The CIA methodology adopted has been defined taking into account the six step process as detailed in the IFC guidance note referred to above, and has comprised the following:

- *Scoping Phase I:* This entailed defining which VECs need to be included within the CIA taking into account the characteristics of the Project and the prevailing environmental and social conditions within areas that are potentially impacted by the Project. The VEC identification process has been assisted through the completion of engagement activities with applicable stakeholders. This phase of the assessment has also required setting temporal and spatial boundaries of the CIA for specific VECs;
- *Scoping Phase II:* This required the identification of other projects or human activities that could potentially impact upon defined VECs that could result in cumulative impacts. An analysis has then been undertaken which aims to define those development projects that are scoped into the CIA given their potential ability to generate a cumulative impact associated with the Project (due to temporal or spatial interactions with the Project);
- *Establish Information on the Baseline Status of VECs:* Defining the baseline characteristics of VECs is an important stage in the CIA process, as this identifies their sensitivity to change. Note that relevant baseline information has been provided in Chapter 7 to 12 of this ESIA Report and is not reproduced here; and
- *Assess Cumulative Impacts Upon VECs:* Taking into account the Project's predicted impacts upon identified VECs, an assessment has been undertaken to evaluate the ability of the Project to interact with other planned or reasonably defined developments in such a manner that gives rise to a cumulative impact (where the temporal and spatial influences may coincide). Note that the assessment presented in this chapter only considers the residual impacts arising from the Project (i.e. impacts following the application of mitigation measures as detailed in this ESIA Report). It follows that the chapter only considers those VECs that will experience any degree of residual impact associated with the Project. Thus VECs for which there is a Project residual impact that is deemed to be insignificant in this ESIA, do not need to be included in the CIA in accordance with Ref. 14.2 (Table 14.1);

Table 14.1 Scoping Criteria for Including VECs in the CIA

Residual Impact			
Not significant	*Low*	*Moderate*	*High*
Scoped out of CIA	Reviewed for potential cumulative impacts	Scoped into CIA	

As detailed in Table 14.1, where VEC residual impacts are defined as being moderate or high, these are scoped into the CIA. Where VEC residual impacts are assessed as being not significant, these can be scoped out of the CIA (given that such VECs are either of negligible sensitivity or impact magnitudes are negligible – refer to impact significance matrix in **Chapter 3 Impact Assessment Methodology**). For VEC residual impacts that are defined as being

Low, the applicable VECs have been subject to further evaluation to see if there is scope for cumulative impacts to be generated:

- *Assess Significance of Predicted Cumulative Impacts:* Significant cumulative impacts have been evaluated as far as possible using the significance matrix presented in **Chapter 3 Impact Assessment Methodology**. Note that this has been possible only where the magnitude of impacts is capable of definition, for example, through readily accessible documents (e.g. other EIA or ESIA reports or project documentation). Where such information is not available, the assessment of potential cumulative impacts has been qualitative, and has relied on professional opinion using the impact significance definitions described in **Chapter 3 Impact Assessment Methodology**. The assessment has not considered unplanned events as discussed in **Chapter 13 Unplanned Events**; and
- *Management of Cumulative Impacts – Design and Implementation:* Should the CIA indicate that there is a potential cumulative impact which is of moderate or high significance, the need for additional mitigation or management actions (or monitoring) beyond those which are targeted at Project-induced impacts as reported within this ESIA Report, has been specified.

14.5 CIA Scoping Phase I: VECs, Spatial and Temporal Boundaries

14.5.1 VEC Identification

The ESIA Report considers the potential Project impacts across a range of VECs. These VECs have been defined by taking into account the prevailing environmental and social conditions in the Project Area, and the ability of the Project to impact upon these resources (during all Phases of the Project). Consultation with relevant stakeholders has been a key component of the environmental and social resource identification process – stakeholder engagement activities are detailed in **Chapter 6 Stakeholder Engagement**.

A summary of the VECs that have been considered within this ESIA Report, and thus within this CIA, comprise the following:

- Physical (i.e. non-living environmental components, including air quality and marine sediments and geology);
- Biological (i.e. fauna); and
- Human (i.e. marine users, social, health and cultural heritage).

14.5.2 Temporal and Spatial Boundaries

The temporal boundary of the CIA includes the Project Construction and Pre-Commissioning Phase and into the Operational Phase. However, the degree of uncertainty increases the further into the future the assessment extends. As such, potential cumulative impacts during the Decommissioning Phase have been scoped out of the assessment given that the decommissioning programme is uncertain and will be developed during the Operational Phase of the Project. A review, and relevant studies if necessary, will be undertaken during the

Operational Phase to confirm that the planned decommissioning activities are the most appropriate to the prevailing circumstances. The review would outline management controls and demonstrate that the decommissioning activities will not cause unacceptable cumulative environmental and social impacts should there be other developments in the vicinity of the proposed decommissioning works.

The spatial or geographic boundaries of the CIA have been defined taking into account the Project characteristics (**Chapter 5 Project Description**) and the assessment areas applied to defined VECs as included within the various technical assessments (Chapters 7 to 12) within this ESIA Report. A flexible approach has been maintained, such that the boundaries of the assessment vary depending upon the characteristics of the potentially impacted VEC. The geographic boundary thus varies from the space occupied by a small VEC feature (e.g. a discrete feature of cultural heritage value) to a large geographic region or habitat within which a particular VEC occurs (e.g. habitat occupied by a protected species). The spatial extent of relevant VECs is detailed in the various technical assessments as presented within this ESIA Report.

14.5.3 Scoping – Further Evaluation of Low Significance Impact to VECs

Table 14.2 presents a summary of the impact assessments within this ESIA Report and identifies residual impacts upon defined VECs during the Project Construction and Pre-Commissioning and Operational Phases.

Table 14.2 Summary of Project Residual Impacts

ESIA Chapter	VEC	Impact Source	Construction – Residual Impact	Operation – Residual Impact
Biological Environment (Chapter 8)	Plankton	Vessel movements and routine operations. ROV use during pre-lay, as-built surveys (Construction and Pre-Commissioning Phase) Maintenance/repair to pipelines (including span correction etc.) (Operational Phase)	**Not Significant**	**Not Significant**
	Benthos		**Not Significant**	**Not Significant**
	Fish		**Low**	**Not Significant**
	Birds		**Low**	**Not Significant**
	Mammals		**Low**	**Not Significant**

Continued...

ESIA Chapter	VEC	Impact Source	Construction – Residual Impact	Operation – Residual Impact
Cultural Heritage (Chapter 10)	Currently unknown cultural heritage objects	Pipe-laying (Construction and Pre-Commissioning Phase) Inspection and maintenance of pipelines (Operational Phase)	**Low**	**Not Significant**
Ecosystem Services (Chapter 11)	Wild species diversity	Vessel movements and routine operations (Construction and Pre-Commissioning and Operational Phases)	**Low**	**Not significant**
Waste Management (Chapter 12)	Natural resources and the receiving environment	Waste materials generated and disposed of (Construction and Pre-Commissioning and Operational Phases)	**Low**	**Low**

Complete.

As per the IFC guidance note (Ref. 14.2), this CIA considers those VECs that will be impacted by the Project with any degree of residual impact thus VECs for which there is an impact that is deemed to be not significant have been scoped out of this CIA. Where the Project residual impact significance is defined to be **Moderate** or **High**, the applicable VEC is scoped into the CIA. As there are no impacts of **Moderate** impact significance, residual impacts defined as **Low** have been subject to further evaluation in order to see if there is potential for cumulative impacts to be generated. Physical and social receptors, as discussed in **Chapter 7 Physical and Geophysical Environment** and **Chapter 9 Socio-Economic** are not considered within this CIA given the limited scope for Project activities to impact upon them. Table 14.2illustrates that all impacts upon the biological environment, cultural heritage, ecosystem services and waste management are either **Not Significant** or of **Low** Significance. These are considered further in Section 14.7 together with commentary on selected VECs which experience **Low** residual impacts. The activities and potential impacts are discussed in detail in the technical Chapters 7 to 12 of this ESIA Report.

14.6 CIA Scoping Phase II: Other Developments

14.6.1 Introduction

This section defines the planned and reasonably defined developments in the vicinity of the Project. If the Project is able to interact with such developments (temporally and/or spatially), the Project may be able to exert a potential cumulative impact.

Information has been obtained from the Project stakeholder engagement and consultation process (**Chapter 6 Stakeholder Engagement**) and in particular information has been obtained from local, regional and national governmental organisations and from a review of open literature. This has included information on potential developments obtained from the Ministry of Energy and Natural Resources (Transit Petroleum Pipelines Department, the General Directorate of Mineral Research and Exploration (MTA), and the Turkish Petroleum Corporation (TPAO)).

14.6.2 Development Proposals

The following planned and reasonably defined development proposals have been identified in the vicinity of the Project:

- Project connection with South Stream Offshore Pipeline (Russian and Bulgarian Sectors) at the Turkish and Russian EEZ border and the Turkish and Bulgarian EEZ border respectively; and
- Proposed oil and gas exploration and preliminary activities within the Turkish EEZ to be conducted by the TPAO (refer to Figure 14.1 for the locations of the license areas).

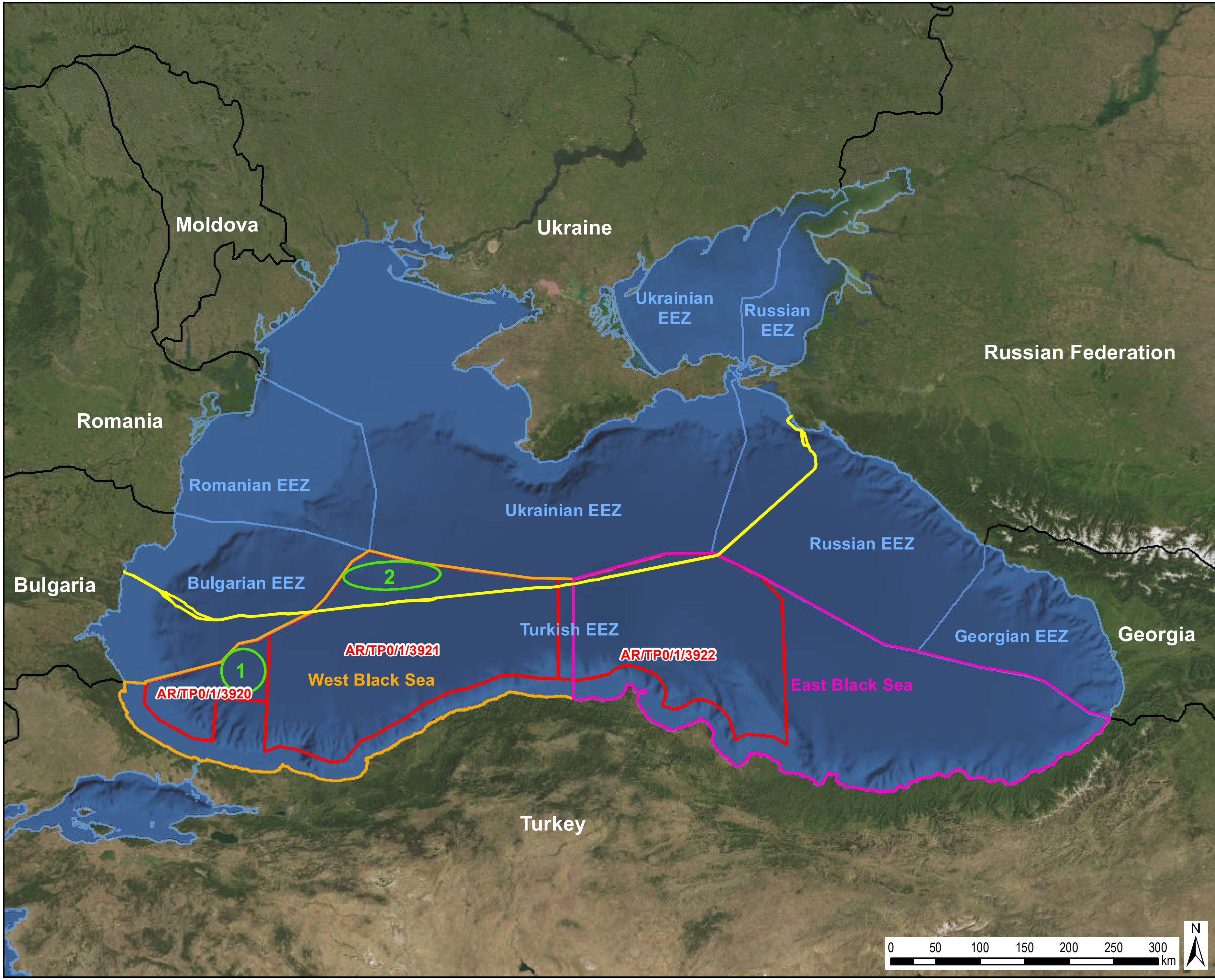
These developments are discussed in the sections below. No other developments have been identified in the vicinity of the Project.

14.6.2.1 Project Connection with South Stream Pipeline at the Russian and Bulgarian EEZ Borders

The Project will interface with the South Stream Offshore Pipeline (Russian and Bulgarian Sectors) located in the Russian and Bulgarian EEZs. During the Construction and Pre-Commissioning Phase, activities taking place within Russian and Bulgarian waters will be similar to those taking place in the Turkish EEZ. A summary of the main offshore activities associated with the Bulgarian and Russian Sectors is given in Table 14.3.

Table 14.3 Summary of Offshore Construction Phase Activities in the Bulgarian and Russian Sectors

Sector	Activities
Russia Offshore Approximately 225 km from 23 m (exiting of micro-tunnelling pits) water depth to boundary of Russian and Turkish EEZ Pipelines will be laid on the seabed *Bulgaria Offshore* Approximately 210 km from the border of the Turkish and Bulgarian EEZ to water depth of 36 m (where dredging starts) Pipelines will be laid on the seabed	• Mobilisation of vessels to and from Project Area and vessel movements within construction spread; • Perform as-laid, pre-laid and as-built survey ROV surveys etc.); • Delivery of fuel, pipe and other supplies including hazardous substances to pipe-lay vessel by supply vessel; • Storage of fuel and other hazardous materials; • Refuelling of vessels, plant and machinery; • Helicopter operations for crew changes; • Waste generation from vessel operations; • Use of fresh water maker/desalination unit and vessel cooling water system; and • Night time working.



LEGEND

- South Stream Offshore Pipeline Project
- East Black Sea
- West Black Sea
- TPAO license areas
- Areas for proposed TPAO activities
  1. Şile prospect
  2. Tuna prospect
- Exclusive Economic Zones
- Country Boundaries

Projection: Lambert Conformal Conic

Purpose of Issue
For Information

Client
South Stream Offshore Pipeline ENERGISING EUROPE

Project Title
SOUTH STREAM OFFSHORE PIPELINE

Drawing Title
EXPLORATION LICENSE AREAS OF TPAO

Drawn	Checked	Approved	Date
JM	VS	MW	03/06/2014

URS Internal Project No.	Scale @ A4
46369082	1:5,500,000

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Figure 14.1

Rev

Plot Date: 03 Jun 2014
File Name:I:\5004 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Turkey\Tukey ESIA\Chapter 14\Figure 14.1 Exploration License Areas of TPAO.mxd

During the Operational Phase, the South Stream Offshore Pipeline in Russian and Bulgarian waters will be subject to the same monitoring and maintenance regime as being applied to the pipelines in Turkey (refer to **Chapter 5 Project Description**).

14.6.2.2 TPAO Developments

TPAO has confirmed to South Stream Transport that there are no existing oil and gas exploration or development activities taking place within the Project Area. TPAO has, however, advised of two possible oil and gas exploration and production projects which may be brought forward over the next three years, namely the 'Tuna Prospect', in the northwest of License Area 3921 and the Şile Prospect in License Area 3920. These areas are shown in Figure 14.1.

TPAO has advised that exploration drilling for both prospects may take place in 2016; preceded by seismic survey in 2015 (possibly late 2014 in the case of the 'Tuna Prospect'). The co-ordinates of the survey work and subsequent drilling have not yet been determined and will be informed by further geological and geophysical studies which are currently being conducted (Ref. 14.4).

Given that these two prospects are at a very early stage of evaluation, no information is available regarding the extent of development (e.g. number and extent of well heads or number and type of seismic surveys). TPAO has indicated that if oil or gas is discovered in the 'Tuna Prospect' license area 3921, it may be necessary to construct a pipeline(s) to carry the hydrocarbons south, thus potentially intersecting the Project. (Ref. 14.4). A summary of the main activities likely to be associated with the TPAO development are detailed in Table 14.4.

Table 14.4 Summary of Potential TPAO Development Activities

Development	Potential Activities
TPAO (Two prospects)	• Geological and geophysical studies; • Seismic survey(s) in 2015 (possibly late 2014 in the case of the 'Tuna Prospect') during Construction and Pre-commissioning Phase; • Exploration drilling for two prospects may take place in 2016 (see locations on Figure 14.1); • Potential oil/gas exploitation activities should oil or gas be discovered in the 'Tuna Prospect' license area 3921; and • Potential construction of a pipeline(s) to carry the hydrocarbons south of the 'Tuna prospect', thus potentially intersecting the Project Area during the Operational Phase of the Project.

14.6.3 Development Proposal CIA Analysis

Section 14.6.2 describes planned and reasonably defined development proposals in the vicinity of the Project. An analysis has been undertaken of the possible characteristics (programme, distance from the Project activities, development footprint characteristics) of these projects in order to ascertain their potential to generate a cumulative impact during the Construction and Pre-Commissioning and Operational Phases. This analysis is presented in Table 14.5 and details which development proposals have been scoped in or out of the CIA.

Table 14.5 Project Cumulative Impact Analysis

Development	Interaction with Project	Scoped In/ Out of CIA
Offshore Section of the South Stream Offshore Pipeline – Russian and Bulgarian Sectors	Construction works will be taking place within Russian and Bulgarian waters and Turkish waters at the same time, and thus there is the potential for concurrent activities to generate a cumulative impact. Based on the current Project programme, construction activities will be taking place in Russian and Turkish waters at the same time for approximately 170 days, whilst construction activities will be taking place in Bulgarian and Turkish waters at the same time for approximately 98 days. The construction spreads in Turkey, Bulgaria and Russia will be travelling at the same speed, whilst there will be around 500 km between these spreads at any given time. There are no plans to have two construction spreads in Turkish waters at the same time. Given this distance between the construction spreads and the limited spatial range of potential impacts associated with the works (such as underwater noise impacts upon marine mammals extending approximately 1 km from the vessels), it is considered that concurrent activities within Turkey and Bulgarian or Russian offshore areas will not be able to generate any significant cumulative impacts. Similarly any concurrent Operational Phase maintenance activities taking place are not anticipated to generate any significant cumulative impacts.	Scoped out
TPAO Developments	As illustrated in Figure 14.1, the Project passes through the TPAO exploration blocks. Anticipated activities that may be taking place within the exploration blocks include geological and geophysical studies, seismic surveys and exploration drilling. If oil or gas is discovered in the 'Tuna Prospect' license area 3921, following installation of exploitation infrastructure it may be necessary to construct a pipeline(s) to carry the hydrocarbons south, thus intersecting the Pipeline during the Operational Phase of the Project (Ref. 14.4). It is not anticipated that exploration activities within the exploration blocks will take place in close proximity to Project construction activities, although as described in Section 14.6.2.2, detailed information on exploration activities are not currently available. It is thus difficult to undertake a meaningful cumulative impact assessment due to a lack of available information. Nevertheless, given that this is the only marine development in proximity to the Project, the sections below consider the potential for cumulative impacts to be generated.	Scoped in

14.7 CIA and Significance Assessment

Section 14.5.3 indicated that the significance of all Project impacts upon the biological environment, cultural heritage, ecosystem services and waste management are either **Not Significant** or of **Low** significance.

Section 14.6.3 identified that the TPAO development should be considered in the CIA given the potential interactions with the Project. The sections below thus consider the potential for the significant cumulative impacts to occur as associated with the TPAO development. This assessment focuses in particular upon the VECs and associated impact sources as highlighted in Table 14.4. If a cumulative impact is identified, the significance of the potential cumulative impact is either quantified or qualified (depending upon data availability).

14.7.1 Biological Environment

Chapter 8 Biological Environment (as summarised in Table 14.4) reports that residual marine ecological impacts are predicted to be **Not Significant**, except the following:

- **Low** significance to marine mammals due to noise impacts associated with pipe-laying works;
- **Low** significance impacts upon birds (particularly those that migrate at night) which may be attracted to lights and suffer damage as a result of collisions with vessels; and
- **Low** significance impacts upon fish (including impacts upon migratory species such as anchovy) due to noise generated by construction activities which may cause behavioural changes over a limited area.

Given that most residual ecological impacts are either **Not Significant** or of **Low** significance indicates that the Project has a very low ability to exert a potentially significant cumulative impact upon marine ecological VECs when considering other developments. Nevertheless, the sections below consider the potential for the Project and the TPAO development to generate a cumulative impact upon the marine ecological VECs as detailed above.

During the Construction and Pre-commissioning Phase of the Project, potential TPAO activities may include geological and geophysical studies which would involve the use of maritime vessels, seismic surveys and drilling. Whilst there is no information available regarding the extent, technical scope and precise location of TPAO development activities, it is considered that they are unlikely to take place in very close proximity to Project construction activities. The potential for vessel noise and noise associated with seismic surveys from TPAO development activities to interact with noise generated by Project construction activities is thus considered to be unlikely. The greatest impact would occur during potential seismic surveys as seismic equipment generates underwater noise. **Chapter 8 Biological Environment** states that behavioural reactions in fish can occur up to 0.5 km from the noise source and up to 1 km for marine mammals.

TPAO activities, including potential seismic surveys, would need to take place at the same time that the Project construction spread is present, and within sufficient range, in order for a cumulative noise impact to be generated. In the event that this occurs, impacts are likely to be temporary and localised. Given the wide ranges of potentially impacted species in the Black Sea and their ability to avoid areas of disturbance, cumulative impacts upon marine mammals and fish due to noise are thus not anticipated.

Chapter 8 Biological Environment also indicates the potential for a **Low** significance impact upon birds (particularly those that migrate at night) which may be attracted to lights and suffer damage as a result of collisions with vessels. The TPAO activities would need to take place at the same time and near the vicinity of the Project construction spread at night, using numerous vessels with lights in order to generate a cumulative impact – this is considered to be unlikely. Cumulative impacts upon migrating birds are thus not anticipated.

Given the above, South Stream Transport will seek to further liaise with TPAO regarding any simultaneous activities.

During the Operational Phase, it is possible that the Tuna Prospect license area 3921 is developed if oil or gas is discovered. This could require the construction of a pipeline(s) which may intersect the Project Area (Ref. 14.4). As Project impacts during the Operational Phase upon marine mammals and other marine ecological VECs are **Not Significant**, the Project is not able to generate any cumulative impacts even if TPAO activities were taking place in close proximity to the Project.

14.7.2 Cultural Heritage

Chapter 10 Cultural Heritage (as summarised in Table 14.4) reports that residual impact significance on potential unknown cultural heritage objects (CHOs) would be **Low** during the Project Construction and Pre-Commissioning Phase. As TPAO activities are not planned to occur within the Project Area during the Construction and Pre-Commissioning Phase, there will be no cumulative impact upon potential unknown CHOs that may be potentially affected by the Project.

Residual impacts on potential unknown CHOs would be **Not Significant** during the Operational Phase, and as such cumulative impacts are not anticipated.

14.7.3 Ecosystem Services

As detailed in Section 14.3, the CIA methodology considers VECs which are environmental and social attributes which should:

"…reflect public concern for social, cultural, economic or aesthetic values, and also the scientific concerns of the professional community" (Ref. 14.2)

There are therefore strong parallels between VECs and ecosystem services, where the type and level of service provision (and the value this confers) is determined by:

- The condition of the underlying habitat or ecosystem type;
- The functioning of ecosystem processes and the interactions between them; and
- The importance of the services to beneficiaries (in terms of livelihoods, health, safety, and cultural heritage) and the Project (in terms of social, operational, financial, regulatory, and reputational risks).

IFC PS1 limits the cumulative impacts to be addressed to:

"…those impacts generally recognised as important on the basis of scientific concerns and/or concerns from Affected Communities" (Ref. 14.1).

However, as no *priority* ecosystem services have been identified in **Chapter 11 Ecosystem Services,** assessing the incremental impact of the Project on priority ecosystem services and their beneficiaries in relation to the combined impacts of multiple developments have been scoped out from further consideration in this CIA.

14.7.4 Waste

Chapter 12 Waste Management includes an assessment of waste management impacts arising from the Project as associated with the various waste streams that are anticipated to be produced during the Construction and Pre-Commissioning Phase and during the Operational Phase.

The chapter indicates that with regard to non-hazardous wastes, impacts would be negligible following the preparation and implementation of a comprehensive Integrated Waste Management Plan (described in **Chapter 16 Environmental and Social Management**) covering the entire Project and prepared by contractors. **Low** significance residual impacts are identified with regard to a number of hazardous wastes.

14.8 Cumulative Impact Mitigation, Monitoring and Management

The CIA has not identified any cumulative impacts that are considered to be significant and in need of mitigation measures, monitoring or management. However, the assessment has made a number of recommendations with regard to the alignment of mitigation strategies – this includes the following:

- South Stream Transport (or their contractors) will undertake regular liaison meetings with TPAO in order confirm if and when oil and gas exploration and development activities will take place. South Stream Transport will thus seek to further liaise with TPAO regarding simultaneous activities.

14.9 Assumptions and Limitations

This CIA has been undertaken based upon the available information contained within this ESIA Report. Key assumptions and limitations are detailed below:

- The CIA is restricted to Turkish VECs and only concerns potential cumulative impacts associated with the Project (i.e. within Turkey);
- The assessment only considers residual impacts after the implementation of mitigation measures as detailed in this ESIA Report;
- The assessment has not considered unplanned events as discussed in **Chapter 13 Unplanned Events**;
- The details regarding the TPAO development are limited (refer to Section 14.6.2.2) and it is unclear whether these activities have been subject to any formal environmental impact assessment process. This has limited the CIA to only consider potential cumulative impacts on a qualitative basis in some cases; and

- The CIA excludes potential cumulative impacts during the Decommissioning Phase given that the decommissioning programme is uncertain and will only be developed during the Operational Phase of the Project, whilst other developments that may be taking place at the same time are also unknown.

14.10 Conclusions

TPAO exploration and development proposals have been considered in the CIA. A cumulative noise impact would only occur in the event that potential TPAO seismic surveys are within sufficient range of the construction spread. In this event, cumulative noise impacts on marine mammals and fish are anticipated to be temporary and localised. The assessment has not identified any adverse cumulative impacts that are considered to be significant and in need of specific mitigation measures, monitoring or management. However, South Stream Transport will seek to further liaise with TPAO regarding any simultaneous activities.

References

Number	Reference
Ref. 14.1	IFC (2012) Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts. http://www.ifc.org/wps/wcm/connect/3be1a68049a78dc8b7e4f7a8c6a8312a/PS1_English_2012.pdf?MOD=AJPERES Accessed on 20 September 2013.
Ref. 14.2	IFC (2013) Good Practice Note: Cumulative Impact Assessment and Management – Guidance for the Private Sector in Emerging Markets (August 2013). http://www.ifc.org/wps/wcm/connect/c635da004e5fcb908dd3adfce4951bf6/CIA_PNG_ExternalReview.pdf?MOD=AJPERES Accessed on 20 September 2013.
Ref. 14.3	Directive 2011/92/EU of the European Parliament and of the Council (13 December 2011) on the Assessment of the Effects of Certain Public and Private Projects on the Environment. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:026:0001:0021:EN:PDF Accessed on 20 September 2013.
Ref. 14.4	Turkish Petroleum Inc. General Directorate. Exploration Department (2013). EIA opinion letter from the TPAO. Dated 20 September 2013. Ref. 30319279-109.99

Chapter 15: Transboundary Impact Assessment

URS-EIA-REP-203876

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15 Transboundary Impact Assessment

15.1 Introduction

Transboundary impacts may be considered as:

"…*impacts that extend to multiple countries, beyond the host country of the project, but are not global in nature. Examples include air pollution extending to multiple countries, pollution of international waterways, and transboundary epidemic disease transmission*" (Ref. 15.1).

As the South Stream Offshore Pipeline spans multiple countries and is being constructed across a dynamic marine environment, there is the potential for some Project activities to generate transboundary impacts. Such impacts may arise from Project activities which traverse country boundaries, or impacts that originate within one country, but have the ability to extend across national borders.

This chapter considers the potential for transboundary impacts resulting from the Project. Where applicable, the chapter draws upon the impact assessments conducted in each of the technical discipline sections of this Environmental and Social impact Assessment (ESIA) Report (Chapters 7 to 12).

Given that greenhouse gas emissions are a global issue as opposed to a transboundary concern; this chapter does not include a Project-related greenhouse gas assessment. Details regarding greenhouse gas emissions associated with Project activities are provided in **Chapter 5 Project Description** and **Chapter 7 Physical and Geophysical Environment**.

15.2 Frameworks for Considering Transboundary Impacts

The following have informed the assessment of potential transboundary impacts:

- International Finance Corporation (IFC) Performance Standard (PS) 1 Assessment and Management of Environmental and Social Risks and Impacts (Ref. 15.2) recognises the need to consider transboundary impacts. It states that the risks and impacts identification process needs to consider:

  "*…potential transboundary effects, such as pollution of air, or use of or pollution of international waterways*"; and

- The Espoo Convention specifies the obligations on countries[1] in which a project is proposed where significant adverse environmental impacts might be experienced in another country's territory. Of the three countries in which the South Stream Offshore Pipeline is proposed, only Bulgaria has ratified the Convention (signed by Bulgaria on 25 February 1991, ratified on 16 March 1995 and came into force on 10 October 1997). Turkey and Russia have not

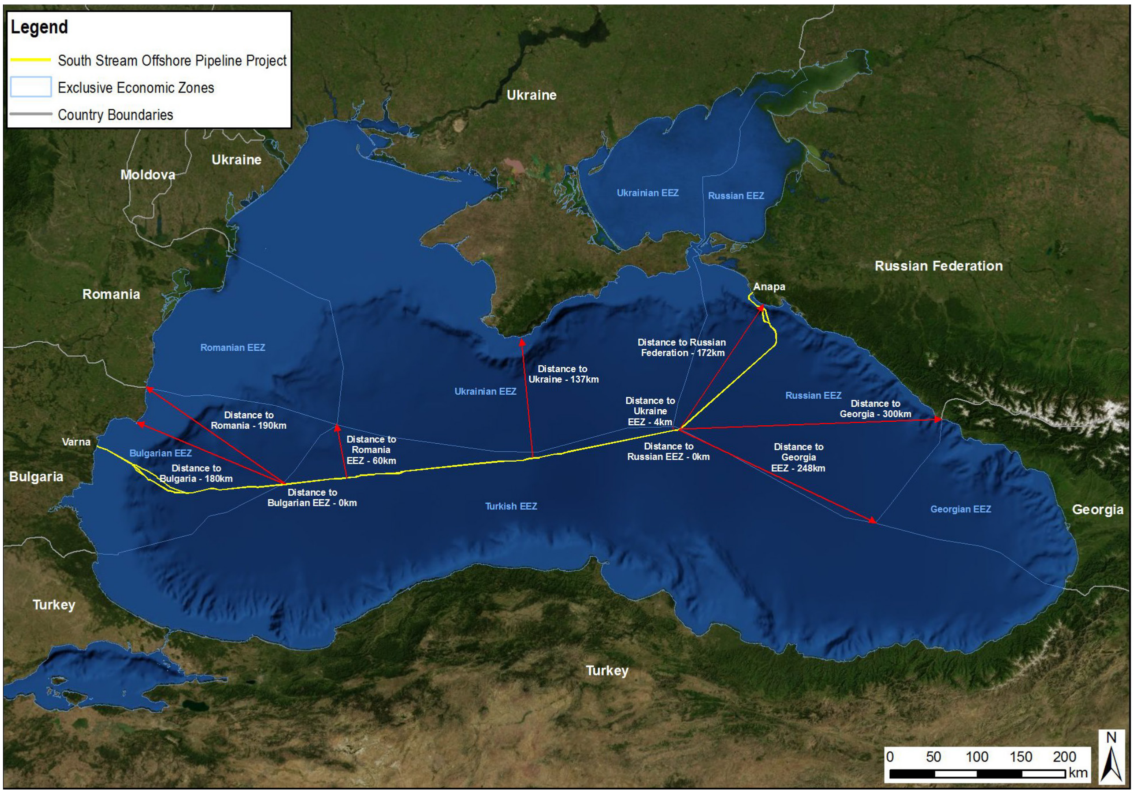
[1] The Convention defines a Party of Origin, being the country in which a project is planned, and Affected Parties, being the States whose territory might be affected. The Convention imposes an obligation on Parties of Origin to notify Affected Parties where a project is likely to have significant adverse environmental transboundary effects.

ratified the Convention. Nevertheless, the principle of the Convention, that the potential exists for significant adverse environmental impacts to be experienced in the territories of Georgia, Ukraine, Russia, Bulgaria and Romania, has informed the assessment as presented herein.

15.3 Potential for Transboundary Impacts

In order to generate a transboundary impact, activities arising from the Project would need to generate an impact that has the potential to cross national jurisdictions which for the purpose of this Chapter are defined by the EEZ boundaries of the Black Sea countries. Figure 15.1 illustrates the closest points of the Project to these EEZ boundaries and to land territory of nearby countries.

Figure 15.1 Distances from the Project to Turkey, Georgia and Ukraine EEZ Boundaries



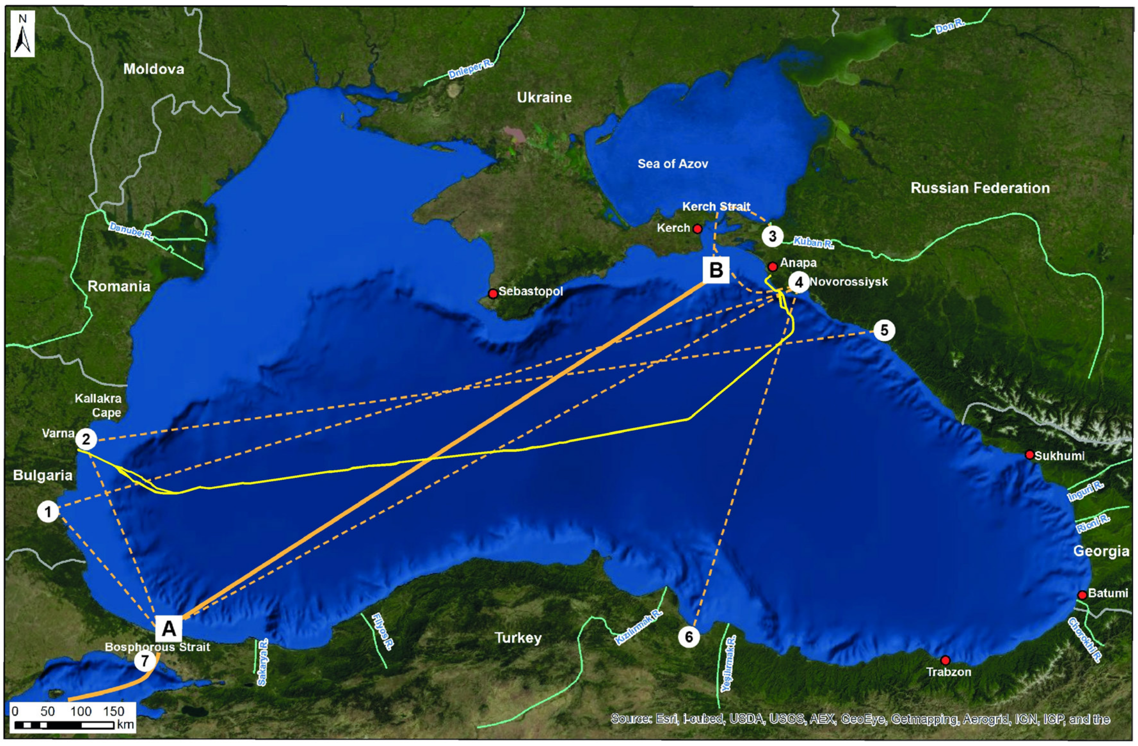
Note: All geographic boundaries depicted in maps in this ESIA Report relate to February 2014.

It is acknowledged that some Project Activities will be located closer to EEZ boundaries and Black Sea country land borders than indicated in Table 15.1. This includes Project-related marine supply vessel movements which are likely to use existing international shipping routes to and from selected ports (as shown in Figure 15.2).

Table 15.1 Closest Points of the Project to Turkey, Georgia and Ukraine EEZ Boundaries and to Land Territories

Country	Closest Distance of Project to Land Territory (kilometres (km))	Closest Distance of Project to EEZ Waters (km)
Georgia	300	248
Ukraine	137	4
Russia	172	Located directly adjacent to the EEZ boundary
Bulgaria	180	Located directly adjacent to the EEZ boundary
Romania	190	60

Figure 15.2 Shipping and Navigational Routes in the Black Sea which Potentially Interact with the Project Pipelines



Key:

A: Bosporus shipping junction (Istanbul)
B: Kerch Strait shipping junction

river
existing shipping route
main shipping route

1: Burgas	**3:** Temryuk	**5:** Tuapse	**7:** Istanbul
2: Varna	**4:** Novorossiysk	**6:** Samsun	

15.4 Impact Assessment Methodology

The various technical assessments as presented within this ESIA Report (Chapters 7 to 12) have used defined impact assessment methodologies to quantify Project impacts upon defined sensitive receptors. In undertaking this task, these assessments have considered the potential for identified impacts during the various Project Phases (Construction and Pre-Commissioning, Operational and Decommissioning Phases) to traverse EEZ borders. This chapter captures the findings of earlier chapters in so far as they relate to transboundary impacts and considers both planned and unplanned events.

In general, potential impacts generated by planned activities during the Construction and Pre-Commissioning Phase of the Project are typically temporary in nature and localised in extent. Similarly impacts generated from planned activities during the Operational Phase will also be localised. However, during the various Project Phases there is the potential for unplanned events which are those events that are unintended and that may pose risks to environmental and socio-economic receptors (**Chapter 13 Unplanned Events**) that may result in wider transboundary impacts. Unplanned events include the accidental release of hydrocarbons (e.g. spills of fuel from vessels) to the marine environment during the Construction and Pre-Commissioning Phase and the release of natural gas to the atmosphere in the event that the Pipeline is damaged during the Operational Phase. Such events have a low likelihood of occurrence and strict management measures will be put in place to ensure that risks and any resultant impacts are minimised (**Chapter 13 Unplanned Events**).

The sections below consider the potential for marine environment transboundary impacts from both planned and unplanned events during the Construction and Pre-Commissioning Phase and Operational Phases of the Project. The activities to be undertaken during the Decommissioning Phase are uncertain, as decommissioning proposals will be developed during the Operational Phase of the Project. Current Good International Industry Practice (GIIP) is to decommission pipelines in place, with few resultant environmental impacts. However, should a decision be made to remove the pipelines and the associated infrastructure, it is expected that the potential transboundary impacts and mitigation measures will be similar in nature to some of those as described herein for the Construction and Pre-Commissioning Phase of the Project. As such, the Decommissioning Phase is not specifically covered in this chapter.

15.5 Potential Transboundary Impacts

15.5.1 Introduction

The following potential adverse transboundary impacts arising from the Project have been identified and are discussed below:

- Impacts from waste generation;
- Impacts from underwater noise on fish and marine mammals;
- Impacts on birds;
- Impacts on fish migration and fisheries; and

- Impacts from unplanned events, specifically from maritime accidents leading to oil spills, from the introduction of invasive species and from gas releases.

15.5.2 Waste Generation

Waste material will be generated on-board the pipe-laying and other vessels throughout the Construction and Pre-Commissioning Phase (**Chapter 12 Waste Management**). Supply and support vessels will originate from Russia and Bulgaria. Materials will be transported to the pipe-laying vessel by the supply vessel, which will transport waste from the pipe-laying vessel for management and disposal on shore. Support vessels may transport waste from the pipe-laying vessel for management and disposal on shore. In some circumstances waste from the pipe-lay vessel may be temporarily stored on-board pipe-lay vessels, prior to its subsequent transfer to supply vessels.

No Turkish ports will be used for any purpose for the Project. Thus support or supply vessels will come from either Russia or Bulgaria, collect waste material from the pipe-laying vessel within Turkish waters, and then return to its home port. It is normal practice in the shipping industry for port waste reception facilities to receive waste from vessels using that port, where the waste has been generated during the ship's voyage which may have been outside of the waters of the receiving country.

The Project will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) Annexes I, IV and V, each of which includes specific waste management provisions, as well as relevant national requirements of the recipient country. All hazardous waste will be disposed of at licenced facilities.

Adherence to MARPOL requirements will enable significant adverse transboundary impacts associated with Project waste to be avoided.

15.5.3 Underwater Noise Impacts upon Fish and Marine Mammals

The acoustically sensitive receptors in the Black Sea are the fish species categorised as 'hearing specialists' and marine mammals. Some of the sensitive fish species and all marine mammal species, specifically the bottlenose dolphin, common dolphin and harbour porpoise that are found in the Black Sea, are of conservation concern (**Chapter 8 Biological Environment**). The potential for Project construction activities in Turkish waters to impact upon acoustically sensitive ecological receptors located across EEZ boundaries thus needs to be considered. As reported in **Chapter 8 Biological Environment**, some Project Activities such as pipe-laying and vessel movements will increase underwater noise levels. The noise levels associated with such activities are most likely to cause harassment reactions rather than strong behavioural reactions and injury.

For hearing generalist fish, no impacts are anticipated. Hearing specialist fish are generally more sensitive to underwater noise and behavioural effects may be apparent in some species such as sprat or anchovy in some situations. Modelling has suggested that pipe-laying may generate noise impacts at a range of approximately 0.5 km. **Chapter 8 Biological Environment** also reports that underwater noise arising from several vessels simultaneously were insufficient to give rise to lethality in marine mammals. Based on audiogram weighted criteria, behavioural effect ranges for individual vessel operations are only estimated to be significant for dolphins and porpoises with effect ranges never exceeding approximately 1 km.

Given the above, whilst Project construction activities have the potential to generate underwater noise, and thus impact upon fish and marine mammal behaviour, the limited spatial extent of behavioural reactions is such that no significant adverse transboundary impacts are expected.

15.5.4 Birds

A number of migration routes stretching from the Arctic to South Africa occur around and over the Black Sea for birds that overwinter, nest and roost in coastal locations (**Chapter 8 Biological Environment**). In the Turkish EEZ (outside of territorial waters), there are no nesting sites and so the birds observed in this region are restricted to a small number of species that may be feeding or migrating through the area. The Central Black Sea is outside the main Mediterranean/Black Sea Flyway migration route which connects Europe with Africa. The area is not important for large numbers of migrating birds, although data on the occurrence of birds in the Central Black Sea are scarce.

Vessel movements during construction activities have the potential to temporarily disturb seabirds. However, these are highly mobile animals generally able to avoid areas of disturbance, and the density of seabirds at sea in the Central Black Sea is lower than coastal areas, birds will generally only be present during migration and are unlikely to be present on the sea surface in any significant number.

There will be occasions where night-time works are required necessitating the use of floodlights. Light can affect migrating birds and cause mortality from bird strikes on highly illuminated offshore installations. The source of illumination (e.g. pipe-lay vessel) will be transient at any given location and have limited scope to interact with night-flying birds. Because only a small number of localised individuals could be affected, this is considered a short term impact. Mitigation measures to minimise such impacts include removing unnecessary illumination, reducing light intensity and shielding light sources during the most active bird migration period.

Overall, no significant adverse transboundary impacts to individuals or populations of migratory birds are expected as a result of planned Project Activities.

15.5.5 Fisheries

The European anchovy is the only commercial species in the Black Sea known to migrate across the Project Area. However, as the construction spread will only be moving at around 2.75 km per day it can be considered a stationary object and anchovy will be able to avoid it. Migrating schools of fish are fast moving and their presence at a particular point is temporary. The main migration corridor could extend around 125 km in width through the EEZs of Turkey and Ukraine. Given that the main impact radius associated with construction noise is 0.5 km in hearing specialist fish, no significant adverse impacts upon anchovy migration and therefore fishing activities across EEZ boundaries are anticipated as a result of planned Project activities[2].

15.5.6 Maritime Accidents Leading to Oil Spills

A maritime risk assessment has considered the probability of unplanned events, such as vessel collisions and sinking during the Construction and Pre-Commissioning Phase and the subsequent probability of an oil spill. Vessel collisions during Operational and Decommissioning Phases have been discounted from this assessment.

The probability of an oil spill arising from an unplanned event been assessed as ranging from unlikely to extremely remote, depending on the event leading to the spill. The adoption by vessels employed by the Project of Oil Spill Prevention and Response Plans, and Shipboard Oil Pollution Emergency Plans, and of crew training programmes will reduce the likelihood of a spill, and minimise the extent and fate of any spill that does occur by the deployment of spill response procedures. Further the fact that wherever practicable, Marine Gas Oil (MGO) or Marine Diesel Oil (MDO) will be used means that spillages would evaporate and disperse as a result of wave action.

Oil spill modelling has been undertaken and is reported in Appendix 13.1: Maritime Risk Assessment and Oil Spill modelling. Four locations for oil spill modelling were selected along the pipeline route within the Turkish EEZ, with modelling undertaken for a spill of 2,000 m^3 of MDO at each release location. Modelling results are discussed below:

- *Modelling Oil Spillage Near the Turkish/Bulgarian EEZ Border:* It is predicted that a localised area of the Black Sea would be affected with a surface slick of thicknesses over 1 micrometre (μm) for up to 128 km from the release location. There is an 11% probability of visible surface hydrocarbons reaching Bulgarian waters. Hydrocarbons may enter the Bulgarian EEZ within 6 hours. Dissolved water column concentrations of greater than 50 parts per billion (ppb) are predicted a maximum of 100 km away from the release site and therefore are not expected to reach the Turkish coast. Concentrations will take up to 1.5 days to fall below this threshold in localised areas (oil is not expected to have acute toxic effects at water column concentrations of less than 50 ppb) (Ref. 15.3).

  For the worst scenarios of oil reaching the shoreline, deterministic modelling was undertaken to predict the mass balance fate of the oil as it disperses over time, typical development and appearance of the surface slick. The modelling has predicted that oil might beach after 5 days across a wide area of coastline but that the oil would arrive in a highly weathered and dispersed state, and would not be visible. This modelling does not take into consideration oil spill response procedures being in place during the spill;
- *Modelling Oil Spillage North West Turkish EEZ:* It is predicted a moderate area of the Black Sea would be affected with a surface slick of thicknesses over 1 μm for up to 128 km from the release location. Dissolved water column concentrations of greater than 50 ppb are predicted a maximum of 105 km away from the release site and therefore are not expected

[2] Transboundary impacts on Turkey are considered in the Appendix 9.1: Fishing Study.

to reach the Turkish coast. Concentrations will take up to 2 days to fall below this threshold in localised areas.

For the worst scenarios of oil reaching the shoreline, deterministic modelling was undertaken to predict the mass balance fate of the oil as it disperses over time, typical development and appearance of the surface slick. The modelling has predicted that oil might beach after 5 days across a wide area of coastline but that the oil would arrive in a highly weathered and dispersed state, and would not be visible. This modelling does not take into consideration oil spill response procedures being in place during the spill;

- *Modelling Oil Spillage North Turkish EEZ Close to the Ukrainian EEZ Border:* It is predicted a moderate area of the Black Sea would be affected with a surface slick of thicknesses over 1 µm for up to 115 km from the release location. There is a 20% probability of visible surface hydrocarbons reaching Ukrainian waters. Hydrocarbons may enter international waters (i.e. cross EEZ borders) within 5 hours. Dissolved water column concentrations of greater than 50 ppb are predicted a maximum of 100 km away from the release site and therefore are not expected to reach the Turkish coast. Concentrations will take up to 1.5 days to fall below this threshold in localised areas.

  For the worst scenarios of oil reaching the shoreline, deterministic modelling was undertaken to predict the mass balance fate of the oil as it disperses over time, typical development and appearance of the surface slick. The modelling has predicted that oil might beach after 5 days across a wide area of coastline but that the oil would arrive in a highly weathered and dispersed state, and would not be visible. This modelling does not take into consideration oil spill response procedures being in place during the spill; and

- *Modelling Oil Spillage North East Turkish EEZ Close to the Ukrainian and Russian EEZ Borders:* It is predicted a moderate area of the Black Sea would be affected with a surface slick of thicknesses over 1 µm for up to 96 km from the release location. There is a 33% probability of visible surface hydrocarbons reaching Russian waters and a 10% chance in Ukrainian waters. Hydrocarbons may enter international waters (i.e. cross EEZ borders) within 1 hour. Dissolved water column concentrations of greater than 50 ppb are predicted a maximum of 68 km away from the release site, and therefore are not expected to reach the Turkish coast. Concentrations will take up to 1.5 days to fall below this threshold in localised areas.

  For the worst scenarios of oil reaching the shoreline, deterministic modelling was undertaken to predict the mass balance fate of the oil as it disperses over time, typical development and appearance of the surface slick. The modelling has predicted that oil might beach after 3 days across a wide area of coastline but that the oil would arrive in a highly weathered and dispersed state, and would not be visible. This modelling does not take into consideration oil spill response procedures being in place during the spill.

Given that unplanned hydrocarbon spillages have the potential to generate a transboundary impact, the Project will implement a range of design controls that aim to reduce the probability of such events occurring which are applicable to all Project phases (refer to **Chapter 13 Unplanned Events**), including the following:

- Where practicable vessels deployed in the Project Area will use MGO or MDO and, therefore, any accidental spill of fuel will have less adverse consequences than a spill that involves heavier fuels;
- All contractors and operators of marine vessels working on behalf of South Stream Transport will be required to develop and implement an Oil Spill Prevention and Response Plans. South Stream Transport will ensure that contractor Oil Spill Prevention and Response Plans are appropriately aligned with the Black Sea Contingency Plan (Ref. 15.4);
- Contractors and operators of vessels working on behalf of South Stream Transport will operate in compliance with MARPOL regulations on oil spill prevention and response and are required to prepare Shipboard Oil Pollution Emergency Plans (SOPEP) and Shipboard Marine Pollution Emergency Plans (SMPEP) as applicable for each vessel. The SOPEPs will specify the control and response measures that have to be available on board every vessel to respond to a spill that does not require external intervention; and
- All marine vessel crews will have the appropriate training, qualification and certification to undertake the tasks required during the construction of the pipelines.

15.5.7 Invasive Species

Some of the vessels used by the Project will originate from locations outside of the Black Sea. Depending on the previous location of marine vessels (including the pipe-lay, support and supply vessels), there is a possibility that some vessels could introduce invasive species to the Black Sea via ballast water or fouling organisms on the vessel hulls. To mitigate against such risks, where practicable, the following measures will be put in place (also refer to **Chapter 13 Unplanned Events**):

- Where relevant and practical these measures will be based on those identified in the IPIECA (Global Oil and Gas Industry Association for Environmental and Social Issues) document Alien Invasive Species and the Oil and Gas Industry, Guidance for Prevention and Management and the International Maritime Organisation (IMO) Ballast Water Management Convention and Guidelines. They will be applied to all marine plant and equipment that is used on the Project and which has the potential to be a vector of live organisms, spores, larvae and young and will include ballast water management, use of antifouling coatings, cleaning of equipment prior to deployment and the change of cooling water;
- Use anti-fouling coatings (non- Tributyltin (TBT)) or sealing coatings to minimise inadvertent transport of organisms;
- Careful cleaning of hulls, tanks and dredging equipment before use (wherever practically possible prior to entering the Black Sea); and
- All ships using ballast water exchange should conduct ballast water exchange at least 50 nautical miles (NM) from the nearest land and in water at least 200 m in depth, taking into account Guidelines developed by IMO.

With the implementation of such measures, no significant transboundary impacts associated with invasive species are expected as a result of planned Project Activities in any of the Project phases.

15.5.8 Release of Gas

A Shipping Risk Report undertaken for the Project (Ref. 15.5) has considered possible shipping hazards which might affect the integrity of the Pipelines, specifically, a ship sinking or a ship dropping an object (such as a container) onto the pipeline, resulting in pipeline damage or failure, which could result in the release of gas (and potential subsequent fire) which may in turn impact the environment and socio-economic receptors.

As a result of the engineering design standards being applied and quality assurance during construction, together with the high external pipeline pressure at 2,000 m water depth, the potential for such an event is remote. For a fire incident following a gas leakage to impact upon human receptors, it would require a pipeline failure and gas leakage, followed by ignition at the sea surface in conjunction with a passing vessel, the likelihood of which is extremely unlikely.

If a Pipeline rupture were to occur in the Turkish EEZ, in some cases gas would not escape from the Pipeline, rather water would ingress the Pipeline due to the external water ambient pressure. This would occur along approximately a third of the pipeline length through the Turkish EEZ. Elsewhere, any gas released from the Pipeline would rise through the water column as a plume of gas bubbles, eventually dispersing into the air. Acute environmental damage would not occur, although such releases would represent an increase in greenhouse gas emissions in Turkey. Methane levels at the release site would be temporarily elevated which could locally impact upon any present marine ecology including seabirds. Gas passage through the water column could also impact upon marine organisms (such as fish), resulting in potential acute or chronic impacts depending upon exposure levels. In neither case, however, are significant transboundary impacts considered likely.

15.6 Conclusions

Some planned and unplanned Project Activities have the potential to result in adverse transboundary environmental and social impacts given that Project Activities will be taking place close to EEZ boundaries. However, defined mitigation strategies and the very low probability of unplanned events occurring will mean that no significant transboundary impacts are anticipated.

References

Number	Reference
Ref. 15.1	IFC Guidance Note 1: Assessment and Management of Environmental and Social Risks and Impacts. January 2012.
Ref. 15.2	IFC (2012) Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts. Accessed at: http://www.ifc.org/wps/wcm/connect/3be1a68049a78dc8b7e4f7a8c6a8312a/PS1_English_2012.pdf?MOD=AJPERES Accessed on 20 September 2013.
Ref. 15.3	Black Sea Diesel and Fuel Release Modelling: South Stream Development. Genesis: Technical Note August 2013.
Ref. 15.4	Black Sea Contingency Plan 2002. To the Protocol on Cooperation in Combating Pollution of the Black Sea by Oil and Other Harmful Substances in Emergency Situations – Volume 1 Response to Oil Spills. AG ESAS 8.4d.
Ref. 15.5	South Stream Offshore Pipeline FEED - Shipping Risk Analysis Report. Intecsea Report 10-00050-10-SR-REP-0040-0011 dated February 2013.

Chapter 16: Environmental and Social Management

URS-EIA-REP-203876

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Figures

16 Environmental and Social Management

16.1 Introduction

South Stream Transport is committed to develop and operate the South Stream Offshore Pipeline in an environmentally and socially responsible manner.

Further, South Stream Transport is seeking international financing and consequently must meet the legal and other requirements of all countries through which it passes (i.e. the Russian Federation, Bulgaria and Turkey), plus adopted standards and guidelines for international financing[1].

As the South Stream Offshore Pipeline will be constructed and operated as a single, coherent development across three countries, it will be managed by means of an overarching corporate management system. A Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS) will form an important part of the corporate management system. Key elements of the HSSE-IMS relating to environmental and social management are described in more detail in Section 16.5.

This chapter explains how commitments identified during planning stages (i.e. during national and international impact assessments) are captured in Environmental and Social Management Plans (ESMPs) that in turn form an important element of the HSSE-IMS.

16.2 Environmental and Social Commitments

Commitments in the form of design controls, safeguards, mitigation measures and monitoring requirements that aim to avoid, prevent, minimise or where this is not possible, offset potential adverse impacts and enhance beneficial impacts, have been identified or developed during the planning stages of the Project and the wider South Stream Offshore Pipeline. Figure 16.1 describes the key sources of environmental and social commitments, and their incorporation via a Commitments Register into ESMPs.

Thus, the Commitments Register represents the principal link and provides coherence between various source documents (including this ESIA Report) and the South Stream Offshore Pipeline ESMPs. As such, a single Commitments Register is compiled from sources from all three countries – Russia, Turkey and Bulgaria.

[1] Including: the Japan Bank for International Cooperation (JBIC), Equator Principles, the Organisation for Economic Co-operation and Development (OECD) Common Approaches and International Finance Corporation (IFC) Performance Standards (2012) as outlined in **Chapter 2 Policy, Regulatory and Administrative Framework**.

16.3 Environmental and Social Aspects and Impacts Register

South Stream Transport has evaluated environmental and social aspects for the South Stream Offshore Pipeline (i.e. for all three countries – Russia, Turkey and Bulgaria), and as a result has prepared an Aspects and Impacts Register. This register lists environmental and social aspects and impacts, based upon ENVIID, ESIA and Environmental Due Diligence Assessments, and identifies those that constitute a significant risk. These are subsequently transferred to the EIA / ESIA and Project Risk Register.

The purpose of ESMPs is to ensure that appropriate control and monitoring measures are in place to deal with all significant potential environmental and social impacts of a project. The Aspects and Impacts Register therefore provides a focus for environmental and social management and development of the management plans for the Project and the overall South Stream Offshore pipeline as shown in Figure 16.1.

16.4 Environmental and Social Management Plans

ESMPs are the principal means by which environmental and social impacts are managed and compliance with Project Standards is assured. ESMPs will be subject to regular review to determine adequacy and effectiveness and therefore, may be adjusted in line with the model described by International Organisation for Standardisation (ISO) 14001:2004 in order to improve future performance.

The ESMPs will form the basis for subsequent, more detailed management plans to be prepared and/or implemented by construction and operations contractors (Section 16.4.3), who will be contractually obliged to comply with the relevant environmental and social requirements, specifications, and procedures set out in South Stream Transport ESMPs.

Consultation with stakeholders has been an on-going process and will continue over the coming months, including for disclosure of the ESMPs, as outlined in **Chapter 6 Stakeholder Engagement**.

16.4.1 ESMP Structure

The potential impacts are markedly different between Project phases, with many construction-related impacts ceasing during the Operational Phase. The HSSE-IMS will therefore include the development of phase-specific ESMPs:

- Construction Phase ESMP; and
- Operational Phase ESMP.

The Construction ESMP and the Operations ESMP will each comprise a suite of documents including a Framework Document and a set of management plans. The document structure is shown in Figure 16.2.

Figure 16.1 Inputs to Environmental and Social Management Plans

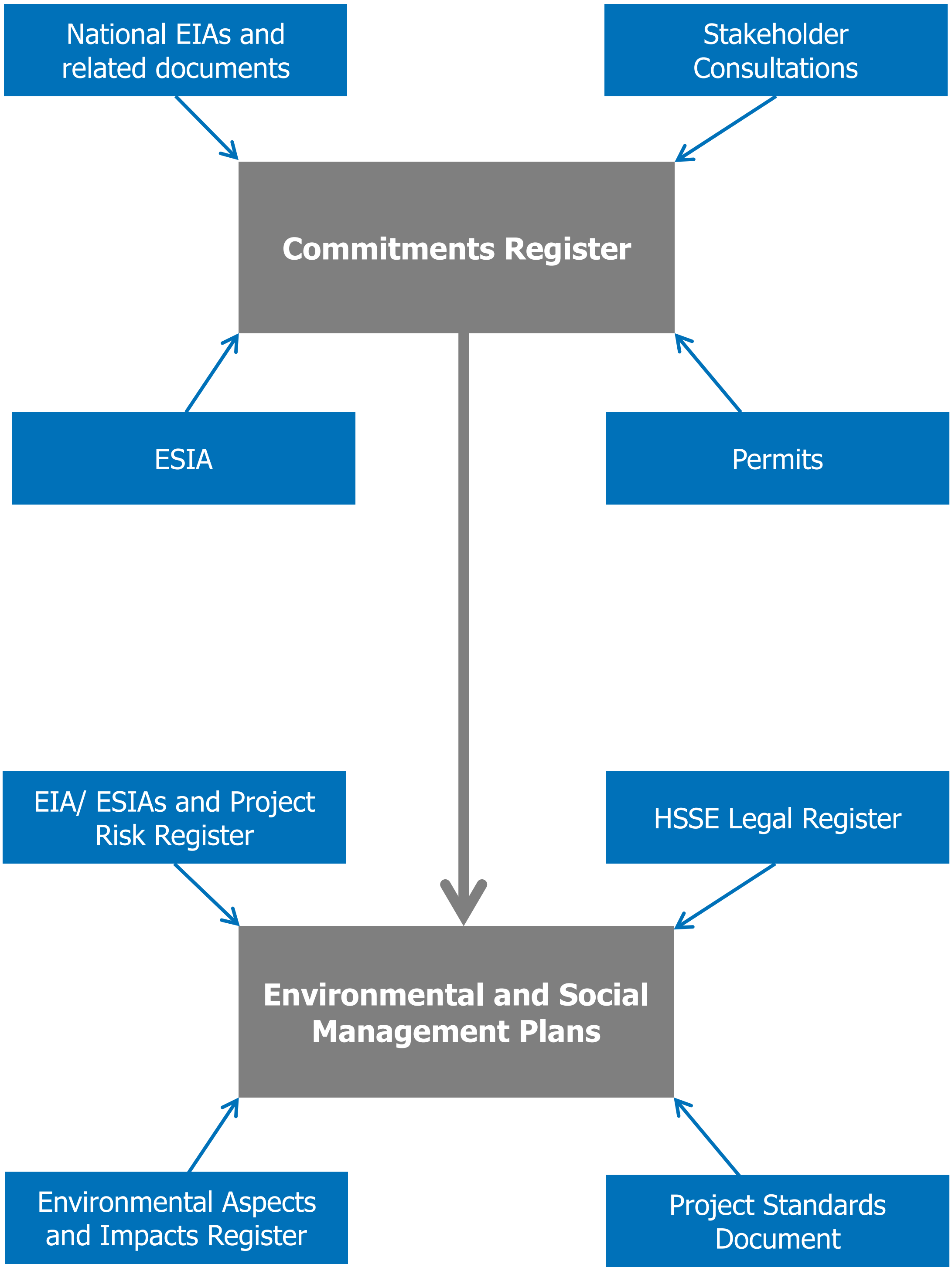
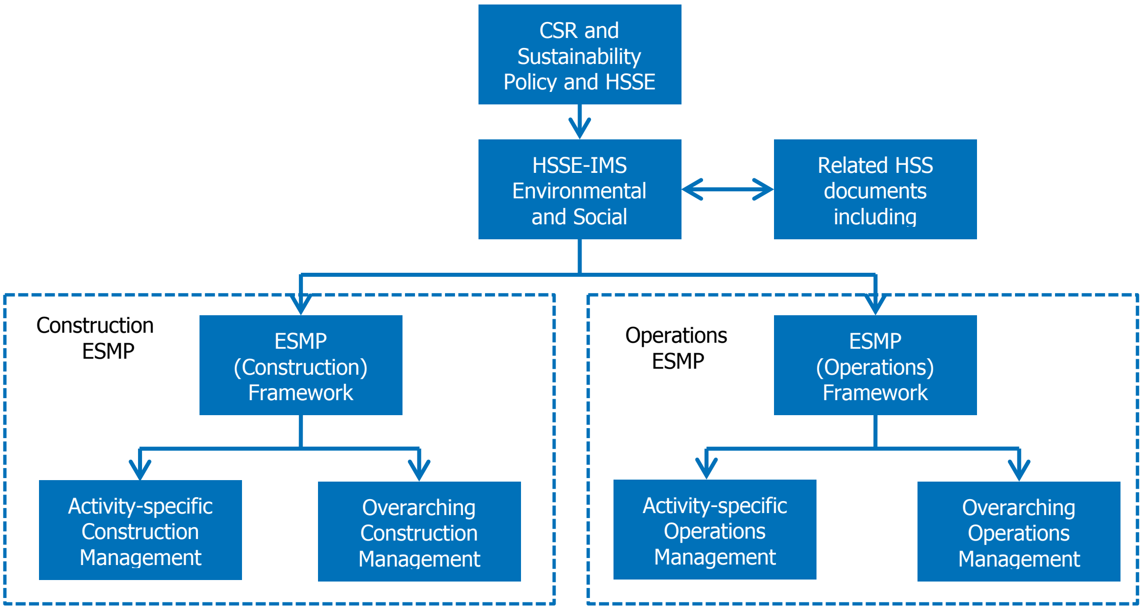


Figure 16.2 South Stream Offshore Pipeline HSSE-IMS and ESMP Structure



16.4.1.1 Construction ESMP

The Construction ESMP will comprise an "ESMP (Construction) Framework Document", a suite of activity-specific Construction Management Plans (CMPs), and overarching CMPs. Between them, these documents will capture all relevant South Stream Offshore Pipeline commitments in terms of mitigation, management and monitoring actions defined in this ESIA Report and other documentation.

The ESMP (Construction) Framework Document will describe the Construction ESMP including its constituents and key linkages to other elements of the HSSE-IMS. In particular, it will set out the context and purpose of the activity-specific and overarching CMPs and will describe the rationale behind their development and how they will be implemented. This document will also include:

- Summary of the policies, legal and regulatory requirements and other applicable standards relevant to construction;
- Construction ESMP roles and responsibilities;
- Training requirements and standards;
- Performance milestones and indicators including key Performance Indicators (KPIs);
- Inspection, audit and reporting strategies; and
- General instructions as to how the Construction ESMP should be used.

Activity-specific CMPs will be designed for identifiable discrete Project activities (e.g. Vessel and Marine Transport). These plans will address environmental and, social impacts that are likely to occur as a result of the relevant activities.

As an example, the Vessels and Marine Transport CMP will address South Stream Offshore Pipeline commitments (mitigation, management and monitoring) applicable to all Turkish EEZ construction activities as well as offshore activities in the Russian and Bulgarian Sectors of the South Stream Offshore Pipeline.

The activity-specific CMPs will contain activity-specific requirements to be met by both South Stream Transport and appointed contractors (and sub-contractors). The activity-specific CMPs will be developed for contractors as the primary users (as opposed to South Stream Transport personnel). Figure 16.3 presents the activity-specific CMPs and overarching CMPs.

Figure 16.3 Activity-Specific and Overarching CMPs

Activity-Specific Construction Management Plans

- Vessels and Marine Transport
- Seabed Intervention*
- Russian Landfall*
- Bulgarian Landfall*
- Bulgaria Marshalling Yards*
- Pre-Commissioning*

Overarching Construction Management Plans

- Labour and Working Conditions
- Compensation
- Cultural Heritage
- Biodiversity
- Stakeholder Engagement

* Identifies plans that are not relevant to the Project (i.e. Turkish Sector)
The overarching Stakeholder Engagement CMP is supplementary to the country Stakeholder Engagement Plans (SEPs) (see **Chapter 6 Biological Environment**) and will be implemented primarily by contractors. In particular it aims to ensure that any stakeholder engagement undertaken by contractors is aligned with South Stream Transport procedures.

In addition to the activity-specific CMPs, it is recognised that some Project Activities are applicable to the South Stream Offshore Pipeline, independent of the location or nature of the activity in question.

The overarching CMPs, as shown in Figure 16.3 will address the South Stream Offshore Pipeline requirements, the majority of which will primarily be the responsibility of South Stream Transport.

16.4.1.2 Operations ESMP

The Operations ESMP will follow the same structure as the Construction ESMP, including both the development of an ESMP (Operations) Framework Document to describe the ESMP and key linkages to other elements of the HSSE-IMS, as well as a suite of activity-specific Operations Management Plans (OMPs) and overarching OMPs. The anticipated OMPs for the Operations ESMP are presented in Figure 16.4.

Figure 16.4 Activity-Specific and Overarching OMPs

Activity-Specific Operations Management Plans	Overarching Operations Management Plans
• Offshore Pipelines • Russian Landfall* • Bulgarian Landfall*	• Monitoring Plan • Social and Employment Plan

* Identifies plans that are not relevant to the Project (i.e. Turkish Sector)

Each OMP describes environmental and social mitigation, management and monitoring requirements and actions in relation to normal operating conditions and planned maintenance, minor repairs and minor incidents. Unscheduled major repair work relating to the offshore pipelines will be subject to permitting and impact assessment activities and development of bespoke management plans and procedures. Emergency situations will be covered by separate emergency response plans and procedures described in **Chapter 13 Unplanned Events**.

Decommissioning activities will be covered by specific management plans to be developed during the Operational Phase.

16.4.2 ESMP Content

Each of the individual management plans within the ESMPs consists of two main components:

- Management and Mitigation Plan; and
- Monitoring Plan.

These two components are contained within the appendices to each of the management plans. The main body of the management plans contains supporting information specific to the topic of the management plan including scope, responsibilities, linkages to other documents, implementation and verification and a summary policies and standards (including legal requirements).

16.4.2.1 Management and Mitigation Plan of ESMP

The Management and Mitigation Plan component captures all management and mitigation measures outlined in the source documents described in Figure 16.1. Those measures play a vital role in reducing the potential impacts associated with activities, and include:

- *Design Controls* As part of the Project design process, measures to avoid or minimise impacts were identified and incorporated into the design. These are referred to as design controls and include design features and management measures. They are based on Good International Industry Practice (GIIP) and are intended to avoid or control unacceptable impacts. Specific design controls are described in greater detail in **Chapter 5 Project Description** and the relevant technical chapters. Their role in controlling impacts on environmental and social impacts is discussed more in **Chapter 3 Impact Assessment Methodology**; and

- *Management and Mitigation Measures* Where the outcome of the ESIA Report indicates that design controls are insufficient to manage an impact to an acceptable level, further measures have been identified. These measures have been termed 'mitigation measures' and are described in respective chapters and detailed in Environmental and Social Management Plans.

Management and Mitigation Actions

The ESMPs provide a detailed list of mitigation measures and actions that are required to reduce to acceptable standards the potential adverse environmental and, social impacts and enhance the positive impacts of the Project as presented in Section 16.3.

The management and mitigation measures are presented in a tabular format in the ESMPs (and associated CMPs) setting out the location and impact that each mitigation measure or action relates to, the entity responsible for implementing each measure or action, details of the mechanisms that will be used to monitor each measure or action and the performance criteria to be utilised in order to define or measure the success or failure of the measure or action.

16.4.2.2 Monitoring Plan of ESMP

The Monitoring Plan component of the ESMPs details the monitoring requirements based on the findings of this ESIA Report and other source documents (Figure 16.1) as applicable to the specific phase and activity or overarching topic.

For each of these monitoring requirements, the management plans specify:

- The parameters to be assessed as part of the monitoring;
- The proposed scheduling of monitoring activities;
- The proposed location of monitoring activities;
- The means of verification; and
- The roles and responsibilities for the monitoring activity.

In addition, South Stream Transport is developing a detailed overarching Environmental and Social Monitoring Programme for the South Stream Offshore Pipeline which will detail all monitoring requirements applicable to the South Stream Offshore Pipeline, discussed below.

Monitoring is required in order to both demonstrate compliance with legal limits and South Stream Transport's Project Standards as well as provide verification of the overall design and effectiveness of the implemented mitigation and management measures. The key objectives of South Stream Transport's proposed monitoring activities are as follows:

- To monitor compliance with relevant standards and South Stream Transport's environmental and social objectives;
- To provide an early indication of any mitigation and management measures or practices that are failing to achieve objectives;

- To determine whether environmental and social changes are attributable to construction and operational activities; and
- To provide a basis for continuous review of, and improvement to, the monitoring activities.

Overarching Environmental and Social Monitoring Programme

The monitoring plan requirements outlined in the ESMPs are defined in more detail in the overarching Environmental and Social Monitoring Programme. The overarching Monitoring Programme takes the monitoring requirements described in the ESMP monitoring plans and provides greater specificity and instruction on the monitoring locations, parameters to be monitored, sampling and storage methodologies, sampling frequency, analytical techniques and reporting.

In developing the overarching Environmental and Social Monitoring Programme, the following factors have been considered:

- Significance of environmental and social aspects identified through impact assessment;
- National legislative requirements;
- Good International Industry Practice (GIIP);
- Responsiveness to the detection of environmental and social changes or trends;
- Logistical practicality; and
- Cost effectiveness.

The following monitoring activities may be included in the overarching Monitoring Programme for the South Stream Offshore Pipeline (not all are of relevance to the Project):

- Air Quality Monitoring;
- Noise Monitoring;
- Vibration and Seismicity Monitoring;
- Terrestrial Soils, Groundwater, and Surface Water Monitoring;
- Seabed Sediments and Marine Water Quality Monitoring;
- Biodiversity, Ecological and Natural Resources Monitoring;
- Solid and Liquid Wastes Monitoring (Onshore and Offshore);
- Landscape and Visual Amenity Monitoring;
- Land Use and Ownership Monitoring;
- Community, Local Economy and Traffic Monitoring;
- Cultural Heritage Monitoring; and
- Unplanned Events Monitoring.

16.4.3 ESMP Responsibilities and Implementation

Construction ESMPs will be implemented primarily via construction contracts and as appropriate will be issued to contractors who will be required to demonstrate how they will comply with the ESMPs through the development of their own contract-specific HSSE plans and procedures. These will be approved by South Stream Transport.

16.5 South Stream Offshore Pipeline HSSE-IMS

16.5.1 Introduction

As already described under the preceding sections of this chapter, the ESMPs – based on commitments raised in EIAs, ESIAs and other documents – form an important part of South Stream Transport's HSSE-IMS. The HSSE-IMS, which provides the framework for implementation of the ESMPs, has been developed to align with the requirements of the two relevant international standards:

- ISO 14001:2004: Environmental management systems – requirements with guidance for use; and
- OHSAS 18001:2007: Occupational health and safety management systems – requirements.

In addition, the system has been developed to meet the requirements of an Environmental and Social Management System (ESMS) defined in International Finance Corporation (IFC) Performance Standard 1 Assessment and management of environmental and social risks and impacts (Ref. 16.1).

The main objective of the HSSE-IMS is to provide a robust framework for meeting the Project's HSSE objectives during the entire Project lifecycle, from development to decommissioning. More specifically, the system has been designed to:

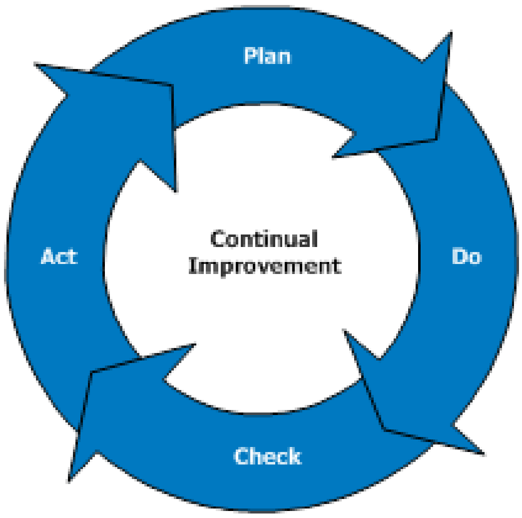
- Manage health, safety, security and environmental issues in an integrated manner;
- Clearly define the interface with other South Stream Transport management systems (e.g. quality assurance, corporate management system);
- Ensure high standards of management;
- Provide a mechanism to ensure that contractors meet South Stream Transport HSSE performance requirements;
- Establish procedures to allow South Stream Transport to monitor its HSSE performance and to report such information to its stakeholders;
- Provide South Stream Transport with a mechanism to meet its HSSE policy and associated corporate social responsibility (CSR) and sustainability goals; and
- Allow South Stream Transport to demonstrate to its stakeholders that it is committed to effective HSSE management through adopting the requirements of the relevant international standards.

The HSSE-IMS covers all persons employed directly and indirectly by South Stream Transport, including contractor and sub-contractor personnel.

The HSSE-IMS draws on the elements of the established business management process, outlined in IFC PS1, of "plan, do, check and act" which provides a methodological approach to managing environmental and social risks and impacts in a structured way on an on-going basis. (Figure 16.5):

- *Plan:* Establish the objectives, and design the processes necessary to achieve those objectives and their associated targets;
- *Do:* Implement the plan and execute the processes;
- *Check:* Monitor implementation (usually through regular monitoring procedures or through audit), and analyse data against targets and requirements. Determine root causes of non-conformity where necessary, and design and implement corrective actions where required in order to achieve objectives and targets; and
- *Act:* Management Review of system performance to determine if policy, objectives and targets have been met, and where necessary to adapt these to reflect changing circumstances. The requirements of the system (e.g. organisational structure, resources and competence) that will enable it to achieve policy, objectives and targets, are also reviewed. The Management Review process concludes on the suitability, adequacy, and effectiveness of the management system, and decisions are made in order to improve the overall system.

Figure 16.5 The Plan-Do-Act-Check Cycle



The following sections provide a brief description of some of the key elements of the HSSE-IMS that are necessary to meet the HSSE objectives listed above and ensure implementation of the ESMPs.

16.5.2 Strategic Objectives and Targets

The approach to setting strategic HSSE goals by senior management is to define:

1. Annual strategic objectives and targets;
2. Performance Indicators (including KPIs); and
3. Injury and other statistics to benchmark performance.

Annual strategic objectives are set by senior management, with associated targets determined at the expert-level as appropriate. The objectives and targets support the CSR Policy and HSSE Policy, and are connected to significant aspects and impacts, and/or risks, related to the Project.

Performance indicators are defined to provide proactive and leading measures of HSSE performance over time. They act as a positive incentive for the delivery of the intended management tasks dictated by the HSSE-IMS to prevent incidents and adverse outcomes, and measure how well the HSSE-IMS is being applied.

A limited subset of the performance indicators related to key HSSE risk areas are selected as KPIs. KPIs are limited in number in order to optimise performance monitoring, analysis and reporting by South Stream Transport and its contractors and to allow senior management to track headline HSSE performance in an effective and efficient manner.

Injury and other safety statistics are used to benchmark Project performance against industry or sector statistics for similar activities, e.g. oil and gas industry, offshore pipeline construction, etc.

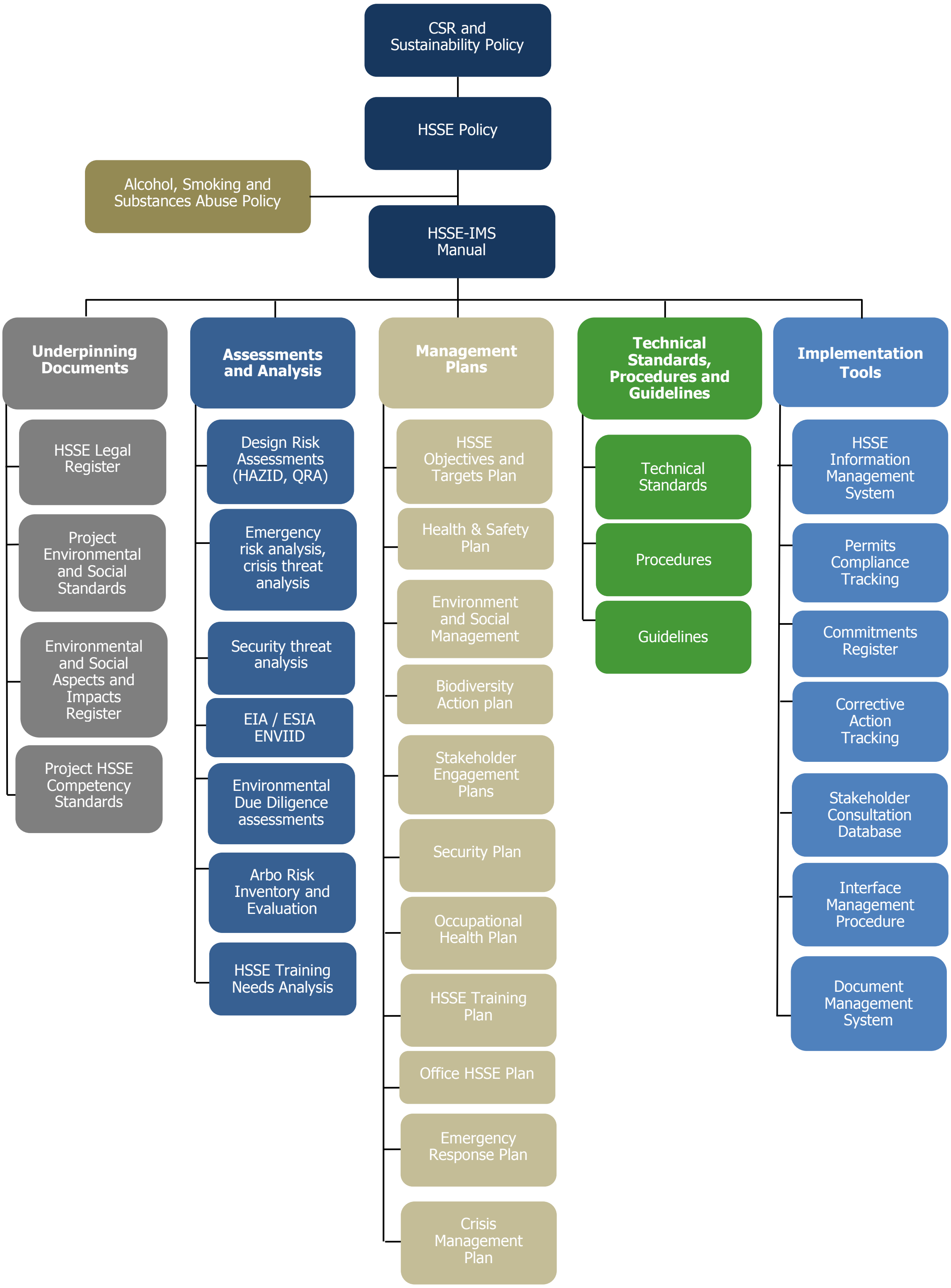
16.5.3 Management System Structure

An overview of the HSSE-IMS document structure is shown in Figure 16.6.

16.5.4 Contract Management

South Stream Transport has developed a Contract Management Procedure. The procedure stipulates that contractors are held responsible as a condition of contract for the compliance of their workers and any subcontractors with the requirements of the HSSE-IMS and other relevant commitments defined in their tender. All contractors are required to provide their workers and subcontractors with the means to ensure compliance, e.g. information, instruction and training, work equipment and personal protective equipment.

Figure 16.6 HSSE-IMS Document Structure



The ESMPs, or relevant parts thereof, will be issued to contractors who will be required to demonstrate how they will comply with the ESMPs through the development of their own contract-specific plans and procedures.

Compliance will be assured through a range of means, including HSSE audits and inspections (pre-contract, pre-mobilisation, and during contract execution).

The contractors will develop an overarching HSSE Plan that describes how the CMP requirements will be met and provide cross-references to more detailed supporting plans prepared by the Contractor, or bridges to existing company or vessel plans and/or procedures. The precise structure of the Contractors HSSE plans and procedures will be decided by the Contractor, however it is envisaged that the Contractor will have its own Management System (equivalent to South Transport's HSSE-IMS). The HSSE-IMS will address the management of environmental and social issues via a 'Contractor's Environmental Management Plan' (equivalent to South Stream Transport's Construction ESMP) which in turn will be underpinned by a number of supporting plans.

Examples of detailed supporting plans, which contractors may develop or bridge to in order to meet the requirements of the CMPs include, but are not limited to:

- Chemicals and Hazardous Substances Management Plan;
- Integrated Waste Management Plan;
- Environmental Monitoring Plan;
- Fuel Delivery, Storage and Handling Plan;
- Emergency Response Plan;
- Spill Prevention and Response Plan;
- Training Plan;
- Unexploded Ordnance (UXO) Clearance Plan; and
- Ballast Water Management Plan

16.5.5 Emergency Response

South Stream Transport will prepare an Emergency Preparedness and Response Plan (EPRP) for the South Stream Offshore Pipeline. South Stream Transport will work with its construction contractors to ensure that South Stream Transport and contractor plans are integrated with regional contingency plans. Emergency Response Plans are discussed in more detail within **Chapter 13 Unplanned Events**.

16.5.6 Management of Change

During the different phases of the Project, there may be a requirement to amend design elements or processes which results in a deviation from that presented in **Chapter 5 Project Description**. Accordingly, South Stream Transport has a management of change process to manage and track any such amendments which includes a screening process to identify potential environmental and social consequences.

Where a change has the potential to result in significant environmental and/or social impact it will be subject to a health, safety, security and environmental evaluation as part of the change management process, including review and revision of:

- Health, safety and environmental hazards and risks;
- Environmental aspects and impacts;
- Environmental and Social Management Plans;
- HSSE risk assessments, including updating of risk registers;
- HSSE mitigation measures and operational controls;
- Competency and training;
- Emergency preparedness and response; and
- Regulatory compliance.

For changes where a significant environmental and social impact is likely to arise, South Stream Transport will inform and consult with relevant parties on the nature of the impact and on proposed mitigation measures, where practical and appropriate.

All design changes will be added to a register of changes, which will summarise the change, the assessment, and the justification for South Stream Transport actions.

16.5.7 Performance Management

16.5.7.1 Audits and Inspections

HSSE performance will be assessed by a number of inspections and audits that are designed to identify positive implementation and also missing elements or non-compliance with the HSSE-IMS. Periodic inspections and audits will include:

- Marine vessel inspections; and
- Internal (South Stream Transport) and external (third party) audits.

This will provide assurance that the requirements of the HSSE-IMS, including the ESMPs, have been met.

16.5.7.2 Corrective Action Procedures

Corrective actions are necessary to address new hazards or changes to hazards, inadequate implementation of control and mitigation measures, and non-compliances or non-conformances with the performance standards and requirements defined for the Project.

Corrective actions are identified from any of:

- Examinations and inspections;

- Environmental and social monitoring;
- Meetings;
- Performance reviews and analysis;
- Observations made by workers or other parties;
- Incidents (and subsequent investigations);
- Near-miss or unsafe conditions;
- Emergency drills and exercises;
- Internal and external audits;
- Management Review of the HSSE-IMS; and
- Other communications.

All corrective actions that are not possible to implement immediately will be managed by a Corrective Action Procedure. The procedure includes a Corrective Action Tracking Register (CATR), through which appropriate corrective and preventative actions are identified, documented, tracked and closed-out.

16.5.8 HSSE Reporting

The format and protocols for HSSE reporting is specified by the HSSE-IMS, which requires periodic internal and external reporting. Reports will be prepared for a range of stakeholders, including Project Lenders, and will range from weekly contractor HSSE report to annual Project HSSE reports (in which the findings of more frequent reports are consolidated). Reports necessary to satisfy applicable law, regulations and permits will also be produced.

Annual Project HSSE reports will provide an annualised summary of HSSE performance against objectives and targets, performance indicators and industry benchmarks, together with supporting information on the implementation of the HSSE-IMS.

16.5.9 Management Review

The HSSE-IMS is subject to an annual review to comprehensively assess HSSE performance and the continued effectiveness and relevance of the HSSE-IMS to the Project and to encourage continual improvement in the management system and HSSE performance overall. The management review is carried out by senior management in consultation with the Project HSSE Manager and based largely on the findings of monitoring, inspections and audits described in Section 16.5.7.

References

Number	Reference
Ref. 16.1	IFC 2012. Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. http://www1.ifc.org. Accessed on 21 January 2013.

Chapter 17: Conclusions

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Tables

17 Conclusions

This chapter summarises the conclusions of the impact assessment undertaken for the Project. It provides a holistic overview of how the Environmental and Social Impact Assessment (ESIA) process was undertaken, how the Project has committed to avoiding, mitigating and managing impacts, and provides a summary of impact assessment conclusions for each technical discipline.

17.1 Meeting ESIA Objectives

In accordance with the Equator Principles and the Organisation for Economic Co-operation and Development (OECD) Common Approaches, the objectives of this ESIA are based on those of International Finance Corporation (IFC) Performance Standard (PS) 1 (Assessment and Management of Environmental and Social Risks) and can be summarised as:

- To identify and evaluate environmental and social risks and impacts of the Project;
- To adopt a mitigation hierarchy to anticipate and avoid, minimise, and, where residual impacts remain, compensate or offset risks and impacts;
- To promote improved environmental and social performance through the use of management systems;
- To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately; and
- To promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

South Stream Transport is committed to implementing Good International Industry Practice (GIIP) in relation to environmental and social performance during all phases of the Project, including the Construction and Pre-Commissioning, Operational and Decommissioning Phases. The Project is being carried out in accordance with applicable standards for international financing.

Chapter 1 Introduction demonstrates how the South Stream Offshore Pipeline will respond to the increased European Union (EU) demand for natural gas by providing an overall export capacity of 63 bcm/year, the bulk of which will be directed to the EU supply network. The South Stream Offshore Pipeline is estimated to account for between 11% to 22% of the gas imported to Europe under the future scenarios presented in the International Energy Agency (IEA) and Wood Mackenzie (WM) reports.

Chapter 2 Policy, Regulatory and Administrative Framework explains how this ESIA process has been undertaken having regard to the following: the OECD Common Approaches, Equator Principles III (EP III) Financial Institutions requirements for a Category A project, the Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Consideration, and the IFC PS and Word Bank Group Environmental Health and Safety (EHS) Guidelines, which underpin the OECD Common Approaches and EP III.

Chapter 3 Impact Assessment Methodology describes the approach taken to the identification and assessment of impacts. Potential impacts to the key receptors were assessed using an impact significance matrix approach that considers the sensitivity of the receptors and the magnitude of the impacts. Impacts due to unplanned events, cumulative and transboundary impacts were also considered.

Impact significance was assessed with and without mitigation and management measures in place. The adoption of design controls and mitigation measures considered the mitigation hierarchy, as specified in IFC PS1 and PS6, which is widely regarded as a best practice approach to managing risks. For the Project, efforts were made to firstly avoid or prevent, then minimise or reduce adverse impacts, which were principally achieved through the application of 'design controls'. The list of design controls was influenced throughout the ESIA process by allowing technical experts within the Project team to feedback results of their initial assessment work to the Project engineers. Minimisation, avoidance, repair and restoration were considered during the application of 'mitigation measures', to avoid adverse effects.

The assessment goes onto present the post-mitigation, or residual impact and its significance, which is predicted to remain after all mitigation and management measures have been adopted. If applicable, any remaining significant residual impacts are then addressed via offsetting or compensation.

Chapter 4 Analysis of Alternatives describes the technically and financially feasible alternatives, which were analysed in the context of the engineering, environmental, socio-economic and cultural heritage constraints identified during the Feasibility and Development Phases of the Project. Due to the fact that the Project is located offshore, the water depth and the physical characteristics of the Black Sea present a challenge for the Project and have influenced a number of key technical decisions. The proposed Pipeline route in the Turkish EEZ was influenced by the selected locations of the landfalls in Russia and Bulgaria and the location of continental slope crossings. No significant engineering or social constraints were identified in the Turkish EEZ and as such direct line routes were initially adopted within the preferred corridor.

Chapter 5 Project Description provides a detailed description of the Project, at the time of writing this ESIA Report, which has formed the basis for the assessment of Project Activities. It describes the physical characteristics of the Project and the activities (e.g. pipe-laying techniques) of the Project which are proposed during the Pre-Commissioning and Commissioning and Operational Phases. It describes the arrangements to ensure safety and safeguard against risks, anticipated labour requirements and hours of working. The design life of the Project is 50 years; the chapter suggests possible decommissioning scenarios which might be appropriate at that time. Finally, the chapter describes how any amendments to Project design elements or processes would be managed to ensure any environmental and social consequences are assessed and outlines arrangements for notifying relevant parties should the conclusions of this ESIA Report materially change, as a result.

This ESIA Report has been prepared taking into consideration the definition of Project Area of Influence provided by IFC PS1. The Project Area of Influence includes those areas likely to be affected by the main Project facilities, and in the case of cumulative impacts, incremental impacts from the Russian and Bulgarian sectors of the South Stream Offshore Pipeline and from any other developments, unrelated to the Project, that will take place within the vicinity of the Project Area and within the Project timescale of implementation.

17.2 Stakeholder Engagement

South Stream Transport is committed to a transparent and respectful dialogue with stakeholders throughout the life of the Project. As part of the ESIA process, stakeholder engagement was and continues to be undertaken to ensure that interested parties are aware and informed of the Project and have an opportunity to provide input regarding potential Project impacts and mitigation measures.

Chapter 6 Stakeholder Engagement describes South Stream Transport's approach to stakeholder engagement, its purpose, and the regulatory context in which it occurs. It provides information about engagement activities undertaken to date for the ESIA process and those that are planned for the future. The chapter also summarises the comments that have been made by stakeholders to date and how these comments have been informed and been addressed in this ESIA Report. A Stakeholder Engagement Plan has been developed and a Grievance Procedure will be implemented by South Stream Transport in partnership with its contractors to ensure that grievances are brought to the attention of the appropriate Project staff and addressed in an appropriate and timely way.

The Project's approach to stakeholder engagement considers both regulatory requirements and principles of GIIP, and seeks to:

- Meet the legal requirements of Turkey for public consultation and disclosure during the EIA process;
- Align with international standards for financing (and GIIP), as related to ESIA, that provide a framework for public consultation and disclosure during the ESIA process; and
- Align with international conventions and protocols relevant to stakeholder engagement for the Project.

17.3 Impact Assessment Conclusions

17.3.1 Overview

After implementation of design controls, management and mitigation measures, the remaining residual environmental and social impacts predicted to arise from the Project have been assessed to be of **Low** significance and, as such, do not require additional mitigation measures. A summary of all residual impacts is given in Table 17.1.

Decommissioning activities are not known at this stage, and consequently, impacts from decommissioning activities have not been assessed in detail. On the assumption that decommissioning would involve the removal of the pipelines form the seabed; impacts are likely to be broadly similar to those associated with the Construction and Pre-Commissioning Phase. If the pipelines are left in situ, potential impacts would be negligible.

Table 17.1 Summary of Residual Impacts

Discipline	Phase	Activity and Receptors	Impact	Residual Impact Significance
Physical and Geophysical	No residual adverse impacts			
Biological	Construction and Pre-Commissioning	Vessel operations, birds	Physical disturbance of animals at sea surface, lighting	Low
Biological	Construction and Pre-Commissioning	Vessel operations, fish	Behavioural changes (noise)	Low
Biological	Construction and Pre-Commissioning	Vessel operations, mammals	Behavioural changes (noise) and collision risk	Low
Socio-Economic	No residual adverse impacts			
Cultural Heritage	Construction and Pre-Commissioning	Pipe-laying and surveys, unknown Cultural Heritage Objects (CHOs)	Damage to previously unidentified CHOs	Low
Ecosystem Services	Construction and Pre-Commissioning	Wild species diversity	Disturbance to species as a result of vessel movements and operations	Low

The following sections provide further detail on the residual impact assessment undertaken for the Project.

17.3.2 Biological Environment

The Black Sea is the world's largest anoxic basin due to the presence of a permanent density gradient (pycnocline) at around 150 to 200 m water depth that limits the vertical exchange of water between surface waters and anoxic deeper waters creating a unique chemical and biological environment. Waters with hypoxic or entirely anoxic conditions are typically incapable of sustaining permanent populations of species dependant on aerobic respiration.

The ESIA process has considered potential impacts to main habitat types (namely microbial communities in the anoxic waters of the abyssal plain and the open sea), and to species grouped according to plankton fish, seabirds, and marine mammals, and including the conservation status of designated areas and species.

Construction and pre-commissioning activities have the greatest potential to impact marine ecological receptors. Residual impacts to benthos are **Not Significant** given the lack of benthic receptors in the Project Area. Most of the impacts to plankton, fish, birds and marine mammals have been reduced to either **Low** significance or **Not Significant** through various Project design controls and mitigation measures, including strict adherence to relevant environmental standards, appropriate technology and comprehensive environmental management.

Potential impacts during the Operational Phase relate to the presence of the pipeline on the seabed directly, as well as disturbance due to inspection and maintenance activities, such as the periodic use of remotely operated vehicles (ROVs). These impacts are all deemed **Not Significant**.

The impacts on cetaceans from underwater noise were initially assessed as of **Moderate** significance after mitigation. However, such significance is not compatible with the definition of '**Moderate'** impacts as applied throughout the Project and therefore expert judgement has been applied, in line with **Chapter 3 Impact Assessment Methodology**. This degree of impact is consistent with the definition of **Low** significance because though changes are detectable, they are very short term (no more than a few days duration on any one receptor) and *"not expected to cause hardship, degradation, or impair the function and value of the resource/receptor"*.

A critical habitat assessment was undertaken in line with IFC PS6[1] guidance. The ESIA Report concluded that the Project Area could be considered Tier 2 critical habitat for endangered species such as Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*) and Black Sea common dolphin (*Delphinus delphis ponticus*). The Project Area also constitutes Tier 2 critical habitat for migratory species such as the Mediterranean shearwater (*Puffinus yelkouan*). It should be noted that the Project Area does not, per se, represent particular habitat that is not replicated elsewhere in the Turkish Black Sea; it is merely part of a wider zone that meets the requisite criteria. The Project will produce a Biodiversity Action Plan (BAP) which will provide the mitigation strategy for identified critical habitats and include relevant stakeholders identified to help achieve net gain.

17.3.3 Socio-Economics

There are no anticipated impacts on fishers and fisheries, shipping or other marine users during the Construction and Pre-Commissioning Phase.

Engagement with fishing cooperatives and unions, as well as government and academic authorities, highlighted the issue of potential impacts to fish and fisheries, particularly with regard to impacts on migratory species of commercial significance such as anchovy. Given the

[1] IFC (2012) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

importance attached to the issue expressed by stakeholders, an additional fisheries study was undertaken as part of the ESIA process.

The Fishing Study has shown that the Turkish fishing fleet, which is mostly comprised of small vessels with limited range, most likely concentrates their fishing efforts in waters relatively close to the Turkish coast and approximately 100 km from the Project Area and that fishing is not known to occur within the Project Area. The fisheries study has also shown that any significant impact on fish migration routes and patterns across the Black Sea is unlikely, including for the key species targeted by Turkish fishing fleet including anchovy.

It is therefore considered that there will be no impacts on commercial fish stocks, on the size of catch or on the fishing effort expended by Turkish fishing vessels. Even considering the potential vulnerability of fishers (including small-scale and artisanal fisheries) who may have low or variable (and unreliable) incomes that may make them susceptible to economic fluctuations, it is unlikely that there will be any discernible change in fishing industry revenues, incomes or livelihoods associated with the fishing industry as a result of the Project.

A review was undertaken on the effects of the construction and operation of the Project, including the associated safety exclusion zone, on potential future oil and gas exploration and development. While the Project Area intersects with TPAO exploration licence blocks, due to the narrow width of the Project Area, there is no expected impact on the feasibility of future oil-and-gas exploration or development activities occurring in the vicinity of the Project Area.

As part of the design process, South Stream Transport has liaised with the TPAO regarding the width of the pipeline corridor so as to reduce any potential impact on future TPAO activities. As a result of these consultations, it is proposed that the pipelines will be laid within a 420 m width corridor, in agreement with the relevant Turkish authorities. Due to the narrow width of the pipeline corridor, there will be no impact on the feasibility of potential oil and gas exploration or development activities occurring in the vicinity of the Project. Therefore, no socio-economic impacts are predicted to arise from the Operational Phase of the Project.

Notwithstanding, management measures will be put in place to help manage stakeholder perceptions and to provide a mechanism for identifying and handling any unexpected issues or impacts. These will include but are not limited to on-going stakeholder engagement, a grievance procedure and a Project Compensation Management Plan.

With regard to Human Rights, the policies, plans and procedures to protect the safety and security of the workforce and Project stakeholders documented in the Health, Safety, Security and Environment Integrated Management System (HSSE-IMS) mean that no significant residual impacts are anticipated.

17.3.4 Cultural Heritage

Impacts on two known cultural heritage objects (CHOs) in the Project Area have been avoided as a result of the Project's design control of avoiding cultural heritage objects (known CHOs by 150 m.

There is the potential for Project activities to impact currently unidentified CHOs in the Project Area. Potential impacts on unknown CHOs during the Construction and Pre-Commissioning

Phase will be mitigated by real-time monitoring of the pipe-laying process, archaeological watching briefs, and careful piloting and management of ROVs. Additionally, a Project specific Chance Find Procedure will be established. These measures will reduce the significance of any potential impacts to **Low**. Due to the mitigation measures applied, no impacts are anticipated during the Operational Phase.

17.3.5 Ecosystem Services

The assessment of ecosystem services has identified no priority services on which the Project is likely to have a significant impact during the Construction and Pre-Commissioning Phase or during the Operational Phase. As such no additional mitigation was identified to be required beyond that set out in other technical chapters (7 to 12). The only priority service for which an assessment was undertaken was 'Wild Species Diversity' relating to the fact that people derive value from interaction with wild species as well as from knowledge of their continued existence. The ESIA Report concluded that any potential impacts are of **Low** significance. However, it is considered that the Project will generate beneficial impacts on *Scientific and Knowledge Values* given the data that has been acquired on CHOs and the Black Sea abyssal plain through Project surveys.

17.3.6 Waste

The assessment has identified the waste streams that are anticipated to be produced during the Construction and Pre-Commissioning Phase and during the Operational Phase, and identified the availability and suitability of existing waste management facilities to manage those wastes in Russia and Bulgaria. Mitigation measures have been recommended in order to minimise the impacts as far as possible, including having waste management elements within the Projects ESMP and contractors waste management plans.

Provided that all of the mitigation measures recommended for waste management are implemented, the overall waste management impacts from the development are expected to be **Low** to **Negligible**, using the methodology set out in the waste chapter of this ESIA Report.

17.3.7 Unplanned Events

Unplanned events are events such as accidents that are not expected to occur during the Project's normal construction and operational phase activities. The environmental and social consequences of an unplanned event, should it occur, can often be significant.

This ESIA Report has followed a systematic approach to identify a number of unplanned events, related to marine accidents and loss of pipeline integrity, with the potential to cause a significant impact. In order to manage unplanned events efforts must be made to minimise the likelihood of an unplanned event occurring in the first instance. The Project has therefore adopted the following approach:

- Use design controls based on GIIP to minimise the likelihood of an incident; and
- Develop response measures in case of an unplanned event.

This ESIA Report details a number of modelling scenarios undertaken to investigate the fate and behaviour of an oil spill that may occur following an unplanned event. The chapters also considered impacts from the accidental introduction of invasive species, maritime collisions and gas leakages. It was concluded that the likelihood of occurrence of such significant events is low. Nevertheless, South Stream Transport will prepare an Emergency Preparedness and Response Plan and will work with its contractors to ensure that the South Stream Transport and contractors plans are integrated with regional contingency plans. These plans will help to enable a rapid response should an unplanned event occur.

In the case of potential introduction of invasive species from vessel operations, the Project will develop measures that would effectively minimise the adverse impacts on potentially impacted marine habitats and associated species. Where relevant and practicable these measures will be based on those identified in the IPIECA (Global Oil and Gas Industry Association for Environmental and Social Issues) document Alien Invasive Species and the Oil and Gas Industry, Guidance for Prevention and Management and the International Maritime Organisation (IMO) Ballast Water Management Convention and Guidelines.

17.3.8 Cumulative Impacts

The assessment of cumulative impacts has regard to recent IFC guidance to determine the potential for the Project's impacts to interact with those of other projects or developments in the vicinity. Only one project was identified as a possible source of cumulative impact; Turkish Petroleum Corporation (TPAO's) proposals for exploration activities in oil and gas license areas through which the Project Area passes.

TPAO's development could potentially involve seismic surveys which have the potential to generate underwater noise. However, full details of the type, equipment and extent of TPAO seismic activities are not known. A cumulative noise impact would only occur in the event that potential TPAO seismic surveys are within sufficient range of the construction spread. In this event, cumulative noise impacts on marine mammals and fish are anticipated to be temporary and localised. Given the wide spatial ranges of mammal species within the Black Sea and their ability of avoid areas of disturbance, the cumulative impact assessment has not identified any adverse cumulative impacts that are considered to be significant and in need of specific mitigation measures, monitoring or management.

17.3.9 Transboundary Impacts

The Project has the potential to cause a number of transboundary impacts during planned activities relating to the propagation of underwater noise, disposal of waste from construction vessels, and disruption to migratory fish species. Further transboundary impacts might also result from unplanned events including the introduction of invasive species to neighbouring countries via ballast water exchange and marine accidents resulting in oil spills that could affect Turkey's neighbouring Black Sea countries.

The transboundary impact assessment discusses each of these in turn and concludes that no significant transboundary impacts are likely from planned activities of the Project. Although, unplanned events (e.g. oil spills) do have the potential to cause transboundary impacts, the risks are considered minimal because of the measures which are in place to reduce the likelihood and consequence of such incidents.

17.4 Environmental and Social Management

As described in **Chapter 16 Environmental and Social Management**, a Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS) will form an important part of the corporate management system for the Project. The potential impacts are markedly different between Project phases. The HSSE-IMS will include phase-specific management plans.

Environmental and Social Management Plans (ESMPs) have been developed to capture design controls, safeguards, mitigation measures and monitoring commitments made within the ESIA Report. Adherence to these plans will be a condition of any Project construction and operation contracts awarded. The South Stream Offshore Pipeline will develop construction and operation ESMPs which will contain a number of activity-specific construction management plans (CMPs) and operational management plans (OMPs). Activity-specific CMPs and OMPs will be designed for identifiable discrete Project Activities (e.g. Vessel and Marine Transport CMP) and will address environmental and social impacts that are likely to occur as a result of the relevant activities.

Each individual ESMP will contain a Management and Mitigation Plan and a Monitoring Programme. In addition, South Stream Transport is developing a detailed overarching Environmental and Social Monitoring Programme for the South Stream Offshore Pipeline which will detail all monitoring requirements applicable to the South Stream Offshore Pipeline.

17.5 Summary

Assuming that the mitigation measures identified in this ESIA Report are successfully implemented, it will be possible to mitigate all of the identified adverse impacts associated with the Project to the degree that the residual impacts would be classed as being either **Not Significant** or of **Low** significance.

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